Wise Traditions

IN FOOD, FARMING AND THE HEALING ARTS

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President's Message

In this issue, the indefatigable researcher Sylvia Onusic, PhD, tackles the subject of infant formula. There can be no greater condemnation of modern "science" than what "scientists" have come up with for feeding babies during that period in life when the diet most determines the child's future—health, intelligence, coordination, attractiveness and form. Of course, we know that most of the decisions as to what to put in infant formula are determined by price. To create a baby formula that even comes close to mother's milk would be prohibitively expensive.

High-temperature dried nonfat milk or whey protein; vegetable oils from soy, safflower, sunflower (and sometimes coconut); sugar, polydextrose, maltodextrin, corn syrup, organic brown rice syrup (and sometimes lactose); synthetic vitamins and inorganic forms of minerals—this is what scientists think proper for nourishing the infant. Not one formula contains butterfat with its variety of saturated fatty acids, and all are very low or completely lacking in cholesterol. Synthetic folic acid and synthetic vitamin A in infant formulas are especially problematic. The proteins are highly damaged, the oils rancid, and the sugars inappropriate. Then to top it off, formula makers add indigestible carrageenan and critical fatty acids made from algae.

How can we expect anything but a decline in Western civilization from the continued use of such concoctions—especially generation after generation? Actually, there will not be many generations left if we continue on this path. Is there any doubt that the epidemic of health problems we are seeing in our children—everything from learning difficulties to cancer—are due in part to the use of commercial formula?

Fortunately, many women do choose to breast feed and those who cannot are using our homemade whole-foods formula based on whole raw milk. Hopefully this article will encourage more moms to just say no to this quintessential industrial food-like substance.

It's hard to believe, but our 16th annual conference is just around the corner. Registrations for Wise Traditions 2015 are way ahead of last year, and exhibitor registrations as well, so if you are planning to attend or exhibit, don't wait to sign up. We have a wonderful line-up of speakers this year, and of course delicious food that demonstrates all our dietary principles. We look forward to seeing many of you there!

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CALLOUS DISREGARD

I am alarmed by the callous disregard shown by some in the media and the general public toward parents who choose to opt out of vaccines. A few years ago, on behalf of the Weston A. Price Foundation, I attended a Canary Party conference and met numerous parents of vaccine-injured children. It was very eye opening. Compelling evidence was presented at the conference of the link between vaccine injury and the onset of autism by Mark Blaxill and Dan Olmsted, the authors of *The Age of Autism*. These two researchers, one whose child is autistic, have also discovered the role that pesticides are playing in the ill health of our nation's children (see ageofautism.com).

My husband and I have no children. Yet meeting these parents who saw their children literally descend into autism after receiving their shots put me firmly in the camp of the vaccine-wary. I support wholeheartedly any parent's or adult's decision to shun vaccines and seek other ways to build immunity. Some may choose to slow down the vaccine schedule or be more selective among vaccine choices. We must respect the patient's wishes.

I have since learned that even some adult vaccines have toxins and dangerous ingredients like mercury, and I will read the package inserts in the future. The derision of "anti-vaxxers" shows incredible insensitivity on the part of those hurling the insults. Many such parents have already experienced an adverse reaction to shots and have good reason to resist further harm.

We are a nation where a baby who falls into a well creates a national uproar and garners our collective kindness until the child is rescued and safe. Yet, in the case of vaccines, we are saddling some families with unbelievable sorrows for the "greater good," and then insulting anyone smart enough not to blindly submit.

Kimberly Hartke, Publicist
The Weston A. Price Foundation
Reston, Virginia

BRILLIANT ISSUE

This latest issue of *Wise Traditions* was even more brilliant than usual. No one is speaking about the vaccine issue in the way that WAPF is. Dr. Malcolm Kendrick noted in his latest book, *Doctoring Data*, there are two topics that no one dares talk about. One is the idea that vaccines may harm and the other is that HIV may not lead to AIDS.

Are there any plans to put some of the information on open view so that I can tweet it/send people there? If not, please, would it be possible to buy additional back issues as I would like to send Malcolm one and also a TV producer I know who is interested in the vaccine taboo?

Zoe Harcombe
Gwent, UK

All the articles from the vaccine issue are now posted at westonaprice.org/vaccinations/, along with a great video on vaccination dangers. Copies of the vaccination issue can be ordered from our Order Page, or by calling (202) 363-4395.

PARENS PATRAE?

The Summer 2015 article on *parens patriae* is the first article to appear in *Wise Traditions* that is not a credit to the WAPF.

I first encountered the strawman theory about twenty years ago in conjunction with the redemption movement. It has no legal standing and cannot possibly serve the best interests of parents seeking to protect their children from vaccinations. The idea of serving a vaccination notice on a school administrator requiring they assume liability for injury or illness arising from vaccination is interesting, but perhaps pointless. No school employee or any public official would be allowed to sign such a notice. Birth certificates are not a device of conspiracy.

The point that public health departments, the CDC, and the state are all corporations is an element of legal theory which differentiates between natural persons (human beings) and corporate (or juridical) persons (organizations). This distinction is a part of common law that is now found in virtually every legal system. The distinction has no relevance to parental refusal to vaccinate.

The article claims that "vaccine requestors intentionally withhold the vaccine package insert thus denying . . . real information about the health risks." This seems to imply such a package insert would be accurate and that a parent would be able to refuse vaccination based on the documented risk. Both are unlikely. The whole point of *parens patriae* is that the state can decide that

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the actual risk of vaccination to the individual is outweighed by the imagined risk of non-vaccination to the state. This is the only useful message in the entire article.

Ultimately, the article is a mishmash of theories presented as facts and facts presented as conspiracies. I find no logical argument. My thumb is *down*.

Susan J. Dorey
Sonoma, California

PARENS PATRIAE RESPONSE

Thanks for sharing the really important information we put together about *parens patriae* with your readers (Summer 2015). It is time we take a close look at vaccine mandates and requirements and question the authority of the state to force these toxic substances on us and/or our sons and daughters.

Regarding the above letter, I must say that I disagree. I have no clue what information the responder received twenty years ago about the strawman.We've posted nothing about the "redemption movement," nor do we promote it. Those who wish to research the history of the creation of the strawman, can read *Proof That There is a Strawman* (anticorruptionsociety.files.wordpress.com/2015/07/strawman.pdf). They can also read attorney Melvin Stamper's book *Fruit from a Poisonous Tree* or read *The UCC and You*. (anticorruptionsociety.files.wordpress.com/2015/06/ucc-and-you.pdf).

I personally recommend the fabulous documentary, Strawman: The Nature of the Cage (2015) (youtube.com/watch?v=7sArXw6ajNg).

The Vaccination Notice (information about the notice can be viewed here: parentsagainstmandatoryvaccinesdotnet.wordpress.com/the-vaccination-notice/) does not require (nor request) a signature. It is merely a notice from the mother or father to the school district. It essentially represents conditional compliance and notifies the school's attorney that neither the mother nor the father is consenting to accept the liability for harm or injury to their progeny the vaccine might cause. No institution can force any man or woman to accept the liability for an unwarranted pharmaceutical product.

As for birth certificates, who said anything about conspiracy? Birth certificates are created by and owned by the state. The birth certificate is the state's possession, our sons and daughters are not. See *Who owns our children* (parentsagainstmandatoryvaccinesdotnet.wordpress.com/2015/07/30/who-owns-our-children/).

Regarding the premise that the law distinguishes between persons and corporations, this is an element of commercial (UCC) law, not common law. It is true that the Uniform Commercial Code has constituted all our state laws since the 1960s.

The state of California's SB 277 (regarding the discontinuance of vaccination exemptions) says verbatim: "Existing law prohibits the governing authority of a school or other institution from unconditionally admitting any person as a pupil . . ." The state of California's statutory code defines "person": "Person" includes any person, firm, association, organization, partnership, limited liability company, business trust, corporation, or company." See for yourself: leginfo.ca.gov/cgi-bin/displaycode?section=gov&group=00001-

DIETARY DILEMMAS: VEGETARIAN CHILDREN

Calling all parents and health practitioners! We are interested in your experiences with children raised vegetarian or vegan.

There are countless stories from former vegetarians who suffered from their dietary choices as adults. But what about children? What are the consequences when children from a young age are raised vegetarians by loving parents who only want the best for them? And what about the surprising numbers of sensitive and caring children and teenagers now choosing vegetarianism on their own?

Many parents have attained vastly improved health for their families after switching to traditional diets with nutrient-rich animal foods. And many wish they had discovered this ancestral wisdom sooner, after witnessing their children struggle with health issues on a vegetarian diet. Dentists and doctors, informed by the research of Weston Price, are also seeing unfortunate developmental consequences in their younger vegetarian patients.

We want to gather your stories to help parents better navigate these dietary dilemmas and to expand public awareness about what's truly necessary for our children's optimal development. If you have experiences to share please contact Marie Bishop at kidsthriving@gmail.com for more information.

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01000&file=1-26).

The distinction has everything to do with mothers and fathers complying with vaccine mandates. Hopefully everyone can see that rules for non-living legal constructs (fictions) cannot be applied to living humans . . . unless we are fooled into consenting. Surely it is obvious that small boys and girls are not the same as a "firm, association, organization, partnership, limited liability company, business trust, corporation, or company."

This practice goes on across the country on a daily basis, according to my husband, a retired family practitioner. The refusal to vaccinate form now being deployed is more evidence that mothers and fathers are intentionally being deceived. See: parentsagainstmandatoryvaccinesdotnet.wordpress.com/2015/08/18/do-not-sign-the-refusal-to-vaccinate-form/.

Without the package insert the mother, father or employee is forced to rely on the CDC information sheet, which is nothing more than a sales pitch. Without the package insert there is no informed consent and the mother, father or employee is presumed to have consented and to have been willing to accept the liability. Therefore his or her objection must be stated in writing—for the record—to nullify this presumption. Again, unless you "refuse the liability" it is "presumed that you accept it."

What is the legal definition of "individual"—individual what? The state is merely a corporate construct (like the "person") and as such has no authority to require men, women and their progeny to do anything . . . without their consent, which we are tricked into giving. The notice is designed to put our denial of consent in writing—for the record. Without it our consent is presumed.

The author of this letter is entitled to her uninformed opinion. The bottom line: mandatory vaccination statutes only apply to legal fictions, not to flesh and blood men and women and their sons and daughters . . . unless we consent!

AL Whitney, Editor and Founder
Parents Against Mandatory Vaccines

JUST A LITTLE PINCH

I am a member and respect your organization. I have a seven-month-old daughter, and my husband and I are not giving her any vaccinations. I received a postcard from Blue Cross Blue Shield of Rhode Island (where we live) that disturbed me. I wanted to see if you knew that they send these notices to parents. The language it used was clearly misleading and targeted at parents with little education or understanding of the risks involved with vaccines.

It read: "It may be time for your child's next checkup. At this checkup (called a well visit), your baby will receive important shots called vaccinations. These vaccinations are *just a little pinch*—and they can help protect your baby from serious diseases. Children need to get these shots at certain ages for the vaccines to work best. Talk to your child's doctor to make sure your baby receives all his or her shots" (italics added).

Can we do something about this? Parents should be receiving something much less biased! And without manipulation and fear tactics involved. Thank you for all the work you do,

Kate Roberts
North Kingstown, Rhode Island

ONE FAMILY'S EXPERIENCE

I would like to write about my family's experience with vaccination. The story begins in 1931. My grandparents had six children, born between 1925 and 1937. During a vaccination drive in 1931 my grandmother voiced concern, because my aunt, then three years old, had a bad cold. Up to that point she was a normal beautiful young girl. The doctor dismissed my grandmother's concern and vaccinated anyway.

The very next day my aunt started clenching her right arm to her chest, the vaccinated one. She would hold it close to her chest until her death at age seventy-eight. Unfortunately that was not all. She soon started favoring her leg on that side as well. My grandparents were very concerned. They took her to the doctor who had vaccinated her who immediately told them it had nothing to do with the vaccination and it would probably pass.

Alas, my poor aunt became a hemiplegic, with her right side crippled. She never had full use of her hand, she needed special shoes, and unfortunately she was brain damaged as well. She could never learn to read or write or tell time.

No doctor could help her. My grandparents looked after her and after they passed, my parents took on the task of caring for her. To this day I'm still appalled how harm is done with impunity and without remorse.

I'm more appalled that my parents allowed us to be vaccinated, since I unfortunately became encephalitic after a vaccination and am very lucky to have recovered, due to my grandfather's quick reaction when I uncharacteristically lay down in the middle of the day and

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started rolling my eyes to the back of my head.

I´m still appalled at myself for getting vaccinated for tetanus as an adult, only because my doctor suggested it. That was thirteen years ago. No more vaccinations for me and mine. They are far too dangerous, and if you´re one of the unlucky ones to suffer serious side effects all the burden is on you and yours, for life. And it can be a very long life. The responsible party has impunity and no remorse.

Anita Reusch, chapter leader
Eifel, Germany

VITAMIN D LEVELS

I wanted to respond to people not having their serum vitamin D raised by fermented cod liver oil. A blog post suggests that this may be due to a fat absorption issue.

According to the blog, "I can say the same for myself and my husband—low D levels, even though we were also taking 5000 IUs of vitamin D along with the fermented cod liver oil. This caused me to question, was it the FCLO-vitamin D, or was it my body's inability to absorb it? So I added bile salts to help emulsify the fat to absorb better. Tested again in six months and my husband's D went from nineteen to forty-nine and mine went from thirty-three to eighty-three."

It seems like a general rule for many deficiency diseases like tooth decay and gum disease that before the body really starts breaking down, the person loses his ability to digest and metabolize food well. Think also of Dr. Kelly's cancer treatments that use enzymes. Another example is that one historical gum disease remedy was thyroid glandular supplement and ox bile. Rami Nagiel

Montpelier, Vermont

TETANUS QUANDRY

Many people ask about whether they should get the tetanus vaccine. First, I never tell people what to do, I just give them the facts. Tetanus has been declining for a century—this is most likely due to improved wound cleaning. Tetanus spores are found mostly in manure but also in soil and dust. Interestingly, one can become immune to tetanus by eating the spores. If one gets a tetanus spore in a wound, it can only multiply if it has no air, which is why folks always think of puncture wounds. But if the wound is not dirty, there is extremely low risk of exposure. So as long as a wound bleeds and cleans itself out, or a person cleans the wound themselves, the spores cannot multiply. Also, as long as the wound has oxygen from exposure to the air or to the blood flowing, the spore cannot multiply. Most cases of tetanus and most fatalities are in people over sixty-five. It is extremely rare in children in the developed world. In the developing world, tetanus is a bigger issue because of unsanitary birth conditions such as using a dirty knife or scissors to cut the umbilical cord.

This is from National Vaccine Information Center's website (nvic.org):

- As of August 2012, there had been over twenty-two thousand adverse events in children and adults reported to the Vaccine Adverse Events Reporting System (VAERS) following tetanus or tetanus-containing vaccines combined with diphtheria vaccine (TT, TD, DT) and sixty-seven deaths.
- Reported tetanus vaccine adverse events include redness, swelling and pain at the injection site; headache; fatigue, sore and swollen joints; muscle weakness; fever; chills; nausea; shock; neuropathy; convulsions; encephalopathy; paralysis; Guillain-Barre Syndrome (GBS); death.
- A review of the medical literature by the Institute of Medicine concluded that there is a causal relationship between tetanus toxoid and both brachial neuritis and Guillain-Barre Syndrome (GBS).

With respect to the vaccine and its effectiveness, there have been many cases of folks getting tetanus despite being current on the vaccine. In World War II the U.S. military had mandatory tetanus toxoid vaccines but there were still cases of tetanus. In more recent years, there have been many cases of tetanus in fully vaccinated individuals with very high levels of antibodies which supposedly means they are immune. Also, it is clear that the reason for low levels of tetanus today are not due to the vaccine. In the U.S., during that period only about 60 percent of kids were vaccinated, but the incidence of tetanus continued to decline as it had been for decades before the vaccine.

Leslie Manookian, Ketchum, Idaho, greatergoodmovie.org

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Rami is the author of Cure Tooth Decay *and* Cure Gum Disease *(reviewed on page 86).*

NIGHTSHADE INTOLERANCE

I have recently turned forty. Since my late teens I have experienced almost daily headaches, mental fogginess, fatigue, back and neck pain, muscle soreness, joint stiffness, and joint cracking. I have generally put it down to back trouble, as it seems that when my back and neck are sore, I get headaches. Some days it's bad and some days not so bad, but some days it becomes absolutely debilitating. As a result, I have tried virtually everything there is to remedy this—chiro, osteo, physio, Chinese medicine, massage, acupuncture, cupping, Bowen therapy, naturopathy, micro-current therapy, strength training, yoga—the list goes on. I knew that I couldn't take painkillers all the time, and so generally limited myself to no more than three per week.

In 2014 I decided to focus on diet. I started with keeping a food-and-symptom diary, which narrowed down a list of foods that seemed to exacerbate my symptoms twenty-four to forty-eight hours later. I did a complete water fast for five days and then a strict reintroduction diet (mostly focussing on food allergies as I had never really considered, or heard of, nightshades). I eventually short-listed a number of foods that seemed to be the culprits—tomato, chili, capsicum, paprika, egg plant (aubergine), potato, chocolate, coffee. For eighteen months I stayed off these foods and my symptoms mostly went away—never fully, but enough that it completely changed my life. Sometimes though my love of chili won over my desire to be headache-free, and I'd give it a go. The headache came straight back.

So, research showed me that I had a nightshade intolerance. That seemed to be the answer that most fit the situation, but I wasn't content with that. I had formerly been a big eater of the foods in this family, and I missed them a lot. I couldn't accept the premise that there was just "no reason" for me being intolerant of these foods, so I kept digging. Eventually I stumbled across Garrett Smith's article for WAPF on nightshades and, after having read about his "experiment," I decided to try it on myself.

So it seems that solanine (alkaloid) is in the same family of chemicals as nicotine (I haven't smoked since I was a teenager—it used to make me sick), theobromine (a chemical in chocolate known to trigger headaches in some people), and caffeine (also known to trigger headaches).

I had already gotten rid of my headaches by staying off the alkaloid-containing foods, but by taking vitamin K, I found that I can eat nightshades without any problem. I am theorizing at this point that there is a relationship between consumption of alkaloids, low vitamin K levels (causing excessive serum calcium), and calcification of the soft tissue (thereby causing pain in the muscles and joints). I have always spent a lot of time outdoors in the sun, and my vitamin D levels have always been in the healthy range. I have also always been a big consumer of dairy and leafy greens, and therefore have tested with normal calcium levels.

My assumption at this stage is that the calcium gets out of the bowel and into the blood (with adequate D), but cannot get from the blood to the bones (due to low vitamin K) and therefore accumulates in the soft tissues. Since adding vitamin K supplements (MK-7) I find that I can eat alkaloids without any issues. I still have an underlying muscular stiffness, but my theory is that somehow I need to get the excess calcium "out" of my muscles and back into my blood, so that it can be absorbed into my bones. I am planning on getting a massage (hey, it can't hurt, right?), and dosing up on the vitamin K before and after to accelerate the calcium reabsorption into my bones, and hopefully keep it out of my soft tissue.

Ross Cameron
Melbourne, Australia

ECZEMA CURED

When my fourth child was two months old, he was plagued with severe eczema from head to toe. He spent two hours every night scratching. I had to pin him to my body to get him to stop scratching and go back to sleep. We tried everything you can imagine until we reluctantly put him on Zyrtec twice a day and steroid cream. The eczema was subdued for sure, but as soon as I did not put on the cream, or give him his meds, it flared.

It was not until my friend Kristin Canty said I should get him on raw milk that he got relief. We also gave him fermented cod liver oil and high-vitamin butter oil, and within months he was completely cured. He is almost nine years old now and not only living without eczema but also without the asthma and allergies that most of the docs told me he would have, as they run hand in hand with eczema.

Our entire family of five kids and

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two adults has been on raw milk and FCLO/HVBO pretty consistently for the past eight years, depending on the season. We tend to cut back when the sun is nice and strong and kids are outside.

I credit the Weston A. Price Foundation for changing the way we think about food and the health of our family. I feel blessed to have learned about such an organization, one constantly seeking to empower people to take control of their own health, support the farmers doing things right and prepare traditional foods that have been supporting thriving communities across the globe for thousands of years.

Hilary Boynton
Venice, California

GLARING OMISSION

We love the quarterly journal and very much look forward to reading it from cover to cover as soon as we receive it. They are such a wealth of great information, and we keep them as part of our health library.

While I always enjoy reading Sylvia Onusic's articles, I have to make a comment about her article, "Great Pioneers in Nutrition in the Twentieth Century." I thought the omission of Dr. Royal Lee was an incredibly glaring omission! Dr. Lee and Dr. Price were basically colleagues (both dentists) and knew and supported each other's work. Dr. Lee was a genius and prolific inventor and nutritional pioneer. Anyone who loves his Vitamix machine can be thankful to him, because he invented the variable speed motor that powers them (one of just many inventions we benefit from today).

Like Dr. Price, Dr. Lee believed that good nutrition was the key to good health. He discovered protomorphogens and cytosol extracts. He "named" autoimmunity (didn't call it that, but described it in its current definition) before it was formally recognized; for that he was written off as a quack. Dr. Lee endured horrific persecution at the hands of the FDA and other federal agencies. He was so far ahead of his time and like Dr. Price, his work is consistently validated with modern science.

He died in his late seventies and most believe he basically died of a broken heart from having to endure the ongoing stress of defending his work. I believe his wife, however, lived to be one hundred four. I realize he founded Standard Process and WAPF does not want to promote specific products, but he did so much more than that and his legacy is more than worthy of a big mention in an article such as this.

Julie Martin, RN, BSN, ACN
Henderson, Nevada

Thank you for taking us to task. We will put an article on Dr. Lee on our list for a future issue of Wise Traditions.

GMOs IN SOUTH AFRICA

I have been most involved with protests against GMO technologies and Monsanto in the last month or two here in Cape Town, South Africa.

Africa and South Africa are being targeted by these bio-tech companies as they are selling the people the fraudulent premise that they alone can feed Africa.

Fortunately, various influential people, including the South African Natural Health Alliance and the Traditional Healers Organization, who hold much sway amongst our government and black communities, have recently realized the dangers of GMO and are getting involved in our protests.

A new group to lead the struggle toward proper food sovereignty is now being formed here. . . and because of the speech I delivered at the protest many people are wanting me to take the lead as chairperson.

I know this is an international struggle and the WAPF are leaders in this. I want to know if it is possible to link with organizations like WAPF, the Farm-to-Consumer Legal Defense Fund, and Dr. Mercola, and if you all might offer us support in any way. You all have the experience and the know-how when it comes to this struggle. Your counsel could be invaluable to our African struggle and I feel there is no need to re-invent the wheel.

Pierre Morton
Cape Town, South Africa

FEEDLOT FILTH

My husband and I just returned from Santa Fe, New Mexico. We live in the Dallas-Ft. Worth area and drove to our destination. We have traveled this route many times previously but there is one section that has become progressively more difficult to travel through—Wilderado, Texas, home to the largest feedlot I have ever seen. The stench from the lot is experienced well in advance of seeing it, probably by at least a couple of miles.

The question that continues to run through my mind is how in the world can this possibly be legal? These animals are clearly standing on top of each other and in their feces and appear to be coated in it as well. Not a stitch of grass to be seen anywhere. I can't shake the visual or stop wondering how awful this must

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be for the animals.

I am struggling with what I can possibly do to have a positive impact. I am not sure where to start or what to do, so for now I am just communicating my experience and thoughts. If you have any suggestions for what action I may be able to take I am all ears.

Karen McFarland, NTP
Mansfield, Texas

EARTHING FOR EMR SENSITIVITY

I was inspired to write after reading "How Dangerous and Expensive Became 'Smart': an Exposé of the 'Smart Grid'" by Amy Worthington (Winter 2014). The story of the disastrous impact on Sandi Aders and her husband prompted me to offer some information that may help. A story of a man who developed debilitating sensitivity to EMR and how he recovered is included in a book called *Earthing: The most important health discovery ever!* by Clinton Ober, Stephen T. Sinatra, MD, and Martin Zucker. You can buy this book from barefoothealing.com.au and there are sure to be U.S. websites for this great stuff too. There is also plenty about protecting yourself from EMR by "earthing" on YouTube by David Wolfe and others.

Rebecca South
Darkan, Australia

OLD STYLE MEAT

This story goes back more than thirty-five years, to the dark ages before the Internet and online courses, when college students physically attended classes. My meat science instructor and the animal science instructors used to speak of the decrease in hang time for the meats so as to get them more quickly to the cutting room and out the door, cutting down on overhead. The instructors said some items were better when fresh, like liver. They compared the hang time of some old-style markets in the delivery of meats to the masses then and now. Faster was great for getting fresh meat to the table, but almost every one of the instructors talked about aging their own beef for twenty-one to thirty-six days. Some even hung it old style and let it get good and green before taking some of the cuts off beef, elk and bison. (Deer, sheep, and goats were not hung to age as long.) One of our professors liked his rabbits to age a week or so in the refrigerator before he consumed them. The poultry specialist talked of hanging the pheasants, turkeys, quail, and chicken so that they were consumed not only fresh but also aged.

Some of our instructors liked the old hens because they had more flavor. One teacher said chicken soup made from an older, aged chicken is better than a fresh young bird.

Two old professors from the poultry sciences departments made important discoveries showing that small things matter in feeds and feeding. They said people should eat not just young tender meat, but old aged meat as well. They were concerned because people had stopped eating old chewy meats after World War II, and because meat is no longer allowed to hang and age. They said some of the best meat was going into dog food: livers, pancreases, thalamus glands, hearts, kidneys, and meat of older animals. Older livestock have more connective tissue and more gristle, which are harder to chew and must be cooked so as to release the bonds and get the most out of the foods.

Therefore in our family we have tried to raise or purchase grass-fed meat with the option of eating corn, oats and or barley to finish—and nuts to finish the pork if we can find a source of shells and nut culls.

We always had stew cows that we canned or fermented, even ground into other batches of meats to add full flavor. This old meat gave flavor. The age of cattle going to market is no longer three to six years old, but twenty-two to thirty months. They allow lambs to get older by two to three months but two- to three-year-old wethers are tasty when cooked properly. Stew pots of old hens as well as cull roosters were once welcome sights to our home cooks.

Now the average cook has no idea what to do with a whole chicken, let alone an old tough bird.

My husband's family came over only two generations ago from Portugal and the other side were from the southern Gulf states. Each of his grandparents cooked ducks, geese, and pheasants along with goats, deer, and other wildlife to stretch the beef or fresh chicken. We have largely lost access to meats allowed to hang for more than a few days or under gasses that make the meat relax quickly, or injected with sugar and salt to give the meat flavor. I think your research has not been on the age of the animal used or the length of time left to hang beyond corning the beef or special sausages. Dry aged at times is also a missing part of the healthy diet.

Robin Machado, BS, OSU
Lebanon, Oregon

FREE DEER BONES

I would like to share with you information on the free deer bones that can

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be used to make bone broth. I happened to learn about this bounty in 2014, and have made numerous delicious batches of deer bone broth that I have frozen. My family continues to enjoy the broth each day and we are immensely grateful for this resource.

Here is what I have learned: many hunters bring their kills to processing shops to be butchered. Only the meat is prized, so bones are routinely thrown away. I befriended several deer processors near where I live and asked for the bones before they go to the dumpster. To find locations and names of deer processors, I searched the web for the Department of Natural Resources and Environment Control - DNREC (different states might have different names).

In Delaware, there is a program called "Hunters Feed the Hungry" that the DNREC coordinates. Hunters who want to donate their harvest bring it to a deer processor to be butchered. The meat is packaged and donated to the needy. A non-profit, nationwide program exists called "Farmers, Hunters, Feed the Hungry," whose mission is also to feed the hungry. On their website (fhfh.org), many chapters are listed under each state. I think one can find deer bones through either of these programs.

Practically all bones are tossed out. I have brought home huge bags of legs, ribs, heads, necks and feet. It was through WAPF that I have learned to appreciate all parts of the animal.

Different processing shops have different butchering procedures. At my favorite place, the processor skins the animal; the head is cut off and tossed out. I wanted the head, so I paid him a nominal fee to skin the head for me. So far I have cooked the whole head as is. Someday I will figure out how to get to the brain so I can cook it separately! The feet are also cut off at the ankle, with the cute little hooves still attached. I also paid a nominal fee to have the feet skinned. The neck is full of meat and bones, but it's also targeted for the dumpster. I took the neck and made mock osso buco with it. The neck gave me an esophagus and trachea. Thus, with several trachea, I made trachea broth. Why not? Dr. Prudden cured many illnesses with bovine tracheal cartilage supplement.

I have brought the deer bones to an organization that feeds the homeless. Some of the staff understood the value of bones, but others outright refused to accept them. I am now looking for other ways to bring this nutritious food to the hungry. I am thinking of getting the bones to food banks that have a freezer to store bones.

The deer hunting season is from early September through January. My deer processing friend told me that at the beginning of the hunting season an average of six to seven deer come to his shop each day. I would love to see this resource nourish us rather than go to waste.

Minh-Nhat Tran
Wilmington, Delaware

LARD AND LONG LIFE

Greetings from Bogota where I am visiting relatives. Many people here have told me their grandpas lived to be one hundred and ate lard and other fatty animal products. But here in Bogota with a population of around eight million it is almost impossible to find lard in the markets. Very few people use it these days. Grocery stores look like stores in the U.S., with lots of processed foods made in Colombia or imported from the USA. Coconut oil is very rare, but I finally found a place that sells 450 grams for a whopping twenty-five dollars, yet there are many coconut palms all over Colombia.

Raw milk is gaining a few adepts north of Bogota where the dairy industry thrives. Small farms are selling small amounts of raw milk to peasants and a few city people who know its value. Here in Colombia most beef is pasture-fed so I take advantage of it.

In the Amazon nowadays many Indians are fat, eating modern oils instead of animal fats from tapirs, monkeys, etc. They also eat lots of rice, potatoes, yucca and pasta.

My grandpa died at one hundred four, eating twelve eggs a day and butter and lard. Today, Colombians shy away from fatty meats, yet they consume canola, corn, soy and many vegetable oils. Obesity and heart problems are going through the roof all over Latin America, and Mexico has surpassed the U.S. as the fattest country on earth. Doctors here in Colombia are as useless as conventional doctors in the U.S. They only know how to give prescription drugs.

I would love to see a meeting like the ones you have done in Europe here in Colombia someday. WAPF should go global and mainstream to complete Weston's dream.

Andres Jara
Bogota, Colombia

VINEGAR FOR CHICKENS AND COWS

I want to share the information I got out of an awesome little book called *Folk*

Letters

Medicine by Dr. D.C. Jarvis, which talks about his experiments with chickens on vinegar and milk cows on vinegar. I put my chickens on apple cider vinegar plus water and they grew really fast and got strong and feathered out well. They were less sensitive to the cold because they feathered out faster. They were laying by the time they were six months old. None of the other cages were even close to the maturity of my hens.

I have saved several hens and roosters by putting them on straight five percent apple cider vinegar. I had a rooster that got down. I secluded him and put him on straight five percent vinegar, even putting it down his throat with a medicine dropper. He came back very strong, ornery as ever.

Dr. Jarvis said that dairy cows would have little incidence of mastitis or milk fever if they are given vinegar every day. So when I got my cow, I immediately started giving her vinegar on her hay and feed. I'm going through a gallon of vinegar about every two days, but her milk is so sweet! And she had her calf very easily— carried him to full term and he was on his feet so quick and running and jumping. She never had a hint of milk fever or mastitis.

Anita Leonard
Meadville, Mississippi

DONKEY MILK

I would like to be added to your list of suppliers of donkey milk in the United States. We discovered donkey milk when we were battling our daughter's autoimmune disease, PANDAS. She got strep throat and her immune system attacked her brain. Overnight, we "lost" her to this awful disease. It wasn't until she started drinking donkey milk, months after the onset of the illness, that she said "I love you, Daddy" for the first time.

We have just started our herd of mammoth donkeys, and two are due to foal any day. We should have enough milk to sell as well as provide our daughter with what she needs to stay healthy, and hope to increase our herd. You can read our story with donkey milk for PANDAS autoimmune disease here: buttercupfarm.wordpress.com.

Thanks so much for your amazing website. We love our raw milk!

Saundra Traywick
Midwest City, Oklahoma

BONE BROTH FOR PETS

I was a trauma and couple therapist in private practice for over a decade and have in recent years become a career counselor specializing in people under thirty.

I know that what you are saying about real food and the wisdom of older

WAPF on the WEB

WEBSITE: Thank you for visiting our website and online ordering page! Please be sure to log in to order, renew or donate online. All the articles are free for anyone to read. We invite you to search all the tabs for volumes of information and ask that you tell others about our site: westonaprice.org.

TWITTER and FACEBOOK: twitter.com/WestonAPrice, facebook.com/westonaprice We have a Spanish language page, too: facebook.com/westonaprice.espanol We also have several campaigns, facebook.com/findrawmilk, facebook.com/nopinkslimeburger and facebook.com/soyalert, plus facebook.com/RedMeat4Health. Facebook is a wonderful outreach tool. Please be sensitive to newbies!

YOUTUBE & Flickr: youtube.com/TheWestonAPrice, flickr.com/photos/westonaprice

BLIP TV: westonaprice.blip.tv These are longer format videos such as our press conference on the USDA Dietary Guidelines and Farmageddon panel discussions.

BLOGS: See blogs by Chris Masterjohn, PhD at westonaprice.org/blogs. And check out our realmilk.com/blog and realmilk.com/testimonials where you can read and share raw milk testimonials.

ALEXA WEBSITE RATINGS: westonaprice.org is rated number one among alternative nutrition websites at alexa.com (see alexa.com/topsites/category/Top/Health/Nutrition). Please visit the Alexa site and post a comment about our website. You can help raise our rating by visiting our website frequently and linking to it from your own website, Facebook page or blog.

INSTAGRAM: Users of Instagram, please tag your posts with #WAPF and #westonaprice.

Letters

generations is true, because I healed my elderly dog's arthritis by giving her bone broth daily. After four days she was able to run, sit straight up on her haunches, jump up onto the couch or bed, etc. My very skeptical husband was amazed.

We had tried oral glucosamine, chondroitin and acupuncture. It was absolutely the broth that made the difference. I share this knowledge with everyone—when I am in line at the grocery store and people ask what I am doing with all those bones, when people tell me about their dog's or their own arthritis, etc.

I am very moved and saddened by the photos of primitive youth versus Western diet youth. I wonder whether that is why "heroin chic" has become the look for fashion house ad campaigns—to make unhealthy appear normal and preferred.

I would love to inform my clients and listeners in general about how natural foods can improve health issues for people their age, such as ADD, fertility, heartburn, asthma, allergies, weight, PMS, diabetes, skin issues, depression and anxiety.

I am shocked by how many people, including young people, are medicated for things that could be improved or even eliminated with high quality food. My clients are not able to think or perform optimally and are even making employment and life decisions based upon health insurance and drug plans. It is sad to see them encumbered by health issues that should be reserved for much later in life, if ever.

My website address is YourUltimateGuidanceCounselor.com, and my podcast series is called, "Don't be a Dogsbody."

Thank you for your hard work and candid, thoroughly researched information.

Jenaya Van Horn, MA
Seattle, Washington

CALCIUM AND BREAST CANCER

I think there is a mistake in this article on liver detoxification, westonaprice.org/health-topics/health-issues/liver-detoxification-starve-or-nourish/. The gist of it is true: food sources are better than supplements. However, the idea that calcium prevents breast cancer is wrong. In fact, calcium inhibits iodine uptake, and iodine prevents breast cancer.

André Voisin found long ago that people eating food from areas with high calcium soil had more cancer, and this has been confirmed by more recent research.

According to the article: "The same 'supplement charade' is true of calcium. Calcium glucarate is helpful in the stage two part of the detoxification process, specifically, in the glucuronidation stage where toxins are bound to water substances such as bile so that they can be removed. Raw milk and raw milk products are our best sources of usable calcium."

Articles on calcium glucarate show that it's not the calcium that is active, but the glucarate. Here is an article on calcium-d-glucarate that explains: examine.com/supplements/Calcium-D-Glucarate/.

So I thought you might want to edit that comment slightly so people don't think getting lots of calcium in the diet will prevent cancer. It's good to get lots of calcium, but important to get plenty

NICHOLAS GONZALEZ, MD (December 28, 1947 – July 21, 2015)

We are saddened to announce the death of holistic cancer treatment pioneer Dr. Nicholas Gonzalez from an apparent heart attack. Dr. Gonzalez is best known as a pioneering holistic cancer treatment doctor who helped many thousands of people overcome cancer through the use of complementary and holistic treatment protocols. He was a frequent contributor to Wise Traditions and speaker at our conferences.

Dr. Gonzalez's influence across the alternative medicine world can't be overstated. He was loved and cherished by millions, and he was prominently featured in countless books, documentary summits, interviews and articles

For a beautiful tribute by Dr. Kelly Brogan, visit kellybroganmd.com/article/celebrating-dr-nicholas-gonzalez-legend-time/.

Letters

of iodine, also. It's a balance thing, like the fat soluble vitamins.

Thank you for your good work! The WAPF and the easy access it provides to the best nutritional information have saved my life and helped my grandchildren grow stronger every day.

Maria Minno
Gainesville, Florida

MAGNESIUM FOR
MUSCLE STIFFNESS

In the letter from Niel G. Hilford, PhD, of New Zealand titled "Milk Problems?" (Spring 2015), Dr. Hilford stated that he suffered muscle soreness and stiffness following exercise when he was consuming over 700 ml of milk daily and supplementing with molasses. After reading "Death by Calcium," Dr. Hilford abandoned the daily consumption of milk and molasses and his muscle stiffness disappeared.

In response to the letter, the editor suggested that Dr. Hilford may be among those unable to tolerate milk. While this certainly may be the case, there are two other possible explanations for the muscle soreness Dr. Hilford suffered: (1) magnesium deficiency resulting from consumption of a large quantity of milk, which is high in calcium and low in magnesium, (2) iron overload (and maybe sugar overload) from molasses.

The article "Magnificent Magnesium," (Fall 2010), lists forty adverse effects of magnesium deficiency, including muscle cramping, weakness, fatigue, and arthritis. Katherine Czapp, the author, states: "Both calcium and magnesium are necessary for the healthy body— in proper balance to one another....Considered biochemical antagonists, one cannot act without eliciting the opposite reaction of the other. Yet calcium and magnesium must both be present in balanced amounts for either one to function normally in the body. Some researchers suggest that the healthy ratio of calcium to magnesium in the diet should be 2:1."

The calcium/magnesium ratio is about ten to one in milk and seventeen to one in cheese, so consuming a lot of milk or cheese results in a high dietary calcium-to-magnesium ratio. Magnesium (Mg) and calcium (Ca) antagonize each other in (re)absorption. The absorbed number of Ca or Mg depends on the dietary ratio of Ca to Mg intake. (PMID: 23430595) In other words, an increased calcium-to-magnesium ratio causes increased absorption of calcium and decreased absorption of magnesium, which results in an absorbed calcium-to-magnesium ratio that is greater than the dietary calcium-to-magnesium ratio. The 700 ml of milk consumed by Dr. Hilford contained about 900 mg calcium and 100 mg magnesium and was therefore "short" 350 mg of magnesium based on the suggested healthy calcium to magnesium ratio of 2:1. It is possible that the symptoms suffered by Dr. Hilford were caused by magnesium deficiency due to consuming a lot of calcium in milk without adequate magnesium.

The other possibility is iron overload from molasses: Molasses contains approximately equal amounts of calcium and magnesium and therefore improves the calcium-to-magnesium balance. However, molasses has a high iron content which can result in iron overload that may cause iron accumulation in joints which can be painful. The accumulation of iron with increasing age is a common problem for men in the Western world.

Jack Cameron
Fairhope, Alabama

LIFE COMPLETELY CHANGED

Thanks to WAPF, my husband and I not only changed our diet, we sold all our city properties and business, and bought a farm to produce the food we could not buy.

After careful planning and preparation, I now have a very healthy seven-month-old boy, Jasper. He has already advanced from crawling and now has started to stand, trying to walk. This strength is exceptional. During pregnancy, I drank ten pints of raw milk a week along with one dozen raw oysters per week plus eggs and bacon for breakfast and cod liver oil.

I have gently converted my family—there are eight children, all adults now. I have totally embraced the farm and sell my produce to friends and family. We have built a cellar (for food) and a special food prep shed to our one-acre small-scale organic market garden. This I am using to bring people in for preparing their food and preserving it via lacto-fermentation. I make lots of cheese and butter and hope to make salami and cured meats and lots and lots of bacon.

People get excited when I invite them to be a part of these food days because they are so disconnected from food that it's almost a new thing.

Brigid & John Kennedy
Kardella, VIC, Australia

THE PURPOSE OF MENOPAUSE

The article "Wise Choices, Healthy Bodies" (Winter, 2000), contains some very wise words about menopause:

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". . . this is nature's way of equipping the female sex for her new role as forager, worker and sage. Like the male youth of eighteen, she experiences hot-bloodedness, signaled by hot flashes, as she prepares for a lustier life than the cloistered one she led as a mother of small children. If she falls for the promises of the estrogen-peddlers, she inhibits the forces that push her into the role of activist and extrovert and throws cold water on the fire that her hormones have set to pry her out of her nest and into the brave new world of adventure and challenge."

"By conferring on women the gift of menopause, nature informs us that mothers of small children need help. They cannot do it all, not in primitive societies, much less in the modern age. The pressures for young women to be both wage-earner and mother can place enormous stress on our bodies at just the stage when our strength is needed for the production and care of healthy children. That stress often leads to disease."

Holy cow, that is what I experienced and that is what I am doing! During the last few years I slowly started to turn into a social activist, but in the last year, in the final year of my periods, I turned into a work activist, which for me is an about-face after a lifetime of toeing the corporate line, in a highly hierarchical, stiff-upper-lip type of environment; and I provide help (and farm foods) to women and families with little children who have a hard time doing it themselves. I am acting out of character for me—and I love it! All of a sudden it feels like health, life and time are stretched out before me, as they never were before. Women I know who are on HRT are suffering a lot physically (and therefore mentally). Thank you for that insight.

Sushama Gokhale
Larkspur, California

UNPRECEDENTED DEMAND

Seems like Canadian farmers are dumping fluid skim milk. According to news reports, "The immediate crisis is triggered by *unprecedented demand for butter and cream*, inadequate dairy processing capacity and flat demand for fluid milk..." [italics added].

We live in Oakville, near Toronto, and have weekly raw milk delivery of the most superb Jersey milk and cream—totally illegal, but passionate people will always prevail. Meanwhile our crazy industry here imposes 300 percent tariffs on all imported dairy (but not milk "ingredients"). Accordingly, this has led to rampant cross-border cheese smuggling (if you can believe), with most pizza in the Niagara region being made with smuggled U.S. cheese.

Andrew Garde
Oakville, Canada

WAPF PROFILE

Alex Before

Sixteen-year-old Alex Solis of northern Texas lost over sixty pounds following the WAPF guidelines! Says Alex: "I couldn't be more interested in nutrient-dense foods like butter, raw milk, kefir, fermenting all that stuff. I couldn't be more amazed at my weight loss on the WAPF diet. I am interested in becoming a nutritionist or chapter leader—I can start now or after high school! I would like to attend a conference, even if I have to travel!"

We say, congratulations Alex! The diet that helped you lose sixty pounds will also help you stay healthy for the rest of your life!

Alex After

Caustic Commentary

Sally Fallon Morell takes on the Diet Dictocrats

A CROCK

Country Crock, a Unilever brand, has changed the recipe for its vegetable oil spread in response to rising consumer preferences for more simple, natural foods. The new "simple recipe" contains just ten ingredients: purified water, soybean oil, palm kernel and palm oil, salt, lecithin (soy), vinegar, natural flavors, vitamin A palmitate, beta carotene (for color) and vitamin D_3. "It is the most foul margarine I've ever had the displeasure of eating," said one customer. "When it melts it leaves a hardened film that feels like plastic," complained another. ". . . literally gagged when I tasted it," was the comment of a third (countrycrock.com/product/detail/91770/original). Seems like the executives at Country Crock have been unable to distinguish between the changing preferences of the general consumer—who wants more simple, natural foods—and those of their Country Crock customers. When consumers realize the importance of simple, natural foods, they stop eating garbage like Country Crock because they know it can't be fixed. Maybe the company's executive brains need some butter!

VACCINES AND SALICYLATES

WAPF board member Kim Schuette, CN, has made a disturbing discovery. The package insert for the chickenpox vaccine warns against exposure to medicines containing salicylate for at least six weeks after receiving the vaccine: "For anyone under 18 years old: Do not take a salicylate medicine (such as aspirin, Kaopectate, KneeRelief, Pamprin Cramp Formula, Pepto-Bismol, Tricosal, Trilisate, and others) for at least six weeks after receiving a varicella virus vaccine. Salicylates can cause Reye's syndrome, a serious and sometimes fatal condition in children or teenagers with chickenpox, and the varicella virus exposes you to a small amount of this virus" (drugs.com/mtm/varicella-virus-chickenpox-vaccine.html). Salicylates also occur in many common fruits, such as apricots, plums, pineapple, apples, grapes and all dried fruit. How many doctors are aware of this danger and adequately warn their patients? And how many parents would allow the chickenpox vaccine knowing they had to avoid most fruit for six weeks after the shot?

YOUNGER AND YOUNGER

An article in *Surgical Neurology International* (2015; 6 (1): 123) reveals that dementia and other neurological brain diseases are striking people at younger and younger ages. The researchers compared the rates of neurological brain diseases in twenty-one western countries from 1989 to 2010. They found that the average age of onset for dementia was ten years earlier in 2010 than in 1989. "The rate of increase in such a short time suggests a silent or even 'hidden' epidemic, in which environmental factors must play a major part, not just aging," said lead researcher Colin Pritchard. "Modern living produces multi-interactional environmental pollution but the changes in human morbidity, including neurological disease is remarkable and points to environmental influences." The most likely environmental influences? Could it be three generations of cholesterol-robbing vegetable oil instead of animal fat, and the assault of mercury, aluminum and other neuro-toxic additives in the ever increasing number of vaccines?

AGREEMENT!

It's hard to believe the Centers for Disease Control (CDC) has said something we agree with, but it's true! According to CDC, many women aren't taking enough time between the birth of a child and the conception of another, and we couldn't agree more. Based on birth certificate data from thirty-six states, or 83 percent of live births in 2011, nearly 30 percent of women got pregnant again less than eighteen months after giving birth. White women had the shortest overall birth intervals at twenty-six months, followed by African American women at thirty months and Hispanic women at thirty-four months The younger the mother was, the more likely she was to have a short interval between birth and pregnancy and more than two-thirds of teenagers had a short interval. Short between-birth intervals "may affect the risk of pregnancy complications, such as preterm birth, low birth weight and small gestational age" (cdc.gov/nchs/data/nvsr/nvsr64/nvsr64_03.pdf). However, long intervals of sixty months or more were also associated with health risks for the baby. Preeclampsia, or high blood pressure during pregnancy, and failure to progress during labor were among the associated risks, according to a 2008 study by the University of Florida Maternal Child Health and Education Research and Data Center (ahca.myflorida.com/medicaid/quality_management/mrp/contracts/med062/repeat_births-average_interbirth_interval_among_participants.pdf). The

study found that short birth intervals also affect the mother's health, both mentally and physically. "Pregnancies that occur before a woman has time to regain her health status, replenish her maternal stores (particularly of folate and red blood cells), restore her hormonal balance, or to establish strong bonds with her previous newborn create physical and mental stress that can lead to serious medical complications for both her and her next newborn," the University of Florida study stated. All this validates the findings of Weston Price, who noted that so-called primitive peoples waited until the child was at least two years old before attempting another pregnancy. A longer interval allows a mother to recover her nutritional stores, thus increasing the odds for a healthy subsequent baby.

GUT FLORA AND MOOD

Several studies during the last decade have shown the relationship between the gut flora, stress and anxiety-like behavior. The findings clearly suggest that changing the gut flora can affect behavior, making mice more or less anxious. Even more interesting are animal studies suggesting that the microbial colonization of the gut during a critical window in early life shapes adult neural circuitry and signaling with a long-term effect on adult behavior. In humans, giving a probiotic fermented dairy drink to healthy female participants caused changes in brain activity. All this fascinating research adds up to the conclusion that anything that interferes with the microbial colonization process early on can set the scene for trouble down the road, and that robust and heathy gut flora can determine depression-free moods throughout life. Maternal stress, infections, antibiotic use in the mother and cesarean birth can jeopardize the baby's disposition and even mental health throughout life (*JAMA* 2015;313(17):1699-1701). In fact, researchers at Ohio State University found that toddlers with the most genetically diverse types of bacteria in the gut more frequently exhibited positive mood, curiosity, sociability and impulsivity. Lack of microbiome diversity is associated with greater indications of stress, such as tantrums, especially in boys (https://ccts.osu.edu/news-and-events/news/toddler-temperament-could-be-influenced-gut-bacteria). What used to be treated with the strap or the psychiatrist's couch now calls out for lacto-fermented food!

ANTIBIOTIC USE AND DIABETES

Rates of diabetes are rising throughout the world, with a 45 percent increase from 1990 to 2013, most of it type 2. Blamed on "more people living longer," the causes are certainly more

complex—from a sugary or high-carb diet to lack of vitamin D (needed for insulin production) to statin use. A new study points to yet another cause—antibiotic use. Researchers from the University of Pennsylvania looked at the number of antibiotic prescriptions given to more that two hundred thousand diabetics in the UK at least one year before they were diagnosed with the disease, and compared this to the number of prescriptions given to an equally large group of controls. Patients who received at least two prescriptions for antibiotics were twice as likely to receive a diagnosis of diabetes (*Eur J Endocrinol*. 2015 Jun;172(6):639-48). Scientists have also found that exposure to *Staphylococcus aureus* bacteria causes hallmark symptoms of type 2 diabetes in rabbits–namely insulin resistance, glucose intolerance and systemic inflammation (*MBio*. 2015 Feb 24;6(2):e02554). Overgrowth of a pathogen like *Staph. aureus* is a likely consequence of frequent antibiotic use.

A TURN TOWARDS DARKNESS

"Much of the scientific literature, perhaps half, may simply be untrue. Afflicted by studies with small sample sizes, tiny effects, invalid exploratory analyses, and flagrant conflicts of interest, together with an obsession for pursuing fashionable trends of dubious importance, science had taken a turn towards darkness." So declares Dr. Richard Horton, editor-in-chief of *The Lancet*, the world's most prestigious medical journal. During a closed-door seminar held at the Wellcome Trust in London, Horton stated bluntly that major pharmaceutical companies falsify or manipulate tests on the safety and effectiveness of their products by taking samples too small to be statistically meaningful or hiring test labs or scientists where the lab or scientist has blatant conflicts of interest. At least half of all such tests are worthless, claims Horton (journal-neo.org/2015/06/18/shocking-report-from-medical-insiders/).

WORSE THAN WORTHLESS

"We have provided a critical assessment of research on the reduction of cholesterol levels by statin treatment to reduce cardiovascular disease. Our opinion is that although statins are effective at reducing cholesterol levels, they have failed to substantially improve cardiovascular outcomes." This statement, by David M. Diamond and Uffe Ravnskov, was published in *Expert Review of Clinical Pharmacology* (2015 Mar 8(2):201-210). The authors also describe how statin pushers use deceptive statistical tricks to create the false appearance that cholesterol reduction results in reduction of heart disease. "We have described the deceptive approach statin advocates have deployed to create the appearance that cholesterol reduction results in an impressive reduction in cardiovascular disease outcomes through their use of a statistical tool called relative risk reduction (RRR), a method which amplifies the trivial beneficial effects of statins. We have also described how the directors of the clinical trials have succeeded in minimizing the significance of the numerous adverse effects of statin treatment." These adverse effects include greater risk of cancer, cataracts, dementia, diabetes and muscular-skeletal diseases—all for "benefits" that are trivial or worthless. In the same issue (pages 189-199) Japanese researchers present evidence that statins may cause coronary artery calcification and "can function as mitochondrial toxins that impair muscle function in the heart and blood vessels through the depletion of coenzyme Q_{10} and 'heme A', and thereby ATP generation." According to the authors, statins inhibit the synthesis of vitamin K_2, the cofactor for matrix Gla-protein activation, which in turn protects arteries from calcification. Statins inhibit the biosynthesis of selenium-containing proteins, one of which is glutathione peroxidase serving to suppress peroxidative stress. An impairment of selenoprotein biosynthesis may be a factor in congestive heart failure, reminiscent of the dilated cardiomyopathies seen with selenium deficiency. "Thus," they conclude, "the epidemic of heart failure and atherosclerosis that plagues the modern world may paradoxically be aggravated by the pervasive use of statin drugs. We propose that current statin treatment guidelines be critically reevaluated."

FOR SCIENTISTS AND LAY READERS

Please note that the mission of the Weston A. Price Foundation is to provide important information about diet and health to both scientists and the lay public. For this reason, some of the articles in *Wise Traditions* are necessarily technical. It is very important for us to describe the science that supports the legitimacy of our dietary principles. In articles aimed at scientists and practitioners, we provide a summary of the main points and also put the most technical information in sidebars. These articles are balanced by others that provide practical advice to our lay readers.

Wise Traditions 2015

Sixteenth Annual International Conference of the

Weston A. Price Foundation

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SPEAKERS

Mark Baker, farmer of heritage breed pigs
Ellen Bench, DHom, HMC, founder of Clinical Homeopathic College
Hilary Boynton, author of the *Heal Your Gut Cookbook*
Natasha Campbell-McBride, MD, PhD, author of *Gut & Psychology Syndrome (GAPS)*
Peg Coleman, microbial risk assessor
Mary Cordaro, expert on electromagnetic radiation
Tom Cowan, MD, author of *The Fourfold Path to Healing*
Hannah Crum, Kombucha Mama of kombuchakamp.com
Tom DiGuiseppe, PhD, expert on water filtration, purification, and reuse
Sally Fallon Morell, MA, author of *Nourishing Traditions* and *Nourishing Broth*
Season Johnson, NTP, KICKcancERmovement.com
Chris Kerston, orchardist and agri-tourism Pioneer
Min Kim, expert on sourdough bread
Alex LaGory, kombuchabrewers.org
Mandy Lee, author of the *Heal Your Gut Cookbook*
Norm Lemoine, MBA, president of Radiant Life
Celeste Longacre, author of *Celeste's Garden Delights*
Elaina Luther, MT, HHP, founder of Culture Club 101
Leslie Manookian, writer & producer, film *"The Greater Good"*
Jim Marlowe, nutrition and optimum health counseling
Chris Masterjohn, PhD, expert on fat-soluble vitamins
Mark McAfee, chairman of the board, Raw Milk Institute
Jaimen McMillan, Spacial Dynamics Method
Gerald McNeill, PhD, expert on vegetable oil processing
Marty Michener, PhD, New Hampshire Right to Know GMO
Denise Minger, author of *Death by Food Pyramid*
John Moody, author of *Food Club and Co-op Handbook*
Jorge Moreno, DO, biodynamic osteopathy (cranial-sacral osteopathy)
Gerald Pollack, PhD, author of *Fourth Phase of Water: Beyond Solid, Liquid, & Vapor*
Geri Quintero, LAc, herbalist, Qi Gong teacher, GAPS practitioner
Beverly Rubik, PhD, expert on the subtle energetics of living systems
Allan Savory, of The Savory Institute, author of *The Grazing Revolution*
Kim Schuette, CN, Cert. GAPS Pract, expert on nutrition and Lyme disease
Stephanie Seneff, PhD, expert on sulfur and cholesterol
Kim Thompson, movement expert
Michael Traub, ND, author of *Essentials of Dermatological Diagnosis & Therapeutics*
Sandra Van Gilder, FAFS, CAFS, physical therapist
Philip Weeks, MH, LAc, author of *Make Yourself Better*
Donna Wild, author of *The Skin, Tongue, and Nails Speak*
Louisa Williams, MS, DC, ND, author of *Radical Medicine*
Will Winter, DVM, expert on pastured livestock
Tiffany Wright, PhD, developer of the Skinny Coach Solution

LOCATION AND ACCOMMODATION

The conference hotel is the Anaheim Marriott at 700 W. Convention Way, Anaheim, CA 92802. A special conference room rate of $155 per night plus taxes and fees has been negotiated for our attendees. This rate applies to up to four people per room. You may reserve your hotel reservations by phoning (877) 622-3056 and mentioning the Wise Traditions Conference. Reservations may also be booked on-line at resweb.passkey.com/go/wise2015. The special conference rates for hotel rooms are available only until October 20, 2015 or until all rooms are sold. Self parking is at a special rate of $20 per day.

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MONDAY, NOVEMBER 16 (9 am – 4 pm Registration $100)

- **Raw Milk** – Sally Fallon Morell, Mark McAfee and Peg Coleman
- **Movement – Spacial Dynamics** – Jaimen McMillan
- **Farm Tour** – Will Winter, DVM
- **Basic Traditional Cooking** – Hilary Boynton , Mandy Lee
- **Wiser Dietary Choices through MRT Self-Testing** – Louisa Williams
- **Homeopathy Workshop** – Ellen Bench

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Saturday Seminar Choice – please select one for planning purposes only, not binding.
❒Plenary Session: Focus on Fats ❒Wellness Track ❒Farming & Gardening

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❒I am a chapter leader.
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Thursday, Nov 12, 10 am - 4 pm

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Wise Traditions 2015
Anaheim Schedule

THURSDAY NOVEMBER 12

10:00-4:00 Chapter Leader Meeting – for current chapter leaders
6:00-9:30 FundRAISER Reception and Food Freedom Program (additional fee)

FRIDAY NOVEMBER 13

7:00-7:45 Morning Movement – Kim Thompson
8:00-8:45 Morning Movement – Kim Thompson

SEMINAR ON TRADITIONAL DIETS TRACK

9:00-12:00 Introduction to Dr. Price's Work & Healthy Traditional Diets – Sally Fallon Morell, MA
1:30-3:30 Fats and Oils in Traditional Diets – Sally Fallon Morell, MA
3:30-5:00 How to Change Your Diet for the Better – Sally Fallon Morell, MA

GAPS TRACK

10:00-5:00 Gut and Psychology/Gut and Physiology Syndrome – Natasha Campbell-McBride, MD, PhD

WELLNESS TRACK

10:00-12:00 Ancient Medicine and the Wheel of Health – Philip Weeks, MH, LAc
1:30-3:30 Detox and Fasting for Rejuvenation and Health – Philip Weeks, MH, LAc
3:30-5:00 Adrenal Health—How to Get Your Mojo Back! – Philip Weeks, MH, LAc

FARMING TRACK

10:00-5:00 Managed Intensive Grazing – Allan Savory & Chris Kerston

COOKING AND BUSINESS TRACK

10:00-12:00 Culturing a Real Food Business – Elaina Luther
1:30-3:00 Redeeming Bread, How to Make Einkorn Sourdough – Min Kim
3:30-5:00 Continuous Kombucha – John Moody & Hannah Crum

EVENING LECTURES

8:00-10:00 A Cancer Diagnosis for Your Child—What to Do? – Season Johnson
8:00-10:00 The Science of Kombucha – Hannah Crum & Alex LaGory
8:00-10:00 Ask the Practitioner Panel – Tom Cowan, MD, Kim Schuette, CN, Philip Weeks, MH, LAc, Louisa Williams, MS, DC, ND
8:00-10:00 The Greater Good: Another Look at Vaccines (Followed by Q&A) – Leslie Manookian, MLC Hom

SATURDAY NOVEMBER 14

6:00-6:45 Morning Qi Gong – Geri Quintero
7:00-7:45 Morning Movement – Kim Thompson

PLENARY SESSION: Focus on Fats

9:00-9:30 Introduction to the Work of Weston A. Price – Sally Fallon Morell, MA
9:30-10:45 Saturated Fat Does a Body Good: Exploring the Biological Role of These Long-Demonized Yet Heroic Nutrients – Chris Masterjohn, PhD
11:00-12:15 The PHO Public Health Disaster – the Complete Story – Gerald McNeill, PhD
1:45-3:00 Resolving Inflammation and Creating Food Tolerance with Animal Fats – Chris Masterjohn, PhD
3:15-4:30 The Fat-Soluble Activators – Sally Fallon Morell, MA

WELLNESS TRACK

9:00-12:15 Understanding Your Own Blood Test Results – Jim Marlowe
1:45-4:30 Noninvasive Testing for Nutritional Deficiencies – Donna Wild

FARMING AND GARDENING TRACK

9:00-10:30 Dirt Poor, Badly Bred and Improperly Prepared: Missing Nutrients in Modern Food – John Moody
10:45-12:15 How to Put Nurtient Density Back into Meat, Milk and Eggs – Will Winter, DVM
1:45-3:00 How to Have a Totally Organic Garden – Celeste Longacre
3:15-4:30 BioChar Production – Mark Baker

EVENING

Banquet Keynote – Allan Savory

Wise Traditions 2015
Anaheim Schedule

SUNDAY NOVEMBER 15

6:00-6:45 Morning Movement – Kim Thompson
7:00-7:45 Morning Qi Gong – Geri Quintero

Track I: FOOD AND NUTRITION

9:00-10:20 Folic Acid Supplementation: Masking a Small Problem While Creating a Bigger Problem? – Stephanie Seneff, PhD
10:30-11:50 Vaccines or Nutrition – Marty Michener, PhD
1:30-2:50 Methylation Nutrients: Balancing the Diet Targeting the Needs of the Individual – Chris Masterjohn, PhD
4:00-5:20 Death by Food Pyramid – Denise Minger

Track II: LYME DISEASE

9:00-10:20 Simple Nutritional Support for Lyme Disease – Kim Schuette, CN, Cert. GAPS Pract.
10:30-11:50 Building a Strong Immune System Against Lyme and Other Diseases – Natasha Campbell-McBride, MD, PhD
1:30-2:50 Herbal Support for Lyme Disease – Philip Weeks, MH, LAc
4:00-5:20 Natural Approaches to Lyme Disease – Jorge Moreno, DO

Track III: HEART DISEASE

9:00-10:20 Heart Disease: The Dental Connection – Louisa Williams, MS, DC, ND
10:30-11:50 Heart Rate Variability: What Does it Reveal? – Beverly Rubik, PhD
1:30-2:50 Blood Flow and Cardiovascular Disease: A New Perspective – Stephanie Seneff, PhD
4:00-5:20 Blood Microscopy: Studies on Nutrition and Exposure to Cell Phone Radiation – Beverly Rubik, PhD

Track IV: WATER

9:00-10:20 Extraordinary Properties of Water – Tom Cowan, MD
10:30-11:50 Most Americans Drink Treated Sewage—Are You One of Them? – Norm Lemoine & Tom DiGuiseppe, PhD
1:30-2:50 Is Water Nature's Best Food? – Gerald Pollack, PhD
4:00-5:20 Cells, Tissue and Crystalline Water – Marty Michener, PhD

Track V: MAKING IT PRACTICAL

9:00-10:20 Let There Be Light – John Moody
10:30-11:50 Can Food Be Addictive? As Addictive as Cocaine? Cigarettes? Alcohol? – Tiffany Wright, PhD
1:30-2:50 Movement and Sleep: Myths and Truths that Impact Our Health - Sandra Van Gilder
4:00-5:20 Practical Ways to Protect Yourself from Electromagnetic Radiation – Mary Cordaro

CLOSING CEREMONY

5:30-6:30 Raw Milk Nation – Mark McAfee

MONDAY NOVEMBER 16

GUIDED FARM VISIT

7:30-5:00 Guided Farm Visit – Will Winter, DVM

COOKING TRACK

9:00-4:00 Basic Traditional Cooking – Hilary Boynton & Mandy Lee

ENERGETIC TESTING TRACK

9:00-4:00 Wiser Nutritional & Dietary Choices through MRT Self-Testing – Louisa Williams, MS, DC, ND

HOMEOPATHY TRACK

9:00-12:00 Family Empowerment – Ellen Bench, Dhom, HMC
1:00-4:00 Child Immunization Options – Ellen Bench, Dhom, HMC

MOVEMENT TRACK

9:00-4:00 Moving Towards Wholeness – Jaimen McMillan

RAW MILK TRACK

9:15-10:30 Why Raw Milk? – Sally Fallon Morell, MA
10:45-12:00 Behind the Scenes: What's Really Happening with Raw Milk in the USA? – Mark McAfee
1:15-2:30 Beyond the Numbers: Understanding Data, Gaps, and Assumptions Bridging Them – Peg Coleman
2:45-4:00 Building, Managing, Marketing & Sustaining a Raw Milk Micro-Dairy – Charlotte Smith

The Scandal of Infant Formula:
A Poor Replacement for Mother's Milk

by Sylvia Onusic, PhD, CNS, LDN

Modern-day infant formula is the ultimate refined food, a product of science, composed of highly processed ingredients such as sugar, nonfat dried milk, vegetable oils and a list of synthetic nutrients. But it is convenient: just open, mix with water, heat and serve. And all can be done at home, much like preparing a can of condensed soup. A dubious added bonus is that with the "science" of infant formula there is no work or worry. You don't have to think about it. One size fits all.

Infant formulas may be convenient but they have a very dark side. Even though some pediatricians think commercial formula is equivalent to breast milk, they are sorely mistaken. A simple review of the medical literature emphasizes the inadequacy of infant formula in infant nutrition. Formulas are much higher in protein than breast milk, a fact which has been significantly linked to childhood obesity. Formula is calorie-dense and increases insulin levels.

Trends in the use of infant formula over the last century have tracked an increase in allergic reactions, diabetes type 1 and type 2, and other chronic diseases among those children fed infant formula.[1] Commercial formulas contain GM (genetically modified) ingredients and synthetically derived nutrients; they lack vitally necessary cholesterol but include mostly polyunsaturated fats which could include *trans* fats, toxic by-products as a result of heating and chemical additions, and many other substances not found in breast milk.

"Formula-fed babies are sicker, sick more often, and are more likely to die in infancy or childhood. Studies for a white American population show that bottle-fed infants were fourteen times more likely to be hospitalized than breast-fed infants. Compared to breastfed babies, formula-fed babies have a doubled overall infant death risk, and four-fold risk of Sudden Infant Death Syndrome (SIDS)." Bottle-fed infants and children have more frequent and more severe upper respiratory infections, wheezing, pneumonia and influenza. They have more diarrhea, more gastrointestinal infections and constipation.[2]

Formula-fed babies suffer more jaw misalignment and are more likely to need orthodontic work as they get older. Speech problems are more likely to develop because of weak facial muscles and tongue thrust problems which develop among bottle-fed babies. Formula-fed babies tend to become mouth breathers who snore and develop sleep apnea.[2]

Formula-fed infants also tend to have more dental decay—so-called "baby bottle caries" when habitually put to bed with a bottle—along with periodontal disease and TMJ problems.[3-4]

Most infants in the U.S. today rely on infant formula for some portion of their nutrition. An estimated one million infants in the United States are fed formula from birth every year.[5] Today infant formulas are made by drug companies not mothers. Drug companies hold patents on their products and fiercely protect many "trade secrets."

But unlike drugs, infant formulas are considered by law to be food, and food is considered inherently safe. There are few regulations governing infant formulas and the Food and Drug Administration (FDA), the government organization responsible for overseeing infant formulas, has left the burden of proof of their safety up to the manufacturers.[5]

The FDA does not approve infant formulas before they can be marketed. Surprisingly no government agency is charged with this responsibility. However, all formulas marketed in the United States must meet federal nutrient requirements. Infant formula manufacturers are required to register with the FDA and provide the agency with a notification prior to marketing a new formula or adding a new ingredient. But these were not always the rules.[5]

There are few regulations governing infant formulas and the Food and Drug Administration (FDA), the government organization responsible for overseeing infant formulas, has left the burden of proof of their safety up to the manufacturers.

ARTICLE SUMMARY

- Infant formula lacks many key substances for development and growth. If a key nutrient is missing or not available, the body cannot adequately accomplish the task.
- Infant formula is primarily composed of sugar or lactose, dried skim milk and refined vegetable oil which can include genetically modified components. Organic formula is made of basically the same ingredients but they are not genetically modified. Soy-based formula is made of soy protein, sugar and refined oils.
- Breast milk from a well-nourished mother is composed of hundreds of substances—over one hundred fats alone.
- Infant formula contains double the amount of protein that breast milk does, which promotes insulin resistance and adiposity.
- There have been over twenty infant formula recalls since 1980 involving ingredients, pollution with pathogens, adulteration with foreign substances like glass, lack of required nutrients, foul smells, etc.
- Rocket fuel, phthalates, melamine, and high levels of heavy metals have been found in infant formula.
- There is no FDA regulation of infant formula; proof of safety is left to the manufacturers.
- Additives to infant formula, such as iron, DHA, ARA and laboratory-made folic acid are all problematic.
- Heat damages the protein in formulas forming advanced glycation end products as well as compromising the nutritional value.

In the 1800s breastfeeding of infants was understood to be the "gold standard" of nutrition and a baby who was bottle-fed was regarded with pity.

EXPERIMENTATION ON HUMAN INFANTS

In her book, *Breastfeeding: A Guide for the Medical Profession*, now in its seventh edition, the prominent pediatrician Dr. Ruth Lawrence called infant formula "one of the largest human experiments in history." Formulas were concocted, ingredients came and went, and there were no randomized clinical trials or experiments of any kind before the formulas were tried on real live babies. Not much has changed today. The "scientific" formula label you see today is a result of years of guesswork.[6]

Infant formula and breast milk are unique in comparison to almost all other foods in that they are often the sole source of nutrition in the vulnerable and rapidly growing and developing child. "Inadequate nutrition in infancy has the potential to result in serious and irreversible adverse effects."[7] In contrast to breast milk, formulas do not change in composition in response to the infant's ever-changing needs.[6]

Food is a programming system: the new science of epigenetics and nutrigenomics has taught us that food contains information that speaks to our genes, not just provides calories for energy, and what we eat programs our body with messages which ultimately lead to health or disease. Leading neurologist Dr. David Perlmutter and functional medicine specialist Dr. Mark Hyman believe that "Every time you take a bite of food you talk to your genes. The very food you eat is changing your DNA right now."[8] If this is so, what are the devitalized, spray-dried, nonfat milk, GM sugar and glucose solids in baby formula telling your baby's genes every day?

In the 1800s breastfeeding of infants was understood to be the "gold standard" of nutrition, and a baby who was bottle-fed was regarded with pity because of the high mortality rate associated with this inferior method. But ideas were already changing: by 1883 there were twenty-seven patented brands of powdered infant formula which were added to cow's milk, including the first marketed formula of the putative genius Justus von Liebig in 1869. Henry Nestlé's formula, introduced in 1870, was made of "good Swiss milk," sugar, wheat flour, and malt. The use of these formulas was associated with a high death rate in the summer months when milk spoiled easily. Public health movements providing better care for cows improved the quality of milk, while milk clinics for infants were set up. By 1912 many homes had an icebox.[9]

PROBLEMS

Many babies fed formula developed vitamin deficiency diseases such as rickets and scurvy before doctors and manufacturers figured out that the baby's diet should be supplemented with orange juice and cod liver oil. Pundits of the day believed that boiled or sterilized milk caused scurvy and was to be avoided. But physicians showed that boiling could reduce the clumping of casein curds in the infant stomach, apparently making cow's milk more digestible, thus justifying the practice. Cow's milk for use in infant formula was usually boiled in Europe.[9]

In the early 1920s cane sugar became scarce and expensive. Dr. William M. Mariott introduced Karo corn syrup, and it became the carbohydrate of choice for over twenty years. The Evaporated Milk Association funded Mariott's work and not surprisingly, in 1929 he published the first study purporting to show the superiority of that product to cow's milk and even breast milk. Other untrustworthy researchers followed with the same fraudulent results.

In 1934 Carnation irradiated their milk, using a process Henry Steenbock patented for developing vitamin D in the product. Dried milk was also deemed an excellent source of infant nutrition. *Mothers and Medicine: A Social History of Infant Feeding, 1890-1950* by Rima D. Apple provides a fascinating and well-documented account of the shady history of the infant formula industry.[10]

Although formulas containing powdered milk have been around for almost a century, they became widely used during World War II and the post-war years. In the 1950s and 1960s, infant formula feeding was considered the norm and breastfeeding rates plummeted.

Infant formulas in the 1950s were fraught with problems including an excessive quantity of substances requiring excretion by the kidneys and excessive sodium in the blood serum which caused dehydration for some infants. Low iron content and high intake of iron inhibitors caused iron deficiency and increased intestinal blood loss. Intake of fatty acids was low. The formulas

lacked vitamin C so scurvy was a continuing problem, even though leading pediatricians advised the use of orange juice.[11]

The two types of concentrated commercially prepared liquid formulas mostly in use during the 1960s were similar to evaporated milk formula with added vitamins (Lactum, Mead Johnston) and a product with a lower protein content with added vegetable oils and vitamins (Similac and SMA).[12]

By 1970, nearly all of the locally based commercial formula services had ceased to exist. Few hospitals prepared their own formulas in-house as had formerly been the norm and most newborn nurseries used commercially prepared, ready-to-feed formulas.[13]

In the 1970s, a marked resurgence in breastfeeding took place world-wide. The movement toward increased breastfeeding seemed to arise from the general public rather than from the prompting of health professionals, and may have been in part associated with negative publicity directed against the formula industry. In addition new scientific evidence illuminated the benefits of breastfeeding and sparked campaigns to promote the practice.[14]

Ironically, an increased use of powdered formulas after 1971 coincided with the surge in breastfeeding because pediatricians of the time advocated introducing cow's milk at a later age and feeding formula instead to older babies. The percentage of infants fed formulas after four months of age continued to increase. About 20 percent of six-month-old infants were formula-fed in 1971 and 50 percent were formula-fed in 1980.[10]

Despite the persistent claim of formula manufacturers that sound "science" was behind the development of infant formula, the "science" was in fact not well developed at all, and much experimentation fell to trial and error. When babies became ill, didn't develop properly, or even died from consuming a formula, the problem was isolated and the "Band-Aid" applied: the missing ingredient was added or the offending substance was removed.[10]

About 20 percent of six-month-old infants were formula-fed in 1971 and 50 percent were formula-fed in 1980.

NEW STANDARDS

Manufacturers often add new ingredients to infant formulas in an attempt to mimic the composition or performance of human milk. However, the addition of these ingredients is not without risks due to a range of complex issues, such as bioavailability, the potential for toxicity, and the practice of feeding formula and human milk within the same feeding or on the same day.[15]

Shockingly, a review of the information on infant formula regulation and overview shows the FDA dragging its feet for many years in implementing recommendations of professional task forces.[18] Several meetings of the Food Advisory Committee on Infant Formula took place from 1996-2002, but the FDA took no action on any recommendations until September 2014 when the agency published the final rule

INFANT FORMULA RECALLS

There have been over twenty infant formula recalls since 1982. Hazards discovered in formula include:

1. Deficiencies in protein, iron, vitamins A, D, C, B_6, folate, copper, linoleic acid;
2. Contamination with metal, glass, polyvinyl chloride, chlorine, beetle parts, hard plastic, perchlorate (rocket fuel);
3. Contamination with E. sakazakii;
4. Elevated levels of lead, arsenic;
5. Excessive magnesium, vitamins A, D;
6. Incorrect preparation instructions, no label, no instructions, mislabeled;
7. Insufficient processing, peeling can liner, curdling, foul smell;
8. Liquid soy concentrated formula. Class I recall: life threatening, June 1990.

In 2000, CDC researchers found perchlorate in fifteen brands of powdered infant formula including Similac and Enfamil, two manufacturers that cornered 87 percent of the infant formula market.

E. sakazakii is a bacterium that may cause necrotizing enterocolitis among infected infants. Clusters of E. sakazakii infections have been reported in a variety of locations over the past several years among infants fed milk-based powdered infant formula products.[16] Melamine and phthalates have also been found in infant formula.[17]

Synthetic ingredients in infant formula are produced with toxic chemicals.

regarding standards for manufacturers of infant formula. These set in place federally enforceable requirements for the safety and quality of infant formula. The requirements include current good manufacturing practices specifically designed for infant formula, including required testing for the harmful pathogens Salmonella, Cronobacter, and *E. sakazakii*. Further, manufacturers must demonstrate that the infant formulas they produce support normal physical growth, and the formulas must be tested for nutrient content in the final product stage, before entering the market, and at the end of the products' shelf life.

The new rules are rudimentary, however, and in the end "toothless" as they do not apply to formulas manufactured for infants with unusual medical conditions, special dietary needs such as galactosemia, and for babies who are born prematurely. This oversight excludes many infant formula products which will not fall under this regulation, such as soy-based formulas.[19]

These new standards are based on the first Infant Formula Law (1980), which was passed after more than twenty to fifty thousand infants were exposed to a chloride-deficient soy formula and thirty children were diagnosed with hypochloremic metabolic acidosis because of chloride deficiency. These infants developed loss of appetite, failure to gain weight, muscular weakness, vomiting, severe metabolic alkalosis and slowed growth in head circumference. Brain growth is vulnerable to chloride deficiency. In a follow-up of this group of infants four to nine years later, distinct cognitive impairments had emerged including "language disorder, problems with word finding, visual disturbances, attention deficient disorder with repetitive behaviors, and withdrawal and over-focusing as seen in autism."[20]

By law, the FDA requires that all formulas contain the following nutritional constituents: protein; fat; vitamins C, A, D, E, K, B_1, B_2, B_3, B_6, and B_{12}; niacin; folic acid; pantothenic acid; calcium; phosphorous; magnesium; iron; zinc; manganese; copper; iodine; sodium; potassium; and chloride.[21] Selenium, a trace mineral essential for brain growth and thyroid health, was belatedly added to this list in 2015.[22]

THE BASE FOR INFANT FORMULA

Most formulas use cow's milk as their base ingredient, but some adjustments must be made to bring the composition closer to that of breast milk. Human breast milk is 3.8 percent fat, 1.0 percent protein, and 7.0 percent lactose, while cow's milk is 3.7 percent fat, 3.4 percent protein and 4.8 percent lactose.

Cow's milk also has higher levels of phosphorus and calcium and lower levels of iron, zinc, niacin, and ascorbic acid than human milk.[23] Formulas based on goat milk (Kabrita) and other animal milks are also commercially available, as well as a vegan formula (Coopers), along with soy milk formulas, and others.[24]

INFANT FORMULA INGREDIENTS

All infant formulas, both organic and conventional, contain basically the same highly processed ingredients such as sugars, vegetable fats, processed proteins, synthetic vitamins, minerals, nucleotides, and DHA and ARA (see Table 1). The main ingredients include:

1. Carbohydrate, in the form of lactose, corn maltodextrin, maltodextrin(-ose), sugar;

MAJOR INFANT FORMULA MANUFACTURERS

Three leading brands dominate the infant formula market:

- The most popular formula in the U.S. is the Similac brand, made by Abbott Laboratories, cornering about 43 percent of the market.[25] Similac was the first conventional brand to market a GMO-free product in 2015.
- Enfamil, made by Mead Johnson Nutrition, enjoys a 40 percent market share.
- The Gerber Good Start line is made by Nestlé and earns a 15 percent share of the formula market.[26]

All of these companies contributed sizable amounts to the campaign in California (Proposition 37) to defeat the measure which would require labeling of GMOs. Abbott: $334,500; Mead Johnson: $800,000 and Nestlé: $1,461,600.[26] What do they have to hide?

Formula Comparison of Main Ingredients

	proteins	fats	carbs	prebiotics	probiotics	ARA-DHA
Conventional						
Similac Siliac® Advance® Similac® Expert Care® Alimentum®	Nonfat Milk Whey Protein Casein Hydrolysate	High Oleic Safflower Oil, Soy Oil, Coconut Oil High Oleic Safflower Oil, Soy Oil, Medium -Chain Triglyserides	Lactose Sugar, Corn Maltodextrin	Galactooligosaccharides		ARA & DHA*
Enfamil Enfimil® Newborn (Mead Johnson)	Nonfat Milk Whey Protein	Vegetable Oil (Palm Olein, High Oleic Safflower Oil, Soy Oil, Coconut Oil)	Lactose, Polydextrose	Galactooligosaccharides	Lactobacillus Rhamnosus GG (LGG)	ARA & DHA*
Gerber Gerber® Good Start	Whey Protein	Vegetable Oil (Palm Olein, High Oleic Safflower Oil or High Oleic Sunflower Oil, Soy Oil, Coconut Oil)	Corn Maltodextrin	Galacto-oligosaccharides		ARA & DHA*
Soy						
Similac Similac® Soy Insomil	Soy Protein Isolate	High Oleic Safflower Oil, Soy Oil, Coconut Oil	Corn Syrup			ARA & DHA*
Enfamil Enfimil® ProSobee®	Soy Protein Isolate	Vegetable Oil (Palm Olein, High Oleic Safflower Oil, Soy Oil, Coconut Oil)	Corn Syrup Solids			ARA & DHA*
Gerber Gerber Good Start®	Enzymatically Hydrolyzed Protein Isolate	Vegetable Oil (Palm , High Oleic Safflower Oil, Soy Oil, Coconut Oil)	Corn Maltodextrin, Sucrose			ARA & DHA*
Nature's One Natures Own Organic Soy®	Organic Soy Protein Concentrate	Organic Vegetable Oils (High Oleic Safflower & Sunlflower Oil, Soy Oil, Coconut Oil)	Organic Brown Rice Syrup			ARA & DHA*
Organic						
Similac Similac® Advance® Organic Powder	Organic Nonfat Milk* *Does not contain lactose or whey protein	Organic High Oleic Sunlflower Oil, Organic Soy Oil, Organic Coconut Oil	Organic Maltodextrin, Organic Sugar			ARA & DHA*
Nature's One Natures Own® Baby	Organic Nonfat milk	Organic Vegetable Oils (High Oleic Safflower & Sunlflower Oil, Soy Oil, Coconut Oil)	Organic Brown Rice Syrup, Organic Soy Lectin			Contains No DHA or ARA
THE HONEST CO. The Honest Company Organic Premium Formula®	Organic Nonfat milk, Organic Whey Protein* *Contains Soy Lectin	Organic Vegetable Oils (Palm or Plan Olein, High Oleic Safflower or Sunlflower Oil, Soy Oil, Coconut Oil)	Organic Lactose, Organic Glucose Syrup Solids			ARA & DHA*
Vermont Organics Vermont Organics	Organic Nonfat milk	Organic Vegetable Oils (Palm or Plan Olein, High Oleic Safflower or Sunlflower Oil, Soy Oil, Coconut Oil)	Organic Glucose Syrup Solids, Organic Maltodextrin			ARA & DHA*

*Synthetic ARASCO - DHASCO made by Martek Biosciences

Fat mass is higher in formula-fed infants than in breastfed at twelve months.

2. Protein as non-fat milk, casein hydolysate, whey protein concentrate, soy protein isolate;
3. Fat as soy oil, coconut oil, palm olein, high oleic safflower oil, high oleic sunflower oil, "other medium-chain fatty acids";
4. Synthetic arachadonic acid (ARA) and docsahexanoic acid (DHA);
5. Synthetic vitamins A, E, D, K, B_1-B_3, B_5, B_6, C, folic acid, biotin, choline; the carotenoids lycopene, lutein;
6. Minerals in inorganic form: potassium, calcium, iron, magnesium, chloride, zinc, copper, manganese, selenium;
7. Synthetic preservatives: beta carotene and ascorbyl palmitate to prevent rancidity in the DHA and ARA oils;
8. Synthetic amino acids: taurine, L-carnitine and L-methionine (in soy formula);
9. Nucleotides: cytidine 5'-monophosphate, disodium guanosine 5'-monophosphate, disodium uridine 5'-monophosphate, adenosine 5'-monophosphate;
10. Probiotic or prebiotic substances as oligosaccharides, fructooligosaccharides (fos), polydextrose.

Other common additions are carrageenan and salt.[27]

The synthetic ingredients in infant formula are produced with toxic chemicals. Lutein is a hexane extract from marigolds; lycopene is produced with toxic toluene; taurine is processed with sulfuric acid and aziridine; L-carnitine and L-methionine are discussed in depth below; nucelotides are derived from chemically treated yeast; the fatty acids ARA and DHA are present in the synthetic forms of ARASCO and DHASCO, to be discussed below.[28]

AMINO ACIDS AND NUCLEOTIDES

Taurine is an amino acid that is plentiful in breast milk in a free form for easy absorption. It plays an important role in the development of the central nervous system and is credited with growth of the brain, as it is necessary for myelination. It also protects cells in the brain and eye against toxins or oxidants. The human infant, unlike adults, cannot synthesize taurine from cysteine and methionine precursors. Even adults rely somewhat on dietary sources of taurine. Low in cow's milk, taurine was added to infant formula in 1984. But the taurine in infant formula is produced synthetically; one processing method includes the use of sulfuric acid, a toxic and carcinogenic substance, and another technique involves aziridine, listed as a hazardous air pollutant by the Environmental Protection Agency.[29]

L-carnitine production involves epichlorhydrin, listed as a 2-B material (possible human carcinogen) by the International Agency for Research on Cancer. For this reason it was rejected for use in organic foods by the National Organic Standards Board. The bioavailability of oral carnitine supplements is only about 14–18 percent of the administered dose. In contrast, the bioavailability of L-carnitine from food in omnivores is about 54–72 percent.[30]

FDA regulations on the nutrient requirements of infant formula (21 CFR 107.100(a)) do not require the addition of L-carnitine.[31]

L-methionine is required in soy-based infant formula to meet basic amino acid requirements. Given its incompatibility with organic principles, synthetic L-methionine is prohibited in European

CONTROVERSIAL INGREDIENT IN ORGANIC INFANT FORMULAS

Carrageenan, an extract of red seaweed, appears in some organic infant formulas, even though the National Organic Standards Board (NOSB) voted to prohibit it. The Secretary of Agriculture's decision to disregard the NOSB's decision reveals the lobbying power and influence of the infant formula industry. Carrageenan is prohibited in both conventional and organic formula in the European Union. The science linking carrageenan to intestinal inflammation is disturbing enough, but what adds insult to injury is that its addition to infant formula is entirely unnecessary. Carrageenan contributes no nutritional value or flavor to formula, or other food, but is added solely to stabilize ready-to-feed formula. Adding carrageenan means parents or caregivers do not have to shake the product before feeding it to the baby. The simple alternative to adding carrageenan is to put a "shake well" label on the bottle. Earth's Best and Similac Organic ready-to-feed formula, the only liquid organic formulas on the market, both contain carrageenan.[28]

organic foods. For that reason, organic soy-based infant formula does not exist in Europe. The synthetic version of L-methionine used in infant formula is produced with materials including acrolein, an EPA hazardous air pollutant, and hydrogen cyanide, described by the Centers for Disease Control and Prevention as a "systemic chemical asphyxiant" and "chemical warfare agent. . . used commercially for fumigation, electroplating, mining, chemical synthesis, and the production of synthetic fibers, plastics, dyes, and pesticides."[32]

Nucleotides, the building blocks of nucleic acids like DNA and RNA, are produced from hydrolyzed yeast. The yeast undergoes multiple chemical changes in order to allow extraction of nucleotides, including heating to denature proteins, cell wall proteolysis, enzymatic hydrolysis, and dehydration. A Chinese biotech company (Dalian Zhen-Ao Bio-Tech) and a Japanese company supply most of the infant formula nucleotides.[33]

FATTY ACIDS: DHA AND ARA

Martek Bioscience Corporation, a Dutch conglomerate, makes the fatty acids DHA and ARA from a strain of genetically modified algae through induced mutations with the use of radiation and harsh chemicals. The algae are fermented in tanks containing corn syrup, ethanol and other ingredients and then immersed in a bath of hexane, a petrochemical solvent which is a known neurotoxin according to the CDC. If used in infant formulas it is micro-encapsulated, which is also prohibited in organic standards. It is also preserved with synthetic ingredients prohibited in organic standards like mannitol, modified starch, glucose syrup solids, ascorbyl palmitate, and beta carotene. DHASCO, the artifically produced DHA, is used extensively in omega-3 supplements and foods. The natural source of DHA is fish or fish liver oil.[34]

PROTEIN IN INFANT FORMULA

The present protein concentrations in infant formula are twice as high as that in human milk. Too much protein results in the formation of high blood urea and ammonia, which must be eliminated in the urine, and a higher mineral and ash content than the infant requires. Thus the formula-fed infant has a two-thirds higher renal solute load and higher urine specific gravity than the breastfed counterpart. The kidneys of formula-fed infants are taxed working overtime to eliminate the solutes.[35]

Formula feeding of human and rhesus monkey infants accelerates weight gain in early infancy and results in increased serum concentrations of branched-chain amino acids (BCAAs). Milk-derived BCAAs stimulate the secretion of insulin and IGF-1 growth factor. The European Childhood Obesity Trial Study Group confirmed that early high-protein feeding predicts obesity. Fat mass is higher in formula-fed infants than in children breastfed at twelve months.[35]

Whey alpha-lactalbumin is the major protein in breast milk, which is important in lactose formation, and is rich in tryptophan (TRP), the essential amino acid that serves as a precursor for the neurotransmitters serotonin and melatonin. These regulate many neurobehavioral effects such as appetite, satiation, mood, pain perception, and the sleep-wake cycle. Breast milk contains no beta-lactoglobulin, the dominant whey protein in cow's milk and thus in formula.[36]

The infant's daily need for TRP is relatively high compared to children ten to twelve years of age and adults. To meet infant requirements the concentration of protein in formula must be higher than in breast milk: more than 15 grams per liter in formula versus 9-11 grams in breast milk. Despite these higher added levels, studies report that the TRP levels in formula-fed infants are still low. Low levels of TRP in infancy may be related to the development of behavioral disorders like ADHD.[36]

Underscoring the crucial importance of adequate levels of this amino acid in infant nutrition is the fact that the metabolites of TRP are unique among amino acids. TRP with tetrabiopterin (BH4) and dioxygen as cofactors is converted to 5- hydroxytryptophan (5-HTP) which readily crosses the blood-brain barrier. 5-HTP is then converted to serotonin which is further metabolized in the pineal gland to melatonin.

The pathway of TRP that leads to B_3 (niacin) formation requires B_1 (thiamine), B_2 (riboflavin) and B_6 (pyridoxine). Niacin is necessary to prevent pellagra.[36] With unenriched whey in formula, babies are at risk of insufficient TRP

Human milk is high in tryptophan and provides optimal conditions for the availability of serotonin.

A mother can give the gift of immunity to her child in two ways. The first is through breastfeeding when the mother passes specific antibodies, secretory immunoglobulin A (sIgA), to the infant. These antibodies are the first line of defense for the epithelial tissues that line the cavities and surfaces of blood vessels and organs throughout the body. As a component of the immune system, sIgA blocks pathogens from attaching to intestinal epithelial cells, prevents them and antigens such as toxins from gaining access to the intestinal epithelium, and even controls bacterial colony formation. It also may be involved in the establishment of the newborn's microbiome. In studies, sIgA, in concentrations at or below those found in human milk, inhibited the binding of Clostridium difficile toxin A to the brush border of intestinal cells.[1]

The production of sIgA is very important because the infant does not begin to make her own sIgA until several months of age, and at one year her levels are only 20 percent of adult levels.[2] The production of sIgA is exclusive to breastfed infants; formula-fed infants do not acquire this protection from formula.

The maternal diet can help to "boost" the secretory sIgA levels transferred to milk, at least in the animal kingdom. In studies, the milk of nursing mice given a fermented milk kefir had increased levels of IgA antibodies.[1]

Through these processes the baby learns how to interface with the environment from information passed through the breast milk. Breastfeeding can be viewed as an important part of the immune system maturation process.[1]

The second way that a mother transfers immunity to her child is through maternal antibodies called immunoglobulin G (IgG), which pass through the placenta. IgG is the major antibody in the blood and extracellular fluids, and it binds viruses, bacteria and fungi to protect the body from infection.[3]

The beneficial Bifidobacteria and DNA from many other bacteria present in the mother's gut also pass into the breast milk through a specific connection. Because of this factor, it is important for mothers to have a healthy microbiome before pregnancy, eat plenty of lacto-fermented foods, and avoid antibiotics, artificial sweeteners, oral contraceptives and other substances that damage the friendly bacteria.[4] For those who are lactose-intolerant and cannot ingest yogurt, kefir and other dairy products, raw sauerkraut, pickles and other mixtures, as well as kombucha, water kefir and other products containing probiotic bacteria can be consumed.[5]

Surprisingly, the baby's antibodies are stronger than an adult's. The antibodies that mothers pass to babies can inhibit the formation of vaccine responses throughout the first year of life. "This effect is usually overcome by secondary responses to booster immunization," say researchers.[6] In fact published research papers show that science is working to squelch this response. Dr. Stefan Niewiesk from Ohio State University suggests that the infant's response to the mother's natural antibodies "can be partially overcome by injection of a vaccine-specific monoclonal IgM antibody. IgM stimulates the B cell directly through cross-linking the BCR via complement protein C3d and antigen to the complement receptor 2 (CR2) signaling complex."[7]

Studies have shown prolonged protection against illness in breastfed infants including:

- Haemophilus influenzae type b (Hib), infection is enhanced by breastfeeding up to ten years after lactation;
- Diarrhea even if solid foods had been introduced during the breastfeeding;
- Respiratory tract infections for nearly seven years compared with those not breastfed;.
- Otitis media up to the age of three years.[8]

Colostrum is the first milk produced immediately after birth up to four days until regular breast milk begins. It is a source of fats, proteins, sugars and micronutrients in the form of vitamins and minerals and a very rich source of secretory IgA, IgG, lactoferrin and other immune substances that grant protection to the newborn. Colostrum establishes the immune system and confers growth and protective factors. It is full of leukocytes, macrophages, polymorphonuclear neutrophils and lymphocytes, which enhance the immature infant's immune system.[9]

Macrophages are phagocytic cells that are an important part of the immune system. They increase in numbers in response to an infection. These cells recognize, engulf and destroy pathogens, cancer cells and foreign substances, release cytokines, help remove cellular debris and clear away cells that have undergone apoptosis (cell death).[10]

GcMAF, glycoprotein macrophage activating factor, a protein that is made and released into the bloodstream by T cells and B cells, is important in activating macrophage activity. It has other important physiological functions that include involvement in vitamin D transport and storage, other immune functions, and brain communication and development. GcMAF docks into the surface receptors of macrophages to activate them.[11]

The precursor for forming GcMAF is vitamin D-binding protein (DBP) which is a glycoprotein (containing sugars). In order to make GcMAF from vitamin D-binding protein, two steps are needed, each catalyzed by a specific enzyme (beta-galactosidase and sialidase), which remove these sugars from the molecule. Sialidases interact with sialic acid in various natural substances, including glycoproteins.[11]

Human milk, including milk from mothers of preterm infants, is a rich source of sugar-bound sialic acid. Relatively small amounts, if any, are found in infant formulas. Sialic acid is highest in colostrum and decreases over time. In animal

studies, sialic acid supplementation is associated with increases of gangliosides in the brain and improved learning ability.[12] The role of sialic acid in breast milk is currently unknown but it may play a role in the activity of GcMAF.

Nagalase, an enzyme made by viruses and cancer cells to cloak their activities from the immune system, disables GcMAF in vivo, resulting in immunosuppression. In the absence of GcMAF, cancers and HIV and other viruses can grow unimpeded.[11]

In 1990 Dr. Nabuto Yamamoto demonstrated that administration of GcMAF bypasses the nagalase blockade and re-activates the macrophages, and that it is involved in killing cancer cells, inhibiting their further growth and returning the cancer state to normal. Administration of GcMAF rebuilds a depressed immune system, activates white blood cells, and increases the neuronal activity in the brain. It also leads to increased energy production at the mitochondrial level, reducing symptoms of chronic fatigue syndrome, and improves human neuronal metabolic activity.[13]

Dr. Marco Ruggiero, a medical doctor, professor of molecular biology and scientific director of Immuno Biotech, found that colostrum contains GcMAF. Along with his team at the University of Florence, he is researching reversing cancer, autism, autoimmune disease and other diseases based on this special molecule and claims cures in this field. Scientists at Immuno Biotech have published sixteen peer-reviewed research papers in 2013 alone, showing evidence that GcMAF rebuilds a depressed immune system.[13]

Ruggiero has been working to produce a food product, starting with a colostrum-enriched yogurt-like product inoculated with probiotic bacteria and vitamin D. He says that when the yogurt arrives in the gut where there are the highest number of microphages in the GALT (gut associated lymph tissue), the immune system of the gastrointestinal tract, it activates the macrophages. Dr. Ruggerio explains that he can basically the primal mammal microbiome using colostrum and other substances like vitamin D, oleic acid and probiotic bacteria.[14]

In 2013 Immuno Biotech introduced "GOleic," combining colostrum containing the GcMAF molecule with oleic acid, which can be taken orally in yogurt and also under the tongue, proving effective ways to administer GcMAF to younger children with autism. Dr. Ruggerio stressed the fact that changing the diet and lifestyle is a very important part of the treatment: "Daily vitamin D_3, removing sugar and carbohydrates from the diet, decreasing stress, exercise, eating meat and fish are all essential components to beating cancer."[13-14] Again we see the importance of adequate levels of vitamin D_3 in the body.

Physicians like Dr. Thomas Cowan have discussed the fact that vaccines and other factors can weaken and debilitate the cell-mediated immune system, which eventually leads to the formation of cancer. Dr. Cowan outlined the use of GcMAF in cancer therapy at the 2013 Weston A. Price Conference in his presentation "The Holistic Treatment of Cancer, Part II," which is available on MP3-CD ROM through Fleetwood.[15]

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"Children drinking 1 percent or skim milk at both two and four years were more likely to become overweight/ obese between those time points."

for serotonin synthesis in the brain.

Excessive protein intake represents a useless metabolic load to the infant, but if the protein amount is reduced in infant formulas more toward the standard value of human milk, this causes a reduction in the tryptophan and taurine concentrations in the serum of formula-fed infants, even when they contain excess whey protein. Recently, whey sources with elevated concentrations of alpha-lactalbumin have become available, which has permitted the development of formulas with increased concentrations of this protein and decreased concentrations of beta-lactoglobulin. Human milk is high in TRP and provides optimal conditions for the availability of serotonin, the body's feel-good chemical.[36]

The U.S. Dietary Guidelines recommend lowfat or skim milk for children older than two years of age. In 2013, Mark DeBoer, associate professor of pediatrics at the University of Virginia and his colleagues fed toddlers and children between the ages of two and four one percent and skim milk, and found that children who drank milk which has a higher amount of protein than whole fat milk, gained more weight and had a higher body mass index than those who drank whole milk or even 2 percent milk. "Children drinking 1 percent or skim milk at both two and four years were more likely to become overweight/obese between those time points." It was indeed the higher amount of protein in the milk that caused the weight gain, not fat.[37]

COW'S MILK HYDROSYLATE FORMULA

Protein hydrosylate formulas based on casein or whey are considered hypoallergenic. They were first introduced in the 1940s and are recommended for babies who have food allergies and colic because of supposed protein sensitivity. Similac Alimentum, Enfamil Nutramigen, and Enfamil Pregestimil are specific brands. These formulas are more expensive than others on the market.[49] These formulas are extensively processed with heat and chemicals to break down the protein to some extent. The result is a product with "a very sour and bitter taste and an unpleasant sulfur smell."[49]Even so, these formulas have some intact proteins, which can trigger an allergic response; 10-30 percent of allergic babies cannot tolerate these formulas.[49]

In studies of babies using this formula compared to breastfed babies, iron status was lower, and amounts of amino acids excessive. Infants had significantly higher serum urea nitrogen than did all other groups. Plasma threonine, valine, phenylalanine, methionine, and tryptophan were significantly higher in the hydrolysate formula groups than in the breastfed group. Plasma tyrosine was significantly lower.[50]

Atopic dermatitis continues to be a problem in formula-fed babies and rates have been continually increasing. The FDA recently stated that "Partially hydrolyzed formulas should not be fed to infants who are allergic to milk or to infants with existing milk allergy symptoms."[51]

SODIUM IN INFANT FORMULA

Higher sodium concentrations in infant formulas require a greater water intake for excretion and produce increased thirst. The increased thirst in the formula-fed infant is often interpreted as hunger by the mother and the infant is fed more formula. The infant fed artificial formula needs a greater water intake in order to excrete the increased amount of substances produced from metabolizing infant formula. In the past, however, mothers feeding infant formula did not give additional water and infant kidneys were compromised.[63] Could this early exposure to high sodium levels set the stage for hypertension in later life?

FATS IN INFANT FORMULA

Popular books on baby and infant care and scientific articles of the past sixty years have claimed that the fats necessary for brain growth are the long-chain polyunsaturated fats like DHA and that saturated fats must be avoided at all cost. This disastrous misinformation is based on the radical change in government dietary policy promulgated by Ancel Keys, a scientist who rose to become a leading authority on heart disease, cholesterol and saturated fats in the 1950s. His misguided recommendations were adopted and found their way into every home as researchers, dietitians, and health personnel jumped on his anti-saturated fat bandwagon.[64] Babies were harmed by this restriction of saturated fats as these same dangerous theories found their way into the recipes for commercial infant formula.[65]

DESTRUCTION OF AMINO ACIDS IN PROCESSING AND HEAT TREATMENT

Proteins in infant formula are prone to glycation reactions during processing. To ensure safety and extend shelf life, ingredients are blended, pasteurized, homogenized, concentrated, heat sterilized, spray dried and canned up to 130-140°C, which leads to major changes in the compositions of the infant formula.[39] Glycation is the reaction of sugars with amines, amino acids, peptides and proteins at high temperatures, which initially form Amadori products, the first step in a process called the Maillard reaction (MR). Amadori products are degraded via various pathways leading eventually to advanced glycation end products (AGEs). Human milk contains small amounts of these products compared to infant formulas.[38]

Heating results in a decrease in the availability of amino acids, mainly lysine, by up to 50 percent. The lysine and lactose react to form lactulosyllysine (LL), an early-stage AGE, which blocks the uptake of the essential amino acid lysine, resulting in loss of absorption, digestibility and nutritional value. LL can break down into furosine (FUR) and the two AGEs N-carboxymethyllysin (CML) and oxalic acid monoalkylamide (OMA), which also can be produced when omega-3 DHA reacts with lysine. Infant formulas may contain CML levels one-hundred-fold higher than human milk. Studies have shown levels of furosine from 932 to 1550 milligrams per 100 grams of protein in infant formulas versus no furosine in breast milk.[39]

Both the high lactose content and the supplementation with whey proteins promote MRs. Supplemental whey powders can already be highly damaged before they are added to the formula. Whey protein used in infant formulas, protein powders and other products are also subjected to thermal processing. During heating, many chemical reactions take place that can drastically decrease the favorable nutritional properties of whey.[40]

In whey-added formulas, lysine becomes significantly even more degraded. Liquid formulas have six times more lysine loss than powders. To compensate for this loss, formula companies add higher protein concentrations in the formula, about twice that of human milk. But increasing protein leads to higher production of AGEs.[41]

Iron and ascorbic acid increase hydroxyl radical formation, lysine glycation and tryptophan oxidation. Vitamin C itself can oxidize to dehydroascorbic acid. Important minerals like zinc, iron and copper can form complexes with MRPs.[42]

Many MRPs are toxic substances, accumulating in the liver, kidneys and pancreas, causing pathological changes in these organs in laboratory animals. Arginine, methionine, tryptophan and histidine are also similarly affected. MRPs also limit the digestibility of proteins by blocking the availability of a peptide bond for trypsin and carboxypeptidase, and are inhibitors of digestive enzymes.[39]

The most prevalent protein oxidation product generated during milk processing is methionine sulfoxide, which is formed by oxidation of methionine. Methionine sulfoxide levels can be as high as 64 percent of total methionine in whey protein concentrate and calcium caseinate. Methionine is an essential amino acid and a source of methyl groups for a number of methylation reactions, as well as a source for cysteine required for synthesis of glutathione, the most important antioxidant made by the body. If most of the methionine is oxidized, it is not available for use by the infant.[43]

Cysteine and tryptophan also can become oxidized. Tryptophan is oxidized to N-formylkynurenine (NFK). NFK is a metabolite of tryptophan associated with tics.[44]

What happens to these products? Except for LL and fructosyllysine, which are bound into peptides, most of the other MRPs are probably fermented by the gut microbiota.[45] What changes these substances cause in the microbiota is not known.

A diet high in AGEs shows development of inflammation mediators and decreased insulin sensitivity in animals and humans. Experimental studies show that AGEs themselves may start the insulin resistance process in muscles and decrease the insulin content in the pancreas. Higher protein content, lower concentrations of long chain polyunsaturated fatty acids, and presumably the lack of insulin-sensitizing hormones, as well as numerous other biologically active substances in infant formulas in comparison with breast milk, are thought to play a pathophysiological role in formula feeding associated decreased insulin sensitivity. Recently, it has been suggested that food-derived AGEs in AGE-rich infant formulas might precondition infants to insulin resistance via induction of inflammation and oxidative stress.[46]

Recognized as dangerous by the EPA and FDA, acrylamide, identified in 2002, is a known carcinogen and human neurotoxicant formed in food as a result of a heat-induced reaction between two naturally occurring ingredients, the amino acid asparagine and sugars. The FDA detected acrylamide in two out of twelve brands of infant formula they tested: Enfamil Milk-Based Infant Formula with Iron (powdered) and Similac Infant Formula with Iron. Babies may be more sensitive to the neurotoxic impact of acrylamide because of their immature nervous systems. Early epidemiological studies have found an association between acrylamide intake and the occurrence of tumors.[47]

The consumption of MRPs has increased in recent decades along with evidence that these substances may participate in pathological processes such as cataract formation, diabetes, degenerative diseases, atherosclerosis and chronic renal failure. The amount of AGES in formula may exceed that in breast milk up to six-hundred-seventy-fold. In addition to toxic AGES and MRPs, "a significant decrease of nutritive value of infant formulas occurs during their production, relative to the nutritive value declared by the manufacturers." It is unknown whether manufacturers prepare nutritional labeling on the basis of ingredients before or after processing. Thermal processing takes a huge toll on the nutritional content of the formulas as well as creating harmful substances which are not present before production.[48]

In randomized double-blind prospective trials palm olein has been found to hinder bone mineralization and development in infants because of reduced calcium absorption.

In keeping with this lowfat theme, babies also were the subjects in experimental research when pediatricians and researchers in the 1960s and 1970s recommended skim milk for infants beginning at four to six months of age. The advice didn't work out so well—for the babies. A small amount of safflower oil and fat-soluble vitamins was then added. The infants drank enormous quantities of the milk and ate a lot of cereal. They gained in length at a normal rate but had slow or no weight gain. They also lost fat as shown in skinfold thickness because they were using stored fat to make up for the loss of fat in the diet. The researchers concluded that this diet was "likely to be seriously detrimental to the infants."[65]

Saturated fats are essential for the newborn and children in periods of rapid growth. They provide a diverse range of molecular function and actions within cells and tissues beyond providing simple energy. Fatty acids are required for membrane synthesis, modifications of proteins and carbohydrates, construction of various structural elements in cells and tissues, production of signaling compounds, and for oxidative fuel. Saturated fats are so important that the body has a mechanism to synthesize them from acetate in the absence of sufficient dietary fat. Feeding a lowfat diet results in membrane fragility which can disrupt cell signaling and many functions of the cell. This condition can be remedied by a high fat diet. The body has a control mechanism for the production of saturated fat—when they are plentiful in the diet, new synthesis is inhibited.[66]

In fact, cells produce a remarkable diversity of saturated fatty acids under particular conditions, and although not all of their functions are known, they are clearly not simply interchangeable. Saturated fatty acids have been suggested as being the preferred fuel for the heart.[66]

Baby formula today is high in polyunsaturated oils, which can quickly become rancid. They also may contain *trans* fats from the deodorizing process. GM crops can be sources of the oils. Fats undergo further processing when converted to a powdered form. Consequently some baby formulas contain the preservatives ascorbyl palmitate and beta carotenes to prevent oxidation of fats.

High-oleic safflower or sunflower oil is commonly used in infant formulas. Safflower oil itself is a relatively inexpensive oil, mainly produced by Cargill, Archer Daniels Midland, and BASF (a German chemical company), but it is high in the polyunsaturated fatty acid (PUFA) linoleic acid, which makes up about 55-77 percent of the oil. Safflower oil has been linked with the development of heart disease. But the hybridized high-oleic safflower oil contains only 12-16 percent linoleic with 70-80 percent as oleic acid, a monounsaturated fat (MUFA). Hybrids are not genetically modified but radiation and toxic chemicals are used to produce them. PUFAs are highly subject to rancidity and were partly hydrogenated in the past to preserve shelf life. The label on current infant formulas does not indicate whether the PUFAs in the product are hydrogenated. Because PUFAs are so prone to oxidation, increasing the MUFA would give the product a longer shelf life.[68]

Coconut oil is another fat used in infant formula. It is a unique plant fat, which is high in saturated fats the infant desperately needs to grow and develop. Saturated fats like coconut oil are usually not subject to oxidation. However animal sources of saturated fats, which give a wider range of the various saturated fatty acids found abundantly in the breast milk of a well-nourished mother, are still missing from infant formula.[66]

Soybean oil, another common oil used in infant formula, contains 34 percent PUFA with 24 percent MUFA. Most soybean oil in the U.S. is a product of GM soy beans. It is extracted from the beans with high heat and hexane, and the deodorization process may result in *trans* fats in the oil. In the past most soybean oils were partially hydrogenated to preserve their shelf life. But recently the U.S. government recognized *trans* fats as harmful substances, especially damaging to the heart. Soybean oil is reputed to contain omega-3 fatty acids but these fats are very sensitive to heat and quickly become rancid and therefore harmful.[69]

Another prominent fat used in formulas is palm olein, which is not the same as saturated palm oil. It is added to provide palmitic acid at a level similar to that found in breast milk. However, palmitic acid from palm olein is chemically different from that in breast milk and is poorly

absorbed. The fat reacts with calcium to form insoluble soaps and causes constipation.[70]

In randomized double-blind prospective trials palm olein has been found to hinder bone mineralization and development in infants because of reduced calcium absorption. In formulas where palm olein is used and most of the calcium is added in the form of calcium salts as in soy-based and casein hydrolysate formulas, incidence of hard stools and constipation are increased.[70]

For many years, the FDA did not allow canola oil in infant formula, but today the FDA regards canola oil as GRAS (generally regarded as safe) for use in them. The multinational company, Danone, applied to the FDA in 2013 to use canola as a source of fat in infant formulas to be sold in the U.S. In a letter responding to Danone's application, the FDA had no questions regarding the inclusion of canola oil as a source of fat in infant formulas at levels up to 31 percent of the total fat blend. Danone claimed in its petition that canola oil has a higher alpha linoleic acid (ALA) content than soy (11 percent versus 8 percent) and less saturated fat (7 percent versus 15 percent) than soybean oil, offering a "healthier" fat profile overall.[71] Canola oil is mostly produced from GM seed, is processed at high heat, extracted with the neurotoxin hexane, and contains *trans* fats and other rancid products.[72]

DHA AND ARA

DHA (decosahexanoic acid) is the central focus of advertising for infant formulas and almost all formulas contain this synthetic ingredient. Abbott Laboratories now is using OptiGRO™, a blend of DHA, lutein and vitamin E, as their main calling card while Mead Johnston offers "choline and DHA" for its importance in "brain and eye development."[74]

DHA is the most abundant omega-3 fatty acid in the brain making up about 40-50 percent of the polyunsaturated fatty acids (PUFAs). In addition, 50 percent of the weight of a neuron's plasma membrane is composed of DHA. About 40 percent of the retina is made of DHA. It is also very important component in the skin, sperm and testicles. It can be derived directly from human milk but amounts vary widely dependent on dietary intake. Babies cannot synthesize it from the vegetable source, alpha linoleic acid (ALA), and this reaction is slow or non-existent in humans for many reasons. Professionals recommend 300 mg per day of DHA for pregnant and lactating women. The average consumption of DHA among U.S. and Canadian women is between 45 mg and 115 mg per day while Japanese women consume the highest amounts. DHA is found primarily in fish and fish oil. Because of presumed health benefits, synthetic DHA is now added to baby formula.[74]

ARA (arachadonic acid) is a polyunsaturated fatty acid naturally synthesized by the body from linoleic acid. The work of Susan Carlson and colleagues established the importance of ARA levels for growth in the infant. She also found that babies whose formula was supplemented with fish oil but not ARA had slower growth rate than those on conventional formulas and that when DHA was added to infant formula, levels of ARA decreased due to competition in the enzyme available needed to make both conversions.[75]

In 2004 the FDA accepted the claim made by Martek Biosciences Corp for inclusion of ARASCO and DHASCO into infant formula. ARASCO is artificially produced ARA from *Mortierella alpina* oil and DHASCO is produced from *Crypthecodinium cohnii* oil. These ingredients are extracted from algae and soil fungus with hexane—a neurotoxic, petroleum-based solvent. The National Organic Standards Board stated that hexane-extracted algal oil and fungal oil should not be allowed in organic foods—but the USDA has failed to act, and hexane-extracted DHA and ARA remain in organic infant formula.[76]

When the *C. cohnii* and *M. alpina* oils first appeared in infant formula, FDA received dozens of reports from physicians and parents who noticed diarrhea, vomiting and other gastrointestinal distress in infants given formula with these oils—symptoms that disappeared when the infant was switched to the exact same formula without these novel additives.[77]

Three of the most prominent and respected independent scientists in the field of infant formula science stated in 2010 that the scientific evidence supporting the addition of DHA and ARA to infant formula is "recognized by most investigators and Key Opinion Leaders in the

When the C. cohnii and M. alpina oils first appeared in infant formula, FDA received dozens of reports from physicians and parents who noticed diarrhea, vomiting and other gastrointestinal distress in infants given formula with these oils—symptoms that disappeared when the infant was switched to the exact same formula without these novel additives.

SOY-BASED INFANT FORMULA

The most damaging and experimental artificial formula on the market is soy-based formula. Approximately 20–25 percent of infants in the U.S. now receive some soy-based formula during their first year, but no data exist regarding how many are exclusively fed soy formula.[52] The current position of the American Academy of Pediatrics (AAP) is that there is "no conclusive evidence from animal, adult human, or infant populations that dietary soy isoflavones may adversely affect human development, reproduction, or endocrine function." On the other hand the AAP also clearly advises that breast milk is the best food for babies and that soy-based formula must only be used in the case of galactosemia, a life-threatening condition in which the infant cannot tolerate lactose.[52]

In 2014 the Center for Food Safety, a national advocacy organization, purchased soy-based infant formulas in order to test for the presence of GM (genetically modified) ingredients. Similac Soy Isomil and Enfamil Prosobee Powder Soy Infant Formula both tested positive for GM soy, which is genetically engineered for resistance to Monsanto's herbicide Roundup and its active ingredient glyphosate. "I think most moms purchasing infant formula have no idea they are feeding their baby a product that has been genetically engineered to survive exposure to high levels of chemical pesticides," said Aurora Paulsen, with the Center's Portland office. Farmers spray Roundup on their soy crops several times during the growing season. Glyphosate is a systemic herbicide, which means that it is absorbed through the foliage and relocated internally throughout the plant structure, including the soy beans. It cannot, therefore, be "washed off."[53]

Soy-fed infants receive large amounts of phytoestrogens, which are estrogen-like compounds. The infant consuming soy formula has blood levels of these compounds thirteen thousand to twenty-two thousand times higher than children on milk-based formula or, according to toxicologist Michael Fitzpatrick, the equivalent of five to six birth control pills a day. Experiments with animals show many hormonal abnormalities in those fed soy-based formulas.[54]

The late Dr. Mary Enig, past President of the Maryland Nutritionists Association and co-founder of the Weston A. Price Foundation, reviewed the literature and found that high levels of phytoestrogens in soy formula have been implicated in increasingly earlier sexual maturity in girls and delayed or slowed sexual development in boys.[55]

Problems with nutritional deficiencies in babies resulting from soy formula feeding were never pre-determined but only addressed after the babies suffered harm. The first soy formulas made in 1929 and later were made with soy flour and caused major digestive troubles. In 1960 a formula with soy protein isolate was introduced.[54]

Soy protein isolate is 90 percent protein; it is high in arginine, aspartic acid, glutamic acid, and leucine, and low in methionine, tryptophan and cysteine.[56] It contains no lactose and only polyunsaturated fatty acids (PUFA) in the form of linoleic acid, and a small amount of linolenic acid. It is high in sodium, phosphorus and manganese and low in magnesium and iron.[56] High manganese levels have been implicated in behavioral problems in children. Soy protein isolate is also contaminated with high amounts fluoride, aluminum and cadmium.[54]

Soy protein is low in tryptophan and thermal processing further destroys and/or degrades tryptophan as well. Neither the brain nor the body can make this essential amino acid—it must come from the diet. The soy-fed infant brain is starving for tryptophan needed to make the neurotransmitter serotonin. This pattern of low levels of serotonin may come into play years later. In many studies, persons who display aggressive behaviors, who attempt violent suicide, commit impulsive murders, those with ADHD, and depression show low levels of serotonin.[57-58]

Soy proteins contain anti-nutrients that are not totally removed by processing. The following harmful substances can be found in soy-based formula:

- Lectins are sugar-binding proteins that adhere to intestinal cells causing inflammation and toxicity. They are resistant to digestive enzymes and the cooking process. Associated with leaky gut, they invade the blood and are suspected of causing disease. Many lectins are powerful allergens. They also may inhibit leptin, a hormone made by adipose cells which inhibits hunger and this dysregulation may be one of the ways that feeding infant formula encourages obesity and weight gain in infants and later in life.[59]
- Protease inhibitors are substances that inactivate some key digestive enzymes like trypsin and chymotrypsin and are associated with pancreatitis and pancreatic enlargement.
- Phytic acid compounds in plants bind tightly with minerals and are a leading cause of poor growth, immune system dysfunction, iron and zinc deficiencies and other problems. Soy beans contain more phytates than other plants.
- Saponins are associated with leaky gut and inhibit important major enzymes like trypsin and chymotrypsin. Causing enlargement of thyroid, they may also be goitrogens which inhibit production of thyroid hormone.
- Oxalates are compounds in foods that prevent the proper absorption of calcium and are related to kidney stones and vulvodynia.
- Goitrogens are substances which block the synthesis of thyroid hormone causing goiter, an enlarged thyroid, or thyroid dysfunction. They are powerful endocrine disruptors. The phytoestrogens in soy are goitrogens.[54]

field to be weak," and that "this field of research has been driven to an extent by enthusiasm and vested interest."[76] The World Health Organization's Director of Nutrition for Health and Development wrote a letter in 2011 to members of the European Parliament to let them know that no solid evidence existed to confirm that adding DHA to infant formula would provide important clinical benefits.[76]

PREBIOTIC SUBSTANCES

Oligosaccharides are the third largest component in human milk. In an attempt to emulate human milk properties, formula companies add specific prebiotics such as galactooligosaccharides (GOS) to some of their products to stimulate the growth of beneficial bacteria. Polydextrose, made from glucose, is a common GOS. A 2008 Chinese study found that supplementation with low levels of GOS "seemed to improve stool frequency, decrease fecal pH, and stimulate intestinal bifidobacteria and lactobacilli up to levels as found in breastfed infants." The fructooligosaccharides (FOS) inulin and pectin hydrosylate have also been tried as prebiotics in infant formula studies.

Another possible property of prebiotics is the potential to prevent allergic response or food hypersensitivity. A Cochrane Database Review in 2007 determined that "there is insufficient evidence to determine the role of prebiotic supplementation of infant formula for prevention of allergic disease and food reduction in eczema in infants."[78]

CONTAMINANTS IN FORMULA

A study in 2014 from the U.K. found that aluminum concentrations in infant formula were too high. Researchers from Keele University in England published two articles on aluminum contamination in ready-to-drink and powdered formulas and found that some brands contain over one hundred times more aluminum than breast milk. Aluminum was highest in products that contain an aluminum seal between the cap and the product. "Soy is a significant source of aluminum contamination in infant formula," said the authors. Other sources of aluminum are additives such as calcium and phosphorus salts as well as the infant formula manufacturing process itself. The authors say that "despite their 2010 publication of the aluminum content of fifteen well-known infant formula products, manufacturers have not yet addressed the problem."[81]

A study in 2014 from the U.K. found that aluminum concentrations in infant formula were too high.

In 2013, two infants with kidney problems died of aluminum intoxication, and powdered formula was the source. "Brain and bone disease caused by high levels of aluminum in the body have been seen in children with kidney disease. Bone disease has also been seen in children taking some medicines containing aluminum. In these children, the bone damage is caused by aluminum in the stomach preventing the absorption of phosphate, a chemical compound required for healthy bones."[82]

The CDC has not determined whether aluminum causes birth defects in humans. In the U.S., substantial amounts of aluminum are found in drinking water. Babies get a double dose

Higher levels of fluoride are reported in soy formula than in cow's milk formulas but reducing levels is difficult because the fluoride binds to the phytate and tricalcium phosphate in the mix. The CDC recently reported an increased prevalence of dental fluorosis—damage to the enamel of the teeth which is a sign of excessive fluoride intake—in children's teeth in both fluoridated and non-fluoridated communities and indicated that American children were ingesting too much fluoride. Human breast milk contains virtually no fluoride, a mere four parts per billion, about two hundred fifty times less fluoride than is added to water in fluoridation programs.[60] Infants fed formula made with fluoridated water ingest the highest fluoride dose from water of all age groups in the population. In 2007 the American Dental Association warned that parents of children under one year "should consider using water that has no or low levels of fluoride" when mixing baby formula, due to concerns about fluorosis.[60]

Growth and bone development can become problematic in infants fed soy-based formula because of resulting low methionine levels and poor retention of calcium and/or phosphate in the infant, and the absence of lactose in the formula which is a stimulator of calcium absorption. Phytates bind minerals and make them unavailable for bone building.[61]

A 2013 study by Cara J. Westmark at the University of Wisconsin associated soy-based infant formula with specific behaviors, particularly deficits in language, communication, social overtures, and hypersensitivity to environmental stimuli in autistic children. In 2014 she also found indications that that soy-based formula was associated with increased seizure susceptibility and incidence of neuronal disease in mice and human models.[62]

INFANT FORMULA WITH IRON AND LOWERED INTELLIGENCE

Despite the use of whole milk from various animals for centuries as a substitute for human milk, a strong trend away from early introduction of cow's milk between 1971 and 1998 related to a number of studies reported in the 1960s-1980s showing that consumption of pasteurized cow's milk could cause gastrointestinal blood loss in infants with related iron-deficiency anemia.[1] In 1971, a policy statement recommended that iron-fortified formula be used during the first year of life. In 1976, iron-fortified formula or infant cereal was also recommended during older infancy because of feared blood loss. In 1983 the American Academy of Pediatrics (AAP) recommended the use of cow's milk in infants older than six months of age which could replace iron-fortified formula when they consumed one third of calories from supplemental foods. But in 1992 the Academy changed its mind and recommended that cow's milk not be used until after the first year of life because of the risk of reported large fecal blood loss and anemia associated with pasteurized cow's milk. Blood loss did not seem to occur in babies fed cow-based formulas, only in those fed pasteurized cow's milk.[2] Studies by George Fuchs in 1993 at the Louisiana State University Medical School found that infants fed whole cow's milk are at increased risk of developing iron depletion but the iron insufficiency is not due to gastrointestinal blood loss.[3]

On the AAP recommendation, many more infants were fed iron-fortified formulas than ever before. From 1971 to 1991 much of this can be accounted for by the increased enrollment in the USDA's WIC (Women, Infants and Children) program and provision of free formulas, which began in the early 1970s. Because of the AAP position that all infants receive either breast milk or iron-fortified formula for the first year of life, WIC only distributes low-iron formula for infants who have serious medical conditions. Otherwise many of these infants would have been fed cow's milk.[4]

In addition to feeding iron-fortified formula to infants over six months of age, the AAP later advocated feeding high iron (12 milligram/liter) versus low iron (2.3 mg/L) formula to infants for one year after six months of age, further increasing the use of infant formula.[5] Iron-fortified formula can have iron levels twenty times higher than breast milk, and higher still in soy formula compared with cow-based formula. During storage, iron content can increase two milligrams per liter with total iron as high as 20 mg/L. The more iron added the less absorbed: 6 percent of ferrous sulfate is absorbed per liter when 6 mg are added; when 12 mg/L are added only 4 percent is absorbed. European manufacturers have changed to lower levels of iron because of these effects.[6] What happens to the unabsorbed iron is unknown.

Infants need iron primarily for growth. At birth infants of well-fed mothers have adequate iron stores which last until four months of age. Breastfed infants can develop an iron deficiency after six months depending on the diet of the mother.[7] By this time, solids are introduced and liver and egg yolk can contribute adequate iron to the baby's diet. Today's medical advice to feed rice cereal as a first food is unfortunate as the iron in baby cereal is not well absorbed and extra iron can cause constipation.[8-9]

When the AAP made their recommendations, they did not consider the effects of extra iron in the infant's diet. A ten-year randomized follow-up study of almost five hundred infants found that healthy, well-nourished children fed high iron-fortified formula as infants scored an average of eleven points lower on IQ tests at ten years of age than similar children fed low-iron formula, according to the Pediatric Academic Societies and Asian Society Pediatric Research Joint Meeting. The low iron group had higher scores "on every outcome" at ten years of age. The findings were significant for spatial memory and visual motor integration and suggestive for IQ, visual perception and motor coordination compared with those in the high iron-fortified group, who scored lower on all of these measures. "The results raise the possibility that long-term development is adversely affected in iron sufficient infants who receive formula fortified with iron at the level commonly used in the United States."[10]

"Mother's milk is very low in iron and formula makers have seized on this fact to promote iron-fortified formula as an improvement on Mother Nature," says Dr. Naomi Baumslag, Clinical Professor of Pediatrics at Georgetown University Medical College and President of the Woman's International Public Health Network. She points out that mother's milk is low in iron for at least two reasons: low iron levels in human milk contribute to its antiviral effects and iron competes with zinc for absorption. The human infant needs a plentiful supply of zinc for the development of brain and nervous system.[11] Iron also interferes with calcium and copper absorption. Iron-fortified soy-based formulas are especially problematic because they contain low levels of bioavailable zinc.[12]

Mother's milk also contains lactoferrin, an anti-infective agent which prevents iron from becoming bioavailable to pathogenic microbes in the infant intestine. Iron in formula can cause lactoferrin in breast milk to become saturated, which impairs its antibacterial effects.[13]

Ascorbic acid (vitamin C) is usually added to infant formula to increase intestinal absorption of iron. However, ascorbic acid is a very potent glycating agent.[14] Iron and ascorbic acid promote advanced glycation end-product (AGE) formation and tryptophan degradation in infant formula.[14] AGEs induce inflammation, enhance oxidative stress, insulin resistance, kidney damage and promote atherosclerosis.[15]

In the late 1960s and early 70s, iron administration in the presence of vitamin E deficiency was found to lead to hemolytic

of aluminum if fed soy formula made with tap water.

Aluminum is also found in vaccines. According to researchers, "experimental research. . . . clearly shows that aluminum adjuvants have a potential to induce serious immunological disorders in humans. In particular, aluminum in adjuvant form carries a risk for autoimmunity, long-term brain inflammation and associated neurological complications and may thus have profound and widespread adverse health consequences. In our opinion, the possibility that vaccine benefits may have been overrated and the risk of potential adverse effects underestimated, has not been rigorously evaluated in the medical and scientific community."[83]

In the first U.S. study of urinary arsenic in babies, Dartmouth College researchers found that formula-fed infants had higher arsenic levels than breastfed infants, and that breast milk itself contained very low arsenic concentrations. Arsenic is found in rice products like rice syrup, rice milk and rice baby cereal, as well as in apple and grape juice.[84]

BISPHENOL A

The European Safety Authority (EFSA) has determined that canned commercial formulas are a significant source of the chemical bisphenol A (BPA). Formula cans are lined with BPA. It is also part of the composition of polycarbonate baby bottles. BPA is a hormone disruptor and is linked with early puberty in girls, attention deficit disorder, ADHD and urogenital abnormalities in boys. BPA has also been found in breast milk.[87]

CLOSTRIDIUM DIFFICILE

Formula-fed infants have high levels of the pathogen *C. difficile* in their gut bacteria. *C. difficile* is a bacterium whose growth is linked to use of antibiotics. The substance p-Cresol, formed via anaerobic metabolism of the essential amino acid tyrosine by bacteria such as *C. difficile*, is a highly toxic carcinogen, which also causes adverse effects on the central nervous system, the cardiovascular system, lungs, kidney and liver. *C. difficile* is a well-established causal factor in colitis and inflammatory bowel disease.[88]

In a recent case-control study, children with autism were found to be significantly more likely to have been formula-fed rather than breastfed. The study did not distinguish if children were fed organic or conventional

anemia in low-birth-weight infants, especially with the consumption of an infant formula that was rich in polyunsaturated fatty acids. Under these conditions, iron at the level present in iron-fortified infant formula catalyzed oxidative damage to the red blood cell membrane. Despite addition of vitamin E, iron fortification in the low birthweight infants still causes decreases in serum vitamin E.[16]

"Dietary iron may result in a major change in the intestinal flora with consequences that carry important health implications." In studies, infants fed iron-fortified formula had high counts of E.coli and clostridia, but low counts of bifidobacteria, the major beneficial microorganism in the infant gut.[17] Despite these conflicting results, the AAP recommendation still stands, resulting in greater use of iron-fortified formulas and formulas in general in older infants who would normally have received cow's milk.[18]

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formulas, but we know that non-organic soy formula is contaminated with glyphosate, and this could be a contributing factor to the incidence of both autism and *C. difficile* overgrowth.[88] According to Dr. David Perlmutter, children with autism have higher levels of propionic acid (PPA) in their blood which is toxic to the brain. Clostridia species produce large amounts PPA which also weakens tight junctions in the intestines allowing access to the blood stream. PPA directly alters the brain's ability to use energy and depletes the brain of antioxidants, neurotransmitters, and omega-3 fats.[89]

HOMEMADE FORMULAS

Throughout human history, women who could not nurse their babies have turned to other methods of feeding infants, which included animal milk and pre-masticated foodstuffs. Women in the countryside worked outdoors during certain times of the year, and the portable infant was taken with them as the milk source was also portable and readily available. However, when the Industrial Revolution called women to work in droves in urban factory settings, this natural, sensible arrangement was no longer possible and early weaning or feeding of alternative foods became a harsh reality.[10]

In the countryside breast milk substitutes were prepared with whole milk or "top milk" (cream) which made a more digestible offering. A home recipe from 1908 contained instructions to obtain the milk both morning and evening and then let it stand for several hours to ladle off the top cream. This recipe included more fresh cream, cow's milk, limewater (a calcium supplement), brown sugar and boiled water.[90]

From the 1930s or early 1940s, most home-made formulas fed to infants in the United States were prepared with evaporated milk. A typical evaporated milk formula, from around 1949, included one can (13 fl oz) evaporated milk, 19 fl oz water, and 1 oz corn syrup (Karo) or sucrose. If cow's milk was used it was pasteurized and homogenized. Bottles and nipples were thoroughly sterilized.[91]

RAW MILK AND INFANT FEEDING

In the 1920s and 1930s Dr. Weston Price documented his use of raw milk to improve the diets of sickly children during the Great Depression years and showed it was indeed safe, wholesome and healthy. Dr. Francis Pottenger, Jr. showed the benefits of raw milk in his research with cats. His cats receiving raw milk flourished while those receiving heated milk suffered from underdeveloped chests; were infected with ticks, fleas and lice; and had irregular crowded teeth with protruding faces and narrower and smaller skulls. Cat mothers fed heated milk experienced difficult deliveries. The resulting offspring were sterile. Dr. Pottenger also was concerned with differences in the development of the jaw and facial muscles between formula-fed and breast-fed infants.[92]

In May 1945 *Coronet* magazine published "Raw Milk Can Kill," a seemingly factual article about a town called Crossroads, USA where many died from undulant fever contracted from consuming raw milk. The article was entirely fabricated—there was no town called Crossroads—but generated a furor aimed at pasteurizing all milk. To add fuel to the fire, in August 1946, *The Readers Digest* reprinted the story. This carefully planned campaign played a role in the mandatory pasteurization laws instituted in 1948, soon after these articles were published.[93]

RAW MILK FORMULAS

Despite this deliberately planned scandal over the purported dangers of raw milk, Adele Davis, the most popular nutritionist of the 1940s-1970s, advocated "certified raw milk" as the best milk to use in formulas for babies who couldn't nurse. In her bestselling book, *Let's Raise Healthy Children,* she published several

ALL FORMULAS, EXCEPT ORGANIC, CONTAIN GENETICALLY MODIFIED INGREDIENTS

Similac, Enfamil, and Gerber Good Start—which combined account for more than 90 percent of all infant formula sales in the U.S.—expose North American babies to potentially grave health risks by using genetically modified ingredients according to GMO Inside.org.[79]

According to pediatrician Dr. Michelle Perro, infant livers do not reach maturity for about two years and therefore are less equipped to process toxins in the body, such as the herbicides used when growing genetically modified crops. "Because of the toxic effects of herbicides, particularly glyphosate (due to its prolific usage) as well as other organophosphates and genetically engineered foods in non-organic commercial formulas, these are not an option for infant feeding. In order to ensure the health of our infants and children, there is no amount of acceptable herbicide or GMO that should be in their diets."[79]

Several of the ingredients likely to be genetically modified are sugar, maltodextrin, soy, and even the milk base (GM-derived bovine growth hormones). The effects of feeding GMOs to tiny infants and babies are unknown. A search of Pub Med archive at the National Library of Medicine revealed no studies.[80]

infant formulas using raw milk. Mrs. Davis also recommended supplementary cod liver oil drops.[94]

She disdained commercial formulas and referred to children who were fed these formulas as "fatties in training," remarking on the tendency of formula-fed babies to be overweight, a condition which she said could persist into adulthood. Apparently she was right as current research strongly implicates commercial formulas in the risk of obesity and diabetes.[94]

During her career as a dietitian, Mrs. Davis worked in public schools and for obstetricians. She appeared on many major TV programs, on the lecture circuit, and as lecturer at many college campuses. She supported free speech on food safety and food freedoms. In 1972 *Time* magazine called her "the high priestess of a new nutrition religion" and "the Oracle." Her books sold over one million copies. Adele was a great admirer of Dr. Pottenger and Dr. Price, discussed their work in detail, and praised them lavishly in her book on child care.[95]

Around 1999 Dr. Mary Enig and Sally Fallon Morell of the Weston A. Price Foundation developed a raw milk formula for babies using fresh cow's milk or goat's milk, and a liver-based formula for those babies who could not tolerate animal milks.[96] These formulas are still very much in use today and a boon to parents who are determined not to feed their babies commercial formula. They are promoted and supported by popular health pundit Dr. Joseph Mercola.[97]

A full description of the three formulas can be found in *The Nourishing Traditions Book of Baby and Child Care*, and in *Nourishing Traditions*. Sarah Pope, the Healthy Home Economist, presents a comprehensive video on preparation of these formulas on the WAPF website (westonaprice.org) and on YouTube.[98]

WHAT'S MISSING IN INFANT FORMULA?

In contrast to formula where every drop is identical, breast milk from a well-nourished mother is an intricate and ever-changing composition of ingredients prepared by the mother herself for her developing infant: customized nutrition at its best. Scientists have not yet discovered all the many substances in breast milk—they have barely scratched the surface. Breast milk is not just food but "represents a most sophisticated signaling system of mammalian evolution promoting a regulatory network for species-specific, postnatal growth and metabolic programming." Scientists studying the "message" in mother's milk see it as nothing less than a program for life.[99]

Research indicates that "specific micro-constituents of milk, alone and in concert, contribute to neurobiological, cognitive, somatic, metabolic, and immune development in infants among mothers within species."[100]

Drs. Katie Hinde and J. Bruce German, known for their work in decoding the constituents in mammalian breast milk, in their 2012 article called human milk "the Rosetta Stone of food and nourishment…reflecting…the most elegant and compelling example…of 200 million years of symbiotic co-evolution between producer and consumer."

The authors underscore one of many ways in which human milk is unique: "Human milk includes highly selective oligosaccharides that support the growth of only a very unique group of intestinal bacteria (*Bifidobacterium longum* v. *infantis*) that co-evolved with mammals" which guide "the development and phenotype of a bacterial ecosystem" which aids "infant digestive, metabolic, and immunological functions." These oligosaccharides are not digested by the infant or by simple bacteria but are the primary food source for *B. longum*, which are critical for health and nutrition as they modulate immune responses in the intestine and participate in the bioconversion of digested nutrients. They also serve as competitive inhibitors of the establishment of pathogenic bacteria impli-

NUCLEOTIDES AND INFANT GROWTH RATES

Nucleotides (adenylic acid, guanylic acid, cytidylic acid, and uridylic acid) are non-nitrogenous substances that occur naturally in breast milk. They are the building blocks of RNA and DNA necessary for cell growth and proliferation.

Nucleotides were added to baby formula in 1990. They are commercially produced from hydrolyzed yeasts which undergo multiple chemical changes in order to allow extraction of the nucleotides, including heating to denature proteins, cell wall proteolysis, enzymatic hydrolysis and dehydration. In a random-controlled study led by Dr. Singhal and published in Pediatrics in 2010, researchers revealed that nucleotide supplementation increased weight gain and head growth in formula-fed infants. Previous randomized trials had not shown an advantage for supplementing with nucleotides. It was originally proposed that nucleotides would help infants who were small for gestational age or those with the diagnosis failure to thrive (FTT). However, controversy exists as to the benefits of faster weight gain, and the slower weight gain that occurs in breastfed infants compared with formula-fed infants may be more beneficial.[85]

Thirty years ago Michael Crawford, author of What We Eat Today, wrote that if a factor accelerates growth, it is deemed beneficial but "from comparative biology it is clear that animals that grow the fastest are always the least intelligent."[86]

Infant formula manufacturers strive to emulate the content of mother's milk in their products. It's an absolute necessity to add specific vitamins like vitamin A. If not, babies would suffer irreparable harm in body and brain growth. Vitamin A is absolutely vital in the health, development and maintenance of skin, vision, immune system, gene transcription, bone metabolism, antioxidant activity, and other body systems both before and after birth. The active form, retinoic acid, affects many downstream target genes.[1]

Natural sources of vitamin A are animal products such as liver, butter and cold water fish, which provide the "cis" form of vitamin A[2] versus the cheap and artificial "trans" form, retinyl palmitate, which manufacturers put into infant formulas, refrigerated fluid milk products, and other products that are fortified with vitamin A.[3] Retinyl palmitate was first made in 1942 by esterifying crystalline vitamin A with a halide.[4] The natural form and the synthetic are not equivalent.[3]

Poly Vi-Sol vitamin drops and other vitamin supplements for babies contain retinyl palmitate per milliliter (one serving size).[5]

The activity of one International Unit of vitamin A (equivalent to a USP unit) is contained in 0.3 μg (microgram) of all trans retinol and in 0.55 μg of trans retinol palmitate. Each gram of retinyl palmitate contains approximately 9 milligrams of butylated hydroxytoluene (BHT) to retard oxidation.[3] BHT is a toxic petroleum product.[6] Baby formula contains the synthetic retinyl palmitate with BHT added unless indicated otherwise on the label.

According to the Federal Food, Drug, and Cosmetic Act, retinyl palmitate is recognized as safe (GRAS status) with no limitation for use in infant formula[7] despite evidence that it is toxic to various cells and organs,[8] is a tumor promoter,[9] weakens the immune system,[10] affects the nervous system and behavior,[11] and has negative effects on sperm and egg production, reproduction, and development.[12]

As early as 1974, a study by Stoke and Scudder reported that when BHT was fed to pregnant mice, it reduced the cholinesterase and serotonin in the brain of their offspring to half the normal levels. BHT can damage DNA when ingested at the officially sanctioned level of daily intake.[13]

BHT is not always listed on product labels. If the product contains oil or other secondary ingredients, preservatives in those ingredients may not be listed.[6]

The vitamin A content of breast milk is influenced by diet. The breast milk content of well-nourished mothers is much higher in preformed vitamin A than those of poorly nourished mothers. The vitamin A content changes dramatically with the stage of lactation. Levels of vitamin A are many times higher in colostrum and early milk than in later, mature milk. Bile-salt-stimulated lipase in human milk assists in the absorption of preformed vitamin A. The contribution of carotenoids and beta-carotene (pre-vitamin A in vegetables) to breast milk vitamin A levels is much less than pre-formed vitamin A provided by animal products. Preformed vitamin A is a mixture of retinol and retinyl-fatty acid esters.[14]

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cated in chronic infant diarrhea, a leading cause of childhood mortality worldwide.[100]

Lactoferrin and lysozyme are unique immune constituents with anti-bacterial properties that are found in higher concentrations in human milk than in cow's milk, which indicates that these substances are highly important for the infant. In an attempt to replicate these immune components, Chinese researchers inserted human DNA into transgenic cloned cows which produced human-type lactoferrin and lysozyme in the milk. The implications of such genetic grotesqueries are unknown.[100]

Food preferences can be learned through breast milk and appetite is formed, in part, through the foods consumed during early development. When mothers eat garlic, for example, infants drink more breast milk.[101]

Dr. Hinde and Dr. German are convinced that "The period of breastfeeding, by shaping healthy food preferences and healthy growth trajectories, is a potentially critical period for combating future obesity and dealing with our changing environments. Lifestyle modifications in adulthood, once neurobiological and metabolic pathways are well-established, are likely to have a much smaller and more transient effect on phenotype."[100] If this is so, appetite and food preferences of the formula-fed infant will be based on products of conventional agriculture such as sugar, vegetable oils, damaged proteins, GMOs and synthetic ingredients, and linked to the development of inflammation, obesity, chronic disease and premature death.

LACTOSE

Lactose, a disaccharide composed of glucose and galactose, is the main carbohydrate in breast milk and unique to the mammary gland. The amount of lactose in human milk is independent of the mother's consumption of lactose and seems to be fixed. Bovine milk has a much lower amount of lactose and to approximate breast milk, it must be added to formula, although some formulas use maltodextrin, (made from rice, corn, potatoes, sugar or glucose syrup solids) instead of lactose. Lactose is a natural component of whey.[102]

Lactose plays a major role in milk synthesis and draws water into the milk, forming a liquid. It is needed to absorb calcium and up-regulates innate immunity, leading to protection of the baby's gut against pathogens.[103]

FATS

Fats are the main source of energy and carriers of fat-soluble vitamins which provide essential omega-3 and omega-6 fatty acids. In human milk and most formulas, 50 percent of calories are supplied by fats, most of which is in the form of triglycerides of saturated and unsaturated origin. While two hundred fatty acids have been identified in human milk lipids, with fifty metabolically active, the major fatty acids are palmitic, stearic, oleic, and linoleic with medium-chain fatty acids also present. Palmitic acid, the major saturated fat in breast milk, makes up 17-25 percent of fatty acids.

The fatty acid composition of human milk fat varies with the mother's diet, particularly the omega-6 (linoleic acid) and omega-3 (alpha-linolenic acid and DHA) fatty acids. It also varies widely within and among different populations. Levels of linoleic acid have increased over the last century in step with the increase in omega-6-rich processed vegetable oils in the diet.[104]

Lactating women who are on high-carbohydrate, lowfat diets, women who are malnourished, and those with infections or metabolic disorders may see a decrease in their milk fat levels.[105]

In addition to DHA and ARA, breast milk contains the other long-chain fatty acid eicosapentanoic acid (EPA), which is found at almost the same levels as ARA "thus giving some legitimacy to the notion that big-brained mammals need it." Both dietary DHA and EPA reduce plasma ARA acid concentrations. Formula manufacturers have chosen not to add EPA to infant formula.[106]

In 2010 Du Pont developed "a clean and sustainable source of EPA" through fermentation using metabolically engineered (that is, genetically engineered) strains of the oleaginous yeast *Yarrowia lipolytica* , sold as New Harvest EPA oil in GM Nutrition stores. The New Harvest website is no longer active and the project seems to be abandoned as a supplement but we may see this genetically modified EPA product sooner than later. In 2011 the FDA had no problem with

Two hundred fatty acids have been identified in human milk lipids, with fifty metabolically active.

The formula manufacturers' main slogan in those days was that their formulas were "scientific" and thereby certain to contain all the ingredients that the baby needed to grow and be healthy.

DuPont's petition for GRAS status for the GM yeast in producing EPA for use in a wide variety of foods, even chewing gum, but thankfully not yet infant formula.[107]

CHOLESTEROL: ESSENTIAL COMPONENT

Breastfed babies receive large amounts of cholesterol from the milk of well-fed mothers, which ensures healthy brain growth. Cholesterol requirements for growth alone are 36-64 mg/day, excluding requirements for the brain, nervous system, and skin. This component is quite low or missing in formulas and formula-fed babies, especially those fed soy formula, and these infants must make their own cholesterol for use in brain and body.

In a study by Dr. Charles Wong, breastfed babies receiving higher intakes of cholesterol through breast milk had a 3.3 fold lower cholesterol turnover; that is, their bodies made *less* cholesterol than babies on cow-based and soy-based formulas. Those babies fed soy formula had the highest cholesterol synthesis as they were not receiving it in their formula so their bodies up-regulated the process to supply it. Dr. Wong concluded that children and adults who were breastfed milk from a well-nourished mother may not have to make as much cholesterol as those children and adults who were missing it in early life.[108]

Cholesterol is an essential component of cell membranes and is required for growth, replication and maintenance. The central nervous system (CNS) contains 23 percent of the total body cholesterol. Two cholesterol pools exist in the brain: 70 percent is found in the myelin sheath, and 30 percent in the neurons and glial cells.[109] This sterol is important for brain function in numerous ways: it forms nerve synapses; enables neurotransmitter, opioid and receptor signaling; helps the transport of amino acids; and performs many other tasks. Cholesterol also plays an important role in the dopamine transporter (DAT) function, an important regulatory component in maintaining dopamine homeostasis in the brain, which is the primary target for drugs like Ritalin (methylphenidate), prescribed for ADHD. Dopamine is a major neurotransmitter in the brain in charge of the reward mechanism and many other essential functions.[110] Low levels of cholesterol in nerve cell membrane directly result in a decrease in the number of serotonin receptors, resulting in an overall reduction of serotonergic transmission in the brain.[111] Cholesterol is also the activator for the oxytocin receptor in the brain and in the absence of cholesterol, this receptor inactivates. Lack of oxytocin in autistic children is involved with their inability to recognize voices, faces, and other visual cues. Many autistic children on the spectrum have low cholesterol levels. Oxytocin is also responsible for the "let down" response for the milk to start flowing from the breast and for the new mother's attachment to her baby.[112]

Is this lack of cholesterol in infant formula tied to compromised brain development and behavioral problems in childhood? When babies have to make cholesterol at such a young age, can they produce enough to adequately support brain function and does this process program the infant for higher cholesterol levels in adulthood?

HUMAN MILK LIPASE

Lipases are enzymes needed for the breakdown and digestion of fats. In newborns pancreatic lipase is not fully developed but a lipase specific to breast milk is available to the breastfed baby. Bile salt–dependent lipase (BSDL), also known as carboxyl ester lipase (CEL), is an enzyme of the mammary gland which can completely hydrolyze triglycerides, phospholipids, cholesterol and lipid–soluble vitamins and release long chain polyunsaturated fatty acids, which makes BSDL highly desirable for neonatal digestion. Breastfed infants absorb fat better than formula-fed infants due to the presence of BSDL in human milk, which is not present in formulas made from soy or processed cow's milk. Studies show that the BSDL remains active in the infant's gastrointestinal tract and therefore contributes significantly to fat digestion and digestion of vitamin A (retinol esters).[113]

The lipase activity is lost on pasteurization and fat absorption from the milk is reduced by as much as one-third in preterm infants. When preterm infants were fed their mothers' milk they gained significantly more in length and weight than when fed pasteurized milk.[114]

THE RISE OF FORMULA FEEDING

In the nineteenth and early twentieth centuries, the old and honorable tradition of the wet nurse was the preferred alternative when an infant's mother was unable to provide milk for her child. With time, however, a campaign was launched to discredit wet nursing in general. The unmarried status of some of these mothers offended the moral code of influential social groups. Rumors circulated that the women were of low morals and carried venereal diseases. Besides, most modern families did not have the means or the inclination to have a strange woman move into their homes. Gradually, by persuasive advertising and other clever tactics, the formula industry got the attention of mothers everywhere.[10]

The formula manufacturers' main slogan in those days was that their formulas were "scientific" and thereby certain to contain all the ingredients that the baby needed to grow and be healthy. At that time infant mortality was high and breast milk and cow's milk were named as culprits. Further, putative experts claimed that mother's milk was not adequate to support the child.

Sigmund Freud theorized that infants experienced suckling as sexual pleasure. Mothers were scandalized and to head off the development of infantile incestuous desire, breastfeeding, holding, fondling and cuddling were all abandoned. Virtuous mothers instead propped their babies up in high chairs with bottles.

Physicians weren't much interested in birth and breastfeeding until the development of the specialties of obstetrics and pediatrics at the beginning of the twentieth century. At first, formula manufacturers sold their products directly to the public. But later pediatricians became intensely involved in artificial infant feeding, developing and selling their own formulas and writing their own prescriptions. In the 1920s and 1930s, the American Academy of Pediatrics (AAP) even pressured formula manufacturers to sell their products without directions, instructing the buyer to get the directions from their doctors. If the companies did not comply, they did not receive the coveted AAP "seal of approval," which was very influential among the customer base of new mothers. At one point formula preparation became so complicated that it was made in the hospital pharmacy.[10]

Women growing up during these times were acculturated in the infallibility of the new science and technology. They experienced medicalized pregnancies and hospital births where medical technology was on display via monitoring, measuring and assessing. Bottle feeding became part and parcel of this process. More and more women giving birth in hospitals were handed a bottle of formula when leaving with their babies. "Medical knowledge superseded and de-legitimized other sources of knowledge generated from the woman's bodily experiences."[117]

Although it is certainly the ultimate convenience food for babies, breastfeeding is not an exact science. The milk comes directly from the mother's nipple to the infant's mouth. There is no milk level to watch gradually decreasing as there is when the infant feeds from a bottle. Is the milk adequate? Is it nutritious enough? With breastfeeding, there was no way of knowing; with bottle feeding everything could be measured.

Even with mothers who intended to breast feed, the bottle was not far away. Fiona Dykes explains that the most common reason given by women for discontinuing breastfeeding was that breast milk was inadequate for nourishing baby exclusively, and the perception that mothers had "insufficient milk" because "baby seemed hungry." Indeed physicians had contributed to this thinking by advising mothers to give babies a bottle occasionally and to wean their babies early to the bottle.[117]

In addition, lactation failure was a growing phenomenon in the U.S. starting at the beginning of the last century when women claimed that they had no milk. Journalists declared an "epidemic of lactation failure," which dovetailed nicely with the growing success of artificial infant formula available on the market.[118]

About five percent of women cannot produce sufficient milk because of medical conditions such as hypothyroidism or inadequate development of breast tissue, exposure to toxins at a critical period of development, medications, low prolactin levels and other reasons.[119]

Mothers cite lack of interest and support by those on the front lines—medical personnel,

Up until 2006, the only growth charts in use in the U.S. were based on the growth of formula-fed infants, thus ignoring the different growth patterns of the normal breastfed infant.

FOLIC ACID IN INFANT FORMULA

In a 2005 paper, Mark Lucock from the University of Newcastle, Australia, and Zoe Yates from the University of Leeds, U.K., suggested that folic acid fortification and supplement use might be "a genetic time bomb." They were referring to the high levels of folic acid to which the unborn are subjected, which continue after birth and have the potential for serious epigenetic effects.[1] Folic acid is added to all baby formulas.

The terms folate and folic acid (FA) are used interchangeably, but they are not one and the same and do not possess the same properties. Folates are water-soluble B vitamins occurring in foods such as organ meats and green leafy vegetables in the form L-5-MTHF (methyltetrahydrofolate) while FA, the synthetic form used in supplements and fortified foods, was synthesized in 1943 at Lederle Laboratories.[2-3] FA is 100 percent bioavailable unlike folates in food, which are 50-80 percent available. More FA is therefore absorbed by the body for metabolism. Folates are utilized by the infant for life-supporting functions such as methylation reactions, synthesis of amino acids, and RNA and DNA replication.[2-3]

Folates and FA are metabolized differently by the body. FA metabolism requires a two-step process with the same enzyme, dihydrofolate reductase. At certain levels, occurring even at 400 micrograms (μg), which is the recommended daily allowance, this enzyme can become saturated. At this point un-metabolized folic acid (UMFA) passes into the bloodstream by passive diffusion.[4] UMFA has been detected in the blood of the newborn's umbilical cord in mothers who did and did not take prenatal vitamins. In 2005 M.R. Sweeney and colleagues found UMFA in the cord blood of all the four-day-old infants they tested. Others have replicated these findings.[5] The effects of excess UMFA on the newborn and other groups are unknown.[6]

Pregnant women today ingest much higher levels of FA from prenatal vitamins and diet than in the pre-1990 era. Average FA exposure increased after 1998 when the U.S. and Canada, without long-term studies, instituted mandatory fortification of all commercial grain products with FA solely to prevent neural tube defects (NTDs)—structural defects, such as spina bifida, that can occur anywhere along the neuroaxis from the brain to spinal cord between seventeen to twenty-eight days after conception. The United Kingdom Standing Advisory Committee on Nutrition estimated that 370,000 to 780,000 people would be exposed to higher levels of folic acid for each potential NTD infant saved.[7]

Studies have shown, however, that FA fortification is not successful in reducing NTDs among high-risk groups, such as obese or Hispanic women, nor in women with epilepsy taking anti-seizure medication.[8] Most countries do not require fortification of the food supply with FA.

In addition, since 1991 the U.S. government has recommended the use of 400 μg of FA daily during pregnancy and for all women of reproductive age, and 4000 μg daily beginning one month before attempting conception and continuing through the first three months of pregnancy. The U.S. Preventive Task Force recommends 400-800 micrograms daily of FA for all women planning or capable of pregnancy.[9]

For babies, this means higher levels of FA throughout life, not only in the uterine environment, but in infant formulas which are fortified with synthetic FA by law.[10] Because of the rapid rise of autism rates in the 1990s after fortification with FA, some researchers have pointed the finger at this dubious public health measure as a possible cause of autism. In the United States, reported cases of autism have increased significantly since food fortification with FA.[11]

A high FA intake continues throughout childhood with the ingestion of cereals and other grain products. Today the typical five-year-old in America has the highest blood levels of FA (780 μg/d) per day of all groups, double the proposed untested tolerable upper limit (300–400 μg/d) for children of that age. Around 10 percent of these children are consuming 1320 μg per day, which is well above the tolerable upper limit of 1000 μg per day for adults. The second highest group for FA levels is children ages six to eleven years, and the third highest concentrations occur in sixty-year-olds.[12]

In the meantime, research has shown that FA does not prevent NTDs in all women at risk and that some groups in the population are "folic acid resistant." It's estimated that 30-40 percent of the population can't efficiently convert synthetic folic acid into folate.[13] About 10-15 percent of the population has a common genetic error called a single nucleotide polymorphism in the folate enzyme MTHFR, which could account for this resistance. People with certain MTHFR mutations do not process FA acid into 5-MTHF and need folate not FA. Certain groups have much higher levels of this error, such as U.S. Hispanics, Southern Europeans, and the English and Irish. This genetic propensity is relatively new and some have speculated that the high levels of unmetabolized FA contribute to the problem. In Spain, for example, the prevalence of this polymorphism has reportedly doubled since the introduction in 1982 of FA supplements for women in early pregnancy.[14]

The enzyme can still function with polymorphisms but its efficacy is greatly reduced. A copy of one polymorphic gene from one parent results in a 40 percent loss of function in the MTHFR enzyme, while in the case of an affected gene from each parent there is a 75 percent loss of function.[15]

Pregnant women with the folate polymorphism are considered at high risk for spontaneous abortion, stillbirth, and giving birth to babies with brain lesions.[16] This mutation is associated with a two- to four-fold increased risk of NTD if the

mother has two copies of the defective gene (homozygous).[17] In a 2010 Italian study of forty-two high-risk pregnancies in women with the folate polymorphism, in which all women were supplemented with heparin, aspirin, and FA, two women lost their babies, four were lost before delivery, and six had babies with hemorrhagic cerebral lesions.[18]

Breast milk contains levels of natural folate (5-MTHF) but FA supplementation may interfere with that process. In a 2015 double-blinded randomized placebo controlled trial (the gold standard for clinical trials) of over fifty pregnant women, with one group taking 1 mg of FA daily for four weeks, Lisa Houghton and her research team found that with supplementation the red blood cell levels increased but the levels of folate in breast milk did not change. Instead, she found un-metabolized FA in breast milk in both supplemented and non-supplemented mothers, and a down-regulation of the natural folate-binding protein needed to take the folate into the breast milk.[19]

Another problem with synthetic FA is that high supplemental intakes mask B_{12} deficiency, which is related to adverse neurological outcomes and microcytic anemia.[20] In India, FA but not B_{12} is mandatory for all pregnant women despite the high rate of vegetarianism, which can predispose the mother to low B_{12} levels.[21] It was in India, in fact, that the British researcher Dr. Lucy Wills, working with women with anemia during the 1920s and 1930s, discovered a factor in Marmite, an inexpensive British yeast product, which was first called "Wills Factor," then later folate, which cured the women of anemia.[22] In a 2013 Indian study, babies born of mothers with low B_{12} and high folic acid supplementation were small for gestational age, a risk factor for normal growth. B_{12} is an emerging pregnancy and natal concern linked to NTDs, preeclampsia, placental abruption, pregnancy loss, hyperhomocysteinemia, and intrauterine growth restriction (small for gestational age).[21]

Because the folate receptor in the brain also has an affinity for FA, at certain levels unmetabolized FA may tie up the receptor and effectively block the transport of folate needed in the brain through the brain-blood barrier. The effects of unmetabolized FA in the brain are unknown.[23] However, a condition among some autistic children called cerebral folate deficiency (CFD) occurs when auto-antibodies to the folate receptor prevent folate from entering the brain.[24] The auto-antibody has been found in some mothers with the MTHFR mutation who have given birth to babies with NTDs.[25] Among many other functions, the brain uses MTHF to form tetrahydrobiopterin, a crucial cofactor in the synthesis of serotonin, norepinephrine and dopamine.[26] Thus far no studies have examined the link between unmetabolized folic acid and CFD.[27]

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midwives, home visitors and lactation consultants—as reasons not to continue breastfeeding early on in the process.[117]

For mothers the ultimate measure of quality of milk and the central focus of progress of the infant has been weight gain, and indeed this is the focus of doctor's visits. Weight gain was set as a major indicator of growth because it is easier to measure. However, length is considered a better standard.[120]

The growth of breastfed infants in affluent populations differs from that of formula-fed ones. After birth, babies normally lose a small amount of weight: five percent for formula-fed and seven percent for breastfed, with up to a ten percent maximum in the first week of life, before starting to gain. Most formula-fed but not most breastfed infants have exceeded their birth weights by the age of eight days. With breastfeeding this weight loss might seem slower to catch up. Breastfed infants generally are leaner than formula-fed ones after four months of age and gain less than formula-fed infants during the first year of life.[120]

The physiologic reason for slower weight gain is that breastfed infants self-regulate their energy intake at a lower level than that observed in formula-fed infants. This lower activity may be related to the lower body temperature and metabolic rate of breastfed infants. It also may be associated with the different endocrine environment of breastfed as compared with formula-fed infants which could be affected by the marked differences in protein content of human milk and infant formula.[120] However normal it may be, this weight loss is alarming for mothers who want to see a healthy, thriving baby, especially when weight is by consensus the major measure of progress, and these mothers are easily persuaded by family or medical personnel to take up the bottle.[120]

I discussed this topic with a sixty-year-old European mother of two adult children who had breastfed her babies over one year—no bottles. She told me that she learned about her babies' initial weight loss and what it meant from her mother and neighbors who naturally supplied their knowledge and shared experiences. Because of this she was not alarmed when her baby lost weight and was slow to gain, and she continued to breastfeed without doubt or worry.[121] But mothers today have no reference group to turn to because it is unlikely that their own mothers breastfed them.

A family member shared a story of her disappointing breastfeeding experience in 1990. She really wanted to breastfeed and despite an adequate amount of breast milk, her baby was not thriving—at an initial doctor visit she was not gaining weight according to the growth charts. She also had colic. Her mother told her that her milk was "no good" and that she needed to bottle-feed. This didn't go well as she tried one formula after the other. The child, now an adult, continues to experience gastrointestinal difficulties.[122]

Up until 2006, the only growth charts in use in the U.S. were based on the growth of formula-fed infants, thus ignoring the different growth patterns of the normal breastfed infant. Formula-fed infants are heavier and weigh more early in life than breastfed infants. The World Health Organization (WHO) growth standards for breastfed babies came into use at that time and are now recommended for one- to two-year-olds. The WHO standards establish growth of the breastfed infant as the norm for growth and breastfeeding as the recommended standard for infant feeding.[120]

Generations of breastfed babies and mothers trying to breastfeed were subjected to the bottle-based growth charts. Consequently doctors, not familiar with the normal weight gain patterns of breastfed babies, evaluated an infant's physical growth by standards set by bottle-fed infants. Who knows how many mothers were distressed needlessly when their infants were misdiagnosed with failure to thrive and put on a bottle because their baby was not heavy enough compared to bottle-fed babies?[120]

Researchers have found that ineffective feeding practices may actually cause an insufficiency of breast milk. A mother's lack of confidence in the efficacy of the lactation process can lead to a self-fulfilling prophecy whereby milk flow and transfer to the baby is undermined. The mother may then interpret this as representing insufficient milk, making her highly likely to resort to formula, with the result that her milk volume actually diminishes.[123]

The themes of science, insufficient milk, hungry baby and low weight gain formed a strong basis on which the infant formula industry continues to build. Particularly potent were the messages suggesting that when breast milk was insufficient, infant formula was there to ensure optimum growth and health.[124]

The science myth was enhanced by medical doctors who in general did not support breastfeeding. There is a well-documented history of collusion between doctors and the infant formula industry. Formula companies openly give hundreds of thousands of dollars to medical professionals. Physicians and nurses in the U.S. routinely receive gifts, office supplies, meals, a year's supply of free infant formula for themselves or a relative, and even pricey vacations from the infant-formula marketing representatives. They also supply massive amounts of free formula to hospitals. The companies sponsor medical seminars and research studies. Some major medical centers may use more than a quarter of a million dollars in "free" formula every year. What these hospitals fail to realize is that in essence they are providing free advertising for the formula companies. In fact, some pediatric residency programs are largely

underwritten by infant-formula manufacturers, an allegation verified by the National Association of Breastfeeding Advocacy and the International Lactation Consultants Association.[10]

This strategy works. More than 70 percent of surveyed pediatricians recently reported to the AAP that they recommend a particular brand of infant formula to their patients. Many medical professionals do not inform their patients of the impact these infant feeding choices may have, "due in large part to their own ignorance of the facts." Doctors and nurses have little exposure to the recent literature or clinical practice in this area. And with successful breastfeeding, the involvement of a doctor is naturally minimal.[125]

A recent AAP survey revealed that about 45 percent of pediatricians see formula-feeding and breastfeeding as equally acceptable methods for feeding an infant and that "nearly equal proportions of pediatricians agree and disagree as to whether formula-fed babies are just as healthy in the long run as breastfed babies (34 percent vs. 38 percent); 27 percent are undecided."[125]

MATERNITY LEAVE

Maternity leave during the first several months is critical after the birth of the baby to help support breastfeeding, yet the amount of time a working woman is allowed in the U.S. is shamefully brief compared to other countries. The U.S. is one of only three countries in the world that does *not* guarantee paid maternity leave. American women must take vacation or sick days to cover maternity leave. Only 60 percent of all workers are covered by the Family and Medical Leave Act, which allows employees of companies with more than fifty employees to take an unpaid job-protected leave of up to twelve weeks, but this requires at least one year of employment (twenty-five hours or more per week).[126]

Four states have publicly funded paid maternity leaves: California, New Jersey, Massachusetts and Rhode Island. California offers six weeks paid at 55 percent of salary. New Jersey offers six weeks at two-thirds of salary and Rhode Island pays four weeks at 60 percent. Tech companies offering paid maternity leave include Google, Facebook, Apple, Yahoo, Instagram, Reddit and Twitter.[127]

In contrast, Slovenia, Germany, Austria and more than one hundred seventy other countries provide generous maternity-childbirth benefits that are not available to mothers in the U.S. The family financial benefits may include both a maternity and parental allowance, assistance payments upon the birth of a child, child benefit or allowance payments up to age five, and a "large family" allowance payment. Maternity leave can consist of twenty-eight to fifty days *before* giving birth with parental leave of four months up to two years after the birth. A midwife or nurse makes home visits at least every day after the birth for a week or more to help with child care

The health and welfare of generations of Americans have been severely compromised through the use of infant formulas.

FACTORS IN HUMAN MILK

Human milk contains many factors not found in commercial formula, which are unique and affect nutritional status and growth and development of the infant:

- Enzymes: amylase, proteases and lipases.
- Growth factors and hormones: epidermal growth factor, erythropoietin, insulin, insulin-like growth factors I and II, lactoferrin, lipase, nerve growth factor, relaxin, transforming growth factor-alpha.
- Various hormones and growth factors such as adipokines (leptin and adiponectin) as well as ghrelin, resistin, and obestin, which are thought to control food intake and energy balance and induce satiety and self-regulation of intake. Adiponectin, a circulating adipocyte protein, is associated with lower obesity. Breastfed infants are rarely obese. Breast milk also contains a unique number of anti-infective or immunological properties and other substances.[115]
- The high concentration of biopterin in human milk suggests that biopterin has a vital role in fetal development. Tetrahydrobiopterin (BH4) is the essential cofactor for the breakdown of essential amino acids and in the biosynthesis of neurotransmitters. In cells it enhances the release of dopamine and serotonin. Biopterin also serves as the cofactor for production of nitric oxide enzymes. Formulas contain only trace amounts of biopterin.[116]

and breastfeeding, and at least once a week thereafter for a period of six weeks.[125]

OTHER SOLUTIONS

More and more women are selling their breast milk online to other mothers who can't breastfeed. In the past year, somewhere around fifty-five thousand women sold their excess breast milk online, up from thirteen thousand in 2011. No contamination issues have been reported. The FDA does not regulate online breast milk sales but advocates caution in purchasing milk from strangers. Four main internet sites sell breast milk, "Human Milk 4 Human Babies," "Eats on Feets," "Only the Breast," and "Milk Share."[128]

Joseph A. Ladapo, assistant professor of medicine at New York University School of Medicine supports this form of sharing: "Some parents (including this author) go to considerable lengths to provide their infants with human breast milk because of the body of evidence supporting its health benefits."[128]

Breast milk donated to milk banks is not an option. It is pasteurized and reserved for pre-term and sick babies.[128]

CONCLUSION

The health and welfare of generations of Americans have been severely compromised through the use of infant formulas. Autism rates are rampant and rising yearly. Diabetes, obesity and heart disease rates have skyrocketed. Many American children develop ADHD, OCD, and other behavioral "diseases" and take dangerous medications. Some breastfeeding mothers have followed the SAD (Standard American Diet) advice and their children are deprived of vital nutrients necessary for growth of the brain and body. Advances in infant formula technology over the years as a result of research, new knowledge, needs of mothers and infants, and the "Band-Aid" approach have improved the quality of infant formulas but these formulas are still woefully lacking in nutrients and myriad co-factors compared to the breast milk of a well-nourished mother.

Lack of support for breastfeeding is often cited as the main reason that more mothers do not breastfeed. Most women who have children work outside the home. With a new baby, mothers need a great deal of help to cope with just routine matters of everyday life, especially when there are other children in the family. Continuing breastfeeding requires a good deal of planning and most mothers have to return to work within a short period of time.

Rather than developing financial and social support for breastfeeding mothers, granting extended and paid pregnancy and maternity leave, and investing in our collective future by improving the diets of young families, governments and institutions are instead funding transgenic research to try to replicate the unique components of breast milk for commercial formulas, developing GMOs, and looking for new ways to market excess GM soy and corn.

It is just as important to support the mother and family socially and financially as to provide basic knowledge earlier in life, knowledge that the breastfeeding mother needs to know how to produce milk that will nourish her infant. This means a healthy omnivorous diet before pregnancy and throughout breastfeeding with access to pasture-raised clean and healthy foods, knowledge of food preparation techniques, and elimination of sugars, artificial sweeteners, junk and refined foods.

Programs such as "Cooking Kids" in Slovenia, where all young students can learn the value of cooking techniques, reading recipes, traditional foods, and gardening is one way to provide such a path. The "Cooking Kids" model could be easily adapted to cultures willing to recognize the value of basic nutritional principles, traditional foods and their preparation. The Weston A. Price Foundation financially supports this program.[129]

Those families who want to breastfeed are developing their own community breast milk-sharing networks. WAPF chapter leaders are taking the lead throughout the county in providing families in diverse communities with this important information. There remains much work to be done in educating mothers, families, grandparents, and neighbors everywhere about the right to breastfeed their child and how to produce the best possible quality breast milk for our children.

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Vitamin D in Cod Liver Oil:
An Enduring Mystery

Chris Masterjohn, PhD

In my 2006 article, "From Seafood to Sunshine: A New Understanding of Vitamin D Safety" (*Wise Traditions*, Fall 2006), I took the position that vitamin D primarily occurs in cod liver oil as vitamin D_3. Nearly a decade later, there are reasons to revisit this question: first, several lab analyses of Green Pasture fermented cod liver oil have come to conflicting conclusions about whether the primary form of vitamin D therein is vitamin D_2 or vitamin D_3; second, modern research has begun to characterize the way in which fish metabolize vitamin D and has shown that fish contain several different vitamin D compounds. When taken together, the data provide hints that natural cod liver oil may contain a complex array of different vitamin D compounds. The exact nature of vitamin D in cod liver oil, however, remains a mystery in need of resolution.

NATURAL VITAMIN D IS COMPLEX

In an age of fortified foods and vitamin supplements, it is easy for us to overlook the natural complexity of the nutrition found in natural foods. In foods that are fortified with vitamin D, the vitamin D primarily exists in whatever form was added, whether vitamin D_2 or vitamin D_3. This is not true of natural exposure to vitamin D, whether that exposure comes from the sun or from natural foods.

When sunlight strikes our skin, it converts a close relative of cholesterol into vitamin D. At first, the vitamin D concentration within our skin begins to rise. As vitamin D accumulates, however, the sunlight begins to degrade it into a variety of other compounds. Although researchers generally consider these changes as "degradation" or "inactivation," those other compounds are not without biological activity: several of them have been shown to prevent the excessive proliferation of skin cells and are thought to help prevent psoriasis.[1]

When we absorb vitamin D from sun exposure or from our diet, we metabolize it into a plethora of other compounds known as metabolites. The most well known of these is the two-step activation of vitamin D first to 25(OH)D or calcidiol and then to $1,25(OH)_2D$ or calcitriol. These metabolites are also inactivated to $24,25(OH)_2D$ and to $1,24,25(OH)_3D$. Each of these inactivated metabolites undergoes further metabolism to other compounds. In addition to this major inactivation pathway, there are also several other minor inactivation pathways. Moreover, many of these metabolites exist as stereoisomers, which can best be thought of as mirror images of one another at the level of their chemical structures.

While we often refer to these processes as "activation" or "inactivation," this is an oversimplification: the changes of biological activity that occur at each step of metabolism are relative rather than absolute, and are often selective. For example, one study in infants found that between 6-18 percent of the circulating 25(OH)D was present as 3-epi-25(OH)D, a stereoisomer or mirror image of the ordinary form. Presumably, this is converted to 3-epi-$1,25(OH)_2D$, which has been found in a variety of cells. When compared to the ordinary form of calcitriol, the 3-epi form has equal ability to suppress parathyroid hormone, a hormone that contributes to bone resorption, and to suppress the excessive proliferation of skin cells; however this form has less power to raise serum calcium levels.

Thus, the range of vitamin D metabolites within our bodies may carry a diverse array of different biological activities rather than each metabolite representing a gain or loss of a single type of biological activity.

Just as this vitamin D metabolism occurs within our own bodies, so it occurs in the animals whose meat, milk and eggs we eat for food. For example, there are at least five different vitamin D compounds present in natural milk, with the majority of vitamin D activity coming from 25(OH)D, not from vitamin D.[2]

Thus, the range of vitamin D metabolites within our bodies may carry a diverse array of different biological activities rather than each metabolite representing a gain or loss of a single type of biological activity.

THE "MULTIPLE NATURE OF VITAMIN D IN FISH OILS"

In "From Seafood to Sunshine," I cited personal communication with Bruce Hollis for my

ARTICLE SUMMARY

- In recent years, controversy has erupted over whether vitamin D_2 or vitamin D_3 is the predominant form of vitamin D in cod liver oil.
- Research in the 1930s suggested that there were at least four if not six forms of vitamin D in cod liver oil.
- Recent research has shown that fish metabolize vitamin D into at least three other compounds and probably more.
- Although cod liver oil probably does not contain vitamin D_2, it probably does contain an array of different compounds derived from vitamin D_3.
- The diverse array of vitamin D compounds we would expect to exist in natural cod liver oil likely provides a diverse array of biological activities; many people may experience vitamin D-related benefits from a natural cod liver oil without experiencing as pronounced a rise of 25(OH)D – the blood marker of vitamin D nutritional status—as they would have expected.
- Although it makes sense for someone to increase their sun exposure and vitamin D_3 intake if their 25(OH)D is low, low 25(OH)D in and of itself should not be used as evidence that cod liver oil is not providing a vitamin D benefit.

They found that vitamin D activity evaporated into six different fractions, and concluded that cod liver oil contained two major forms of vitamin D and a total of at least four if not six different forms of vitamin D.

statement that "only unconverted vitamin D is found in significant amounts in cod liver oil and most other vitamin D-rich foods." To the best of my recollection from the phone conversation we had while I was writing that article, this was based on speculation about what seemed plausible rather than published data. I also recall from that time that one vitamin D researcher told me privately that I could probably make a lifetime career out of fully characterizing the nature of the vitamins present in natural cod liver oil. I have since encountered a number of reasons to believe the vitamin D in cod liver oil may represent a complex array of compounds.

Research on this topic dates back to the 1930s, much of which is published in the 1937 paper by Charles Bills and colleagues entitled "The Multiple Nature of the Vitamin D in Fish Oils."[3] Bills and his colleagues had shown early on that vitamins D_2 and D_3 were equally effective in rats but that chickens were unable to use vitamin D_2. They then went on to characterize the chick-to-rat "efficacy ratio" of many different marine oils. The logic of the efficacy ratio was as follows: if the oil contained only D_3, it would be equally effective in rats and chicks; if the oil was significantly more effective in one or the other species, this would suggest that some or all of its vitamin D activity came from another compound or several other compounds.

The Bills group implemented a number of experimental controls and analyzed a large enough series of oils to rule out the possibility that differences in efficacy resulted from vitamin D being bound to other substances, from synergism or antagonism between vitamins A and D, or from substances within the oil itself that could affect the bioavailability of vitamin D.

Early work in the Bills laboratory had suggested that cod liver oil was equally potent in rats and chickens. This would be consistent with the premise that cod liver oil contains only vitamin D_3 and would be inconsistent with the premise that cod liver oil contains only vitamin D_2. But these findings may also mean that cod liver oil contains a mix of vitamin D forms that happened to balance out between rats and chickens. In the 1937 paper, the Bills group analyzed the liver oils of three species of codfish: the pollack and two species of hake. They noted that "liver oils of the pollack and these particular hakes are legally cod liver oil" and that they "contribute materially to the 'cod liver oil' of certain localities." The pollack liver oil was only half as effective in chickens than rats, while the hake liver oil was one-third more effective in chickens than rats.

Altogether, they analyzed the efficacy ratios of twenty-five different species and found considerable variation. They concluded that "two (or more than two) kinds of vitamin D exist in fish oils, the proportions varying in the different oils. It now seems unlikely that any particular fish oil, such as cod liver oil, contains one kind exclusively."

Soon after this, Hickman and Gray, in collaboration with the Bills group,[4] subjected cod liver oil to various temperatures to cause specific fractions of the oil to evaporate separately.[5] They found that vitamin D activity evaporated into six different fractions, and concluded that cod liver oil contained two major forms of vitamin D and a total of at least four if not six different forms of vitamin D.

Hickman and Gray noted that they used Norwegian cod liver oil, which was "likely to contain more than one species of fish," so they did not consider their investigation to yield conclusive information about the nature of vitamin D specifically in the species *Gadus morhua*, known commonly as Atlantic cod. "Nevertheless," they wrote, "since a wide range of fractions was available from the distillation of many tons of the Norwegian oil, and since the oil continues to be a medicinal favorite, completion of the investigation seemed justified; it was borne in mind, however, that any complexity found in the vitamin D might arise from the mixture of species."

While this possibility cannot be ignored, it seems quite unlikely that the Norwegian oil would contain liver oils from six different species, each with its own form of vitamin D. It seems far more likely that any one species would have a mix of different vitamin D forms, even if the proportion between those forms might vary from species to species.

At least as late as the 1960s, textbooks cited the Hickman and Gray experiment as showing that vitamins D_2 and D_3 were the major forms of vitamin D in cod liver oil.[6] Hickman and

AN INTRODUCTION TO HIGH-PERFORMANCE LIQUID CHROMATOGRAPHY (HPLC)[8,9]

High-performance liquid chromatography (HPLC) is a means of separating individual compounds within a sample. Sometimes, the separation serves to isolate or concentrate a compound or a collection of compounds so that a scientist may use them for other purposes. This is called preparative HPLC. In this article, we are concerned only with HPLC that separates compounds for the purpose of measuring their concentrations within a sample, which is called analytical HPLC. In these cases, the compounds being analyzed are called analytes. In analyses aimed at quantifying the amount of vitamin D_2 and vitamin D_3 in a sample, we would say that vitamins D_2 and D_3 are the analytes of interest.

The basic setup of an HPLC system is shown in Figure 1. A pump or set of pumps moves a fluid called the mobile phase from its initial reservoir, typically a glass bottle, through the entire system and into a waste container. The person operating the system may have prepared the samples in any number of ways to make them more compatible with the method, and will have loaded them into the autosampler, a machine that automatically injects a defined quantity of sample into the mobile phase at specific time points determined by a computer program. Once the sample is injected, the mobile phase carries it to the column, where separation takes place. The separated analytes exit the column, one by one, into a detector. This process is called elution and the analytes are said to elute from the column. The detector then collects information that can be used to quantify the compounds and sends that information to a computer. Finally, the person operating the system uses a software application on the computer to analyze the information and thereby infer the concentration of the analytes in the sample.

While the fluid mobile phase carries the sample through the column, the column itself contains a solid bedding called the stationary phase. The principle of separation is competitive attraction between the mobile and stationary phases: all the compounds in the sample will have some level of attraction to the mobile phase and some level of attraction to the stationary phase; each particular compound, however, will have its own balance between these two attractions and will therefore pass through the column at its own rate. Thus, while the injected sample first arrives at the column as a single unit, the compounds that are most attracted to the mobile phase and least attracted to the stationary phase will elute from the column first, and the compounds with the opposite characteristics will elute last.

As the analytes elute from the column, they pass into the detector. There are a variety of detector types: some, for example, detect the ability of the analytes to absorb ultraviolet (UV) light, to absorb visible light, to fluoresce, or to undergo chemical reactions. The detector sends this information to a computer, and the computer software creates an image from it called a chromatogram (Figure 2). The chromatogram shows a series of peaks, each representing material that eluted from the column at a specific time point. That time is called the retention time because it reflects the amount of time for which the material that generated the peak had been retained in the column.

To quantify the analytes of interest in a sample, the magnitudes of their peaks (often measured as the peak area or height) are compared to those generated by known quantities of a standard. The standard can be external or internal. An external standard is a known quantity of the pure analyte of interest prepared in the same way and at the same time as the samples but injected separately into the HPLC system so that it generates its own chromatogram. An internal standard is a compound that is very similar to but distinct from the analyte of interest that is added to each sample at the beginning of the preparation step, injected into the system as part of each sample, and generates its own peak within the chromatogram of each sample. External standards help define how the size of the peaks relates to the concentration of the analyte of interest and help control for variation between batches in that relationship. Internal standards help control for loss of the analyte during sample processing. Depending on the relative need for these controls, a method may call for one, the other, or both.

Readers interested in learning more about chromatography should consult Reference 8, an essential text on the subject. General information on HPLC within this sidebar and throughout this article that is not associated with a specific citation is drawn from this reference as well as from my own laboratory experience.

Scientific papers frequently state that although vitamin D_2 is known to exist in large amounts in the diet of fish, it has never been found in the flesh or oil of fish.

Gray never claimed this, however, because they never performed any analysis of the chemical structures of the vitamin fractions and therefore could not positively identify any of them. The Bills group had considered it "conceivable" but "not especially probable" that vitamin D_2 was the component of some marine oils that led to a lower efficacy in chicks than in rats. To my knowledge, the work of Hickman and Gray was never followed up with a definitive identification of the four to six forms of vitamin D they suggested exist in cod liver oil.

MANY VITAMIN D METABOLITES EXIST IN FISH

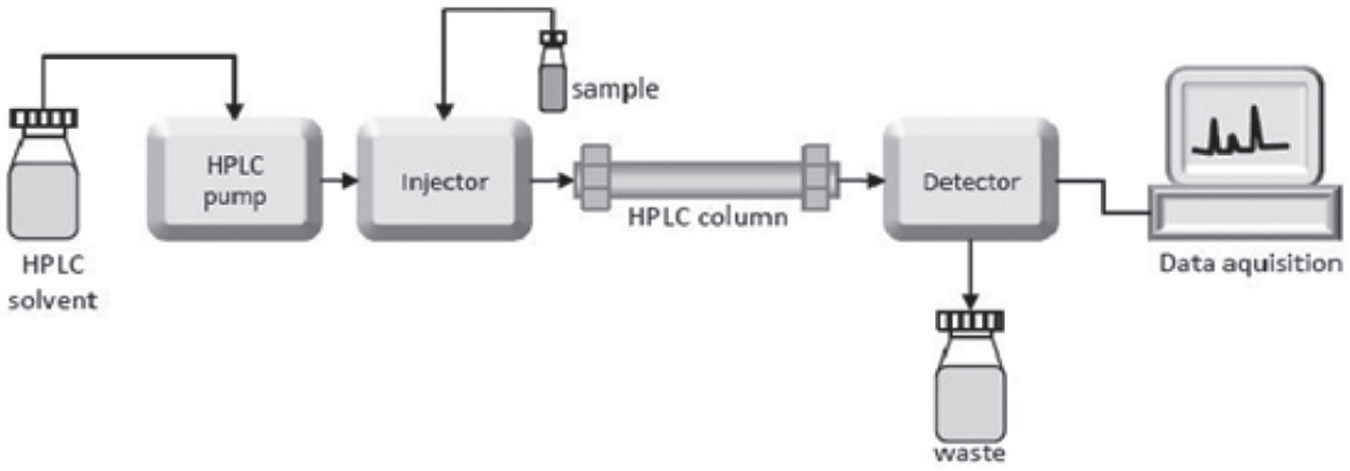
Although less is known about the metabolism of fish than humans and other mammals, a 2010 review documented a number of studies showing the existence of 25(OH)D, 24,25$(OH)_2$D, and 1,25$(OH)_2$D in addition to vitamin D itself. In the Atlantic cod, about 10 percent of the total circulating vitamin D compounds exists as 24,25$(OH)_2$D and about 13 percent exists as 25(OH)D; there are traces of 1,25$(OH)_2$D and the remainder is vitamin D. Both the liver and kidney of Atlantic cod possess the enzyme that converts 25(OH)D to 1,25$(OH)_2$D. Since the liver is a site of this conversion, one would expect that cod liver oil may contain both 25(OH)D and the fully active hormone, 1,25$(OH)_2$D.

The authors of this review suggested that these metabolites were the "various kinds of vitamin D" that Bills and his colleagues had known existed in fish oils. Based on research in mammals, they also stressed that "for the understanding of the complexity of the vitamin D endocrine system, it is important to realize that many more metabolites of vitamin D_3 than described above may exist in fish and could be of physiological significance."

DOES VITAMIN D_2 EXIST IN COD LIVER OIL?

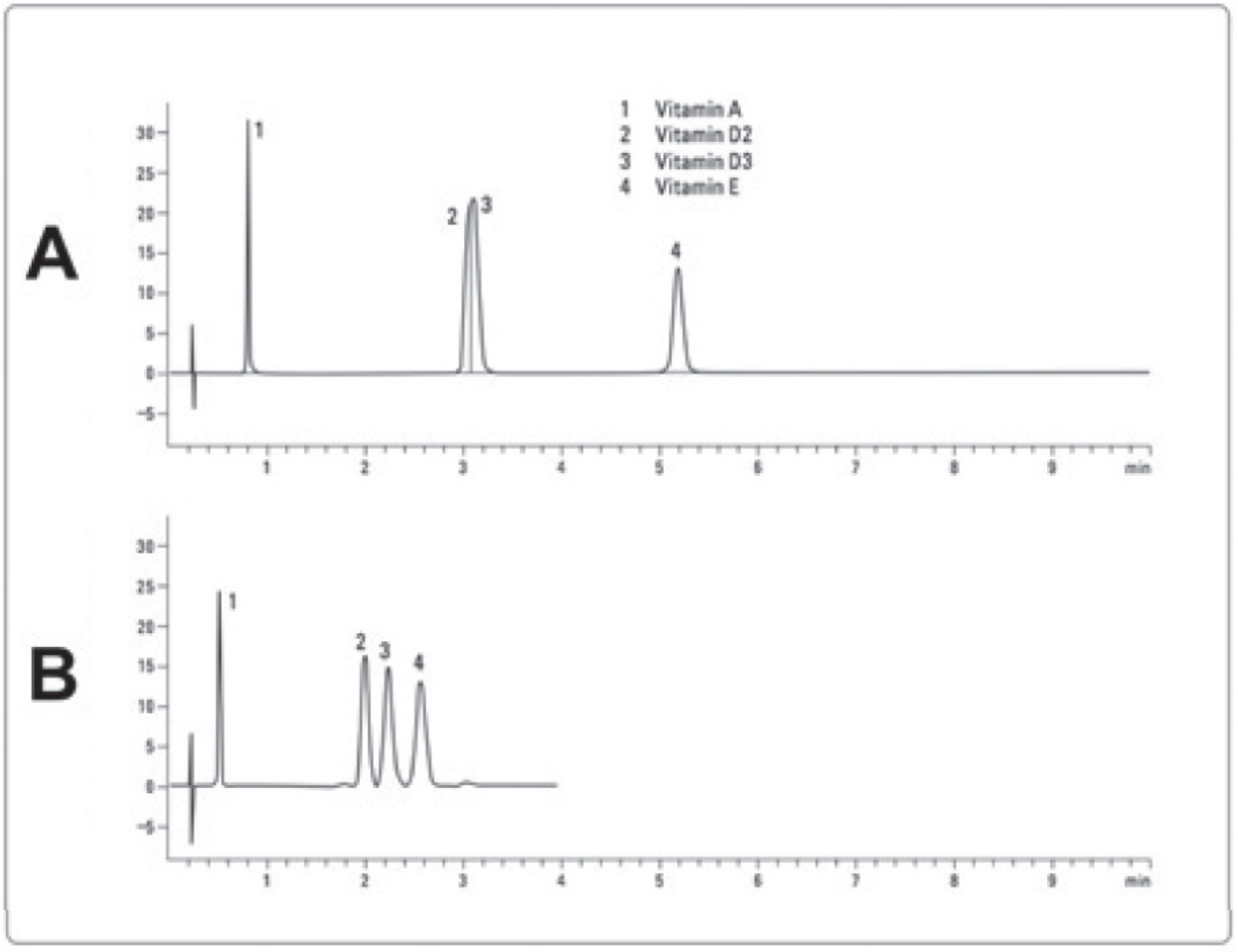
Scientific papers frequently state that although vitamin D_2 is known to exist in large amounts in the diet of fish, it has never been found in the flesh or oil of fish. Various suggestions have been offered to explain this, such as

FIGURE 1. Diagram of an HPLC System



The diagram depicts the basic features of an HPLC System. The pumps circulate the solvent, known as the mobile phase, through the entire system into the waste container. An injector moves a defined quantity of sample into the mobile phase and the mobile phase carries the sample into the column. Although not depicted, sample injection is typically automated by a computer-controlled autosampler. Separation of compounds within the sample takes place in the column. The mobile phase carries the separated sample compounds into the detector and then into the waste container. The detector sends information about the compounds to a computer, and the computer produces a chromatogram used to estimate the concentrations of the analytes of interest within the sample. See sidebar on page 57 for a more detailed explanation. This diagram was originally published in Reference 9.

FIGURE 2. Chromatograms and Coelution



The figure is a slightly edited version of a figure that originally appeared in Reference 11. Both panels of the figure show examples of a chromatogram from an HPLC-UV method. The horizontal axis shows the time in minutes and the vertical axis shows the absorbance of UV light. As compounds that absorb light at the wavelength used elute from the column into the detector, the absorbance suddenly rises and then falls, forming the shape of a peak. The time at which the peak forms is an estimate of the time for which the compound (or compounds) it represents was (or were) retained in the column, and is called the retention time.

Comparing panels A and B demonstrates the principle of coelution (see sidebar on page 60 for a more detailed discussion). In panel A, four vitamins (A, D_2, D_3, and E) were injected but only three peaks are shown in the chromatogram. Since four peaks were expected, this provided strong evidence that two of the vitamins were coeluting with one another. Although not shown, one could easily deduce which peaks represent which vitamins by injecting only one vitamin at a time and determining its retention time. Numbers have been added to the chromatogram to identify the peaks, and a vertical line has been drawn in the second peak to represent the fact that it reflects two compounds. In panel B, a different column was used that achieved separation between vitamins D_2 and D_3. Taken together, it is clear that the second peak of panel A is a case of coelution. Nevertheless, the chromatogram in and of itself gives no sign of this: the second peak looks perfectly formed and appears to represent only a single compound. Had this analysis been performed on a complex biological sample such as a natural food instead of a cocktail of four purified vitamins, it would have been much more difficult to determine that the analytes of interest were coeluting.

CHALLENGES USING HPLC TO MEASURE VITAMIN D

Measuring vitamin D with HPLC (see sidebar on page 57 for a general introduction to HPLC) presents numerous challenges that give the several different methods used their own strengths and limitations. These challenges can best be understood with an appreciation of how the different detectors used to measure vitamin D work.

The most common HPLC method for measuring vitamin D utilizes a detector that measures its absorption of UV light. The detector is called a UV detector, and the method is abbreviated as HPLC-UV. Another way to measure vitamin D is with mass spectrometry (MS). The simplest version of this method adds a charge to the analyte; the detector distinguishes between the analyte of interest and other analytes based on their mass-to-charge ratios. The detector is called a single-stage mass spectral detector and the method is abbreviated LC-MS. A more sophisticated version of MS fragments the charged analyte into smaller pieces; each analyte fragments in a characteristic pattern, giving a specific "signature" of mass-to-charge ratios. This type of detection is called tandem MS, its use to monitor the fragmentation pattern of an analyte is called multiple reaction monitoring, and the method is abbreviated LC-MS/MS.

One can appreciate the difference in specificity between these methods by likening them to the specificity of different methods to identify a person. HPLC-UV is like seeing someone—anyone—in a particular place at a particular time. If you know enough about the context—where the person came from, where they were going, who they interacted with—you can reasonably deduce that the person is who you think it is, but you cannot be completely certain. LC-MS is like identifying someone based on their shape, size, and facial characteristics. LC-MS/MS is like identifying someone based on their fingerprints. In the order HPLC-UV, LC-MS, LC-MS/MS, these methods are not only more specific but also more sensitive, meaning they are better able to detect small traces of compounds. But the equipment for the more sensitive and specific methods is also more expensive to purchase, operate, and maintain, and the technical expertise needed to operate the equipment and analyze the results is less common. Which method to use depends on which challenges one faces in the specific analysis.

The primary challenges in measuring vitamin D relate to a concept known as coelution. In a perfect separation, each compound would elute from the column all by itself, and each peak in the chromatogram would represent a singular substance. In practice, however, compounds often elute together. This is called coelution and the compounds are said to coelute. This is desirable if the coeluting compounds are not the analytes of interest: if you could get the analytes of interest to separate perfectly and everything else to coelute, it would take a lot less time to do the analysis. Coelution can also be irrelevant if the coeluting substances are not picked up by the detector. For example, in a common HPLC-UV method, there is a triglyceride in fish oil that coelutes with vitamin D_2; since that triglyceride does not absorb UV light, however, it does not contribute to the vitamin D_2 peak in the chromatogram and does not interfere with the detection of the vitamin.[10]

Coelution becomes a major problem when either two or more analytes of interest coelute with one another, or when some other substance that generates a signal in the detector coelutes with an analyte of interest. Sometimes the problem is obvious because the peak of interest looks deformed or because one of the peaks of interest is missing, and often the problem can be fixed simply by modifying the method to achieve better separation. For example, the chromatography company Agilent advertises an HPLC column that generates only three peaks in response to vitamins A, D_2, D_3, and E (Figure 2A); one of those peaks represents vitamins D_2 and D_3 coeluting together, but when a different Agilent column is used for the same method, D_2 and D_3 elute separately and each of the four vitamins generates its own peak (Figure 2B).[11]

Sometimes, however, the problem is not obvious at all: what looks like a single, well-formed peak could actually represent the analyte of interest jumbled together with one or more unidentified coeluting substances. For example, when a common HPLC-UV method for measuring vitamin D_3 is used on processed cheese, the D_3 peak appears normal but more than two thirds of the peak area reflects unknown coeluting substances.[12]

In this case, proper use of HPLC-UV could identify the problem by showing the peak to be impure. The peaks in an HPLC-UV chromatogram represent absorption of UV light of a single wavelength; in the case of vitamin D, the wavelength is 265 nanometers (nm). The purity of these peaks can be assessed by conducting a full wavelength scan. Many compounds may absorb UV light at 265 nm, but individual compounds tend to have their own characteristic absorption spectrum, with maximum absorption at one wavelength, minimum absorption at another, and a predictable pattern for the wavelengths in between (Figure 3A). The putative "D_3" peak in processed cheese has an absorption pattern that is clearly distinguishable from that of pure D_3, making it clear the peak is contaminated.

Although a full wavelength scan can help identify the problem by showing that the peak is impure, it cannot solve the problem by quantifying the proportion of the peak that reflects true vitamin D_3. The only way to do this while still using UV detection would be to modify the method in a way that achieves separation of vitamin D_3 from the coeluting substances; this is time- and labor-intensive, and many laboratories would not have the resources to solve the problem

the possibilities that fish do not absorb vitamin D_2 from the diet or quickly clear it from their systems once absorbed.[7] I have had difficulty locating published research documenting the lack of vitamin D_2 in fish, but I have personally corresponded with several researchers who say they have often looked for it and never found it.

Vitamin D_2 is often added to fish oils as an internal standard (a means of adjusting for loss of vitamin D during sample processing; see sidebar on page 57) when quantifying vitamin D_3. Researchers who use vitamin D_2 in this manner routinely look for naturally occurring vitamin D_2 even if they do not publish the data, because if it exists their use of vitamin D_2 as an internal standard would be invalid.

Given this, it was a surprise for two different labs to report that vitamin D_2 is the main form of vitamin D in Green Pasture fermented cod liver oil. For a detailed analysis of this topic, see the sidebar on page 63. Readers who are not already familiar with high-performance liquid chromatography (HPLC) and the challenges of using it to measure vitamin D should start by first reading the sidebars on page 57 and 60 to obtain the necessary background information. The conclusion of the analysis in the sidebar on page 63 is that vitamin D_2 is probably not present in the fermented cod liver oil.

It seems likely that all natural cod liver oils contain a mix of vitamin D metabolites. These may be exclusively metabolites of vitamin D_3, but since the fate of the vitamin D_2 known to be present in the diet of fish has not been definitively characterized, the possibility that vitamin D_2 metabolites exist in the liver oil should not be ruled out entirely. Additionally, the fermented oil could contain other metabolites of vitamin D produced during the fermentation of the livers.

It seems likely that all natural cod liver oils contain a mix of vitamin D metabolites.

25(OH)D AS A MARKER OF COD LIVER OIL EFFICACY

In 2009, Green Pasture submitted fermented cod liver oil samples to Deltanoid Pharmaceuticals in Madison, Wisconsin for analysis of biological activity in rats. This analysis concluded

in this way. Another way to solve the problem is to use LC-MS. In the case of the processed cheese, LC-MS showed that only one-third of the substances that contributed to the "D_3" peak in UV analysis had the mass that would be expected for D_3; thus, LC-MS generated a much lower and more accurate estimate for the vitamin D_3 content of the cheese. Since the compounds that coelute with D_3 in this case have not been identified, one could argue that some of them do generate an ion with the same mass as that generated by D_3 and that even LC-MS is arriving at an overestimation. If this were suspected, LC-MS/MS could offer even greater specificity.

One area where MS becomes especially important is in distinguishing the many vitamin D compounds from one another.[13] Vitamins D_2 and D_3, as well as most of their metabolites, share the same UV absorption spectrum (Figure 3). If they were to coelute with one another, HPLC-UV would not even be able to generate evidence of peak impurity. HPLC-UV also lacks the sensitivity to detect most vitamin D metabolites at the low concentrations in which we would expect them to occur in foods. There are small differences in mass between vitamins D_2 and D_3, and between the parent vitamins and some of their metabolites, allowing LC-MS to make many distinctions that HPLC-UV cannot. Some metabolites of vitamin D, however, have identical masses, limiting the usefulness of LC-MS in some contexts. LC-MS/MS is ideal for these analyses because of its greater specificity and sensitivity.

Even LC-MS/MS faces challenges.[13] One of those has been to distinguish 25(OH)D from 3-epi-25(OH)D. This has been important because both compounds occur in human blood but they do not have the same biological activity. They are stereoisomers of one another, which means that their chemical structures are like mirror images. They generate identical fragmentation signatures, so even an LC-MS/MS detector cannot tell the difference between them. Analytical chemists have therefore been focused on getting the two compounds to elute separately so that they can be distinguished based on their retention times. LC-MS/MS is also usually insufficient for characterizing the structures of previously undiscovered vitamin D-related compounds. This has generally required the combination of mass spectrometry with gas chromatography. Gas chromatography is similar to liquid chromatography except that the solvents and samples move through the machine as gases rather than liquids, and the ionization procedure used in these methods can generate more specific fragmentation signatures.

Thus, HPLC-UV is ideal for routine quantification of nutrients in simple, well characterized samples, while LC-MS or LC-MS/MS is ideal for analyzing nutrients in complex or poorly characterized samples, and gas chromatography is usually a necessary complement to these methods when operating in truly uncharted scientific territory.

that the oil had about 80 IU/mL of vitamin D activity based on the ability of the oil to support normal body weight and normal serum calcium levels.

It is likely that the average human response would be quantitatively different from the average rat response, just as the response from one rat to another or from one human to another would vary. It may also be the case that the oil would better support some biological endpoints than others when compared to other sources of vitamin D. Nevertheless, rats cannot absorb or utilize something from the oil that does not exist, so the rat studies definitively show that the oil is a potent source of one or more compounds responsible for biological vitamin D activity.

At the present time, blood levels of 25(OH) D are almost universally used as the exclusive marker of vitamin D nutritional status. Anecdotally, many people have reported that use of the fermented cod liver oil alone was unable to keep their 25(OH)D levels in the optimal range. It is important to realize that while vitamin D itself will raise 25(OH)D, some vitamin D metabolites would be expected to exert biological activity without raising 25(OH)D. For example, if the fully active $1,25(OH)_2D$ is present in the oil, it will exert most of the biological effects of vitamin D but it will not raise 25(OH)D. In fact, it could even lower 25(OH)D by convincing the body that less 25(OH)D is needed and shunting it into an inactivation pathway.

I think it is wise to diversify one's vitamin D intake between sun exposure and various dietary sources rather than relying on one product alone. However, I have also come to believe that 25(OH) D is being overused as a marker of vitamin D nutritional status and is being used in an overly simplistic manner. As I have been documenting in my "An Ancestral Perspective on Vitamin D Status" series on the Mother Nature Obeyed blog of westonaprice.org, several populations seem to be genetically adapted to a lower 25(OH)D level than American and European whites and there are many factors—some good, such as vitamin A; others bad, such as calcium deficiency or inflammation—that can lower 25(OH)D besides an inadequate intake of vitamin D.

AN ENDURING MYSTERY

The exact nature of vitamin D in cod liver oil remains to be fully elucidated. It is not a mystery in the sense that it cannot be resolved, but it endures as a mystery in the sense that much remains to be learned. I consider it likely that as we learn more, we will come to a greater and greater appreciation of the magnificent complexity contained within natural foods.

Chris Masterjohn, PhD, is assistant professor of health and nutrition sciences at Brooklyn College in Brooklyn, NY. In 2012, he obtained his PhD in nutritional sciences from the University of Connecticut, where he studied the role of vitamin E and other antioxidants in regulating the metabolism of methylglyoxal, a potentially toxic byproduct of energy metabolism that appears to contribute to diabetes and cardiovascular disease. From the fall of 2012 through the summer of 2014, he worked as a postdoctoral research associate at the University of Illinois in Urbana, where he studied interactions between fat-soluble vitamins A, D, and K. He is now continuing this research at Brooklyn College. Chris created and maintains a website Cholesterol-and-Health.Com *which is home to his blog,* The Daily Lipid. *He has published eight peer-reviewed scientific papers and has contributed regularly to the pages of* Wise Traditions *since 2004.*

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DOES THE VITAMIN D ACTIVITY OF FERMENTED COD LIVER OIL COME FROM VITAMIN D_2?

As discussed in the main text, tests of biological activity conducted in rats show that the Green Pasture fermented cod liver oil is a potent source of vitamin D activity. The possibility that vitamin D_2 may be the primary form of vitamin D in this oil arose when lab results from UBE Analytical Laboratories in California and Nutrasource Diagnostics, Inc. (NDI) in Ontario, Canada reported that this was so. More recently, Dr. Kaayla Daniel submitted the product to two laboratories that found vitamin D_3 in the oil but no detectable D_2.[14]

One of the labs that Dr. Daniel used analyzed the oil with LC-MS (not LC-MS/MS). The method used by the other laboratory is unclear based on the data provided in the report. Unfortunately, the data were obtained with non-disclosure agreements that preclude a critical analysis for this article. Dave Wetzel of Green Pasture generously gave me full access to the lab reports from UBE and NDI and allowed me to publish them and critically analyze them in this article. A representative from NDI tried to answer my questions about the laboratory methods but after several days of research into internal records told me that they had been subcontracted to another laboratory in 2007 and it was no longer possible to obtain the detail that would be necessary for this article. Fortunately, Danny Pang, the laboratory manager of UBE, was willing and able to answer all of my questions and I am therefore able to produce a critical analysis of the UBE results herein.

UBE analyzes the oil with HPLC-UV (see the sidebars on pages 57 and 60 for a detailed discussion about the strengths and limitations of this method compared to other methods). As can be seen in Figure 4A, the method efficiently separates pure vitamin D_2 and D_3 external standards. As can be seen in Figure 4B, there is a single putative vitamin D peak in the fermented cod liver oil, and its retention time is, while not exactly the same as either standard, closer to that of the vitamin D_2 standard than to that of the vitamin D_3 standard. Pang told me that they called the peak "vitamin D_2" based solely on its retention time. Since the UV spectra for vitamins D_2 and D_3 are identical, retention time is the only tool available to distinguish between the two in an HPLC-UV method. Pang also told me, however, that he suspected the peak may reflect a microbial metabolite of vitamin D produced during the fermentation process and that it may be better to refer to it as a D_2-like compound.

One problem with concluding that the peak represents D_2 based on the retention time alone is that the retention time of a peak can be affected by the matrix in which the analyte is injected into the HPLC. The standards are dissolved in a chemical solvent, while the vitamin D compounds are dissolved in the fermented cod liver oil itself. I asked Pang whether they had tried spiking the fermented cod liver oil with known, purified D_2. If the known D_2 coeluted with the putative D_2 peak in the oil, this would offer some additional support for the conclusion that the peak truly represents D_2. Pang told me that they had not done so yet because of limitations on their time. However, in response to our conversation Pang had the samples reanalyzed with and without being spiked with known vitamin D_2. As can be seen in Figure 4C, the known vitamin D_2 does not coelute with the putative D_2, strongly suggesting that the peak does not represent D_2 itself.

At the time of writing, I do not have access to any data showing whether pure D_3 coelutes with the unknown peak in the oil. Since the unknown peak in the oil elutes earlier than D_2 (Figure 4C), whereas the pure D_3 standard elutes later (Figure 4A), this seems very unlikely; however, it is not completely impossible that the sample matrix could affect the order of the peaks. Without conclusively identifying the specific compound(s) responsible for the peak, moreover, it is impossible to know whether it represents one compound or a collection of two or more compounds. It is entirely within the realm of possibility that multiple vitamin D compounds, possibly including metabolites produced by the fish as well as microbial metabolites produced during fermentation, are coeluting together. If such metabolites are present in the oil, fully characterizing its vitamin D activity would require a very expensive, time-intensive, and labor-intensive process using more sophisticated chromatography methods.

Overall, the data suggest that the vitamin D activity of the fermented cod liver oil does not come from vitamin D_2, but may not come from vitamin D_3 either; at present, the vitamin D activity of the oil should be regarded as mystery in need of further resolution.

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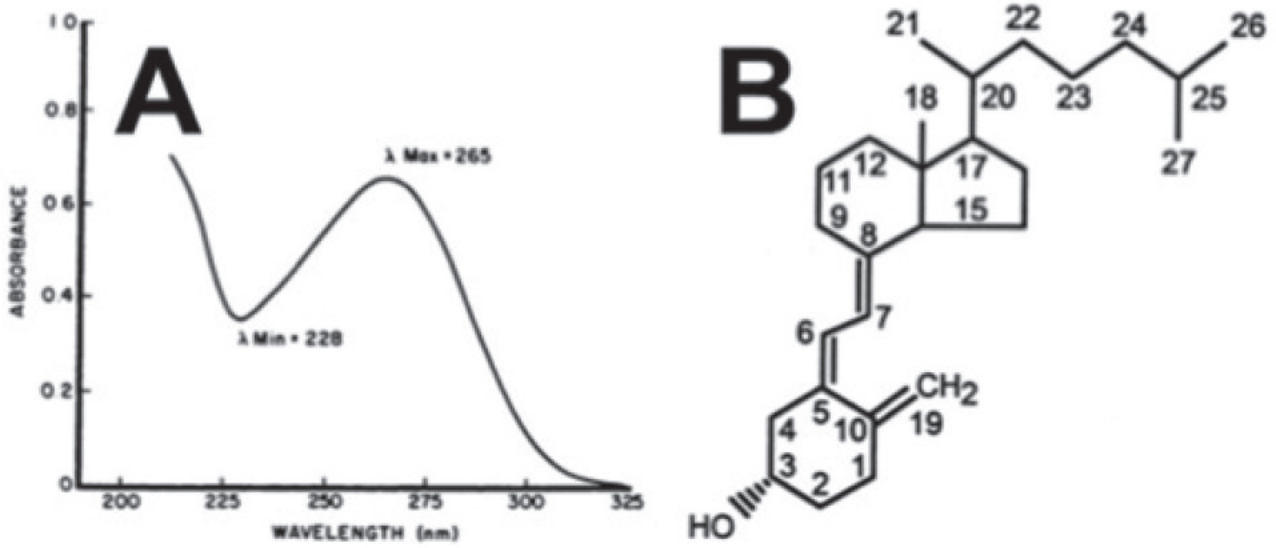
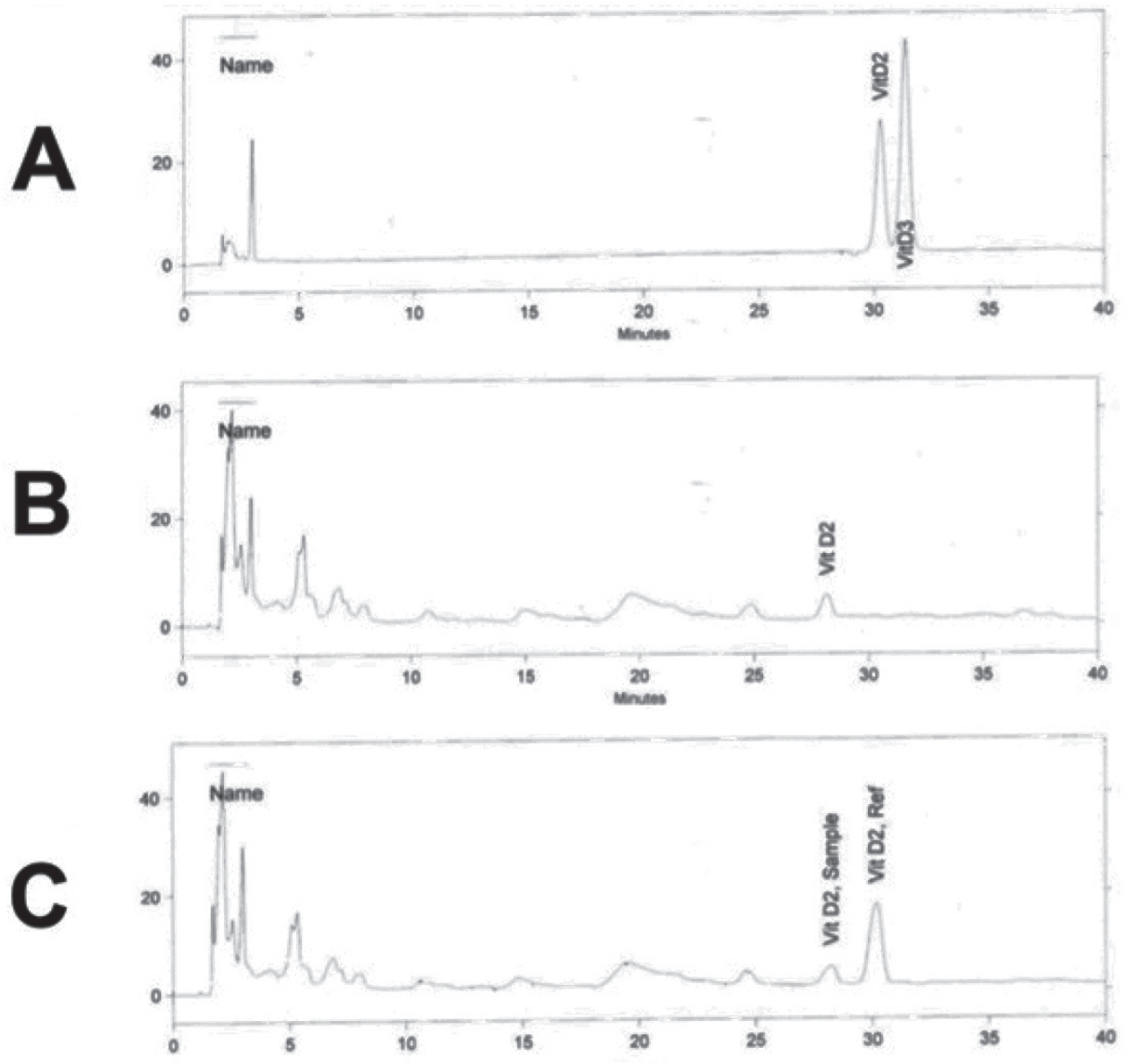
FIGURE 3: Most Vitamin D Compounds Share the Same UV Absorption Spectrum



Any compound that absorbs UV light has a characteristic absorption spectrum. Panel A shows the absorption spectrum of vitamin D and was originally published in Reference 15. Wavelength is abbreviated by the Greek letter lamda (λ). The wavelength at which vitamin D absorbs the most UV light is known as its λ max and is 265 nm. The wavelength at which it absorbs the least is known as its λ min and is 228 nm. A putative vitamin D peak in an HPLC chromatogram could be shown to be misidentified or impure if the absorption spectrum clearly differed from that of pure vitamin D. Solvents used in HPLC absorb UV light, and UV spectra often show additional absorbance at lower wavelengths because of the solvent, as is the case in panel A.

Although the absorption spectrum of any given compound tends to differ from that of most others, most vitamin D compounds share identical absorption spectra because they share in common the structural feature responsible for UV absorption. Panel B shows the structure of vitamin D with each carbon atom assigned a number. The portion of the molecule that absorbs UV light is the set of three double bonds (symbolized by three sets of double lines and known as a triene structure, "tri-" for three and "-ene" for double bonds) between carbons 5 and 6, carbons 7 and 8, and carbons 10 and 19. Most vitamin D compounds retain this structural feature intact. For example, D_2 differs from D_3 by having an extra carbon atom attached to carbon 24; the main activation pathway of vitamin D involves hydroxylation of carbons 25 and 1; the main inactivation pathway involves hydroxylation of carbon 24. All of these modifications occur on the outside rings or the side chain of the molecule and leave the UV-absorbing triene structure unchanged.

FIGURE 4: HPLC Analysis of the Fermented Cod Liver Oil



The figure shows HPLC-UV analysis of Green Pasture fermented cod liver oil, conducted by UBE Laboratories. Panel A is a chromatogram of the external standards and shows that the method satisfactorily separates vitamins D_2 and D_3. Panel B is a chromatogram of the oil. A comparison of panels A and B shows that the putative D_2 peak in the oil has a retention time (28.1) closer to that of the D_2 standard (30.3) than to that of the D_3 standard (31.4). Panel C shows the chromatogram of fermented cod liver oil that has been spiked with known D_2. If the putative D_2 peak (Vit D_2, Sample) truly represents D_2, it should coelute with the D_2 that had been added (Vit D_2, Ref). This does not happen: the putative D_2 peak elutes at 28.2 min, while the known D_2 elutes at 30.2 min. This suggests that the putative D_2 peak does not represent true D_2.

Constant Controversy:
Cod Liver Oil and Our Changing Food Paradigms

Sally Fallon Morell, MA

Cod liver oil—what is it? That stinky stuff kids had to take on a spoon? A magic medicine that heals rheumatism, clears the scrofula of TB and helps children recover from measles? A beauty aid that smooths the skin? A messy industrial product used to tan shoe leather? A clean, clear, standardized yellow liquid or a brown oil that rises from rotting livers?

It's all of these and more. In fact, our views on cod liver oil can serve as a kind of bellwether for evolving attitudes on food, health and processing over the years. Cod liver oil is the quintessential traditional "natural" remedy and also one of the first common foods subjected to industrial processing. And as tradition has collided with modern science, cod liver oil has suffered the buffets of changing attitudes. Even in the early days, when this ancient folk remedy first caught the attention of modern physicians, it provoked instant and constant controversy.

Since early human settlement in northern Norway, cod and cod products have served as the cornerstone of industry for the region. Even as early as the Viking Age, cod liver oil brought prosperity as a chief item of trade with northern Europe, both for consumption and for industrial purposes. Some types were used for oil lamps, ovens, leather treatment, paint manufacture, coloring processes in textile production, soap manufacture, tempering and lathing of steel, manufacture of explosives for the armaments industry, and industrial lubricants, while more carefully extracted versions were consumed as a food and medicine for humans and animals, or used as skin creams and healing ointments, and even as a lubricant for childbirth.[1]

The method used by the Vikings was actually a kind of steam extraction. They brought water in a pan to boil and then placed birch tree branches on top of the pan; the cod livers were put on top of the branches. As the steam from the boiling water rose, it began to cook the livers, and oil from the livers would drop into the pan.[2]

The first notes on cod liver oil used for medicinal purposes appeared in 1789 in Manchester, when a Dr. Darbey described using cod liver oil as a remedy for rheumatism. In 1824, a German journal mentioned cod liver oil as a remedy for rickets.[3]

The year 1841 saw the publication of the *Treatise on the Oleum Jecoris Aselli or Cod Liver Oil as a Therapeutic Agent in Certain Forms of Gout, Rheumatism, and Scrofula; with Cases*, by John Hughes Bennett, MD. (Scrofula, by the way, is tuberculosis of the neck, characterized by firm, rubbery nodes that eventually break open and supperate. It was a common medical problem at the time.) Bennett was "formerly president of the Parisian Medical Society, and of the Royal Medical and Royal Physical Societies of Edinburgh."

Bennett notes that cod liver oil had a long history as a popular remedy in Sweden, Norway, Germany, Holland, Scotland, Britain, France and Belgium. He describes it as useful in treating gout, rheumatism, scrofula, caries, diseased joints, tubercular affections, enlarged mesenteric glands (a type of lymph node) and obstinate chronic afflictions of the skin.

MANY SHADES OF BROWN

In the early days, according to an industry document, fishermen put the livers in barrels to ferment, bringing them into port when the fishing was over. As the weather grew warmer, the cod liver oil separated from the livers and floated to the top. "This type of oil is called 'raw cod liver oil' and was drawn off continuously. The first cod liver oil to be separated in this way is clear with a mild taste and is referred to as 'raw medicinal oil.' Subsequently, the liver emits a darker and stronger tasting cod liver oil." Thus, according to this document, both a pale and a darker oil came off the fermenting livers.

Bottle of Whitman's emulsified cod liver oil, produced in Boston, circa 1910. The color of the oil is brown.

When no further oil could be extracted in this way, the remains were heated in iron cauldrons. This oil was called "brown oil" and was considered the poorest quality—and presumably sold for industrial uses.[4]

In his 1841 publication, Bennett begins by describing a light or yellow transparent cod liver oil and one that is brown and opaque. The lighter one is generally used in medicine, he states, while the other is used for industrial purposes, such as the preparation of leather. However, on questioning physicians, he found that many stated a preference for a darker oil. This darker oil, he says, is not the same as the industrial oil, but something between the clear yellow oil and the dark, opaque, unpleasant-smelling industrial oil. This oil is described as brown or reddish but translucent.

"Many apothecaries in the large towns of Germany have told me that they only keep two kinds, which they call the white and the brown, and that the latter only is used medicinally; but this, in point of fact, is the yellow variety. At Wildbad, however, being present at the half-yearly medical association of Wurtemberg, I had an opportunity of examining and comparing the three different kinds of cod liver oil, then presented to the meeting [September, 1840]. The first was of a light straw colour, almost white much resembling, in appearance, castor oil, perfectly transparent and of a peculiar taste. . . The second was of a golden colour, also transparent, but somewhat less disagreeable to the smell and taste; and the third was of a deep chestnut brown colour, almost opaque, exceedingly nauseous to the taste, and produced an impression on the tongue which gave rise to a burning sensation. Of these the second or deep golden yellow colour is

The cod liver oil from Hamburg or Bremen is "that kind which has been employed with such good effect throughout Germany, and which, in colour, resembles old Malaga wine."

for the most part used medicinally throughout Germany, although, in different places, it is more or less turbid and deep in colour. By some, however, the third or brown kind, not withstanding its disgusting taste, is preferred. When in Mayence last March, I was furnished by Mr. G. Von Siebold, an apothecary of that town, with a cod liver oil, which he said had been prepared for medical purposes with great care. It was clear and transparent, and of a dark reddish colour when held to the light, resembling the colour of diluted tincture of iodine. The taste of this oil is not more disagreeable than the yellow variety, but not having hitherto been much used in medicine, its therapeutic virtues are unknown."

Thus the four types of cod liver oil then available can be summarized as:

- Very light or white: Not preferred by physicians; unpleasant taste and odor (probably bleached with chlorine);
- Yellow, clear, most often preferred by physicians, less disagreeable odor and taste. Sometimes described as "brown";
- Reddish brown, clear, smell and taste like the yellow, prepared for medical purposes, considered the best by many physicians;
- Dark brown oil, opaque, disagreeable smell and odor, leaves a burning sensation on the tongue; probably sold for industrial uses but nevertheless used by some physicians.

In a footnote, Bennett notes that he found a cod liver oil very similar to the reddish translucent oil he had found in Mayence in London, Edinburgh and parts of Germany. The London cod liver oil came from Newfoundland. The cod liver oil from Hamburg or Bremen is "that kind which has been employed with such good effect throughout Germany, and which, in colour, resembles old Malaga wine."

Bennett encountered many descriptions about how cod liver oil was processed. One source told him that the livers were placed in casks and "allowed to putrefy, by which means the oil is separated." By another method, used in Bergen, Norway, the light variety percolates "itself from the liver of the fish, but that the brown kind is obtained by boiling the residuum, when no more of the former will flow out." Another physician relates that three kinds are prepared in Bergen, "one by spontaneous percolation, a second by pressure, and a third by coction" [boiling]. Another source states that "the light oil flows from the liver during the first few days, merely by the action of the sun's heat, and the brown oil is procured afterwards from a period of eight to fourteen days, when it has become putrid." Yet another source states that ". . . both sorts are obtained by the artificial application of heat; the lighter is the first portion, which is procured and skimmed off, and that the brown is procured by a stronger heat, which induces a certain degree of decomposition." Yet another source "asserts that the lighter oil is obtained by boiling the liver, and the brown by boiling also the intestines which are surrounded with fat."

Another method involves placing the livers in an upright cask with three spigots, one above the other. Upon exposure to the sun, the fat melts. The clearest oil flows from the upper spigot while the other two yield two kinds of brown oil. The residue left in the cask, subjected to hot pressure, "yields a very dark and thicker oil, which is for the most part used in the preparation of leather."

Preparation of cod liver oil on the coast of Ireland proceeds by heating the livers in an iron pot "until their substance is broken down." The oily pulp is put into a canvas bag and drained with pressure. A second heating and pressing of the residue yields an oil that is more dark colored and more strongly scented.

In some areas, the fishermen simply boil the livers in an iron pot and then filter the oil through a towel containing a little sand.

A source from Sweden described processing that rendered the four kinds of oil Bennett had found in some apothecary shops:

- "(a) The first, which is almost of a gold yellow colour, much resembling old Rhine wine, quite clear and clean, and with a peculiar strong fishy smell, is obtained by the heat of the sun acting on the liver, placed in large cylindrical glasses. The oil then comes away, leaving the other fatty matters as a residuum. This kind is the most active, but as it cannot be obtained, in comparison with the other kinds, in so great a quantity,

is seldom found in commerce, and is very dear [expensive].

- "(b) When from the liver, treated as above described, no more oil can be obtained, the residuum is placed in vessels made expressly for that purpose (or, in some laboratories, on tinned copper plates), and is exposed to 40° Reaumur [122° F], whereby a considerable quantity of oil flows out, which is darker and not so clear as the former, but has still a strong fishy smell, and in colour is between that of Madeira and Malaga wines. This kind is little inferior to the other, and in Sweden, is equally used internally as a remedy.
- "(c) When no more oil can be obtained from the liver in this manner, the residuum is placed in a kettle, cut in pieces, and then roasted, whereby the third kind, or the less pure. . . oil, is procured. It is thicker than the former kinds, not clear, it resembles in colour common syrup, but is somewhat browner, and possesses a strong, penetrating and burning fish taste and smell. This sort, which not only contains the oily and fatty, but also the biliary ingredient of the fish's liver, is never used as a remedy in Sweden, but is employed in the preparation of leather, and hence is sold in immense quantities under the name of Curry oil.
- "(d) Besides these, there is prepared by chemical means a fourth kind [probably bleaching by chlorine], which is quite clear, has a very weak fishy smell, is similar in appearance to olive oil, and is disposed of in commerce as the only pure oil, but is never used internally in Sweden, and is there considered inert."

Thus in Sweden, as in the rest of Europe, physicians recommended both the yellow and the clear brown cod liver oil, generally avoiding the thicker opaque brown oil as well as the very light oil.

A modern book on fish oils confirms the fact that before industrial processing, the medicinal oils were obtained by fermentation: "Formerly, the livers were allowed to stand in wooden vats or barrels, and the oil was removed as it floated to the surface after being released by autolysis [fermentation]. The two first batches removed in this fashion were used as medicinal oil, and the remainder as industrial oil. The residue was heated in underfired iron kettles, giving a dark oil which contained large amounts of free fatty acids."[5]

DR. DE JONGH

Several years later, in 1849, L.J. de Jongh, M.D. of the Hague published a booklet entitled *The Three Kinds of Cod Liver Oil; comparatively considered with reference to their chemical and therapeutic properties.* He delineates three types of oil: a dark brown oil with a disagreeable smell and bitter taste; a dark oil, the color of Malaga sherry, with a smell not disagreeable and a fishy, bitterish taste; and a gold-yellow oil with a smell not disagreeable and a fishy, bitterish taste. He noted that opinions vary as to which type is the best, but de Jongh himself preferred the brown or light brown varieties (noting that sometimes the pale oil had been "blanched by chlorine."). He based this opinion on his own clinical experience using all three types. "The brown cod liver oil has proved itself a most powerful remedy in rheumatism and scrofula."

A few years later, in 1855, de Jongh wrote a two-hundred-ten page book: *Cod Liver Oil. Causes of its Frequent Inefficacy and Means of Removing the Same; with Remarks upon the Superiority of the Light Brown over the Pale Oil, Directions for its Use and Cases in which the Oil has been used with the Greatest Effect.* By that time, he was marketing his product, Dr. de Jongh's Light Brown Cod Liver Oil, throughout Europe and importing it to the United States. Based on his clinical experience, he concluded that both pale and light brown cod liver oil were effective in curing a variety of diseases, including tuberculosis, but that the brown oil brought a resolution of the symptoms in half the time compared to the pale oil. The "causes of its frequent inefficacy" seem to be the giving too much, or giving cod liver oil without also prescribing a diet of nutritious food. De Jongh also noted that cod liver oil rarely cured advanced cases of tuberculosis but generally prolonged the life of the patient. He found it very effective for reproductive disorders.

Even from the early days, disagreements abounded not only as to the best color, but also

Based on his clinical experience, he concluded that both pale and light brown cod liver oil were effective in curing a variety of diseases, including tuberculosis, but that the brown oil brought a resolution of the symptoms in half the time compared to the pale oil.

Bennett shows great prescience in claiming that "a fat animal diet supports the action of the oil."

as to whether cod liver oil was even safe to consume. Bennett warned that prolonged use could sometimes result in digestive disorders. The doses he recommended seem huge: one to two tablespoons two to four times daily for adults and one to two teaspoons two or three times daily for children of twelve months and under. "To obtain any benefit," he says, "a genuine yellow or brown oil must be employed."

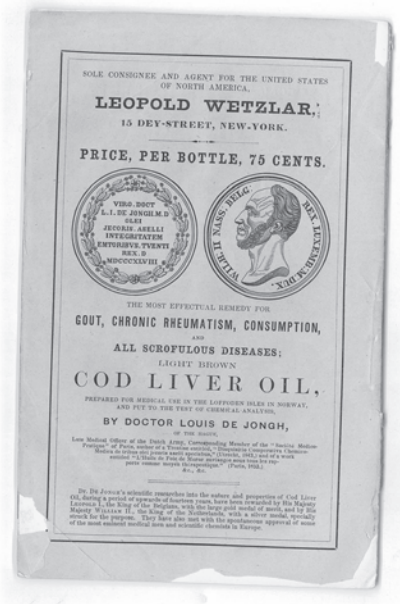
As an aside, Bennett praises animal fat, noting that "butchers, oil men, tallow chandlers, tanners and other individuals who are continually coming in contact with fatty matter, are particularly robust and well-nourished, and are known to be remarkably free from scrofula." Bennett shows great prescience in claiming that "a fat animal diet supports the action of the oil." We now know that the omega-3 fatty acids in cod liver oil require balance with the omega-6 arachidonic acid from animal fats; and that saturated fats in general protect against any harmful tendencies of polyunsaturated fish liver oils. Bennett also warns: "All substances abounding in starch are to be avoided."

Remember that these discussions occurred before anyone knew what a vitamin was. Bennett felt that the best cod liver oils were those that provided iodine and phosphorus.

His conclusion: "The best is the clear brown or reddish variety, next in power is the yellow, and the least beneficial is the white. A sample of the oil employed should always be analysed in order to determine whether it contains iodine as a constituent. . . ."

STEAM PROCESSING

The first industrial cod liver oil production method was steam extraction—a method that is still used today. Typical of the reputation that science and technology enjoyed, as the bringer of cleanliness and purity to replace traditional, less-than-sanitary processing, is this description from *A Thousand Years of Norwegian Oil: Lofoten as Global Manufacturer of Cod Liver Oil*: "Prior to 1850 all cod liver oil was manufactured in the old way, by allowing fermentation and putrefaction, or by boiling the liver. The quality of this oil was abysmal. A major technological breakthrough occurred in 1854 with Norwegian pharmacist Peter Moller and the commencement of the manufacture of cod liver oil in Lofoten [the northern coast line of Norway]. Because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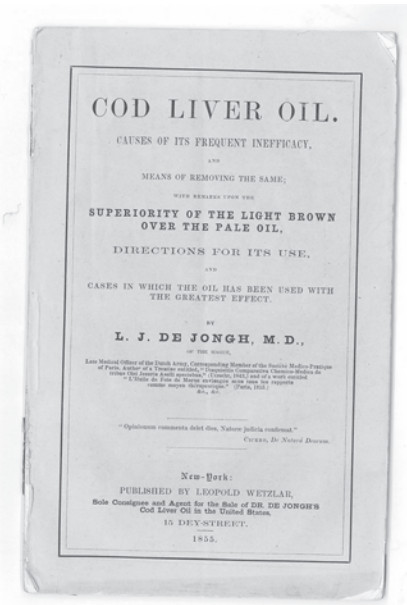
BY DOCTOR LOUIS DE JONGH,

The Three Kinds of Cod Liver Oil; comparatively considered with reference to their chemical and therapeutic properties, by Dr. De Jongh.

Label for Dr. De Jongh's Light Brown Cod Liver Oil.


COD LIVER OIL.

CAUSES OF ITS FREQUENT INEFFICACY,

AND

MEANS OF REMOVING THE SAME;

SUPERIORITY OF THE LIGHT BROWN OVER THE PALE OIL,

DIRECTIONS FOR ITS USE,

AND

CASES IN WHICH THE OIL HAS BEEN USED WITH THE GREATEST EFFECT.

BY

L. J. DE JONGH, M. D.,

New-York:

PUBLISHED BY LEOPOLD WETZLAR,

Sole Consignee and Agent for the Sale of DR. DE JONGH'S Cod Liver Oil in the United States,

15 DEY-STREET.

1855.

Cod Liver Oil. Causes of its Frequent Inefficacy and Means of Removing the Same; with Remarks upon the Superiority of the Light Brown over the Pale Oil, Directions for its Use and Cases in which the Oil has been used with the Greatest Effect, by Dr. De Jongh.

of this, it became possible to manufacture high quality medicinal cod liver oil at a lower cost." (The same document notes that homemade cod liver oil, accused of "abysmal" quality, "always" kept the fishermen healthy, in spite of the wind, rain, cold and snow they endured to practice their profession.)[6]

After 1860, steam-based mills replaced barrels and cauldrons. "This required more advanced technology and improved skills, and the old cod liver oil distillers were replaced by steam-based methods. The manufacture of cod liver oil had become an industry, and a high status job in the fishing village." Said one retired cod liver oil worker: "Yes, it was a good job, except that the steam from the oil gave us such soft, fine skin, you know, like a baby's bottom, and real men aren't supposed to have skin like that."[6]

The most common steaming method today, used since the early 1900s involves "leading steam under high pressure from an external boiler directly into a conical vat, with its point facing downwards, containing 5-6 hectolitres [about 1200 pounds] of liver. . . Steam with 3-5 kilos of excess pressure is led via piping to the bottom of the vat. . . The liver heats up to about 95° C [203° F] in 10-15 minutes. Good circulation is achieved in the liver pulp, while at the same time it is shredded by the powerful jets of steam . . . When the liver is warm enough, the pulp is left for half an hour until the cod liver oil has accumulated on top."

According to this document, earlier, the dregs were tapped over into large cauldrons where they were left to ferment. This resulted in the emission of more cod liver oil: "sour oil" or "pale oil." Then the dregs were reheated and pressed to produce a sour, dark "pressed oil" and a fatty liver cake used as animal feed. Today this process has been replaced by centrifugation. The document does not state whether or not this "sour oil" or "pale oil" was sold for medicinal use.[6]

EMULSIFIED COD LIVER OIL

The biggest impediment to cod liver oil use was the taste and smell—described by some as "highly disagreeable" or "nauseating," although many people had no trouble taking it, especially mixed with water, juice or milk. The preparation of cod liver oil that was easier to take fell to Alfred B. Scott and Samuel W. Bowne who came up with an emulsified cod liver oil called Scott's Emulsion. Their first trademark, registered in 1879, included the initials P.P.P. for "Perfect, Permanent, Palatable." The formula was "50 per cent. of Pure Cod Liver Oil, 6 grs. of the Hypophosphites of Lime, and 3 grs. of the Hypophosphites of Soda to a fluid ounce. Emulsified with Mucilage and Glycerine." The mucilage was probably gum acacia. One advertisement proclaimed, "You do not get the taste at all; because the little drops of oil are covered over in glycerine, just as pills are covered in sugar or gelatin." By the 1890s, Scott and Bowne had factories in Canada, England, Spain, Portugal, Italy and France, and advertised their emulsion throughout the Americas, Europe and Asia.[7]

Today the product is owned by GlaxoSmith-Kline and seems to have faded from use except in the Spanish-speaking world. The ingredients for the modern product: "Water, cod liver oil, sucrose. Contains 2% or less of the following ingredients: phosphoric acid, tricalcium phosphate, monocalcium phosphate, vitamin A, vitamin D_3, xanthan gum, propylene glycol alginate, modified corn starch, L-lysine, potassium sorbate.[8]"

Note the addition of vitamins A and D; the natural vitamins are removed during processing. Recommended dosage is three teaspoons for children age nine and over, two teaspoons for children four to nine and one teaspoon per day for children under two years of age.

MODERN PROCESSING

Over time, cod liver oil processing became more and more complicated. Vegetable oil processing began in the early 1900s, and much of that new technology transferred to cod liver oil manufacture. According to the book *Fish Oils: Their Chemistry, Technology, Stability, Nutritional Properties, and Uses*, published in 1967, "The processing of fish oils is similar to that of vegetable oils."[9]

The processing of fish oils is similar to that of vegetable oils.

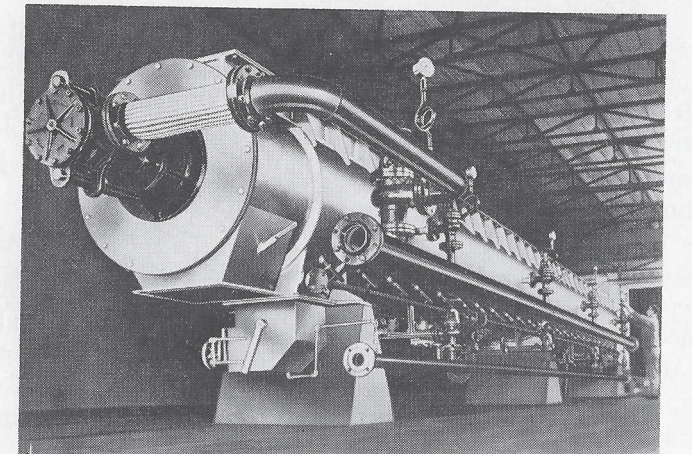
After steam extraction cod liver oil can be subjected to the following processes:[10]

1. Alkali refining, which uses caustic soda to remove free fatty acids and some metals. One of the reasons given for removal of free fatty acids is that they can interfere with

"Other types of processing remove some vitamins, but it is the deodorization step that takes out the most."

other processing.

2. Bleaching, which removes color substances, metals and dioxins. This is a chelation-type of process that uses clay or other natural earth absorbents.
3. Winterization to remove stearines (saturated fats), usually by chilling down the oil and removing the congealed fatty acids. (Removal of stabilizing saturated fatty acids from cod liver oil makes no sense, but processors do it anyway.)
4. Deodorization, which removes pesticides, PCBs, most of vitamin D and quite a bit of the vitamin A. Other types of processing remove some vitamins, but it is the deodorization step that takes out the most. This is why most processors then add the vitamins back in, at doses of about 1100 to 4600 IU vitamin A per teaspoon and 180 to 460 IU vitamin D per teaspoon. These vitamins are single metabolite retinol palmitate and vitamin D_3 made by irradiating lanolin with ultra-violet light. Deodorization is usually carried out by molecular or vacuum distillation, which places the oil under an extreme vacuum. This allows the oil to "boil" at a very low temperature. The various components of cod liver oil can be "boiled off" separately based on their molecular weight. This is how processors can take cod liver oil apart into its components—including omega-3 fatty acids and fat-soluble vitamins—often sold separately. As one manufacturer puts it: "Everything is purified molecule by molecule. There is very little mingling of molecules. The nasty mercury molecules stay in one place and the healthy Omega-3 in another. Now you have pure, concentrated fish oil. And no gunk."[11]
5. Believe it or not, in some cod liver oil plants, the cod liver oil is hydrogenated! "In certain countries, it is desirable to manufacture a liquid oil of good stability through the hydrogenation of fish oils."[12] This is one reason manufacturers remove the free fatty acids, because these compounds interfere with the hydrogenation process.



Norwegian combined cooker for indirect and direct steam heating of cod livers.

The most recent description of industrial cod liver oil production we could find dates from 2011: "Generally, steam cookers are used to extract the oil from the livers. Low-pressure steam is piped into a tank containing the livers and the heat cooks the livers. When the steam condenses a layer of hot water is produced which floats the oil. The oil is then separated and pumped into a storage tank. Some liver oils are extracted at sea on board trawlers when they remain at sea for long periods of time.

"A process that treats the liver residue with caustic soda was developed in Iceland. After the medicinal grade oil is separated, the residue is then treated with caustic soda. This destroys the protein and the oil floats to the surface and is recovered as veterinary grade cod liver oil. This grade is darker in color and *contains a higher level of vitamins than the medicinal grade* [emphasis added].

In a more modern operation, the livers are ground and pumped over magnets to remove tramp metal, especially hooks which come from the freezing plants. The livers are heated and allowed to stand for a period of time to break down the proteins. The livers are then run through decanters to remove solids, and the liquor is collected in kettles, heated to 95°C and then separated. Modern three-way separators are used and the crude cod liver oil is collected and pumped to the refinery. In the refinery the oil is alkali refined to remove free fatty acids, washed and dried in a vacuum tower and then winterized to remove stearines [saturated fatty acids]. The result is medicinal grade cod liver oil."[13]

THE UPS AND DOWNS OF COD LIVER OIL

"Consumption" and "wasting diseases" during the 1800s were a leading cause of death. These terms covered a variety of conditions we now know as manifestations of nutritional deficiencies, such as tuberculosis and rickets. Cod liver oil provided an effective treatment for these diseases, which brought untold suffering to those living in crowded, cold, dark tenements. Cod liver oil worked as well for rheumatism and gout.

In 1882, Koch discovered the tubercle bacillus—the "germ" associated with many cases of tuberculosis—and immediately fingered as the cause. The discovery launched a new era of science and medicine, with a search for "active principles" in traditional remedies. Scientists isolated plant alkaloids—morphine from opium and quinine from cinchona—in order to provide medicines with increased potency and known quantity, with the hope of more predictable results.

Investigators sought these active principles in cod liver oil. In 1888 French chemists Armand Gautier and Louis Mourgues published an analysis of the active principles in light brown cod liver oil, entitled "Sur les alkaloids de l'huile de foie de morue." Like de Jongh of the previous generation, the French chemists expressed a preference for light brown over pale oil.[6]

With the emphasis on "active principles" and patent medicine, cod liver oil dropped out of favor with many doctors. The United States Dispensatory of 1918 summed up the prevailing attitudes: "Whether or not [cod liver oil] acts simply as a foodstuff or whether it has some direct influence on the bodily metabolism, is open to dispute."[6]

But new research soon restored the popularity of cod liver oil. In 1913, in experiments with rats at the University of Wisconsin, Elmer McCollum and Marguerite Davies discovered vitamin A in cod liver oil; in 1922 McCollum found that cod liver oil also contained vitamin D, which protected against rickets. Early studies showed that cod liver oil cut deaths from measles,[14] played a critical role in eyesight,[15] and even reduces colds and absenteeism.[16] In the years between 1926 and 1937, cod liver oil consumption increased threefold, from 1.9 million to 5.8 million gallons. Doctors, health care workers, journalists, government officials, teachers and even Sunday school teachers urged cod liver oil—children in orphanages and refugee camps got it every day.

After World War II, the germ theory of illness came to the fore, pushed into the limelight with the advent of antibiotics. Cod liver oil faded into the background and imports declined.

In the twenty-first century, cod liver oil has come to the fore again; antibiotics and other pharmaceutical "wonders" like vaccinations and a variety of "miracle" drugs have not saved us from what is now an epidemic of chronic disease; our children suffer from learning disorders, growth problems, crooked teeth, rampant caries, asthma, allergies, skin problems and even "adult" diseases like arthritis and cancer. Our search for answers accompanies a growing distrust of the pharmaceutical industry, of the fortification of processed food, of technologies that can heat and pound the life out of milk and take apart a traditional food like cod liver oil, replacing its natural vitamins with vitamins made in factories. The germ paradigm has fallen on its face with the discovery of the human biome, and we have gained a growing respect for fermented foods, once deemed unsanitary. Finally, a resurgence of interest in the work of Weston Price has led to the realization that we need the fat-soluble vitamins

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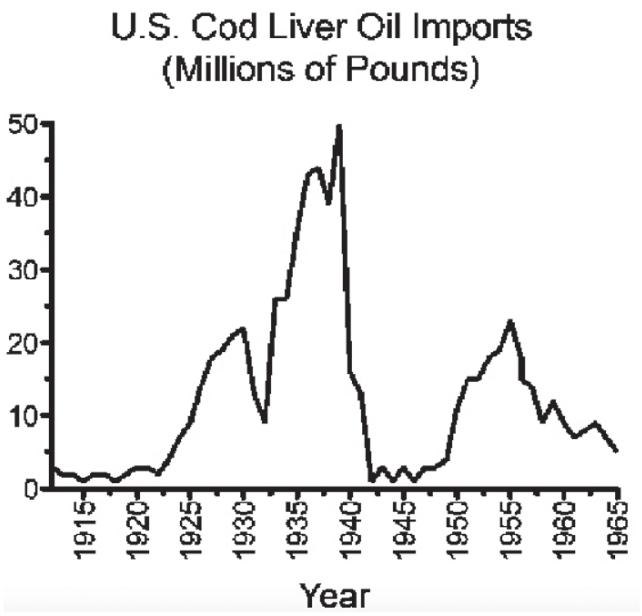

found in the much maligned animal fats.

As Chris Masterjohn has stated, cod liver oil is not so much a necessity as a convenience. The diets of the healthy primitive peoples Price studied were exceptionally rich in vitamin A and D, mostly from foods that modern people no longer eat, such as organ meats and blood, or from foods that are difficult to obtain, like butter, cheese and egg yolks from pastured animals. Price used cod liver oil in his practice " . . . not because the healthy non-modernized populations he studied used it, but because it was a convenient way to increase the fat-soluble vitamin content in the diets of people who needed it. It provides retinol, the physiologically essential form of vitamin A, which can also be obtained from most animal livers, and, in smaller amounts from other animal fats, particularly butter and egg yolks. It provides vitamin D, which can be obtained from sunlight, many fish, and in lesser amounts from terrestrial animal fats, particularly butter and egg yolks. . . . It is easier to add cod liver oil to an imperfect diet than to perfect the diet, and for many people the most balanced approach to obtain all of these nutrients will be to consume a small amount of cod liver oil while also trying to hit the other dietary bases more often than not, allowing the cod liver oil to relieve the need for dietary perfection."[17]

NATURAL IS BETTER

Fortunately, our choice of cod liver oil today is not confined to the industrially processed versions; today both brown and yellow versions of natural cod liver oil are available to us. Light reddish-brown, translucent fermented cod liver oil is now produced under carefully controlled conditions without heat or chemicals; it has a mild flavor and is easy to take.

Yellow cod liver oil with natural vitamins comes as "virgin" or "extra virgin." According to an industry document, virgin cod liver oil "is separated from fresh cod fish livers using cold pressed and advanced purifying technologies without the use of chemicals. The raw material is processed very shortly after catching. The process involves heating to below 100°C, for example to a temperature around 90-95°C [194-203° F] just for the time needed for the material to pass through an indirectly heated tubular scraped surface heat exchanger. The heated suspension is then separated in a suitable decanter in order to isolate the oil. . . . An example is the Norwegian virgin cod liver oil production. The preparation of this product, including winterization, distillation, blending, drumming, and bottling is conducted in a manner that ensures the product is carefully processed to concentrate the healthy long chain omega-3 EPA and DHA fatty acids while removing any unwanted environmental chemicals and retaining the naturally occurring vitamins A and D."[18]

According to the manufacturer, extra virgin cod liver oil is processed without heat, steam or chemicals, according to ancient Viking techniques, although we have not found a description in the industry literature. As with virgin cod liver oil, it retains the natural vitamins and has only a mildly fish smell.

These choices give us an advantage over what Dr. Price had to work with, which was most likely steam-extracted industrial cod liver oil. We also have a better grasp of the necessary factors for cod liver oil to be most effective: vitamin K from animal fats, especially duck and goose fat, aged cheeses, grass-fed butter and butter oil; plentiful dietary calcium and magnesium; and animal fats to supply arachidonic acid to balance the omega-3 fatty acids. We also know that the large doses recommended in the 1800s can be effective in certain situations over the short term but should not be continued for long periods.

And there is certainly much more to learn about cod liver oil and the fat-soluble vitamins it contains. Stay tuned!

SHARK STOMACHS CONTAINING
FERMENTING SHARK LIVERS, FROM TAHITI

South Sea Islanders put great store in fermented shark liver oil—enduring considerable danger to procure the sharks even though other, less dangerous-to-catch seafood was plentiful.

To prepare the oil, they put the livers inside the leathery stomachs of the shark and hang them in the trees for several months. As it ferments, the oil gradually comes out of the livers and fills the hanging stomachs!

The yield is about one liter per shark.

Photo courtesy Kay Baxter.

Sally Fallon Morell is the founding president of the Weston A. Price Foundation and author of Nourishing Traditions *and* The Nourishing Traditions Book of Baby & Child Care *(with Thomas S. Cowan, M.D.).*

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SOME COD LIVER OIL STUDIES

1937: When calcium plus viosterol (synthetic vitamin D_2) was given to pregnant women, researchers found definite calcification of the placenta and indications of adverse effects (such as calcification of the kidneys) in newborns. No such effects occurred with calcium plus cod liver oil, a source of natural vitamin D (Ohio State Medical Journal 33(9):990-994).

1986: Cod liver oil prevented atherosclerosis in swine fed a highly atherogenic diet for eight months (New England Journal of Medicine 315(14):841-846).

2003: Supplementation during pregnancy and lactation with cod liver oil resulted in higher IQ in offspring at 4 years of age (Pediatrics 111(1):e39-e44).

2003: Use of cod liver oil during the first year of life is associated with lower risk of type-1 diabetes (American Journal of Clinical Nutrition 78:1128-34).

2004: Researchers relate the recent decline in cardiovascular disease mortality in Norway to increased use of cod liver oil, among other factors (Medisin Og Vitenskap 124:1532-6).

2005: Women who took cod liver oil during pregnancy were eleven times more likely to give birth to normal-weight babies, thus avoiding the many health problems to which low-birth-weight babies are prone (British Journal Gynecology and Obstetrics, April 2005).

2005: Multivitamin or cod liver oil supplementation was associated with a significantly lower risk of any fracture. "We found no evidence to support any skeletal harm associated with increased serum indices of retinol exposure or modest retinol supplementation in this population" (J Bone Miner Res. 2005 Jun;20(6):913-20).

2007: In Arctic climates, supplemental cod-liver oil during childhood may be protective against multiple sclerosis later in life (J Neurol. 2007 Apr;254(4):471-7).

2007: Reduced breast cancer risks were associated with increasing sun exposure and cod liver oil use from ages ten to nineteen. "We found strong evidence to support the hypothesis that vitamin D could help prevent breast cancer. However, our results suggest that exposure earlier in life, particularly during breast development, may be most relevant" (Cancer Epidemiol Biomarkers Prev. 2007 Mar;16(3):422-9).

2007: Regular use of cod liver oil is negatively associated with high levels of depressive symptoms in the general population (J Affect Disord. 2007 Aug;101(1-3):245-9).

Traditional Fermented Fish Products

by Alison Birks, MS,AHG, CNS

Fermented foods currently comprise approximately one-third of the human diet globally. In traditional diets, cereal grains, dairy products, fruits, vegetables, meats, seafood and fish are all fermented using various methods as a way to preserve food and to improve its nutritional quality.

Fermentation of fish is an ancient practice. It has historically and continues to be employed to preserve fish when other methods of preservation have failed. This method of extending the harvest was born of necessity as a way of coping with seasonal scarcity. Other methods to slow bacterial degradation such as drying, salting, smoking and curing require certain ambient air temperatures and levels of humidity to be successful. Under conditions that were either too wet for drying, or when these other methods were just not feasible, fish fermentation was developed as a needed solution.

Fermentation became especially important for species of fatty fish, such as salmon, trout, Arctic char, and herring, which are not very suitable for drying due to the presence of large amounts of polyunsaturated fatty acids. In addition, fermentation developed as a way to preserve fish using less salt, as salt was expensive and generally scarce in ancient times.

The processes used in fish fermentation vary greatly worldwide, and depend on the culture, climate, and availability of both salt and fish. The species of fish and or shellfish that are fermented have always been determined by what is abundant in a given locale.

The acceptance of the aromas and taste of fermented fish sauces, pastes, and other fish food products is culturally specific. What tastes good is in part determined by familiarity and cultural upbringing as well as genetically determined taste preferences and aversions. Fermented fish products have been variously described as tasting "meaty," "fishy," "cheesy," and "ammonia-like." The combination of the assorted chemical products of fermentation determines which flavors predominate.

Asian Fish Sauce

Of all fermented foods, fermented meats and fish are the least stable, and present several challenges, such as the risk of contamination with pathogenic bacteria, namely *Clostridium botulinum*, and the formation of potentially toxic biogenic amines in the food product. These concerns are much more prevalent in fermented meat and fish than in other categories of fermented foods.

As fermentation expert Sandor Katz remarks in his book, *The Art of Fermentation*: "Fermented fish can definitely force us to confront and perhaps challenge the slippery and elusive boundary between what is and is not fit to eat."

Currently there is a resurgence of interest and a revival in traditionally fermented foods such as sauerkraut, yogurt, sourdough bread, kombucha and the like. Fermented fish products, while new to many, have a long history as health-giving, nutritious foods that impart unique flavors, aromas, textures, and nutrients to the diet. An overview of some of the more notable fermented fish products from around the world, as well as information regarding safety and health benefits, are reviewed here.

FISH SAUCE

Fish sauce has been called "the mother of all condiments." *Garos* and *garum*, the first known historical fish sauces, were prepared by fermenting fish blood and intestines in a salt brine. The proteolytic (protein-digesting) and lipolytic (fat-digesting) enzymes naturally present in the fish guts along with fermentative lactic acid bacteria (LAB) cause these mixtures to undergo "autolysis" or "self-digestion," resulting in a liquid fish ferment. Garum was widely used in the ancient Greco-Roman world over two thousand years ago, particularly in ancient Rome, where it was invented to preserve fish and prevent normal decomposition. As a condiment, it was thought to be an important contributor of salt to the Roman diet. Samples of garum from preserved containers in Pompeii have been analyzed and the contents were comparable to modern fish sauces produced in both Italy and Southeastern Asia (Smirga et al.).

The original catsup or ketchup is our inherited legacy from the historical garum. "Ketchup" is an Anglicization of a Chinese dialect word which literally means "brine of pickled fish." Early British ketchup recipes contained anchovies, shallots, wine, vinegar, spices and peppers (Smith). There once were hundreds of ketchup

Fermentation became especially important for species of fatty fish which are not very suitable for drying due to the presence of large amounts of poly-unsaturated fatty acids.

formulations, many of which were similar to modern fish sauces. Unfortunately, the industrialized food product we know as ketchup today is a corn-syrup sweetened concoction of vinegar and tomatoes which bears no resemblance at all to the original pickled fish liquid. In comparison, Worcestershire sauce may more closely approximate ancient garum, as it is still made with fermented anchovies.

Fish sauce is perhaps the most widely used and accepted form of fermented fish. In Southeast Asia fermented fish sauce is the fourth most important commodity. In Southeast Asian cuisines it is used to impart unique flavors and to provide an inexpensive source of protein in the form of free amino acids and peptides. As a source of bioavailable protein fish sauce has improved the nutritional profile of a diet based mainly on polished rice. Analysis of *nam-pla* or *nam–phrik* (Thai fish sauce) found that the amount of soluble protein was 50-60 percent in the form of free amino acids. Fish sauce provides the savory taste or *umami*, which increases overall enjoyment of a meal thanks to the presence of free amino acids that stimulate taste receptors, such as free glycine, alanine and glutamate.

Nam-pla is produced by fermentation of salted *Sardinella* species of fish. The whole fish is mixed with salt in a 3:1 or 3:2 ratio of fish to salt and left to ferment for twenty-four to forty-eight hours. It is later transferred to holding tanks that maintain a temperature of 35-40 degrees C for six to twelve months. The liquid is then decanted and filtered to produce the final sauce product.

Each Southeast Asian culture produces its own unique version of fish sauce, similar to *nam-pla*. Laos, Korea, Cambodia, Vietnam, the Philippines, as well as China and Japan each have traditional methods of preparing fish in this manner. The recipes and methods used vary from one region to another. Some use raw fish, some dried fish; some come from only a single species of fish, others use a mixture of species including

FACTORS AFFECTING BIOGENIC AMINE FORMATION AND MICROBIAL COMPOSITION IN FERMENTED FISH PRODUCTS

- MICROBIAL CULTURES PRESENT. These may be "wild type" microorganisms or added as commercial "starter cultures" or whey inoculants. Note that only certain bacterial strains can form biogenic amines.
- MOISTURE CONTENT. Submerged culture fermentation is defined as "fermentation under conditions of high moisture content." This highly effective method is used in the preparation of fish sauces and pastes.
- pH. Acidity favors lactic acid bacteria (LAB) and discourages the formation of biogenic amines.
- SALINITY. A higher salt concentration discourages putrefaction and the formation of biogenic amines. At 10 percent salinity Clostridium botulinum is eliminated. Higher or lower amounts of salt are also used in traditional food preparation. If salt content is less than 10 percent, the use of additives such as sugar, spices, and starter cultures, as well as methods of drying, curing, and acidification are used in combination to produce a safe food product.
- SURFACE AREA. Grinding and chopping meat and fish into smaller pieces increases the rate of fermentation, as well as the development of biogenic amines. Note that the interior of a whole fish is sterile and only cut flesh and surfaces will contain bacteria.
- SANITATION OF FACILITIES. With the processing and storage of raw and finished materials, cleanliness is of utmost importance. It is especially important to avoid contact with soil, which may contain pathogenic microorganisms. Storage times can influence overall microbial content and quality.
- PRODUCTION TIME. From start to finish, microbial diversity changes in a predictable manner, based on other factors such as pH, salinity, temperature, enzymatic activity, etc.
- TEMPERATURE. Higher temperatures speed up both the processes of fermentation and decomposition, while cooler temperatures slow it down.
- ADDITIVES. Sugar, spices, and starter cultures can be added to the product to encourage the growth of beneficial LAB and discourage pathogenic bacteria formation.
- ENZYMES. Proteolytic enzymes are naturally present in fish flesh and visceral organs. These aid in the breakdown of fish proteins.

shellfish; some use the whole fish, while others are prepared with only the fish viscera. A source of carbohydrate such as sugar may be added to enhance LAB fermentation, and a wide variety of herbs and spices may be added for flavor, as well as to slow down the growth of pathogenic bacteria.

FISH PASTE

Like fish sauce, fish paste is a traditional condiment in Southeast Asia, prepared by salting and fermenting fish or shellfish. Here, fish is fermented until it reaches the consistency of a soft paste or purée. Classic examples are *prahok*, fish paste from Cambodia prepared from crushed, salted and fermented mud fish, and *kapi* or Cambodian shrimp paste. In Korea, salted and fermented fish products including pastes are known as *jeotkal* (also *jeotgal* or *jeot*). Fish paste may also be prepared by grinding cooked fish into a soft paste, although this form of fish paste does not confer any of the health benefits of a true fermented food. Highly flavorful and salty, fish pastes are added to soups, rice and other foods. Fish pastes are often prepared from "by catch" or fish refuse that would otherwise go to waste. In this way, fish paste may be seen as a sustainable means of adding protein and other nutrients to the diet.

BRINED AND FERMENTED FISH

Pickled herring, a traditional brined food, does not involve significant fermentation, but uses salt and the enzymatic activity of proteolytic enzymes contained in the pyloric caecum of the herring to aid preservation. The pyloric caecum portion of the fish viscera is left in place when the fish are gutted. Here, enzymes break down the fish proteins in the herring and transform both its texture and taste. The herring is later washed to remove some of the salt, then pickled in a spiced vinegar. Although not a completely fermented product, it is a common delicacy that many people are familiar with. Pickled herring is mild in flavor and texture compared with some of the fully fermented fish products. It is also an excellent source of omega-3 fatty acids. Being low on the food chain, small fish such as herring and anchovies are less contaminated with heavy metals such as mercury and cadmium, so may be a better choice than some of the larger cold water fish.

Surstromming is a traditionally fermented Swedish herring prepared by submerging the pre-salted, gutted fish (pyloric caecum intact) in a 17-percent brine solution and left to ferment in barrels at 15-18 degrees C for a month. *Surstromming* relies on both enzymatic and fermentative processes in its preparation.

Rakfisk ("rakr"= wet, "fisk" = fish) is Norwegian fermented trout. Its preparation involves a process similar to that of surstromming. Here, salted (4-6 percent salt) gutted trout or Arctic char are layered under pressure in tight containers and stored at low temperatures (3-7 degrees C) for three to twelve months. The production of rakfisk involves both proteolytic enzyme degradation from the fish enzymes and bacterial fermentation by LAB, specifically *Lactobacillus sakei*. Rakfisk is regarded as a Norwegian specialty food, eaten from late fall until the Christmas season. This tradition stems from the fishing of trout or char in late summer, the prepared fermented fish being ready to eat by late fall (Skara et.al).

FERMENTED FISH AND RICE

Many cultures prepare fermented fish in combination with a grain, such as rice or millet. *Nare zushi* is the Japanese traditional method of preparing meat, poultry or fish with rice through an extensive, two-part, year-long process of fermentation. Modern sushi derives from a form of *nare zushi* called *haya zushi* or "quick zushi." In making *haya zushi*, the complex, two-step process of fish and rice fermentation by LAB is replaced by simply mixing the rice with rice vinegar. Rice vinegar provides the tart, acidic taste traditionally imparted through lactic acid fermentation by LAB, but does not confer any of the benefits of fermentation.

Burong is a Filipino style of fish fermented with rice, where the fermented mixture of fish and rice are cooked before consuming.

Balao-balao is Filipino fermented shrimp prepared by mixing cleaned, salted shrimp with cooked rice. Both rice and shrimp are packed into covered glass jars and allowed to ferment at tropical room temperatures.

There are many other fermented fish

Low on the food chain, small fish such as herring and anchovies are less tainted with heavy metals such as mercury and cadmium.

products consumed as condiments and protein-rich additions to the diet worldwide. Wherever coastal people live, there will be found some form of fermented fish, which may include crustaceans, mollusks or cartilaginous fish in addition to bony fin fish. Inland, fermented freshwater fish products from lakes, streams and rivers are also widely used, although to a lesser degree than in coastal communities.

BENEFICIAL MICROORGANISMS

The most obvious benefits of fermented fish products are the lactic-acid-producing bacteria (LAB) and other beneficial microbes of fermentation. Research on the microbiota of the human gut supports the importance of eating fermented foods for maintaining overall health. Friendly flora in the gut support a healthy immune system, digestive and mental health, enhance detoxification, may influence weight and body composition, and much more. Studies on the human microbiome suggest that modern birth and child feeding practices, such as birth in a hospital setting, a high rate of C-sections, and a lack of extended breastfeeding may be risk factors which contribute to a substantial loss of biodiversity of these crucial health-promoting microorganisms. Eating a wide variety of fermented foods may be one strategy to ameliorate the effects of this loss.

Traditional pickled herring with sour cream, potatoes and hard boiled egg.

ENHANCED NUTRITIONAL CONTENT

Fermentation of protein-rich food (such as fish) enhances the overall protein content and bioavailability of the protein in the food. Multiple feeding studies in animals support traditional wisdom that fermented foods provide a more bioavailable and digestible form of protein. LAB present in fermented foods have been shown in numerous studies to produce vitamins, including several B vitamins and vitamin K_2. Which vitamins are produced is to a large extent dependent on the specific cultures that are present in the ferment.

TOXIC REDUCTION

In general, the process of fermentation has been shown to reduce toxic components in food. In one dramatic example, a recent study showed that the deadly nerve toxin in *fugu* or puffer fish (terodotoxin) was virtually eliminated by traditional methods of food preparation such as prolonged fermentation, and that it yielded a non-toxic, edible food product (Anraku et al.). It is well established that some anti-nutrients in plant foods are degraded during fermentation and it stands to reason that fermentation of fish products may result in fewer naturally present toxins as well.

BIOACTIVE MARINE PEPTIDES

Bioactive marine peptides are released from fish proteins during fermentation. These include a number of unique marine compounds with health benefits. Some bioactive marine peptides are sold as nutraceuticals, for example SeaCure, a fermented cod protein concentrate marketed for digestive health, and Katsuobushi peptide, an ACE inhibitor made from dried bonito fish. Several other ACE inhibitor peptides have been isolated from fermented fish sauce as well, showing the potential value of fish sauce as part of a diet to maintain healthy blood pressure (Ichimura et al.). Other marine bioactives have gained FDA approval as drugs, such as Ziconotide, a potent analgesic from the marine cone snail, and Adcetris, an FDA-approved cancer treatment for classical Hodgkin's lymphoma derived from the sea hare, a type of sea slug. Traditionally fermented fish products such as fish sauce and fish paste may confer health benefits that have yet to be discovered.

BACTERIOCINS

Bacteriocins are anti-microbial isolates produced by salt-tolerant or halophilic species of LAB, such as those used in fermentation of fish products. These food components are currently being researched as alternative methods of food preservation. *Budu*, a fermented anchovy sauce of southern Thailand and Malaysia, was found to contain bacteriocins active against both gram negative and gram positive bacteria (Liasi et al.). *Jeot-gal* a salted, fermented Korean fish product contains lacticin NK24 (Lee et al.) while *plaasom*, a Thai fish sauce, was found to contain Weissellicin 110, active against gram positive bacteria. Nisin, a naturally derived bacteriocin from *Lactococcus lactis* bacteria in fermented

dairy is already widely used as an approved food preservative (Cleveland et al.).

SAFETY CONCERNS: BIOGENIC AMINES

LAB are non-toxic, non-pathogenic bacteria. Select strains of LAB can produce biogenic amines (BA) through the decarboxylation of amino acids. Biogenic amines include tyramine, histamine, tryptamine, spermidine, spermine as well as putrescine and cadaverine. In bacteria, BA are defenses against an acidic environment. They are thought to enhance bacterial survival under acidic stress and may also have other important physiological roles to play, such as protection against oxidative stress and protection of bacterial DNA.

Biogenic amines are normally degraded in the human body by the monoamine oxidase (MAO) enzyme system. Biogenic amines are more problematic in certain individuals, such as those with impaired genetic detoxification ability, users of certain medications and migraine headache sufferers. If BA are not metabolized completely and enter into systemic circulation, they cause an increase in catecholamines, activating the stress hormone system. Symptoms may include flushing, increased heart rate, increased blood pressure, and migraine headache. The MAOI (monoamine oxidase inhibitor) diet restricts biogenic amines, including those from fermented foods.

Additionally, biogenic amines such as both putrescine and cadaverine can react with nitrite to form carcinogenic nitrosamines. For these reasons, commercial fermented fish products have clear limits on the acceptable amount of biogenic amines such as histamines, although the acceptable upper limits vary among countries.

Biogenic amines are considered contaminants in the food supply and can accumulate at toxic amounts. Detection of the presence of bacteria possessing the decarboxylase enzyme activity is important in food manufacturing. According to FDA guidelines, 5 mg per 1000 g is the allowable limit on histamines in food. Today, the use of starter cultures that are unable to produce biogenic amines or the use of biogenic amine-degrading enzymes limits the amount of BA in the food supply.

PUTREFACTION VS. FERMENTATION

Lactic-acid bacteria (LAB) fermentation of food products has existed since the beginning of civilization for the express purpose of eliminating from the food supply harmful putrefactive, anaerobic and pathogenic microorganisms. In particular, this is very important for flesh foods such as meat and fish.

Putrefaction, also known as decomposition or "rotting," is very different from lactic acid fermentation. The formation of the biogenic amines putrescine and cadaverine are biomarkers for incomplete lactic acid fermentation. Both are foul-smelling, toxic compounds produced during putrefaction. Cadaverine is a breakdown product of the amino acid lysine, while putrescine derives from the amino acid ornithine. Both components are formed during the decomposition of the proteins in rotting meats and fish through anaerobic bacterial action. Interestingly, trace amounts of these compounds are often present in fermented meat products (such as dry cured sausages or strong cheeses) where they contribute to the overall flavor profile without causing any harm to human health.

The formation of biogenic amines is affected by many factors and the process requires tight control. A top-quality manufacturing facility can optimize environmental conditions to allow only beneficial microorganisms to thrive and for complete fermentation to occur. Numerous studies of less-than-optimal sanitary conditions or in developing countries where there is a lack of knowledge, experience or resources have demonstrated that there are numerous factors to be considered when determining the safety and edibility of fermented meat and fish products. See the sidebar on page 78 for a detailed list of safety considerations.

Truly, it is the environment that selects the bacteria! Since the safety, nutritional profile and palatability of fermented fish products are determined by the microorganisms present, and because there is a wide range of variation in the nutritional quality of fermented fish products, it makes sense that those techniques proven to have nourished generations of human beings on this planet should be considered reliable and of great value and interest to those who eat a traditional diet.

Techniques proven to have nourished generations of human beings should be considered reliable and of great value and interest to those who eat a traditional diet.

Alison Birks earned a M.S. in human nutrition and holds five certifications in herbal medicine and related fields. She is proud to be a professional member of the American Herbalists Guild, one of the most prestigious organizations in her field. Alison is a motivating public speaker, published author, creative product developer, academic instructor, health coach, and radio, TV and print media personality. She is a lead instructor and science curriculum developer at the Institute of Sustainable Nutrition in West Granby, CT (tiosn.com) as well as an instructor at Charter Oak State College. Alison maintains a busy private practice in Woodbury, CT and can be reached at alisonbirks.com

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Technology as Servant

WEED 'EM OR WEEP: SAFE ALTERNATIVES TO HERBICIDES

By John Moody

After my earlier columns focusing on the hazards of chemical herbicides, a number of readers asked the simple and reasonable question, "So what are the alternatives?" While I cannot offer firsthand experience with all of the available options in light of the varied scale and scope of farms—their operations, resources, disparate climates, as well as differing species of problematic plants—I can offer some observations from our own farming experience and from farms we have visited, worked on and supported, or from farming friends.

Readers should note that controlling weeds or other unwanted plants in growing spaces is a scale-specific situation. Procuring sufficient mulch for an acre or so, for example, is a whole lot easier than for ten acres, and in some areas ten acres of mulch material may be nearly impossible to acquire.

HOT FENCING

If you are keeping a fence "hot," that is, electrified, a charger with a high enough output (high joule) will burn grass and other impediments right off it. Generally speaking, you are looking at 10 joules and above, depending on how many miles of fence you are electrifying and how much "load" of brush and grass you expect it to cope with. If you are new to electric fencing, Kencove, Premier, and several other manufacturers provide primers on volts versus joules and guidance in selecting equipment right on their websites.[1] Modern, high-powered fences are also much safer than in the past for both animals and humans, especially single-strand fencing, due to the pulsed frequency of the charge passing along the line, rather than a constant electrical current. Either way, if you are using an electric fence, remember to exercise caution and care and teach your children and visitors to do the same.

The beauty of using a high-powered system is the incredibly low cost. Electrifying a fence costs just a few dollars a month, even for very high joule chargers. Given the savings in time, labor, and energy (compared to spraying chemicals or manually maintaining fence lines using equipment), it is a sensible and smart solution to keeping fence rows sufficiently clean. Note that such a system still requires inspection and removal of larger diameter debris from the fence lines, but can, along with rotational grazing discussed below, help ensure that fence lines and similar areas stay clean and clear.

HIGH-DENSITY ROTATIONAL GRAZING

Different animals will graze different plants at different heights and growth stages, so the more animals moved through an area in an appropriate manner for the appropriate amount of time, the more likely you are to keep all the various interlopers in check. This type of high-density rotational grazing sounds easy but requires a great deal of skill and knowledge of one's land, soil, and other such considerations to ensure that areas are not under or overgrazed. Many good books and seminars are devoted to these issues, so I encourage readers to avail themselves of such resources.

To give you an idea of how powerful and profitable high-density rotational grazing can be, the online retailer Amazon.com is now offering goat rentals through their website! Airports and other such operations are renting flocks of goats to keep unwanted plants in check instead of resorting to machinery or chemicals. Studies on using particular animals, such as goats, for weed control and removal have shown them to be superior to the so-called best chemical approaches.[2]

Studies using goats for weed control have shown them to be superior to the so-called best chemical approaches.

Gallagher, a farm and fence supply company, recently released a new portable electric fencing system that is garnering excellent re-

views to help make rotational grazing easier to handle and more affordable for farmers.

BIODEGRADABLE BLACK PLASTIC

The black plastic that has dominated some growing systems for the past decade or more is now available in an organic corn-derived version that is fully biodegradable. The use of such plastic is still controversial, but for larger scale, multi-acre growers, such a tool is often seen as a necessary trade-off that also extends the growing season and reduces water consumption while radically reducing labor requirements on the farm.

Chicken tractors weeding between row crops.

Another strategy for weed control in the field is to prompt early-season germination of weeds. This can be accomplished by using clear plastic sheeting to warm the soil a month or so before the last frost date, causing seeds to germinate. Once the seeds have germinated and sprouted, the plastic can be removed, exposing the plants to temperatures they are unlikely to survive. The next option to help control weeds goes along quite nicely with this method to further ensure their demise.

CHICKEN TRACTOR

Few strategies are as effective at weed control as the portable chicken tractor. What is a chicken tractor? It is a portable home for chickens, allowing them to move across the landscape in a controlled and secure fashion, tilling, fertilizing, weeding, and engaging in other "tractor-like" activities as they go.

Utilizing the chicken tractor requires a bit of management skill to use well in a growing space. First, we size our chicken tractor to our bed sizes (generally, six feet in width). This makes using the tractor easy and effective as it can run right down a growing space without needing special attention. Second, you can use the tractor in conjunction with portable electric poultry fencing so that you can move the tractor less often while giving the chickens access to more area.

MULCH

Nothing smothers weeds like mulches, including organic (wood chips, straw, old hay, lawn clippings), living (cover crops like clovers), or inorganic (like sheet metal or black plastic). We use all three in our growing systems. All three have benefits, drawbacks and caveats, along with considerations specific to each version, which is why I devote three whole chapters of my forthcoming book to this subject. Depending on which you have access to and feel comfortable with, all three can help manage weeds, provide weed and growing space buffers, and help improve soil over time.

Cover crops can be cut down into a living suppressive mulch that is then appropriate for grain or other plantings. Such an approach has shown some promise for organic grain growers.

OFF-SEASON CHICKEN ROTATION

For both growing spaces and greenhouses, allowing chickens access when crops are not being grown has been shown to reduce weed load significantly, while also improving soil quality and providing excellent fertilization.[3] Portable poultry net fencing makes this an easy task in outdoor growing spaces, since you can allow access only to sections and areas that are ready for the destructive presence of these little velicoraptors. If you have breeds that are prone to fence jumping, be sure to go with the tallest netting possible or clip the wing feathers of the birds to ensure they don't escape and do damage to your other plants and produce.

WHEEL HOE

A wheel hoe is an amazing tool for quickly weeding larger areas in more standard, row-based growing spaces. These cultivators may be

Few strategies are as effective at weed control as the portable chicken tractor.

purchased from a number of good seed sellers and garden suppliers. You can also build one yourself or purchase a kit to build one from Planet Whizbang. (Google "Planet Whizbang Wheel Hoe" and you will quickly find the website and additional information.)

A wheel hoe makes it easy to weed between rows.

AGRICULTURAL VINEGAR, SOAP, SALT

A mixture of the above ingredients diluted with water and then applied to emerging unwanted plants on hot, dry days can be very effective at killing or at least seriously thwarting particular plants, especially in areas like gravel driveways or walkways, where large amounts of hand labor or chemicals might otherwise be resorted to. If using in a growing space, great care is needed to apply the mixture without damaging the soil or crop plants.

FINAL THOUGHTS

Plantsman and author Eliot Coleman once said that a single season of mature weed seed will spawn *seven* seasons of weeds. Most plants are prolific producers of progeny and seeds can wait dormant in the soil and germinate years later. Prevention of reseeding is thus crucial to weed control. Falling behind on weeding can undo many years of hard work in just a few weeks if those weeds are allowed to produce mature seed.

Tillage is another tactic that is warned against for long-term weed control, although it is one that some farmers rely on regularly. Tillage constantly turns up dormant seeds from deep in the ground, along with providing an open landscape devoid of competitors for these new seeds to take root and quickly conquer the terrain. Thus this short-term benefit in weed control comes with a long-term cost of increased weed germination along with damage to the soil food web and overall soil health. On occasion, of course, tillage may be the last resort available to handle certain weed problems.

There is so much more that can be said about reducing weed load and unwanted plants in growing spaces and pastures. I hope that this brief introduction to some cultivation strategies and solutions for modern growers may help growers reap the rewards of their care and attention to their farms, gardens, and homesteads.

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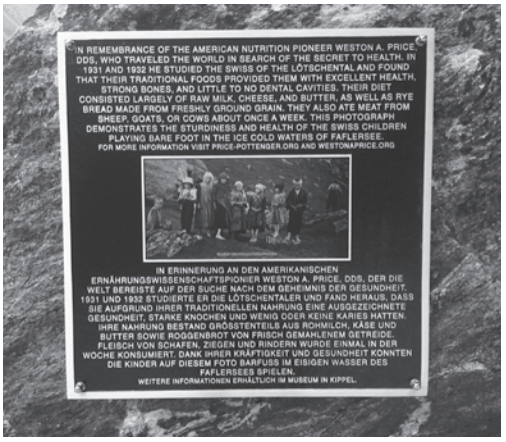
WESTON A. PRICE PLAQUE IN SWISS VILLAGE

About thirty-five Weston Price fans, including Prof. Dr. Ton Baars and Roland Braendle, Swiss WAPF member, attended the unveiling of a plaque commemorating Dr. Price's visit to the Lötschental. Sponsored jointly by the Price-Pottenger Nutrition Foundation and the Weston A. Price Foundation, the plaque reads: "In rememberence of the American nutrition pioneer Weston A. Price, DDS, who traveled the world in search of the secret to health. In 1931 and 1932 he studied the Swiss of the Lötschental and found that their traditional foods provided them with excellent health, strong bones, and little to no dental cavities. Their diet consisted largely of raw milk, cheese, and butter as well as bread made from freshly ground grain. They also ate meat from sheep, goats, or cows about once a week. This photograph demonstrates the sturdiness and health of the Swiss children playing bare foot in the cold waters of Faflersee. For more information visit price-pottenger.org and westonaprice.org."



Twelve-year-old Judith Lauber helped unveil the plaque accompanied with a drum roll on a milk can and the ringing of bells by Judith's siblings. Everyone then enjoyed raw milk, raw cheese, rye bread and meat—all from local producers.

A huge thank you to Judith Mudrak, chapter leader for Southampton, New Jersey and Bern, Switzerland, who organized the plaque and the ceremony.

Homeopathy Journal

WHEN SYNTHETIC HORMONES MANIPULATE WOMEN

By Joette Calabrese, HMC,CCH, RSHom (NA)

As always, I'm here to convince you that homeopathy stimulates the body's natural ability to heal imbalances while synthetic, allopathic methods cause more problems. I'm reminded of the words of Dr. William Osler, a founding professor of Johns Hopkins Hospital: "The person who takes medicine must recover twice, once from the disease and once from the medicine."

Here I offer a proposal for consideration: is it possible that chemical manipulation via birth control pills, hormone replacement therapy, and even bio-identical hormones can cause a woman to suffer a seemingly new condition and even change the biology of her thought processes? Is it possible that these changes could cause a family to break apart? Could a woman's endocrine system that has been manipulated by synthetic hormones induce her to become disinterested in her husband and family, alter her personality and promote obesity?

I DON'T LOVE HIM

It started with her lack of interest in intimacy with her husband because she claimed he had an unacceptable odor. Next, she began sleeping in the guest room. It wasn't long before she began spending nights out with a friend from work who happened to be divorced. Robin was in the process of walking away from her twenty-five-year marriage because, as she stated, "I just don't love him anymore. Maybe I used to, but in the last year, his mere existence is an annoyance to me." When prodded as to what prompted these feelings about her husband Will, Robin cited a well-rehearsed list of his infractions over the years: "He didn't tell his mother to stop nagging me." "He's messy around the house." "He watches too much golf on TV." "He's behaved this way since the first year of our marriage." And lastly, "I have no interest in him in the bedroom anymore."

Wait. Didn't she just say he's *always* been this way? In spite of the fact that he's always demonstrated these idiosyncrasies, they have only become bothersome in the last year or so. And it seems rather coincidental that this is precisely the time when Robin's hormonal equilibrium became unsettled. Menopausal hot flashes have become part of her daily experience, her libido has diminished greatly, and her middle has become noticeably thicker. Is it a coincidence that she had taken birth control pills throughout her entire marriage and had recently commenced taking hormone replacement creams advised by her doctor? I contend that it is quite possible that her current unhappiness is not a matter of her husband Will's cumulative transgressions, but rather Robin's changing hormones, which unfortunately are being manipulated synthetically, particularly at such a delicate and significant time in her life. Menopause can be trying enough without the further insult of "patented" drugs.

THE FEMALE ENDOCRINE SYSTEM

Consider the study of the remedy *Sepia* 200, a very dilute, homeopathically prepared medicine made from the ink of the cuttlefish. Some say that the ancient physicians Dioscorides, Soranus, Plinius and Marcellus used parts of the cuttlefish for female ailments such as leucorrhoea, gonorrhea, catarrh of the bladder, and gravel and spasms of the bladder. But it wasn't until the 1800s that *Sepia* found its way to a more energetically developed and universal form via the homeopathic method. Its effectiveness was fully proven by Dr. Samuel Hahnemann, the father of homeopathy, during the early 1800s. Although it is chiefly known as a medicine for women's endocrine conditions, it can also be used to treat men who suffer from headaches, as well as for ailments caused by synthetic hormone treatments. It should be noted that even when there are no synthetics involved, a woman

The person who takes medicine must recover twice, once from the disease and once from the medicine.

can experience a loss of interest in her husband and even her children when there is a pathology associated with hormonal imbalance.

Sepia is frequently prescribed for women suffering from postpartum depression who feel overwhelmed by their new motherly responsibilities. It is also an important medicine for women who have experienced consecutive births, suffer from menstrual headaches, or even for those suffering from a thyroid condition in relation to the aforementioned circumstances. In fact, *Sepia* ought to be considered whenever the female hormones are in flux, particularly for middle-aged and older women.

Side-effects from synthetic hormones influence more than the emotions. They can cause long-suffering physical ailments as well. Take the case of Juanita, a young woman who suffered from severe lower back pain. She had seen numerous doctors and endured months' worth of tests but nothing disclosed the cause nor relieved her pain. She made it a general policy to avoid pain relievers because for her they tended to make any of her conditions worse, yet her doctor was so convincing that she eventually succumbed to the advice. Accustomed to, and dependent upon, high intensity workouts to keep her weight in check, she was no longer able to remain active because of her back pain. She gained a considerable amount of weight—more than would be expected from a simple lack of exercise. At the point of gaining nearly seventy pounds she desperately sought the aid of homeopathy. In this case something else was clearly at play.

The person in need of Sepia is "irritable and easily offended" with "an aversion to husband and to members of her family, and dwells on past disagreeable occurrences."

When questioned in depth, Juanita revealed that the pain in her lower back began shortly after beginning the Depo-Provera injectable birth control regime. "It's great!" her gynecologist had declared. "I take an injection of it yearly myself. And best of all, no nasty period! What could be better?"

What could be better would be genuine health and a birth control method that respects the innate wisdom, expression and complex functioning of a woman's body. The day Juanita visited her doctor when the drug was prescribed, she had reported that she had been experiencing long, painful periods. It gave her doctor the perfect justification for choosing the drug. And as promised, once the injections commenced, her monthly cramps were successfully eliminated as she in fact no longer menstruated. Instead, her menses were replaced with unrelenting pain in her lower back. This is the part of allopathic medicine that is the most sinister. It "works" with the promise of removing this or that symptom, yet never reveals the price that will come with the bargain.

THE DIVORCE PILL

After years of hearing the same kinds of stories as Robin's, I have become suspicious. I've noted far too many times the same scenario for this to be a simple coincidence. The medical history usually reveals the presence of synthetic hormones or a history of synthetic birth control pills.

Do I have conclusive data to prove my suspicion? Can I provide numbers to substantiate this hypothesis? No. I simply relay this information based on my repeated experiences from having worked with women who confide in me. Once I noticed this pattern, however, I researched my reflections and found that I was not alone in this observation. In 1988 *Time* Magazine published an exposé entitled, "The Divorce Pill: Has the Pill Caused an Increase in Divorces?"

Drudge Report and Instapundit recently published information on a British study: "Commenting on the latest study, the researchers said that it could indicate that the Pill disrupts women's ability to judge the genetic compatibility of men by means of their smell. They said that this might not only impact on fertility and miscarriage risk, but could even contribute to the end of relationships as women who stop or start taking the Pill no longer find their boyfriend or husband so attractive."

In a 2012 study conducted by S. Craig Roberts et al., titled "Relationship satisfaction and outcome in women who meet their partner while using oral contraception," the researchers concluded: "Our results demonstrate that widespread use of hormonal contraception may contribute to relationship outcome, with implications for human reproductive behavior, family cohesion and quality of life."

PROTOCOLS FOR ROBIN AND JUANITA

Once Juanita connected the dots, it was clear

what she needed to do; that is, stop submitting to synthetic hormone injections. While doing so might eliminate any forthcoming back pain, it would not halt the pain she was presently experiencing. Remember, one Depo-Provera shot is intended to suppress menses for one full year. And often once a drug is used, the side-effects won't diminish for months, or even years, after cessation. This means Juanita might need to wait for the side-effects to dissipate and likely be plagued with her old sufferings at the same time, hoping against hope she had stopped taking the shot soon enough to make a full recovery.

I have noted time and again that when a drug is halted the symptoms they were intended to relieve frequently increase greatly. There is a boomerang effect in which the body must compensate for the efforts it put forth that allowed for the suppression of the initial symptoms. This is where homeopathy comes in. Since it is a corrective medicine, it is only needed until the body has completed its work.

Dr. James Gibson reports in *Studies of Homeopathic Remedies* that, "The main tissue affinity of *Sepia* is with the endocrine glands, resulting in hormonal imbalance of the adreno-cortico-gonadal-pituitary system. Relative adrenal insufficiency is associated with a preponderance of androgens over estrogens." In Frans Vermuellen's *Concordant Materia Medica* it is stated that the person in need of *Sepia* is "irritable and easily offended" with "an aversion to husband and to members of her family, and dwells on past disagreeable occurrences."

In the *Homeopathic Clinical Repertory* by Robin Murphy, N.D., under the rubrics "Pain: back, from suppressed menses," *Sepia* is listed as one of the eight most important medicines.

We initiate the homeopathic method with *Camphor* 200c, one dose for one day only. It aids in antidoting allopathic drugs. For cases like Juanita's, the medicine that follows best is *Sepia* 200c, to be taken once weekly for as many weeks as necessary to make the adjustment. In her particular case it took just over one month until one morning her menstruation resumed. This provided her a sense of relief she hadn't felt in well over a year. Concomitantly, as though on cue, the back pain was conspicuously and happily absent. After a year and a half of mysterious back pain, this was extraordinarily satisfying. However, it took another two months before her periods normalized. During those two months, she experienced flooding and severe menstrual cramps in the same way she had prior to starting the synthetic drugs. But we're not done. Now we use the homeopathics that should have been employed for this condition in the first place. For heavy and painful menses the Banerji Protocol of *Arnica montana* 3X, along with *Sabina* 6X, twice daily is the best place to start. By the second day of this protocol Juanita's pain was manageable. The month that followed showed even better improvement until finally her periods normalized after three months. Quite a journey. We only hope she'll not fall for another medical scheme in the future.

As for Robin, well, she couldn't get her head wrapped around the idea that her decision to leave her husband was anything other than reasonable. I have often found this to be so. Our hormones are so powerful we often confuse their influence with sound thinking. Robin filed for divorce, moved out and rented an apartment with her friend, leaving her two adolescent children with their father. Will is puzzled and to this day wonders where he went wrong.

EMPTY PROMISES OF SYNTHETIC HORMONES

Patented drugs are far from natural or genuinely bio-identical. They represent a treatment method that is an allopathic, symptom-suppressing approach decked out in savvy marketing tactics that most conventional doctors hold in high regard. Haven't we all had enough by now?

Instead, when there is a condition that arises from a hormonal upheaval, it ought to be met by a medicine that truly corrects the problem, not suppresses its symptoms. Do it the right way and get yourself, your daughters and granddaughters off of disingenuous pharmaceutical synthetics and address the underlying condition with nutrition and homeopathy. Our most precious endocrine system is worth the extra effort.

For Joette's newest online course covering the subject of female health, please go to Joette Calabrese.com for a link to "Feminopathy: How You Can Correct Female Ailments Using Safe, Inexpensive, and Super Effective Homeopathy." A discussion of the dangers of "bio-identical" hormones can be found by visiting joettecalabrese.com/blog/bioidenticalhormone-shomeopathy/ This blog also offers other practical, tips on curing your family yourself. Should you be interested in meeting with Joette for a 15-minute phone conversation to see if homeopathy is a fit for you or a family member, feel free to call (716) 941-1045.

ERRATA

An astute reader caught an error on page 41 of the Summer 2015 Wise Traditions, in the article "Adjuvants in Vaccines" by Megan Pond. We stated that 5000 micrograms (mcg) equals 5 grams (a teaspoon) when in fact it equals 5 milligrams. We have made the correction on the website.

All Thumbs Book Reviews

Cure Gum Disease Naturally: Heal and Prevent Periodontal Disease and Gingivitis with Whole Foods
Ramiel Nagel
Golden Child Publishing 2015

Conventional dental or periodontal approaches to gum disease make the same shortsighted mistake that most modern medical treatment protocols make. Typical approaches in dentistry focus just on the gums and teeth as if they are in no way connected to the rest of the body. This approach has led to painful treatments like scraping the roots of teeth and cutting back gum tissue. I heard of a case once where root scraping was performed without anesthetic. It took three people to hold the poor victim down. It would take more than that to hold me down if you even suggest it. Even with pain killers it is unpleasant. On top of all that, the success rate is not impressive.

If you like pain you can go with that approach. Ramiel Nagel helpfully provides an alternative for more normal people. This alternative takes a holistic approach and considers root causes of the conditions. It is based on the pioneering work of three great dentists of the twentieth century: Weston Price, Melvin Page, and Harold Hawkins. Price sums it up as largely a nutrition problem. Insufficient fat-soluble vitamins and minerals (especially phosphorus) can lead to gum disease, among other things. Inadequate calcium can also be a factor. You may be getting enough calcium but not assimilating it due to lack of fat-soluble vitamins.

Dr. Hawkins studied the relationship between gum disease and pH of blood, urine, saliva and calcium and phosphorus levels. He found that the ratios between those components are important and nutrition is the key to prevention. Melvin Page also found in particular that the ratio between calcium and phosphorus closely correlated to gum disease or tooth decay.

Good fat is also critical to gum health.

Nagel goes into detail on where to get the nutrition you need to stop the decay. Nutrition alone will not necessarily repair the damage already done but can prevent any further damage. Dr. Price made an interesting observation concerning an Australian aboriginal on a government boat: "It is of interest that while the native Aborigines had relatively perfect teeth, this man who was a trained dietitian for the whites had lost nearly all his teeth from tooth decay and pyorrhea (gum disease)."

Good fat is also critical to gum health. Fat phobia is still alive and well in the United States but even Harvard School of Public Health has admitted that it is time to extinguish the dangerous myth that a lowfat diet confers health.

Cure Gum Disease Naturally covers environmental and other factors involved in gum disease. Dental implants end up causing trouble more often than not. There is also a section near the end that explains why you need to be very careful when you choose a dentist to consult. Many of them are more concerned about dollars than dentition. Dentists as a group are not very healthy. If you follow the advice of unhealthy dentists, you will end up just like them. The thumb is UP.

Review by Tim Boyd

CARY GRANT ON SAUERKRAUT AND STERILE PACKAGING!

From a 1951 movie People Will Talk, actor Cary Grant has this to say about sauerkraut: "That's wonderful sauerkraut! Tastes like sauerkraut used to taste. There's a German woman who makes it in a barrel. I'll send you some. Sauerkraut belongs in a barrel, not a can. Our American mania for sterile packages has removed the flavor from most foods. Butter is no longer sold out of wooden tubs. There is a whole generation who thinks butter tastes like paper. There was never a perfume like an old time grocery store, now they smell like drug stores." You'll find this at 41:56 on youtube.com/watch?v=laXfBmj-Yzl.

All Thumbs Book Reviews

Brain Maker: The Power of Gut Microbes to Heal and Protect Your Brain—for Life
David Perlmutter, MD with Kristin Loberg
Little, Brown and Company 2015

Modern medicine has no cure for the major illnesses that plague both young and old today. Despite a barrage of pharmacological intervention, cures for Alzheimer's disease, autism, depression, Parkinson's disease, ADHD, multiple sclerosis (MS), migraines and others involving the brain and nervous system, remain elusive. Rates of diabetes, obesity and chronic diseases continue to rise. In his newest book, *Brain Makers*, world-renowned neurologist Dr. David Perlmutter shows us how the health of the brain and body are intertwined through the health of the microbiome, a community of bacteria made up of one hundred trillion microscopic creatures which share our body space, predominantly but not exclusively in the human gut. Perlmutter makes the case that research at the leading edge of medicine now acknowledges that the state of the microbiome is the key not only to physical health but to mental health as well.

In 2014 the United States National Institute of Mental Health spent one million dollars establishing a research program targeting the microbiome-brain connection. Out of this program, research is now emerging that clearly establishes the gut-brain connection.

The brain and gut communicate via the vagus nerve and the enteric (intestinal) nervous system, also called "the second brain." The vagus nerve is the primary channel of information between the central nervous system and the intestinal nervous system, extending from the brain to the abdomen. The second brain and central nervous systems are created from the same fetal tissue and are connected via the vagus nerve. Scientists have found that the kinds of bacteria in the gut "directly affect the stimulation and function of the cells along the vagus nerve." The second brain makes 80-90 percent of the body's supply of the hormone serotonin, the feel-good chemical—much more than the brain produces. This may be the reason that dietary adjustments rather than antidepressant drugs are so effective in treating depression.

In a new study at the Ohio State University Center for Clinical and Translational Science published in May 2015, researchers determined that the microbiome of a toddler's gut may influence temperament and behaviors. Scientists found correlations between these factors and the presence of specific types of intestinal bacteria in both girls and boys. They are trying to determine how and where chronic illnesses like obesity, asthma, allergies, and bowel diseases begin. Many new studies like this one are exploring the connection between the microbiome and chronic diseases of brain and body.

The central concept highlighted in this book, which is of special relevance to family doctors, pediatricians, parents and caregivers, is that early colonization by gut microflora may have lifelong and far-reaching effects, even outside of the intestinal tract, such as with the respiratory system or allergies, among others. According to Perlmutter, following nature's way through vaginal delivery and breastfeeding sets the stage for the infant to receive the building blocks necessary to develop a strong immune system, which protects the fragile newborn from pathogens and potential infections from infancy all through life. However, the rates of Cesarean delivery in the U.S. have risen 48 percent since 1996 and today 32 percent of all babies are born via this surgery. Children born through Cesarean section (CS) will inherit only a limited number of bacteria strains—those found on the mother's external skin—which differ completely from the diverse microbiota that children born vaginally receive from their mothers. Greater microbiome diversity is associated with better health. Even the oral microbiome (mouth and throat) is vastly different in CS babies, whose oral cavities are colonized by *Slackia exigua*, a periodontal pathogen not

Research shows that the state of the microbiome is the key not only to physical health but to mental health as well.

present in vaginally delivered babies.

In addition, CS carries risks for the child, such as depression due to anesthesia, fetal injury, increased likelihood of respiratory distress, and breastfeeding complications. Along with the increased rates of CS deliveries, rates of autoimmune diseases and allergies have reached epidemic proportions.

Perlmutter describes ways that the CS-delivered child can be inoculated with his mother's microbiotic bacteria and how infants can be given probiotic supplements to successfully treat colic.

The breast milk of a well-nourished mother provides her infant with many precious nutritional substances to develop a healthy body and brain: immunological substances that protect against bacterial infections, hormones to regulate appetite and protect against obesity, and many others. The first milk, colostrum, contains substances that establish the basis for the human immune system. Babies fed infant formula receive none of these substances, but instead get artificial ingredients as determined by infant formula producers based on legal requirements.

Breastfeeding also teaches the microbiome tolerance and the budding immune system discrimination between food components, without which certain immune reactions such as eczema, allergies, and asthma might appear. Reactions or intolerance to food components can become a life-long problem leading to the development of other pathologies and gut disturbances.

Most infants are prescribed a number of antibiotics during the first year because of ear infections and other problems. These drugs can be a lifesaver in some instances but are used much too often in babies and infants. Babies today are not allowed to experience fevers which is nature's way to help the developing immune system mature. Instead, fevers are knocked down with antibiotics and acetaminophen, a potent liver toxin which interferes with the production of glutathione, the body's major defender. With the continued use of antibiotics damage to the microbiome shows up in a number of different ways both physically and mentally. Perlmutter uses recent studies to establish links between the damaged microbiome and multiple disorders including neurological, autoimmune, digestive, diabetes, obesity, allergies and other chronic diseases.

By destroying beneficial bacteria antibiotics can allow pathogens to grow. These harmful bacteria create toxins which dump into the bloodstream and pollute the brain. They interact with the immune system to cause release of inflammatory molecules and stress hormones. As it turns out, antibiotics encourage the growth of a very problematic microbe, *Clostridium difficile*, or *C. diff*. This species is dangerous to the host and produces extremely high levels of propionic acid (PPA), one of the three major short-chain fatty acids produced by bacteria. PPA, if released into the circulation, is toxic to the brain and causes leaky gut by weakening the cells of the intestinal lining, enters the blood stream and causes inflammation and oxidative stress. It also assaults the mitochondria, interferes with cellular communication, and wreaks havoc in the brain by depleting it of antioxidants, neurotransmitters and omega-3 fatty acids. Researchers have determined that PPA "plays a central role in autism" and that treatment with oral NAC (n-acetyl cysteine), omega-3 fatty acids, and L-carnitine caused improvements in autism symptoms.

Diet composition directly controls the numbers of bacteria in the microbiome. The bacteria in our body are divided basically into two families, *Firmicutes* and *Bacteriodetes*. A whole foods diet with plenty of organic fruits and vegetables encourages the growth of *Bacteriodetes* while the *Firmicutes* prosper under the standard American diet. When *Bacteriodetes* are low there is increased leaky gut.

Our microbiome is also at the front in the battle of the bulge. Experiments with obese individuals show that their microbiome is predominant with *Firmicutes* while lean individual have more *Bacteriodetes*. High fructose corn syrup, for example, feeds pathogens and creates a type of microbiome ("the Westernized microbiome") that limits diversity and favors overgrowth of bacteria strains that fuel adipose cells.

In addition to a healthy diet that excludes sugars and refined carbohydrates and incorporates wise choices, the supplement *Lactobacillus* GG (LGG) given to mothers during pregnancy not only affected their own weight, but even that of their children up to age four, according to recent studies.

Scientists from the Netherlands have improved blood sugar levels in type 2 diabetics using fecal transplantation of good bacteria into those patients. No medication known to man is able to reverse diabetes or improve insulin sensitivity. Elevated and uncontrolled blood sugar levels have been established as a risk factor in brain degeneration and Alzheimer's disease which is now being called "diabetes type 3." Focus on improving the health of the microbiome shows the future of treatment for easing the

health burden associated with these diseases.

A healthy microbiome can become "sick" through the use of antibiotics, oral contraceptives, dietary choices, chlorinated and fluoridated water, environmental toxins and others. But the good news is that it can be improved by re-establishing a healthy balance of microbes through improved diet and lifestyle choices.

Food choices are a major source of problems for the microbiome as the standard American diet is high in sugars and artificial sweeteners; processed foods; vegetables fats; GMOs (genetically modified foods subjected to heavy spraying with toxic chemicals); factory meats, poultry and dairy; and lack of traditionally fermented foods.

Brain Makers outlines a prescription for improving the microbiome through sample menus and recipes. Recommendations for healthy foods include beneficial fats such as coconut, grass-fed butter and tallow, ghee, and olive oil, as well as organic products, grass-fed meats, pastured chickens, eggs and other products, along with increasing the amount of naturally lacto-fermented products in the diet. Lacto-fermented does not necessarily mean that a dairy product is involved but usually lacto-fermented foods are prepared with whey from cow's milk because it contains probiotic bacteria and is easily available. Dairy-free probiotic starter bacteria for preparing lacto-fermented foods are available and sauerkraut made with organic cabbage, for example, can be made traditionally without adding any probiotic materials, just a brine of salt and water.

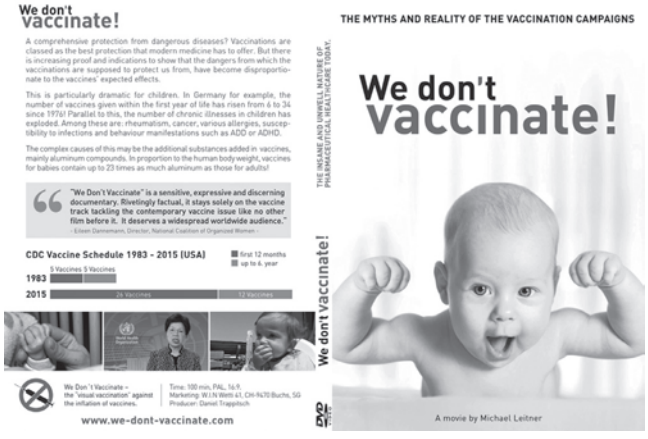
The Perlmutter plan recommends frequent use of food sources of prebiotics, those "nondigestible food ingredients" such as leeks, garlic, onions, asparagus and others that beneficially affect the host by selectively nourishing and stimulating the growth of lactic-acid bacteria in the gut. In addition to diet and prebiotics, Perlmutter points out the probiotic supplements that are helpful in reseeding the microbiome. He recommends five core species that provide documented benefits to health: *Lactobacillus plantarum*, *Lactobacillus acidophilus*, *Lactobacillus brevis*, *Bifidobacterium lactis*, and *Bifidobacterium longum*. These probiotic strains have shown brain benefits in reducing "leaky gut" (gut permeability); increasing BDNF (brain growth hormone); favorably controlling the microbiome balance; and reducing levels of LPS (lipopolysaccharide), an inflammatory molecule that is a risk factor for Alzheimer's disease, autism, depression, inflammation and other disorders.

In *Brain Maker*, Perlmutter describes his successes in treating autistic children, patients with multiple sclerosis and others with his program of healthy diet, probiotic supplements, and lifestyle changes. His book outlines "six essential keys to boosting your brain by boosting your gut," a guide to supplements, a seven-day meal plan to incorporate more probiotic foods into the diet, and delightful recipes including some old standards like kombucha, kefir and sauerkraut, with some new favorites like coconut water lemonade, blueberry mint preserves, and a wide range of others, complementing the lacto-fermented recipes found in the traditional cookbook favorite, *Nourishing Traditions* by Sally Fallon and Mary Enig, PhD.

To learn more I highly recommend this potentially life-changing book for all readers and give it a most enthusiastic thumbs up.

Review by Sylvia Onusic, PhD, CNS, LDN

WE DON'T VACCINATE



We Don't Vaccinate is a sensitive, expressive and discerning documentary. Rivetingly factual, it stays solely on the vaccine track tackling the contemporary vaccine issue like no other film before it. Out of Germany, the originating homeland of Merck & GlaxoSmithKline, Michael Leitner's documentary, We Don't Vaccinate deserves a widespread worldwide audience so that the mass hypnosis which allows these pharmaceutical companies to commit crimes against humanity can finally come to an end.

$3.00 to rent, $8.00 to download
vimeo.com/ondemand/wdv

All Thumbs Book Reviews

Grain Brain: The Surprising Truth about Wheat, Carbs, and Sugar—Your Brain's Silent Killers
David Perlmutter, MD with Kristin Loberg
Little, Brown and Company 2013

Grain Brain is an ambitious book. Both in style and substance, it is technical enough to provide justification for the dietary principles it espouses, but won't bog down a less science-savvy reader. The biggest question the book raises for this reviewer is in the soundness of its thesis: are carbohydrates really brain killers?

As its full title suggests, Dr. Perlmutter's book focuses not solely on grains, but on carbohydrates in general. It takes time to address the fact that modern grains often bear little resemblance to their forbears: "…[because of] modern hybridization and gene-modifying technology, the 133 pounds of wheat that the average American consumes each year shares almost no genetic, structural, or chemical likeness to what hunter-gatherers might have stumbled upon" (page 8). It is interesting to note that while one hundred thirty-three pounds of wheat seems like a lot, numerous other countries consume double or more this amount per person annually, and yet their populations don't suffer the same health troubles at the same rate as Americans. Even more interesting, we Americans consume four or more times that amount of dairy products, most of which are highly processed industrial milk products from confinement dairy operations.

Second, there is some information that, from a historical perspective, is problematic. Not only does Perlmutter recommend completely eliminating grains from the diet, he further advises to radically restrict carbohydrate consumption to a scant 60 grams per day, or just two ounces. He admits that this is the equivalent of merely a single piece of fruit per day.

His discussion of inflammation, oxidation, diet, and disease is intriguing, but incomplete, as the focus on carbohydrates and grains means that other likely contributors or culprits, like the increased consumption of PUFAs in the general American diet and rancid, overly processed vegetable oils, as well as processed foods in general, are given little consideration or inclusion.

Chapter 3, which focuses on fat, cholesterol and statin drugs, is excellent, exonerating saturated fat and cholesterol while indicting statins for the shell game that they are. Perlmutter also takes time to point out that these drugs are well known in his field of neurology to harm the brain, whose dependence on cholesterol for proper functioning is well documented. Perlmutter further reveals other dangers of statin drugs, such as an increased risk of type 2 diabetes.

It is when he gets onto the topic of carbohydrates that some inconsistencies seem to emerge. On the one hand, refined carbs and processed foods are rightly spotlighted as destructive to health. Perlmutter even admits, "Not all carbohydrates are treated equally by the body" (page 106). His discussion of fruit consumption has a few historical flaws, given that some native peoples indeed had access to fruit year round and some of the fruits they consumed were exceptionally high in sugar and low in fiber. (Denise Minger on her rawfoodsos.com blog has a wonderful, picture-laden article on this subject, http://rawfoodsos.com/2011/05/31/wild-and-ancient-fruit/) Perlmutter does cite many excellent studies that show the dangers of obesity, especially to brain health, and the importance of maintaining healthy insulin levels and exercising as ways to protect not only the brain, but the entire body from various degenerative diseases.

Yet the brain requires not only cholesterol to function well, but a certain supply of glucose. To argue for the necessity of the former while neglecting the importance of the latter does injustice to clear metabolic needs of the body. While the body can manufacture glucose from protein and utilize ketone bodies from fat metabolism, not everyone is equipped to function perfectly in this manner without some additional source of carbohydrates. Just as the body can adapt to a low-cholesterol diet, it can also adapt to a low-

While the body can manufacture glucose from protein and utilize ketone bodies from fat metabolism, not everyone is equipped to function perfectly in this manner without some additional source of carbohydrates.

carb diet, but this does not mean that such a diet is optimal for everyone everywhere and at all times.

Many indigenous peoples of the past few thousand years with excellent cognitive and physiological development consumed moderate to copious amounts of carbohydrates (especially compared to a restricted regime of 60 grams a day), some in the form of grains. Many individuals do not do well on highly restrictive, low-carb diets for an extended time. It is worth noting that many healing dietary protocols temporarily reduce and restrict carbs, but this is not because carbs are inherently bad or dangerous. Rather, we moderns—exposed from infancy to antibiotics, overly sanitized lifestyles, lack of fermented foods, miserable dietary habits, and so on—find ourselves with a compromised and damaged microbiota. Restricting carbs seems to help many people recover from this damage (some, but not all, people achieve healing by eliminating the wrong kinds of carbohydrate sources and incorporating the right kinds).

Grain Brain also includes information on caloric restriction that a number of other works have shown to be incorrect or at least partially so. If the figures cited are true (the average person in United States consumes a bit under 4,000 calories per day), then for many people, reducing this number by 25-30 percent isn't so much a caloric restriction as a caloric readjustment to levels both more historically accurate and normal for their lifestyles. Interestingly, some of the benefits of caloric restriction may be achievable through ancient practices, such as short-term fasting, something not considered or discussed by Perlmutter, whereas the dangers of long-term caloric restriction are not mentioned at all.

Overall, this book gets a mixed thumbs review. If carbohydrates, including sweet fruits and starchy vegetables and grains are inherently damaging to our health and especially to the nervous system, then many indigenous populations that Dr. Price and others have studied must have missed that memo. Does gluten cause damaged guts or are damaged guts no longer able to digest gluten? Do people benefit from removing gluten from their diet because gluten is harmful or because they have harmed themselves to the point where now normal foods hurt? Or is it because we have tampered with the genetics of grains to the point where our bodies no longer recognize the proteins in them as friends, but treat them as foes? How do traditional preparation techniques on truly organic grains affect all of the above? These are complex questions that elude easy answers such as blaming the entire macronutrient category.

Blame needs to be assigned where it clearly belongs: on our tampering with the genetics and nutritional value of our foods, on our abuse of growing systems through herbicides, pesticides, fungicides and a host of other chemicals that contaminate our foods and render them nutritionally deficient, and on our further destruction of these foods through industrial processing. Contributing factors such as our genetic differences and the many ways American health has steadily declined in the past century also need to be considered as to why some people do well and others do not with carbohydrate foods in the diet.

But the case against carbohydrates as an inherently dangerous and damaging macronutrient isn't sound, and people ought to enjoy their traditional sourdough breads (if they do well on them!), organic seasonal fruits, and organic starchy vegetables with a sure spirit that such foods help rather than harm the majority of bodies and souls. A very qualified Thumbs Up.

Review by John Moody

A VISIT TO AFRICA

Hilda Gore and Mary Gercke with a youth group from a Maasai village in Kenya. Hilda and Mary represented WAPF on a week-long tour, teaching the importance of eating the foods of our ancestors. Coming soon: a full report of their fascinating visit.

All Thumbs Book Reviews

Beyond Biotechnology:
The Barren Promise of Genetic Engineering
Craig Holdrege & Steve Talbott
University Press of Kentucky

Before reading this book I was under the impression that I had at least a reasonable layman's understanding of the principles and practices involved in genetic engineering. By the time I finished it I had undergone a shocking yet invigorating reappraisal of the entire field of biotechnology.

Judging from the usual portrayals of GE in the popular media, my lack of understanding is widely shared, not only among the general public but also—however ironically—among the very scientists who are carrying out the work. To put the matter quite bluntly, we truly don't understand what we're doing; there is in fact a yawning and treacherous gulf between the theory and practice of genetic engineering.

The authors, Craig Holdrege and Steve Talbott of The Nature Institute, a holistic science nonprofit in upstate New York, do an admirable job of unpacking and recontextualizing the assumptions and practices of GE. The crux of the difficulty with biotechnology lies in its ignorance of the inescapable role of the cognitive activity of the scientist in carrying out scientific work. This lack of awareness is unfortunately the norm within modern science in general, and is the primary reason for the often destructive effects of modern technology.

By the time I finished it I had undergone a shocking yet invigorating reappraisal of the entire field of biotechnology.

Indeed, the conceptual cornerstone of GE, the gene, has been thoroughly exposed over the years for what it is: "not a thing at all, but a way of ordering and interpreting phenomena …" In other words, in contrast to DNA, for example, which is an actual substance, the gene is a thought-model, an abstract concept that has been reified and treated as a real thing. This is what has created the yawning gulf alluded to earlier, because on a fundamental level scientists are creating abstractions in the theoretical aspects of their work, then foisting the results on organisms that have their own reality, one that cannot accurately be reduced to these abstractions. As the authors remark, "Genetic engineering is usually hailed as a precise new technique to make exact modifications. In reality, precision stops when the DNA leaves the laboratory and enters the plant. The scientists have to wait and see what the organism has made of their attempted manipulation." This is what gives the lie to the oft-repeated canard that GMOs have been proven safe. Apart from the obvious conflict of interest inherent in corporations funding their own scientific—or pseudo-scientific—experiments, there is the deeper problem of how such statements can be taken as valid within a context in which we demonstrably don't know what we're doing. The ever-escalating list of unintended effects of GE (which can be found on The Nature Institute website: natureinstitute.org) bears this out quite clearly.

Even our understanding of DNA itself has been profoundly distorted by a naïve disregard for the assumptions we bring to the practice of modern science. The cellular phenomena themselves show us a substance we call DNA participating in the overall life and functioning of the organism. This is undeniable. Yet we insist on interpreting such observations through a mechanistic and deterministic mindset that effectively alienates us from an accurate understanding of DNA's true role within the context of the organism: "The intention to effect discrete, single-target changes in an organism lies at the heart of genetic engineering. But this frame of mind, which assumes one-directional cause-and-effect mechanisms, is inherently unecological, since all biological and ecological processes involve reciprocal relations." In a balanced approach, by contrast, "We [would] attend to the reciprocal relations within the context of the whole rather than isolating linear pathways and manipulating them as if the rest of the system didn't exist."

The authors have written this book for the general public, employing easily understandable terminology. And, though the overall tone is

sober and restrained, they have not shied away from pointing out hypocrisy where the evidence warrants it. An example of this is their highlighting of a blatant corporate double-standard. For the purposes of securing patents, GE organisms are declared to be novel, yet when it comes to assessing safety they are said to be not essentially different from the products of traditional breeding. Such bald-faced deceit, more than any other factor, lays bare the reality that profits, rather than feeding the world, are the true motive behind GE.

The authors seek to uncover the deeper roots of modern science's materialistic bias in some later chapters of the book, examining fundamental questions of meaning and selfhood that shed profound light on the practice of biotechnology as a whole. Of particular importance is their reappraisal of our centuries-old banishment of qualitative and supersensible aspects from scientific practice: "[I]t's true that the identification of science with empty formal structure leaves no room for soul and spirit. But it leaves no room for anything else, either." In other words, if there's no spirit, there's no science. Any scientist who claims not to believe this does so only in theory, not in practice.

So is there any viable alternative to the distorted scientific practice that has given rise to such follies as biotechnology? Many readers may be surprised to find the oft-misunderstood scientific ideas of the great German poet Goëthe presented as the basis of a truly modern, qualitative science. Goëthe's science brings together aspects of both science and art, and features a conscious transformation of the most sensitive and indeed central scientific "instrument" of all: the human being. Two concrete examples are provided to illustrate how such an inquiry can actually be carried out, showing how warm and respectful science can be when conducted from an attitude of humanity and humility.

Pieces on GE in the popular media often implicitly portray its opponents as deeply unscientific, credulous ninnies. This fine book clearly demonstrates that Craig Holdrege and Steve Talbott stand on a far sounder scientific footing than the genetic "engineers" themselves. Genetic engineering, as presently practiced, is largely a profoundly misconceived, pseudo-scientific fantasy masquerading as rigorous science. As Hungarian philosopher Georg Kühlewind once wrote, "I see no other hope of avoiding destruction than for our mentality to change." A balanced, properly scientific reassessment of GE, which is precisely what this book offers, would be as good a place as any to start. Review by Andy Shaw

CHEDDAR: A JOURNEY TO THE HEART OF AMERICA'S MOST ICONIC CHEESE by Gordon Edgar

Since I am an English-major cheesemaker specializing in raw milk artisan cheddar, I was delighted to find a book devoted to the subject—in fact, cheesemonger Gordon Edgar describes his book as a search for the "meaning of Cheddar." Cheddar is the quintessential American cheese, the first to be standarized and made in factories. Over time, the traditional, round, cloth-wrapped and lard-rubbed cylinders gave way to waxed cheese (so-called rindless Cheddar) and then to quarter-ton blocks, wrapped in plastic, which could fit nicely on pallets and in warehouses. Then came Joseph Kraft who used the rindless Cheddar to make processed American cheese—heated, emulsified and formed into a "homogeneous plastic mass" with infinite shelf life. The next morph brought us Velveeta, the chief ingredient in a winning mac-and-cheese contest that Edgar describes as a prelude to his search for the meaning of Cheddar.

If cheesemaking is a ritual, Cheddar making is the most ritualistic of rituals: heat milk to just the right temperature (about 90 degrees), add cultures, stir gently, add rennet, let sit until gel is just right, cut curds, let them "heal" (fall to the bottom), "scald" (heat slowly to 102 degrees), drain whey, pile curds on both sides of the vat (great exercise for back muscles), cut into wedges (called cheddars), turn wedges every ten minutes for an hour or more (called cheddaring), run cheddars through a peg mill to shred, hand mix salt in three batches, pile into cloth-lined molds (called truckles), put in a press for one-half hour, remove from press and pull up cloth, return to press and leave overnight, remove from press, remove from truckles and transfer to aging room, wash truckles, next day rub with lard, feed whey to pigs, leave (the cheese) six months to two years, turning weekly. (The industrial method: "press button, then watch someone take the finished cheddar off the conveyor belt a while later," powder whey, sell to body builders.)

So Cheddar is the most time-consuming, exacting cheese you can make—and the most industrialized cheese on the planet. I can't say that I have found the meaning of Cheddar during the long ritual of Cheddar-making, but it does give you lots of time to consider life's persistent questions—like whether the word "Cheddar" and the word "wedge" come from the same linguistic root.

I enjoyed this book from cover to cover—plus I learned a great new word: turophile. Review by Sally Fallon Morell

All Thumbs Book Reviews

Statin Toxic Side Effects:
Evidence from 500 Scientific Papers
David Evans
Grosvenor House Publishing, Ltd

David Evans has already given us two great compendiums: *Low Cholesterol Leads to an Early Death: Evidence from 101 Scientific Papers*, and *Cholesterol and Saturated Fat Prevent Heart Disease: Evidence from 101 Scientific Papers*. His latest contribution, *Statin Toxic Side Effects* is a tour de force, a collection of five hundred studies showing that statin use is associated with greater risk of diabetes, cancer, muscle damage, hypothyroidism, organ failure, liver problems, pancreatitis, peripheral neuropathy, lupus, skin abnormalities, asthma, reduced lung function, reduced cognition, neurodegenerative diseases, depression, suicide, damaged eyes, impotence and birth defects.

And if you think this is a good tradeoff for protection against heart disease, think again. Evans cites thirty-two studies showing that statins won't help with that either; they are associated with increased risk of serious adverse cardiovascular events, higher cardiac death rates, increased adverse events and death in those undergoing coronary artery bypass surgery, increased risk of death in angioplasty patients, increased risk of heart failure, and double the risk of death in patients with coronary artery disease.

And just for good measure, case reports show that statins increase the risk of osteoarthritis and joint pain, cause both constipation and diarrhea, are associated with colitis, bone loss, tendon rupture, urinary track infectons and general infections including MRSA. The list of adverse conditions associated with low cholesterol is a long one, covering several pages.

If you have a loved one in the clutches of a statin-pushing cardiologist, this would be a good book to give—to both your loved one and the cardiologist. Maybe, just maybe, it will empower your friend or relative to stop taking these terrible drugs; and maybe, just maybe, it will give the cardiologist a twinge of conscience.

What about all those studies showing that statins save lives? Evans sums them up neatly with a chart showing virtual identical numbers of people alive in the treatment and control groups in the thirty-three major studies used to tout statins.

Review by Sally Fallon Morell

BOOK REVIEWS IN WISE TRADITIONS

The Weston A. Price Foundation receives two or three books per week, all of course seeking a Thumbs Up review. What are the criteria we use for choosing a book to review, and for giving a Thumbs Up review?

- First and foremost, we are looking for books that add to the WAPF message. Dietary advice should incorporate the WAPF guidelines while adding new insights, new discoveries and/or new therapies.
- We are especially interested in books on the fat-soluble vitamins, traditional food preparation methods and healing protocols based on the WAPF dietary principles.
- We look for consistency. If you talk about toxins in vaccines in one part of your book, but say you are not against vaccines in another part of your book, we are unlikely to review it.
- We do not like to give Thumbs Down reviews. If we do not agree with the major tenets expounded in a book that is sent to us, we will just not review it. However, we feel that we have an obligation to point out the problems in influential or bestselling books that are peddling misinformation, and for these we will give a negative review. We also will give a negative review to a book that misrepresents the findings of Weston A. Price.
- Please do not send us a book as an email attachment. Have the courtesy to send us a hard copy book or a print-out of your ebook or manuscript in a coil binding.

Legislative Updates

FEDERAL POLICY UPDATE
By Judith McGeary, Esq.

SUPPORTING LOCAL MEAT PRODUCTION

Imagine a consumer who wants to buy local, hormone- and antibiotic-free, 100 percent grass-fed meat. Upon finding a farmer who is raising her animals exactly the way the consumer wants he asks, "I'd like to buy five pounds of ground beef, please."

"I'm sorry, I can't sell you that. What I can sell you is this box. It's around one hundred pounds of beef."

"One hundred pounds of ground beef?!"

"No. It's a mix of ground beef, ribs, roasts, steaks and organ meats. But I don't know exactly how much of each cut or even how much total meat there is. It could be as little as eighty pounds or as much as one hundred twenty pounds."

"How much does it cost?"

"It'll be X dollars per pound of live animal."

"What does that mean in terms of price per pound of meat?"

"I can give you an estimate, but we won't know until after you buy the animal and it is processed."

"When can I get it?"

"I need to find three other people who want this same deal, and then we can make it happen. Or you could buy the whole animal, somewhere between three hundred and four hundred pounds of meat."

Some readers of *Wise Traditions* buy their meat exactly this way—but how many consumers want to do this? Or are even in a position to buy that much meat all at one time?

Yet this is the sort of arrangement that many farmers have to make in order to sell their meat. For farmers who don't have access to an inspected slaughterhouse—which would allow them to sell their meat by the cut—"custom slaughterhouses" are the only option. Custom slaughterhouses are regulated under state law, but federal law requires that the meat from a custom facility can only go to the individual or individuals who owned the animal at the time the slaughter took place. This means that the customer(s) must buy the whole animal while it is still alive, accepting a lot of variability and uncertainty in the pricing, quantity, and final product.

To sell meat by the cut, the way most people are used to buying it, farmers often have to haul their animals several hours away to reach a slaughterhouse that has an inspector on-site—even if they're just selling the meat directly to consumers at a local farmers market or similar venue. This increases expenses for the farmer, raises prices for consumers, creates stress on the animals and undermines the concept of local food.

H.R. 3187, the Processing Revival and Intrastate Meat Exemption (PRIME) Act, would tackle one of the greatest challenges facing local farmers and consumers seeking local food—the lack of infrastructure, particularly the lack of inspected small-scale slaughterhouses. The PRIME Act would give individual states the freedom to permit intra-state distribution of custom-slaughtered meat to individual consumers, as well as to restaurants, hotels, and grocery stores that directly serve consumers. Custom-processed beef, pork, lamb, and goat are covered under the bill. Each state would be able to set the requirements and limitations on the custom slaughterhouses it considers appropriate.

The bill has already garnered bipartisan support; at the time this article goes to print, eleven Representatives from both parties have joined Representative Thomas Massie (R-KY), the author of the bill, in supporting local meat production: Chellie Pingree (D-ME), Walter Jones (R-NC), Jared Polis (D-CO), Jared Huff-

Judith McGeary is the Austin, Texas chapter leader, an attorney and small farmer in Austin, and the executive director of the Farm and Ranch Freedom Alliance. She has a B.S. in biology from Stanford University and a J.D. from the University of Texas at Austin. She and her husband run a small grass-based farm with sheep, cattle, horses, and poultry. For more information go to farmandranch-freedom.org or call (254) 697-2661.

man (D-CA), Justin Amash (R-MI), Scott Garrett (R-NJ), John Garamendi (D-CA), Kevin Cramer (R-ND), Scott DesJarlais (R-TN), John Duncan (R-TN), and Mike Coffman (R-CO).

Getting any bill through Congress is a long, arduous task. The more co-sponsors a bill has, the better its chances of getting a committee hearing or of being approved as an amendment to another bill.

Please take a couple of minutes to call or email your U.S. Representative, urging him or her to co-sponsor H.R. 3187, the PRIME Act. You can find out who represents you by going to www.house.gov or by calling the Capitol Switchboard at 202-224-3121.

Here is a sample message for calls/ emails: "As a constituent, I urge Representative ____ to co-sponsor H.R. 3187, the PRIME Act. This important bill will make it easier for small farms and ranches to succeed financially and provide consumers with greater access to locally raised meats. The bill simply removes the federal ban on the sale of meat from custom slaughterhouses directly to consumers and venues serving consumers within a state, subject to state law. This returns power to the states to establish a regulatory scheme that makes sense for their citizens.

"The PRIME Act is the first step to rebuilding local processing infrastructure, which can revive rural economies and enable communities to become more self-sufficient in meat production.

"Please support our local farmers and consumer choice by co-sponsoring H.R. 3187." Add you name and city and state.

Whatever issue you are advocating for, calls are far more effective than emails. While speaking about the PRIME Act at a recent event hosted by the Farm-to-Consumer Legal Defense Fund, Congressman Massie stated that as few as *ten phone calls on one day* would get his attention on an issue. Generally, hundreds of emails are needed for the same effect. Call and let your Representative's staff hear the real live voice of a constituent who cares about this issue!

If you are a livestock producer, take a few extra minutes and ask to speak to the staffer who handles agricultural issues. Briefly explain to the staffer any problems you have faced with lack of access to inspected slaughterhouses, and how the PRIME Act would help your business and benefit your customers.

FDA ISSUES FIRST MAJOR RULE UNDER THE FOOD SAFETY MODERNIZATION ACT

On September 10, FDA released the first major final rule under the Food Safety Modernization Act (FSMA). This final rule addresses the standards for "facilities" that sell food for human consumption. The rule has staggered deadlines for compliance, so that large businesses will have to come into compliance in November 2016, while small businesses will have an additional one to two years depending on their size. The Produce Safety Rule, the other major rule under FSMA, is supposed to be finalized by late October of this year.

This first published final rule implements FSMA's requirement that businesses that manufacture, process, pack, hold or store food implement "hazard analysis and risk-based preventive controls" (HARPC), including a written food safety plan that identifies the possible problems that could affect the safety of their products and outlines steps the facility would take to prevent or significantly minimize the likelihood of those problems occurring.

WAPF, together with many other groups, succeeded in fighting for an exemption for small, direct-marketing facilities from this rule. The Tester-Hagan amendment, which Congress included in FSMA, provides a "qualified exemption" for businesses that gross under half a million dollars annually and that sell more than half directly to individual consumers or local restaurants and retailers. Rather than do a full HARPC plan and implement the extensive verification procedures required for it, these small businesses need only do a simplified plan or submit documentation that they comply with state and local laws. The Tester-Hagan amendment also provided a qualified exemption for "very small businesses;" in the rulemaking process, we succeeded in getting the FDA to define very small businesses as those that gross under one million dollars annually, regardless of who they sell food to.

In the rulemaking process, we also fought to protect exempt businesses from having that exemption removed unfairly, prevent farms from being treated as facilities, and address some of the heaviest burdens that will be imposed on non-exempt businesses. We had success with some of these issues, although far from all.

One of the most important changes from the rule as originally proposed by FDA is in the definitions section, addressing how farms and farm activities are defined. Farms are exempt from this new rule, although they will have to comply (unless exempted under Tester-Hagan) with the produce safety rule that is due out in October. FDA's final definition of a farm allows for multiple owners and multiple locations, reflecting the reality of many farms. In addition, the definitions of various farm activities, such as harvesting and packing, are more expansive and will help prevent farms from being misclassified as facilities for doing normal farm activities such as cleaning and bagging produce.

Unfortunately, the FDA still has not issued its final definition of "retail food establishments," which are also exempt from this rule. In FSMA, Congress clarified that sales through direct-to-

consumer sales platforms like roadside stands, farmers markets, and community-supported agriculture (CSAs) operations were included within the exemption for retail food establishments. Yet FDA is draffing its fight in incorporating this provision in the regulations.

Another serious problem is that the process for withdrawing the qualified exemption under the Tester-Hagan provision is left far too much to FDA's discretion and lacks appropriate procedural safeguards. We did succeed in getting a few improvements: pre-withdrawal notification and an opportunity to respond, a longer time frame for coming into compliance if the exemption is withdrawn, and a provision for reinstating the exemption. However, the timelines are still very tight.

The FDA did clarify in the final rule that it can only withdraw the exemption on specific farms, not classes of farms. In other words, FDA can withdraw the exemption on Farm X, but not on all raw milk cheese farms. That was the intention of the Tester-Hagan amendment from the beginning, and it is valuable that FDA has officially acknowledged it.

For those businesses that are not exempt, one of the potentially biggest problems is the requirements for supplier, or supply chain, verification. When Congress passed FSMA, it was sensitive to the fact that buyers are increasingly requiring audits of farmers and that—while an audit can provide a useful verification tool—it is only one tool to ensure that risks are being minimized across a supply chain. Congress specifically said audits could not be required as part of FDA's new food safety framework. But FDA's final rule includes requirements for supplier verification that create significant pressure to implement an audit system.

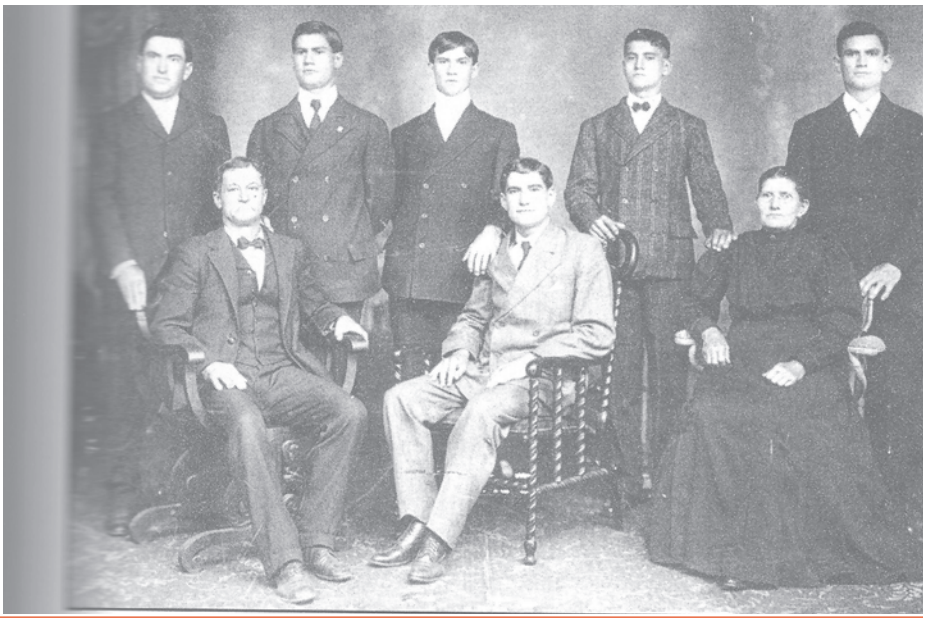
As originally proposed, the supplier verification requirement would even have imposed burdens on small facilities exempt under Tester-Hagan, if they sold to a facility that wasn't exempt. In other words, to be a supplier of a non-exempt facility, the exempt facility would have to provide various assurances that would have created unknown liabilities. After WAPF and others objected, FDA modified the requirement so that the exempt facility need only provide assurances about its exemption.

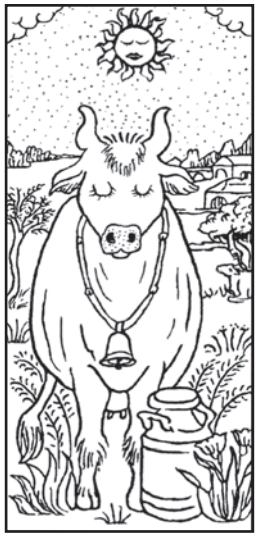
The true impact of this rule on farmers and small food enterprises will ultimately be determined as the rule is implemented. FDA noted in the final rule that many of the specifics surrounding how these provisions will be implemented—and enforced—will be determined through the development of guidance documents. We will continue to to provide information on the rules, and we will work to protect producers of nutrient-foods.

The true impact of this rule on farmers and small food enterprises will ultimately be determined as the rule is implemented.

ANCESTORS

Shelly Eshbaugh-Soha sends this photo of her ancestors in the Addison Eschbach family, from around 1905—six tall and handsome sons along with mother and father (sitting left and right). Says Shelly, "It is striking to look through the genealogy book a relative put together and see how the faces and bodies changed over the years in both form and posture." What a handsome set of children in the photo!





A Campaign for *Real Milk*

RAW MILK IN CALIFORNIA'S HUMBOLDT COUNTY

Cindy Ashy

Humboldt County is one of only three counties in California, along with Kings and Trinity, to maintain a ban on the retail sale of certified raw milk produced in California. Humboldt County also requires compulsory pasteurization on all commercial milk products produced and distributed in the county.

Title V, Division 1, Section 512-4 of the Humboldt County Code reads: "All market milk, skim milk, and other fluid milk products sold, offered for sale, distributed or in possession for sale in the County shall be pasteurized as provided in the Milk and Milk Products Act of 1947 (Division 15 of the Food and Agricultural Code). This section shall not apply to any milk or cream produced and sold from dairies having fewer cows or goats than that defined as a 'dairy farm' in said Milk and Milk Products Act. Nor shall anything in this section be construed to prevent the delivery or sale of Raw Grade 'A' milk, not conforming to this section, to a milk products plant for the purpose of pasteurizing the same" (Repealed and Re-Enacted by Ord.1921,§1,01/08/1991).

Title V, Division 1, Section 512-5 of the same county code makes a violation of Section 512-4 a criminal act, punishable by up to a one thousand dollar fine or up to ninety days in jail for *each individual violation!*

ADVOCATING FOR RAW MILK

Toward the end of 2009, raw milk advocates in Humboldt County, spearheaded by Ursula Hunter, began approaching individual Humboldt County supervisors requesting a repeal of the ban on raw milk. In their discussions, they stressed the health benefits of raw milk and the importance that people be free to make their own decisions about what they eat. Six-term Supervisor Bonnie Neely agreed to let the raw milk advocates make a public presentation to the Humboldt County Board of Supervisors and she placed this item on the agenda for the August 24, 2010 board meeting.

Prior to the August 24, 2010 meeting, more than twenty-five hundred people in Humboldt County signed a petition asking the supervisors to repeal the ban on raw milk. The local raw milk advocates also invited Mark McAfee to give part of the official public presentation and to be part of the private meetings held with various officials in the county. McAfee is the founder of Organic Pastures, the largest certified raw milk dairy in California. He is also nationally known as an expert on raw milk.

There was a packed house when the raw milk agenda item came up, even though it occurred during business hours, and many people who wanted to attend had to be at work. Numerous citizens came to the microphone to add spirited comments, and the vast majority wanted the ban on raw milk repealed. Supervisor Neely made a motion to refer all the information received from the advocates to staff and have them report back to the board at a later time. The motion passed with a three-to-two vote.

At a later meeting, on January 11, 2011, several staff members from the Humboldt County Health Department gave a report essentially supporting the FDA party line and expressing deep concerns for the potential "risks" of drinking raw milk. Each one of them strongly urged the board to keep the ban on raw milk in place. Some dairymen and the Humboldt County Agriculture Commissioner also urged the board to keep the ban in place. Even though the supervisors stated many times that no action would be taken that day, a motion was made by Supervisor Jimmy Smith to maintain the status quo and keep the ban on raw milk in place. The motion passed with a five-to-zero vote.

Raw milk advocates were vocally upset by the fact that a vote had been taken when they were promised no vote would be taken. A lengthy

A Campaign for *Real Milk* is a project of the Weston A. Price Foundation. To obtain some of our informative *Real Milk* brochures, contact the Foundation at (202) 363-4394. Check out our website, RealMilk.com for additional information and sources of *Real Milk* products.

discussion ensued about whether or not the vote really meant anything. At one point, Chairman Mark Lovelace stated, "Taking this action is essentially no action. . . it doesn't change the ability of any supervisor to revisit this issue if they so chose." All of the supervisors publicly vowed to remain open to hearing more from the raw milk advocates.

While raw milk advocates were understandably deflated by the results of those meetings, there is renewed interest in taking this issue back to the board and demanding even louder that the ban on raw milk be lifted. This issue is definitely not going away as it remains a major sore spot among a large segment of the Humboldt County population. Plus, the 2016 election is looming, and the ban on raw milk could easily become a key election issue.

MISSING FROM THE PUBLIC RECORD

With no payment from any source and a great deal of personal expense, the raw milk advocates spent thousands of hours working on the raw milk issue before they gave their public presentation at the August 24, 2010 meeting. An important part of this effort was preparing a thick packet of information on raw milk for the educational benefit of the supervisors, county staff and the public at large. They assumed the packet they worked so hard to produce would become part of the public record.

According to the advocates, this packet contained full length copies of peer-reviewed research papers supporting the health benefits of raw milk and published in respected scientific journals like the *New England Journal of Medicine* and *The Lancet*. In addition, the packet contained other evidence on how drinking raw milk has improved the health of many people, official records from the CDC showing how clean certified raw milk production is in California, and other compelling information on raw milk.

In August 2015, when a copy of this packet was requested multiple times from Humboldt County, it could not be found by Tracy D'Amico, the Humboldt County Board of Supervisors' administrative assistant. She was very accommodating and looked for the packet at least three times. In fact, D'Amico sent copies of everything she found in the folders for both the August 24, 2010 meeting and the January 11, 2011 meeting, but none of the materials from the raw milk advocates' packet were included in this official public record! Kathy Hayes, the Humboldt County Board of Supervisors' clerk, also checked and could not find the packet.

Since the packet of information was part of an official presentation to the board, put on the agenda by a supervisor, this is a very serious omission. It should have been included in the public record so that anyone at any time could review the information. The archived video of the August 24, 2010 meeting clearly shows nine copies of the packet being given to the board during the official presentation. Thus, there is no doubt that the advocates gave their materials to the board. Copies of the packet were distributed before the meeting as well. Materials provided by staff, dairymen and doctors are included in the pubic record so it is not an issue of the entire contents being lost. It appears only the materials provided by the raw milk advocates are missing.

WHY THE BAN PERPLEXES MOST PEOPLE

According to the latest estimate by the United States Census Bureau, the total population of Humboldt County is only 134,809. However, even with this relatively sparse population, there are a total of seven natural food stores in the county, with four of these offering a selection that rivals the best natural food stores in metropolitan areas. Furthermore, most of these natural food stores have been in business a long time, and they stay very busy.

Given the stats above, it is obvious that the Humboldt County citizenry shows a high propensity for natural food as they vote for it loud and clear every day with their pocketbooks. Therefore, when like-minded new residents move to the area, they find it quite surprising when they can't buy certified raw milk at any of seven natural food stores, and they can't even legally buy it from a farmer in the county. According to several employees at both locations of the Natural Food Co-op (Arcata and Eureka), tourists passing through also find the raw milk ban in Humboldt County a real head-scratcher when they see how devoted the community is to natural food.

What are the real reasons this ban still exists?

When like-minded new residents move to the area, they find it quite surprising when they can't buy certified raw milk at any of seven natural food stores, and they can't even legally buy it from a farmer in the county.

UNFORTUNATE TIMING?

To many, it is perplexing why the Humboldt County supervisors voted on January 11, 2011 to maintain the status quo and keep the ban on raw milk in place. While their decision was purportedly due to perceived health risks, a careful examination of the official record, a reconstruction of the timeline, and dozens of interviews reveal that other factors likely played an even bigger role in their decision.

According to court documents, Humboldt Creamery filed for Chapter 11 bankruptcy on April 21, 2009. At the time of filing, Humboldt Creamery owed creditors about fifty-five million dollars. On August 27, 2009, Humboldt Creamery was sold at auction to Foster Farms for nineteen and one-half million dollars. This left them with no assets with which to pay the remaining thirty-five and one-half million dollars due creditors!

The bankruptcy of Humboldt Creamery followed on the heels of the sudden resignation of Rich Ghilarducci, who held the position of CEO for twelve years. A financial scandal soon emerged as it was determined that Ghilarducci had overstated the creamery's inventory and accounts receivables while understating the accounts payable—that is, he "cooked the books" and had evidently been doing so for years. Ghilarducci was sentenced to thirty months in federal prison.

The community felt the pain in the aftermath of this troubling situation. Humboldt Creamery had been one of the biggest employers in the county and many people were suddenly without a job. Most of the fifty to seventy dairy farmers in Humboldt County had contracts with Humboldt Creamery to process their milk, but during this fiasco, they weren't paid for about two months. It was also uncertain for a while whether Humboldt Creamery, considered a vital economic engine for the county, would survive at all. To make matters even worse, many of the investors in Humboldt Creamery who lost dearly after the bankruptcy were local people who live in Humboldt County. Reverberations of this financial and moral devastation were felt throughout the whole county.

Humboldt Creamery had been one of the biggest employers in the county and many people were suddenly without a job.

Given the events described above, it is surprising that many people in the community do not fully realize how the timing of these events line up with the efforts made by the raw milk advocates to get the ban on raw milk rescinded. In many ways, the timing could not have been worse.

Humboldt Creamery filed for bankruptcy only one year and five months before the raw milk advocates gave their public presentation to the board and formally asked the Humboldt County supervisors to rescind the county ban on certified raw milk. Moreover, their presentation took place only one year after Foster Farms bought Humboldt Creamery. The dairy community and many others in the community were still reeling from financial and moral devastation.

CRYSTAL CREAMERY

Foster Farms has chosen to keep "Humboldt Creamery" as a brand name but the creamery located in Humboldt County is now officially under the umbrella of Crystal Creamery, the milk division of Foster Farms. Crystal Creamery touts itself as the largest dairy in California, and it is looking to expand even more. Further, the Foster Farms corporate culture may be a far cry from the former Humboldt Creamery's "fiercely independent" spirit that Rich Ghilarducci described in a 2006 interview with the *North Coast Journal*.

From the archived video of both the August 24, 2010 and January 11, 2011 meetings, it is clear that Humboldt County locals, including the supervisors, county staff, and citizens still refer to the creamery as "Humboldt Creamery" and still think of it as an independent entity, although county records refer to by its official name, Crystal Creamery. Proponents of the raw milk ban repeatedly referred to the "brand recognition" of the milk produced in Humboldt County.

PUBLIC COMMENTS REVEAL THE TRUE REASONS

With the events described above in mind, it is instructive to now go back and review the public comments made by local dairymen, county officials and supervisors at both the August 24, 2010 and January 11, 2011 Humboldt County Supervisor board meetings. In doing so, it begins to make more sense why it may not have been the best time to ask the county supervisors to rescind

the ban on raw milk in Humboldt County. These comments also show that the purported reasons that most of the supervisors gave (perceived health risks) may have only been an excuse to delay action, take no action, or "maintain the status quo," when in fact the overriding reasons were actually related to the recent devastation suffered by the Humboldt dairy industry.

For example, at the August 24 meeting, Jeff Dolf, Agricultural Commissioner, Humboldt and Trinity Counties stated: "I can appreciate the passion that people speaking for raw milk have for raw milk. My concern is for the dairy industry. I am concerned that if we were to change our county ordinance and there was an incident, or something happened, because of the strong brand identity that Humboldt County has with its dairy products, it could be devastating for our dairy industry. You are aware that the agricultural commissioner compiles crop statistics for agricultural products in the county. I'm sorry to report that last year the value of our market milk was down sixteen million dollars. If there was to be a change of our ordinance, and if there was an incident involving Humboldt County raw milk, I'm really very concerned for what's left of our dairy industry and I believe that our ordinance helps to preserve that industry."

He made a similar and equally strong statement at the January 11, 2011 meeting.

In a breach of protocol, but with the chairman's permission, on August 24, 2010, Supervisor Jimmy Smith called two of the local dairymen to the microphone *before* other citizens who were there to make public comment, even though they were not on the agenda. Said Jim Regli, dairyman in Ferndale, California: ". . . I'm not speaking for all those dairymen but I have spoken to quite a few and they want this ordinance to remain mainly because of the *fear* of something happening to our market if someone consumes milk that is not pasteurized. Because of that fear, I hope this board keeps this ordinance in place."

Regli emphatically emphasized the word "*Fear*!" and others repeated this word as well. It seemed to be a theme.

John Vevoda, another dairyman from Ferndale, referred to the Humboldt Dairy situation: "In light of what happened in 2009, and the majority of the dairymen really lost, you try going two months paying all your bills and not getting any income, we can't afford something like that again. Public perception is they don't care if it's raw milk, pasteurized milk, what it is, it's milk and we have worked extremely hard in the last year to build up our reputation outside of our area. Our organic milk now goes to the Los Angeles area, and if they were to find out that something bad happened up here, it could kill us. With that said, I'd like you to consider that in your decision."

At the January 11, 2011 Humboldt County Board of Supervisors meeting, newly elected Supervisor Virginia Bass requested that two of the dairymen in the audience come to the microphone and give a summary of their opinion from the previous meeting and state whether that had changed. Neither of them had elected to make public comment during the public comment period, and they were not on the agenda.

John Vevoda stated that when the Humboldt Dairy went down in 2009, ". . . we didn't get paid for about a month and half." He went on to say, ". . . so we don't want to take any chances. We're not big gamblers. We're all small dairymen and we can't afford if someone were to get sick to lose the marketshare that we have now. Most of our milk is shipped out of the area, at least on the organic side, and we have an extremely good reputation. We don't want to jeopardize that."

The majority of all milk produced in Humboldt County is now certified organic.

At the January 11, 2011 board meeting, Supervisor Smith stated the following as he made his motion to maintain the ban on raw milk in Humboldt County: ". . . I stood by these guys when their industry was extremely strained and they're still not out of the woods. . . but it's in trying to maintain a strong industry that's here as a big component of our economy so with great respect to your comments Mr. Chairman, I'm going to move that we retain the status quo as recommended by our staff.. . . that's the motion, maintain the status quo and keep the ordinance in place."

IS THERE MORE TO THE DAIRY FARMER SIDE OF THE STORY?

Milk is a highly perishable product. Therefore, if a dairy farmer can't sell his milk right

Last year the value of our market milk was down sixteen million dollars.

The contract that a dairy farmer signs with a creamery almost always states that they cannot sell (or even give away) milk to any other business or individual.

away, it goes bad or they have to sell it as powdered milk for a tiny fraction of its true value. To solve this issue, the vast majority of dairy farmers have a contract with a creamery, which sends a truck to their farm on a regular basis to pick up the milk and the creamery pays them for the milk. On the negative side, this means they essentially have one "customer" and they are beholden to that one "customer" for their livelihood.

The contract that a dairy farmer signs with a creamery almost always states that they cannot sell (or even give away) milk to any other business or individual. If they do so, they are considered in violation of their contract and they may lose their contract. If this were to happen, the dairy farmer may be stuck with hundreds of gallons of milk *every day* and no where to send it or sell it. Crystal Creamery (formerly Humboldt Creamery) works this way for most, if not all, of the dairy farmers they work with.

If a dairy farmer criticizes this policy publicly, or even merely says he or she would like to sell a portion of their milk to another source, this puts them on tenuous ground with their one big "customer," and they naturally worry they may not have their contract renewed. This can also potentially happen if the dairy farmer publicly supports the idea of other dairy farmers selling raw milk, if their creamery is not in favor of this idea (most are not).

If a dairy farmer loses his or her contract with their creamery, they stand to lose not only their livelihood but also their way of life, a connection to their family history, and their ability to leave a legacy to their children and grandchildren. Many of the dairy farms in Humboldt County have been around for several generations, some going back to the 1800s. Humboldt dairy farmers come from industrious hard-working families who have been an integral part of the community for a long time, with deep-rooted personal stakes in the county.

As raw milk advocates continue to work on rescinding the ban on raw milk in Humboldt County, it will be very important to understand things from the perspective of the dairy farmers and others who have expressed "fear" in allowing certified raw milk to be sold and produced in the county. Perhaps there are ways to help allay those fears and accommodate everyone going forward, especially since Humboldt County is now further removed from the crisis that occurred in 2009 when Humboldt Creamery went bankrupt and was sold to Foster Farms.

AN IMPORTANT POINT

It should be noted that certified raw milk dairies in the state of California do not have to worry about a contract with a creamery because they are required to have their own creameries

RAW MILK KID

David Smith,
son of Alice Curtin
Smith, grandson of
Alexandria, VA chapter leader
Janice Curtin,
is growing strong
with raw milk.
On a visit,
he's more excited
to carry in the raw milk
than to see Grandma!

and bottle their own milk! There are also very strict standards in place, and actively regulated by California officials, to ensure a highly sanitary process, as evidenced by the stellar track record of certified raw milk dairies in California.

LOOKING TO THE FUTURE

Many farmers and consumers living in Humboldt County have expressed a strong desire for certified raw milk dairies in Humboldt County. In fact, it is fair to say that they are begging for this industry to be born, and they correctly point out this cannot happen without rescinding the ban on the sale of raw milk in Humboldt County.

In her public comment before the Humboldt County Board of Supervisors on August 24, 2010, Liz Lux stated, "In Humboldt Country, we enjoy some of the freshest air and cleanest water in the world. We have rolling hills of green and sun drenched dewy pastures. We have a community of people who use discretion in choosing which foods to consume. We have a history of supporting dairy farmers in this great land of Humboldt County. To me, this sounds like a recipe for the freshest, most delicious, and healthiest of conditions on which to build a raw milk dairy farm."

Lux's comment was met with resounding applause. Several other speakers talked about the economic advantages of allowing certified raw milk dairies in Humboldt County. One speaker from Eureka asked the supervisors, "Why would you want to stand in the way of dairy farmers from entering a growing niche market?"

In an interview, Mike Fraga, who runs a goat farm in Arcata, expressed an interest in starting a certified raw milk dairy. In fact, he has already looked into what's involved in doing so in California and he seems to have a good grasp on the details of what that entails. Fraga currently has about three hundred goats. He milks approximately sixty percent of these goats and sells the milk to the Cypress Grove Chevre creamery, which in turn, produces several types of popular goat cheeses. Fraga also stated that he has enough land to expand his business should he decide to do so.

The Jose Homem Dairy, located in Arcata, has expressed a desire to sell certified raw milk too if the ban on raw milk is lifted. Several others have privately expressed a similar interest but they are hesitant to express this publicly at this time, some of them believing it could affect their creamery contracts or their relationship with other dairy farmers in the county. However, they seem to think it would become much easier to express their opinions openly if just one certified raw milk dairy were to become established.

Fraga points out that it would be easier for someone with a smaller operation to get started selling certified raw milk because the investment in the new equipment needed would be much lower. He also points out that a certified raw milk micro-dairy, with just a few cows or goats, could be used as a financial stepping stone for expanding into a larger certified raw milk dairy.

Mark McAfee has personally pledged, both publicly and privately, to help anyone who wants to start a certified raw milk dairy in Humboldt County should the ban on raw milk be lifted. Multiple people in the raw milk community report that McAfee has been exceedingly generous with his time in the past. One person commented privately, "For Mark, it's not just about business. His whole heart is in it and he truly wants to help people." Thus, there is ample reason to believe that McAfee is sincere and will follow through on his promise if the opportunity should present itself.

David Lippman, general manager of North Coast Co-op (now retired), publicly stated at the August 24, 2010 meeting, "Our membership includes thirteen hundred families in Humboldt County. We get constant regular requests from our members and shoppers for raw milk. I would simply urge the board to give people in our county the same choice that they have in almost every other country in California."

Rick Littlefield, owner of Eureka Natural Food Store, stressed freedom of choice in his public comment at the same meeting, "We almost never get involved in political issues but we see this as more of a personal right. . .so on behalf of our customers. . . why would our county supercede the state and federal government in this case. Now nobody's blaming you because you didn't pass this, it's been here for over fifty years, but it is time to let it go!" Huge applause followed his statement.

In a recent interview, Littlefield continues to stress freedom of choice. To that end, he points out that the right to make decisions about your own health has been a battle since the formation of our country when physician Benjamin Rush, one of the signers of the Declaration of Independence, advocated for this right to be included in that document. His motion failed by only one vote! We continue to fight for this right in various iterations, including the right to drink raw milk!

Cindy Ashy is a freelance writer living in northern California. Trained as a biologist, Ms. Ashy's specialties include natural health, the natural world, cutting edge science, and investigative journalism. She can be reached at (360) 325-1081.

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RAW MILK UPDATES By Pete Kennedy, Esq.

MICHIGAN – HILL HIGH DAIRY

On July 14th, the Michigan Department of Agriculture and Rural Development (MDARD) filed a lawsuit against dairy farmers Joe and Brenda Golimbieski, seeking an injunction prohibiting the Golimbieskis from processing and distributing raw dairy products (butter, cream, yogurt and kefir) and from selling food (eggs, honey, maple syrup) without a food establishment permit. The Golimbieskis own and operate Hill High Dairy LLC, a Grade A facility which produces milk for pasteurization, and they are also the proprietors of a herdshare operation, B.J.'s Cow Boarding, LLC. MDARD has adopted a written policy allowing the distribution of raw milk through a herdshare agreement but the department's position is that the distribution of any other raw dairy product through a herdshare agreement violates Michigan's Grade A Milk and Milk Manufacturing laws.

MDARD investigated the Golimbieskis for nearly two years before filing the suit and had sent cease and desist letters before going to court. Part of the investigation included a July 2014 raid on the food buyers club, My Family Co-Op, where the department seized thousands of dollars of raw dairy products and other foods; most of the seized foods were eventually destroyed. My Family Co-Op and its members had ownership interest through a herdshare agreement in cows boarded at the Golimbieskis' farm.

Joe Golimbieski has stuck to his belief that MDARD has no jurisdiction over private sales of food such as eggs and honey direct to consumers and no jurisdiction over distribution of any raw dairy products to shareholders. MDARD's written policy (Policy # 1.40) specifically states that the department "does not license or inspect the herdshare portion of a dairy farm." It was during routine inspections of Hill High Dairy's Grade A operations that MDARD inspectors claimed they saw raw dairy products other than milk being offered for sale, triggering the investigation.

The department's policy recognizes that someone with an ownership interest in a dairy animal has the right to raw milk produced by that animal but refuses to acknowledge that the shareholders have the right to take their property (i.e., the raw milk) and have it processed into another dairy product—a position that doesn't make sense. MDARD is denying the shareholders access to raw dairy products that have great track records for safety; butter, cream, yogurt and kefir have been implicated in few, if any, incidents of foodborne illness outbreaks.

Joe Golimbieski has courageously stood up to MDARD, but his case will not be an easy one to win. The department filed for the injunction in the 30th Circuit Court in Lansing, the capital city where MDARD has the home field advantage. His case represents another chance to convince a court that there is a difference between the public and private distribution of food. One of his shareholders, Mike Lobsinger, has successfully petitioned to intervene in the case and is now a defendant in the suit along with the Golimbieskis. Lobsinger is claiming that MDARD is illegally interfering with his right to contract with the Golimbieskis to have the milk produced by cows in which he has an ownership interest in processed into another raw dairy product. Judge James S. Jomo, the 30th Circuit Court judge who is hearing the case, has set a July 2016 trial date.

ILLINOIS – PROPOSED RAW MILK REGULATIONS

After nearly three years of working on raw milk regulation, the Illinois Department of Health (IDPH) still has more work to do. On August 11th the Joint Committee on Administrative Regulations (JCAR), a legislative body that has the final say on approving proposed rules, voted to prohibit the filing of IDPH's proposed rules with the Secretary of State—proposed regulations do not become law unless they are filed with the Secretary. The rules IDPH submitted to JCAR were an amended version of proposed regulations the department issued in September 2014. Over seven hundred people had submitted comments on the original version; nearly all of them opposed.

For over thirty years, IDPH had a successful policy of allowing unlicensed on-farm sales; there was not a single case of foodborne illness legitimately attributed to a raw milk producer operating under the policy. (See Wise Traditions Summer and Fall 2013 issues for background.)

Through the proposed regulations, the department is trying to implement a two-tier licensing system where producers who meet requirements outlined in the proposed rules can obtain a license to sell raw milk on the farm while those who meet Grade A requirements, including expensive physical facility requirements, can deliver and sell raw milk to off-farm customers. The proposed rules would require herdshare operations to meet the Grade A mandates.

Both raw milk proponents and opponents opposed IDPH's amended version of the rules. Even raw milk producers who were willing to submit to licensing and inspection thought the sanitary standards in the proposed regulations were too broad and subject to abuse by inspectors. The Northern Illinois Public Health Consortium—which had unsuccessfully pushed legislation to ban raw milk in 2014 (see Wise Traditions Summer 2014 issue)—and other public health organizations opposed IDPH's amended version of the rules, mainly on the grounds that they would allow the retail sale of raw milk in population centers instead of just on the farm, which is what the original version called for. JCAR's notice

prohibiting filing of the rules stated, "This rulemaking has not achieved an adequate balance between the State's role in protecting the public health and its mission to avoid unduly burdensome regulations on small business. JCAR finds that adoption of this rulemaking in its current form would not be in the public interest."

JCAR can still lift the prohibition on filing the rules but first IDPH would need to reach an agreement with stakeholders (e.g., representatives for raw milk producers and consumers, the dairy industry, Farm Bureau and public health agencies) on a compromise version of the rules. According to one media report, if an agreement couldn't be reached on the rules within one hundred eighty days after JCAR voted for prohibition, "then all future efforts to regulate raw milk must be implemented legislatively" (FarmWeekNow.com, "Raw Milk Amendments Prohibited", August 17, 2005).

CONNECTICUT – NEW HERDSHARE LAW

Connecticut became the sixth state to pass legislation increasing access to raw milk in 2015 when Governor Dannel Malloy signed Senate Bill 360 (SB 360) into law on June 23rd. The bill legalizes the "transfer or exchange of raw milk between persons who are parties to the same shared animal ownership agreement." SB 360 took effect immediately. In Connecticut, licensed dairies can sell raw milk on the farm, at farmers markets and at retail stores; the new herdshare law mainly benefits micro-dairies that cannot afford the cost of complying with the requirements of obtaining a license.

SB 360 lifts a ban on herdshares that the Connecticut Department of Agriculture engineered toward the end of the 2009 legislative session when an amendment prohibiting unlicensed dairies from even giving milk to anyone outside the producer's family was tacked onto a bill titled the "Connecticut Fertilizer Law of 2008." SB 360 passed unanimously through both chambers in the legislature.

MINNESOTA – DAVE BERGLUND, LAKEVIEW NATURAL DAIRY

In a ruling paving the way for a possible precedent-setting court decision on food freedom in Minnesota, Cook County District Judge Michael J. Cuzzo has denied the request by the Minnesota Department of Agriculture (MDA) to hold dairy farmer Dave Berglund in contempt for refusing to let MDA officials possessing an administrative warrant inspect his farm. Judge Cuzzo also stayed the order he issued in October 2014 requiring inspection of Lakeview Natural Dairy, the farm Berglund owns and operates, until the judge makes a ruling on the constitutionality of regulations governing MDA's authority to inspect Lakeview Natural Dairy, which the farmer and his attorney, Zenas Baer, are challenging. The Farm-to-Consumer Legal Defense Fund is providing funding for Berglund's legal representation.

Judge Cuzzo granted the administrative inspection warrant on October 14, 2014, at MDA's request because Berglund had already refused to let MDA conduct an inspection of his farm on two different occasions in 2013. Berglund contends that the state had no jurisdiction over his farm because of a provision in Article XIII Section 7 of the Minnesota Constitution stating, "Any person may sell or peddle the products of the farm or garden occupied by him without obtaining a license therefor." After Berglund refused to let MDA inspectors with the warrant onto his farm on October 22, the department petitioned the court to hold the farmer in contempt. (See Wise Traditions Spring 2015 issue for background on the case.)

On March 2, 2015, a week before the contempt hearing, Baer filed a submission with the Court challenging the validity of the warrant and MDA's underlying statutory authority to inspect Berglund's farm on numerous constitutional grounds. At the March 9 hearing, Judge Cuzzo temporarily denied MDA's request to hold Berglund in contempt and indefinitely stayed his own order that granted MDA the warrant to inspect.

In his June 3rd opinion, which actually denied MDA's contempt request, the judge held that Berglund "has demonstrated a valid reason for his failure to comply" with the administrative warrant. Judge Cuzzo stated, "This Court will not hold Mr. Berglund in contempt, an 'extraordinary remedy,' for asserting a challenge to the constitutionality of a statute."

The key section of the judge's opinion was where he distinguished between Berglund's situation and the 2005 Minnesota Supreme Court case of State vs. Hartmann. In the Hartmann case, the State Supreme Court reversed a criminal conviction for selling meat since it was a product of the farm, but it upheld the conviction for processing meat that was prohibited under Minnesota law. In issuing its decision, the Court held that Article XIII Section 7 of the state constitution "exempts farmers" licensure to sell products but not from substantive regulation of the production or sale of their farm products." In the Berglund case, Judge Cuzzo noted, "As of March 2, 2015, Mr. Berglund raised numerous different constitutional arguments regarding the State's ability to regulate his dairy. Mr. Berglund is now challenging the constitutionality of the regulations that allow the Department to inspect his farm in the first place. The Minnesota Supreme Court did not address this precise issue in Hartmann."

If Baer can persuade Judge Cuzzo that the Minnesota laws governing inspection are unconstitutional as applied to farmers selling the products of the farm direct to consumers, then it will be a major step toward establishing a food system in which farmers can legally sell the products of the farm direct to consumers without regulation.

Local Chapters

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NORTH COLORADO SPRINGS CHAPTER GET-TOGETHER

Recent chapter meeting of the North Colorado Springs Chapter. Everyone brought nourishing traditional dishes. "It was a big success and as expected, all was delicious and we were inspired to try more recipes." Pictured here is the North Colorado Springs group with co-leaders Maria Kretchman and Carol Aleson.

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CHAPTER RESOURCES

Resources for chapter leaders can be accessed at westonaprice.org/local-chapters/chapter-resources, including our trifold brochures in Word format, chapter handbook, and PowerPoint presentations.

LOCAL CHAPTER LIST SERVE

Thank you to Maureen Diaz a chapter leader in Pennsylvania, for administering the local chapter chat group. New chapter leaders can sign up at http://groups.yahoo.com/group/wapfchapterleaders/

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LOCAL CHAPTER BASIC REQUIREMENTS

1. Create a Food Resource List of organic or biodynamic produce, milk products from pasture-fed livestock (preferably raw), pasture-fed eggs and livestock and properly produced whole foods in your area.
2. Provide a contact phone number to be listed on the website and in our quarterly magazine.
3. Provide Weston A. Price Foundation materials to inquirers, and make available as appropriate in local health food stores, libraries and service organizations and to health care practitioners.
4. Provide a yearly report of your local chapter activities.
5. Be a member in good standing of the Weston A. Price Foundation.
6. Sign a contract on the use of the Weston A. Price Foundation name and trademark.

OPTIONAL ACTIVITIES

1. Maintain a list of local health care practitioners who support the Foundation's teachings regarding diet and health.
2. Represent the Foundation at local conferences and fairs.
3. Organize social gatherings, such as support groups and pot luck dinners, to present the Weston A. Price Foundation philosophy and materials.
4. Present seminars, workshops and/or cooking classes featuring speakers from the Weston A. Price Foundation, or local speakers who support the Foundation's goals and philosophy.
5. Represent the Weston A. Price Foundation philosophy and goals to local media, governments and lawmakers.
6. Lobby for the elimination of laws that restrict access to locally produced and processed food (such as pasteurization laws) or that limit health freedoms in any way.
7. Publish a simple newsletter containing information and announcements for local chapter members.
8. Work with schools to provide curriculum materials and training for classes in physical education, human development and home economics.
9. Help the Foundation find outlets for the sale of its quarterly magazine.

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WAPF AT PALEOCON IN GERMANY

Katalin Nagypal Kokaveczne, our chapter leader in Hungary, organized the WAPF booth at the large Paleocon conference in Berlin, Germany. The event attracted lots of health-conscious people to learn about nutrition and to taste yummy real food locally from Germany!

There was a great food market with many vendors serving high quality food. Katalin reports a focus on real food rather than on food bars and powders. The WAPF booth was placed in the symposium hall.

Three other European members participated. Pictured here, from left to right: Charlotte Van Loo, from Holland; Tanja Stevens, chapter leader from Limburg, Holland; Wolfgang Haak, from UK; and Katalin Kokaveczne Nagypal, chapter leader from Budapest, Hungary. Thank you all for representing us so well!

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VA

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WI

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WY

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Small farm near Tampa FL looking for others to partner with us in our farming efforts. Have detailed ad in Eager Farmer www.eagerfarmer.com and listing in www.ic.org under Ecofarmfl Tampa FL. Small dairy (water buffalo), pigs, vegetables, cane syrup, and other sustainable, permaculture related farming ventures. Direct farm sales. ecofarmfl@yahoo.com, (813)754-7374.

Investors Needed

"Get An Oil Change" is a documentary film showing one nutritionist's vision for a population to embrace once again the coconut – essentially, for the people of the Cayman Islands to change their oil in order to change their health. Sally Fallon Morell is featured in it. Check out the Facebook page, Facebook.com/GetAnOilChange, as well as the Vimeo teaser vimeo.com/118666649. You can make a contribution by "tipping" us using the tip jar on the Vimeo page.

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WAPF RESEARCH

STUDY ON HEALTHY BABIES: Johanna M. Keefe, MS, MA, AHN-BC, RN, GAPs, certfied as an Advanced Holistic Nurse, is seeking volunteers for a PhD research project in Transformative Studies through CIIS (California Institute for Integral Studies). If you have had a healthy baby using the WAPF dietary guidelines, she would like to hear from you. She would like to interview you by Skype or Facetime, or in person if you are located in New England, Northern California or North Carolina—or at the annual conference in Novemember. Contact: johanna@enhancedwellnessbythesea.com, (978) 290-0266.

If people let government decide what foods they eat and what medicines they take, their bodies will soon be in as sorry a state as are the souls of those who live under tyranny.

Thomas Jefferson

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Thomas Jefferson to John Jay
August 23, 1785

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Healthy Products

INFORMATION

Fish That We Eat
Iqaluich Niginaqtuat

This manual by Anore Paniyauraq Jones is the second in a series of three detailing the traditional foods of the Inupiat. The first book in this series about Inupiat foods was *Nauriat Niginaqtuat, Plants That We Eat*, an ethno-botanical manual, long out of print but due to be re-printed in the fall of 2009 by University of Alaska Press. It is 150 pages with black and white photos and sketches.

The second manual, *Iqaluich Niginaqtuat, Fish That We Eat*, provides information regarding the traditional use of fish, their processing, recipes and eating enjoyment. It was compiled from the local traditional fish knowledge of northwest Alaska and was partially funded and placed on the web by the U.S. Fish and Wildlife Service.

The third manual in this series will similarly detail the traditional Inupiat processing techniques and recipes for sea mammals.

Presently there is no funding to support this work. Any suggestions would be welcome. The web link to *Iqaluich Niginaqtuat, Fish That We Eat*, is below. The report is located under the U.S.F.W. Northwest AK section. From here you can read it and/or download and print it. It should be printed double-sided due to the length (341 pages), including 100+color photos, sketches.

http://alaska.fws.gov/asm/fisreportdetail.cfm?fisrep=21

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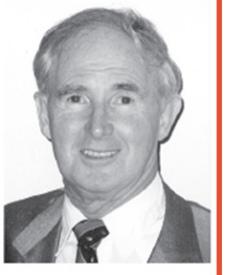

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