Vitamin A Saga

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The discovery of vitamin A and the history of its application in the field of human nutrition is a story of bravery and brilliance, one that represents a marriage of the best of scientific inquiry with worldwide cultural traditions; and the suborning of that knowledge to the dictates of the food industry provides a sad lesson in the use of power and influence to obfuscate the truth.

A key player in this fascinating story is Weston A. Price, who discovered that the diets of healthy traditional peoples contained at least ten times as much vitamin A as the American diet of his day. His work revealed that vitamin A is one of several fat-soluble activators present only in animal fats and necessary for the assimilation of minerals in the diet. He noted that the foods held sacred by the peoples he studied, such as spring butter, fish eggs and shark liver, were exceptionally rich in vitamin A.

All traditional cultures recognized that certain foods were necessary to prevent blindness. In his pioneering work, Nutrition and Physical Degeneration, Weston Price tells the story of a prospector who, while crossing a high plateau in the Rocky Mountains, went blind with xerophthalmia, due to a lack of vitamin A. As he wept in despair, he was discovered by an Indian who caught him a trout and fed him "the flesh of the head and the tissues back of the eyes, including the eyes." Within a few hours his sight began to return and within two days his eyes were nearly normal. Several years previous to the travels of Weston Price, scientists had discovered that the richest source of vitamin A in the entire animal body is that of the retina and the tissues in back of the eyes.

Many cultures used liver, another excellent source of vitamin A, for various types of blindness. The liver was first pressed to the eye and then eaten, a ritual through which the patient directed the healing powers of liver to the afflicted sense organ. The Egyptians described this cure at least 3500 years ago. Similar practices have been described in 18th-century Russia, rural Java in 1978 and among the inhabitants of Newfoundland in 1929. Other cultures used the liver of shark. Hippocrates (460-327 BC) prescribed liver soaked in honey for blindness in malnourished children. Assyrian texts dating from 700 BC and Chinese medical writings from the 7th century AD both call for the use of liver in the treatment of night blindness. A 12th-century Hebrew treatise recommends pressing goat liver to the eyes, followed by eating of the liver. In the Middle Ages, the Dutch physician Jacob van Laerlandt (1235-1299) wrote the following:

Who does not at night see right
Eats the liver of goat
He will then see better at night.

VITAMIN-A BRAVERY

Night blindness was a recurring problem among sailors on long voyages but by the advent of the great European navies, the wisdom of traditional liver therapy was largely ignored. It took brave dedication to the scientific method to confirm the validity of the ancient treatments. The first to do this was Eduard Schwarz (1831-1862), a ship's doctor on an Austrian frigate that was sent around the world on a scientific exploration. Before his departure from Vienna, several physicians had asked Schwarz to test the old folk remedy of boiled ox liver against night
blindness. On the voyage, 75 of the 352 men developed the condition. Every evening when dusk came, they lost their vision and had to be led about like the blind. Schwartz fed them ox or pork liver and found that the night vision in all of the afflicted was restored.

The cure was "a true miracle," said Schwartz in his published report, which stated emphatically that night blindness was a nutritional disease. For this he was viciously attacked by the medical profession, which accused him of "frivolity" and "self-aggrandizement." Three years after his return from the expedition, the discredited physician died of TB. He was 31. The use of vitamin-A-rich foods for tuberculosis had not yet been discovered.

In 1904, the Japanese physician M. Mori described xerophthalmia in undernourished children whose diet consisted of rice, barley, cereals "and other vegetables." Xerophthalmia is a condition that progresses from night blindness to dissolution of the cornea and finally the bursting of the eye. He treated the children with liver and also cod liver oil with excellent results. In fact, he found that cod liver oil was even more effective than liver in restoring visual function. Mori described it as "an excellent, almost specific medication. . . Indeed, in most cases, the effect is so rapid that by evening the children with night blindness are already dancing around briskly, to the joy of their mothers." Cod liver oil also helped reverse keratomalacia, a condition associated with severe nutritional deficiencies and characterized by corneal ulceration, extreme dryness of the eyes and infection.

At the end of the First World War, a physician named Bloch discovered that a diet containing whole milk, butter, eggs and cod liver oil cured night blindness and keratomalacia. In one important experiment, Bloch compared the results when he fed one group of children whole milk and the other margarine as the only fat. Half of the margarine-fed children developed corneal problems while the children receiving butterfat and cod liver oil remained healthy.

The actual discovery of vitamin A is credited to a researcher named E. V. McCollum. He was curious why cows fed wheat did not thrive, became blind and gave birth to dead calves, while those fed yellow corn had no health problems. The year was 1907 and by this time, scientists were able to determine the levels of protein, carbohydrate, fat and minerals in food. The wheat and corn used in McCollum's experiments contained equal levels of minerals and macronutrients. McCollum wondered whether the wheat contained a toxic substance, or whether there was something lacking in the wheat that was present in yellow maize?

In order to solve the puzzle, McCollum hit upon the idea of using small animals like mice or rats rather than cows for nutrition experiments—they ate less, took up less space, reproduced rapidly and could be given controlled diets. Like many good ideas, this one met with considerable opposition. McCollum worked in the Wisconsin College of Agriculture and was told by the dean "to experiment with economically valuable animals—the rat was a pest to farmers!" McCollum was forced to work secretly in the basement of the Agriculture Hall where he studied the effects of various diets on colonies of rats. He discovered that rats fed pure protein, pure skim milk, sugar, minerals and lard or olive oil for fat failed to grow. When he added butterfat or an extract of egg yolk to their diets, their health was restored. He discovered a fat-soluble factor in certain foods that was essential for growth and survival. This was named "fat-soluble factor A" as opposed to other accessory dietary factors, called "water-soluble B."

Research by Osbourne and Mendel, published just five months after McCollum's study, found that cod liver oil produced the same results as butter in rat studies, thus confirming the early work of Mori in Japan. Continued experiments helped scientists determine that vitamin A was
colorless, but often associated in foods with beta-carotene, which was yellow. In the 1930s, researchers discovered that vitamin A is formed by the conversion of beta-carotenes in the intestinal mucosa of animals and humans.

The scientific term for vitamin A is retinol, because of its presence in the retina of the eye. The role of retinol in vision was elucidated by a number of brilliant scientists, beginning in 1877 with a German, W. Kuhne, who discovered that the purple retinas from dark-adapted frogs turned yellow when exposed to light. The purple color is restored in a complex biochemical cycle involving vitamin A, which makes vision possible. Other scientists demonstrated the role of vitamin A in cell differentiation, bone development, reproduction and immune system function. Weston Price confirmed the value of vitamin A in traditional diets during his studies of primitive peoples carried out during the 1930s and 1940s.

Due to the outstanding scientific work of these and many other researchers, the administration of cod liver oil to growing children—a tradition found among Arctic peoples such as the Scandanivians and Eskimos—became standard practice until after the Second World War. Ironically, as Americans have stopped giving cod liver oil to their children, programs to administer vitamin A to children in Africa and Asia have had astonishing success in preventing blindness and infectious disease. This vitamin-A-treatment program was the brainchild of yet another brave researcher, Alfred Sommer, an ophthalmologist at Johns Hopkins University, who patiently lobbied for an international program after observing the wonderful effects of vitamin-A supplementation in Indonesia and Nepal.

In recent decades, much vitamin-A research has focussed on its role in preventing cancer, and its use in combination with nontoxic therapies in the treatment of cancer. Unfortunately, research on the anticarcinogenic properties of vitamin A has not been widely adopted. Perhaps the most tragic example is Dr. Max Gerson, who treated many cases of terminal cancer with excellent results using raw liver juice, a rich source of vitamin A. In 1946, he testified before a US congressional committee on the success of his treatment, but it was subsequently ignored. In 1973, Dr. Kanematsu Sigiura of the Sloan Kettering Institute published the results of studies on mammary tumors in mice using high doses of vitamin A and a derivative of seeds called laetrile. He observed complete regression of all the tumors in a total of five mice. The final report noted that "Dr. Sigiura has never observed complete regression of these tumors in all his cosmic experience with other chemotherapeutic agents." Nevertheless, just a few months later, spokesmen for Sloan Kettering flatly denied that there was any value in the therapy.

**VITAMIN-A VAGARY**

While the ongoing process of research into vitamin A and its effects is a boon to children and adults throughout the world, modern agriculture and food processing conglomerates gain nothing from this knowledge. Confinement farming practices effectively prevent vitamin A from incorporation into animal foods and the processing industry would rather use vegetable oils than animal fats. Some vegetable oils contain carotenes but they do not contain true vitamin A. Only animal fats contain vitamin A and vitamin A is present in large amounts only when the animals have a source of carotenes or vitamin A in the diet, such as green pasture, insects and fish meal.

Unfortunately, the vast majority of popular books on nutrition insist that humans can obtain vitamin A from fruits and vegetables. Even worse, FDA regulations allow food processors to label carotenes as vitamin A. The label for a can of tomatoes says that
tomatoes contain vitamin A, even though the only source of true vitamin A in the tomatoes is the microscopic insect parts. The food industry, and the lowfat school of nutrition that the industry has spawned, benefit greatly from the fact that the public has only vague notions about vitamin A. In fact, most of the foods that provide large amounts of vitamin A—butter, egg yolks, liver, organ meats and shellfish—have been subject to intense demonization.

Under optimal conditions, humans can indeed convert carotenes to vitamin A. This occurs in the upper intestinal tract by the action of bile salts and fat-splitting enzymes. Of the entire family of carotenes, beta-carotene is most easily converted to vitamin A. Early studies indicated an equivalency of 4:1 of beta-carotene to retinol. In other words, four units of beta-carotene were needed to produce one unit of vitamin A. This ratio was later revised to 6:1 and recent research suggests an even higher ratio. This means that you have to eat an awful lot of vegetables and fruits to obtain even the daily minimal requirements of vitamin A, assuming optimal conversion.

But the transformation of carotene to retinol is rarely optimal. Diabetics and those with poor thyroid function, a group that could well include at least half the adult US population, cannot make the conversion. Children make the conversion very poorly and infants not at all — they must obtain their precious stores of vitamin A from animal fats— yet the low-fat diet is often recommended for children. Strenuous physical exercise, excessive consumption of alcohol, excessive consumption of iron (especially from "fortified" white flour and breakfast cereal), use of a number of popular drugs, excessive consumption of polyunsaturated fatty acids, zinc deficiency and even cold weather can hinder the conversion of carotenes to vitamin A, as does the lowfat diet.

Carotenes are converted by the action of bile salts, and very little bile reaches the intestine when a meal is low in fat. The epicure who puts butter on his vegetables and adds cream to his vegetable soup is wiser than he knows. Butterfat stimulates the secretion of bile needed to convert carotenes from vegetables into vitamin A, and at the same time supplies very easily absorbed true vitamin A. Polyunsaturated oils also stimulate the secretion of bile salts but can cause rapid destruction of carotene unless antioxidants are present.

It is very unwise, therefore, to depend on plant sources for vitamin A. This vital nutrient is needed for the growth and repair of body tissues; it helps protect mucous membranes of the mouth, nose, throat and lungs; it prompts the secretion of gastric juices necessary for proper digestion of protein; it helps to build strong bones and teeth and rich blood; it is essential for good eyesight; it aids in the production of RNA; and contributes to the health of the immune system. Vitamin-A deficiency in pregnant mothers results in offspring with eye defects, displaced kidneys, harelip, cleft palate and abnormalities of the heart and larger blood vessels. Vitamin A stores are rapidly depleted during exercise, fever and periods of stress. Even people who can efficiently convert carotenes to vitamin A cannot quickly and adequately replenish vitamin A stores from plant foods.

Foods high in vitamin A are especially important for diabetics and those suffering from thyroid conditions. In fact, the thyroid gland requires more vitamin A than the other glands, and cannot function without it. And a diet rich in vitamin A will help protect the diabetic from the degenerative conditions associated with the disease, such as problems with the retina and with healing.
Weston Price considered the fat-soluble vitamins, especially vitamin A, to be the catalysts on which all other biological processes depend. Efficient mineral uptake and utilization of water-soluble vitamins require sufficient vitamin A in the diet. His research demonstrated that generous amounts of vitamin A insure healthy reproduction and offspring with attractive wide faces, straight teeth and strong sturdy bodies. He discovered that healthy primitives especially value vitamin-A-rich foods for growing children and pregnant mothers. The tenfold disparity that Price discovered between primitive diets and the American diet in the 1940s is almost certainly greater today as Americans have forsworn butter and cod liver oil for empty, processed polyunsaturates.

In Third World communities that have come into contact with the West, vitamin-A deficiencies are widespread and contribute to high infant mortality, blindness, stunting, bone deformities and susceptibility to infection. These occur even in communities that have access to plentiful carotenes in vegetables and fruits. Scarcity of good quality dairy products, a rejection of organ meats as old fashioned or unhealthful, and a substitution of vegetable oil for animal fat in cooking all contribute to the physical degeneration and suffering of Third World peoples.

Supplies of vitamin A are so vital to the human organism that mankind is able to store large quantities of it in the liver and other organs. Thus it is possible for an adult to subsist on a fat-free diet for a considerable period of time before overt symptoms of deficiency appear. But during times of stress, vitamin A stores are rapidly depleted. Strenuous physical exercise, periods of physical growth, pregnancy, lactation and infection are stresses that quickly deplete vitamin A stores. Children with measles rapidly use up vitamin A, which can result in irreversible blindness. An interval of three years between pregnancies allows mothers to rebuild vitamin A stores so that subsequent children will not suffer diminished vitality.

One aspect of vitamin A that deserves more emphasis is its role in protein utilization. Kwashiorkor is as much a disease of vitamin-A deficiency, leading to impaired protein absorption, as it is a result of absence of protein in the diet. High-protein, lowfat diets are especially dangerous because protein consumption rapidly depletes vitamin-A stores. Children brought up on high-protein, lowfat diets often experience rapid growth. The results—tall, myopic, lanky individuals with crowded teeth, and poor bone structure, a kind of Ichabod Crane syndrome—are a fixture in America. High-protein, lowfat diets can even cause blindness as occurred once in Guatemala where huge amounts of instant nonfat dry milk were donated in a food relief program. The people who consumed the dried milk went blind. Primitive peoples understood this principle instinctively, which is why they never ate lean meat and always consumed the organ meats of the animals that served them for food.

Growing children actually benefit from a diet that contains considerably more calories as fat than as protein. A high-fat diet that is rich in vitamin A will result in steady, even growth, a sturdy physique and high immunity to illness.

The great discrepancy between what science has discovered about vitamin A and what nutrition writers promote in the popular press contributes to awkward moments. The New York Times has been a strong advocate for lowfat diets, even for children, yet a recent NYT article noted that vitamin-A-rich foods like liver, egg yolk, cream and shellfish confer resistance to infectious diseases in children and prevent cancer in adults. A Washington Post article hailed vitamin A as "cheap and effective, with wonders still being (re)discovered," noting that recent studies have found that vitamin-A supplements help prevent infant mortality in Third World countries, protect measles
Victims from severe complications and prevent mother-to-child transmission of HIV virus.\textsuperscript{14} The article lists butter, egg yolk and liver as important sources of vitamin A, but claims, unfortunately, that carotenes from vegetables are "equally important."

Vitamin-A vagary confuses the public and contributes to continued acceptance of lowfat dogma, even among science writers.

**VITAMIN-A KNAVERY**

Even worse than vitamin-A vagary is vitamin-A knavery in the form of concerns that vitamin A may be toxic in more than the minuscule RDA-recommended amounts. In fact, so great is the propaganda against the vitamin that obstetricians and pediatricians are now warning patients to avoid foods containing vitamin A!

Recently an "expert" panel recommended lowering the RDA (recommended daily allowance) for vitamin A from 5000 IU daily to about 2500 IU and has set an upper limit of about 10,000 IUs for women. The panel was headed by Dr. Robert Russell of Tufts University, who warned that intake over the "upper limit" may cause irreversible liver damage and birth defects—a ridiculous statement in view of the fact that just a few decades ago pregnant women were routinely advised to take cod liver oil daily and eat liver several times per week. One tablespoon of cod liver oil contains at least 15,000 IU and one serving of liver can contain up to 40,000 IU vitamin A. Russell epitomizes the establishment view when he insists that vitamin-A requirements can be met with one-half cup of carrots daily.

The anti-vitamin-A campaign began in 1995 with the publication of a Boston University School of Medicine study published in the New England Journal of Medicine.\textsuperscript{15} "Teratogenicity of High Vitamin A Intake," by Kenneth J. Rothman and his colleagues, correlates vitamin-A consumption among more than 22,000 pregnant women with birth defects occurring in subsequent offspring. The study received extensive press coverage in the same publications that had earlier extolled the benefits of vitamin A. "Study Links Excess Vitamin A and Birth Defects" by Jane Brody appeared on the front page of the New York Times on October 7, 1995; on November 24, 1995, the Washington Times reported: "High doses of vitamin A linked to babies' brain defects."

When a single study receives front-page coverage, it's important to take a closer look, especially as earlier research discovered the importance of vitamin A in preventing birth defects. In fact, the defects listed as increasing with increased vitamin A dosage—cleft lip, cleft palate, hydrocephalus and major heart malformations—are also defects of vitamin A deficiency.

In the study, researchers asked over 22,000 women to respond to questionnaires about their eating habits and supplement intake before and during pregnancy. Their responses were used to determine vitamin-A status. As reported in the newspapers, researchers found that cranial-neural-crest defects increased with increased dosages of vitamin A; what the papers did not report was the fact that neural tube defects decreased with increased vitamin A consumption, and that no trend was apparent with musculoskeletal, urogenital or other defects. The trend was much less pronounced, and less statistically significant, when cranial-neural-crest defects were correlated with vitamin-A consumption from food alone.

The study is compromised by a number of flaws. Vitamin-A status was assessed by the inaccurate method of recall and questionnaires; and no blood tests were taken to determine the actual usable vitamin-A status of the mothers. Researchers did not weight birth defects
according to severity; thus we do not know whether the defects of babies born to mothers taking high doses of vitamin A were serious or minor compared to those of mothers taking lower amounts.

The most serious flaw was that researchers failed to distinguish between manufactured vitamin A in the form of retinol, found in supplements and added to fabricated foods, from natural vitamin-A complex, present with numerous co-factors, from vitamin-A-containing foods. It is well known that synthetic vitamins are less biologically active, hence less effective, than naturally occurring vitamins. This is especially true of the fat-soluble vitamins like vitamin A, because these tend to be more complex molecules, with numerous double bonds and a multiplicity of forms. Natural vitamin A occurs as a mixture of various isomers, aldehydes, esters, acids and alcohols. Pure retinoic acid, a metabolite of vitamin A used to treat adult acne, is well known to cause birth defects. Apparently pure retinol has teratogenic properties in high amounts as well.

Researchers found that cranial-neural-crest defects increased in proportion to the amount of retinol from supplements consumed during the first trimester of pregnancy (although the total number of defects remained stable up to 15,000 IU daily). Research into vitamin A has indicated that many factors interfere with its absorption and utilization. Inadequate fat in the diet, poor production of bile salts, low enzyme status, and compromised liver function can all interfere with the uptake and usage of vitamin A, especially when given as a supplement in the form of retinol, rather than as a component of whole foods. It may be that the teratogenic effects of commercial vitamin-A preparations are exacerbated in women whose dietary practices and general health status are poor. Some researchers believe that synthetic vitamin A interferes with the proper utilization of natural vitamin A from foods.

Pure retinol is added to many fabricated foods like margarine, breakfast cereals and pizza. The study made no distinction between those women whose vitamin A was supplied by whole animal foods and those who ingested retinol added to margarine, white flour and extruded breakfast cereals—foods which contain many other factors that can cause birth defects. Natural vitamin A provided by liver, eggs, butter, cream and cod liver oil is well recognized as providing excellent protection against birth defects.

Distinctions between synthetic and natural vitamin A have been absent in the extensive media coverage of this study—on the contrary, the newspaper reports contain implied warnings against pregnant women eating liver, dairy products, meat and eggs, but none against eating fabricated foods like margarine and breakfast cereals to which synthetic vitamin A is added. And there has been no media coverage for subsequent studies, which found that high levels of vitamin A did not increase the risk of birth defects. A study carried out in Rome, Italy found no congenital malformations among 120 infants exposed to more than 50,000 IU of vitamin A per day. A study from Switzerland looked at blood levels of vitamin A in pregnant women and found that a dose of 30,000 IU per day resulted in blood levels that had no association with birth defects.

**VITAMIN-A SLAVERY**

While scientists in America are creating confusion and fear about vitamin A, WHO and UNICEF vitamin-A-distribution programs in Africa and Asia have been extremely successful in reducing blindness and death among both children and adults. Vitamin A is more cost effective in saving lives and preventing suffering than immunizations and drugs and it can be administered with 2-cent capsules. The program does not
undermine traditional cultures or foodways and is easily carried out on the village level.

But this kind of success doesn't sit well with the food and pharmaceutical industries because it strengthens village life and lessens the market for drugs and processed foods. Fulsome with praise, the "big guns of the international food supply system" have joined in a "public-private partnership" to get in on the program. Kellogg, Cargill, Monsanto and Procter & Gamble have pioneered the addition of vitamin A to margarine, vegetable oil, wheat flour, sugar and breakfast cereals—even to MSG! At a formal luncheon hosted by Hillary Clinton, the corporate executives and leaders of various relief groups announced their goal of showing "indigenous food companies. . . how to add vitamin A to foods that low-income people eat." In other words, vitamin A will be used to promote processed foods to villagers in Africa and Asia in the guise of humanitarian relief. Low income people in America eat margarine and other processed foods, but low-income people in the Third World eat foods grown by farmers and processed locally by artisans.

And when people refuse to eat processed foods, the "big guns" have devised another stratagem—genetically engineering rice to produce carotenes. Those who promote the so-called "golden" rice as a solution to the vitamin-A problem are either woefully ignorant or unabashedly corrupt. Golden rice containing carotenes can't provide true vitamin A to the world's children but it will further the trend of pushing their parents off the farm and into ghastly slums.

In the process of showing "indigenous food companies. . . how to add vitamin A to foods. . ." and of inserting genes for producing carotenes into rice, the multinational corporations will strengthen their grip on the world's food supply, leading to a disruption of village life and what Indian writer Vandana Shiva calls "food dictatorship." If the conglomerates have their way, programs to promote golden rice and "enriched" processed foods will replace programs to distribute vitamin-A capsules, increasing the suffering of children and worldwide economic slavery.

What can we in the west do to foil the nefarious plans of the food-and-pharmaceutical-complex in nations less prosperous than our own? The answer is simple: cut off their funding at the source by refusing to spend money on their products. Boycott processed foods; avoid pharmaceutical drugs. The better way to physical and economic health is through foods containing vitamin A.

THE SUCCESS OF VITAMIN A

One of the most successful programs in the history of nutrition science is the global campaign to distribute high-dose vitamin-A capsules to children throughout Africa and Asia. Launched in 1997, the global campaign is a partnership between UNICEF and the World Health Organization (WHO) as well as the governments of Canada, the United Kingdom, the Netherlands, Japan and the United States Agency for International Development (USAID). The program has been particularly successful in Nepal where groups of local women known as Female Community Health Volunteers help distribute the capsules throughout the rugged terrain. In 2000, over 90 percent of Nepalese children had received their yearly dosage of vitamin A.
Although the vitamin A distributed is synthetic and not the natural form derived from fish oils, it is the animal form of vitamin A (retinol), not carotenes. Children six to twelve months old receive two doses of 100,000 units per year; children over 12 months receive two doses of 200,000 per year. According to Werner Schultink, head of the Nutrition Section at UNICEF headquarters in New York, infant and child mortality drops about 23 percent when vitamin A levels are adequate. The program in Nepal costs just over $2 million per year, less than $1 per child (Reuter's 2/12/01).

CONVERSION OF CAROTENES TO VITAMIN A

The many conditions that interfere with the conversion of carotenes in plant foods to vitamin A include:

- Being an infant or child
- Diabetes
- Low Thyroid Function
- Low Fat Intake
- Intestinal Roundworms
- Diarrhea
- Pancreatic Disease
- Celiac Disease
- Sprue

THE MYTH OF VITAMIN A TOXICITY

Typical of the orthodox medical view of vitamin A is the following statement, posted at WebMD.com: "Vitamin A can be very toxic when taken in high-dose supplements for long periods of time and can affect almost every part of the body, including eyes, bones, blood, skin, central nervous system, liver, and genital and urinary tracts. Symptoms include dizziness, nausea, vomiting, headache, skin damage, mental disturbances and, in women, infrequent periods. Severe toxicity can cause blindness and may even be life-threatening. Liver damage can occur in children who take RDA-approved adult levels over prolonged periods of time or in adults who take as little as five times the RDA-approved amount for seven to ten years. In children, chronic overdose can cause fluid on the brain and other symptoms similar to those in adults. Pregnant women who take amounts not much higher than RDA levels increase the risk for birth defects in their children. High consumption of vitamin A may also increase the risk of gastric cancer and the risk of osteoporosis and fractures in women."

The Merck Manual describes vitamin-A toxicity in less hysterical terms. Acute vitamin-A poisoning can occur in children after taking a single dose of synthetic vitamin A in the range of 300,000 IU or a daily dosage of 60,000 IU for a few weeks. Two fatalities have been reported from acute vitamin-A poisoning in children, which manifests as increased intracranial pressure and vomiting. For the vast majority, however, recovery after discontinuation is "spontaneous, with no residual damage."
In adults, according to the Merck Manual, vitamin-A toxicity has been reported in arctic explorers who developed drowsiness, irritability, headaches and vomiting, with subsequent peeling of the skin, within a few hours of ingesting several million units of vitamin A from polar bear or seal liver. Again, these symptoms cleared up with discontinuation of the vitamin-A rich food. Other than this unusual example, however, only vitamin-A from "megavitamin tablets containing vitamin A . . . when taken for a long time" has induced acute toxicity, that is, 100,000 IU synthetic vitamin-A per day taken for many months.

Unless you are an arctic explorer, it is virtually impossible to develop vitamin-A toxicity from food. The putative toxic dose of 100,000 IU per day would be contained in 3 tablespoons of high vitamin cod liver oil, 6 tablespoons of regular cod liver oil, two-and-one-half 100-gram servings of duck liver, about three 100-gram servings of beef liver, seven pounds of butter or 309 egg yolks. Even synthetic vitamin A is not toxic when given as a single large dose or in small amounts on a daily basis. Children in impoverished areas of the world are routinely given two 100,000-unit doses of retinol per year for infants and two 200,000-unit doses for children over 12 months.

The tragedy is that misplaced concern about vitamin-A toxicity has led doctors to advise pregnant women to avoid foods containing vitamin A, and parents to avoid giving cod liver oil to their babies. Yet the early books on the feeding of pregnant women and infants recommended generous doses of cod liver oil and frequent liver consumption for pregnant women and two teaspoons of cod liver oil per day for babies three months and older. A majority of our medical problems would clear up very quickly if the populace would return to eating liver and embrace the use of cod liver oil—our finest superfoods.

**GETTING IT WRONG**

"Vitamin A can be found in fish liver oils, animal livers and green and yellow fruits and vegetables." —*Prescription for Nutritional Healing* by James F. Balch, MD and Phillis A. Balch, CNC. (However, the authors include the following warning at the end of their section on vitamin A: "Diabetics should avoid beta-carotene as should hypothyroid individuals, because they cannot convert beta-carotene to vitamin A.")

"Cod liver oil used to be taken routinely as a source of vitamin A. But many experts now believe that as a nutritional aid, the oil is obsolete. We can only consume vitamin A directly in the meat of animals—liver is the richest source. But bright orange fruits and vegetables and dark, leafy greens contain beta-carotene which our bodies convert into the vitamin. . . Before the days of refrigerated trucks and mass distribution of produce, vitamin A deficiency was an enormous problem. . . . But today most people have access to a wide range of produce year-round. What's more, beta-carotene supplements are also widely available." —Article on WebMD.com by Karen Cullen, RD, PhD

"Vitamin A is found in animal produce and beta-carotene, a vitamin-A-type compound. It is found in the yellow pigments of vegetables. . . If it is not needed, it remains as beta-carotene; if needed, it is converted into vitamin A. . . vitamin A supplements [are] not necessary."—*Enhancing Fertility Naturally* by Nicky Wesson
"Vitamin A is found in the form of betacarotene in leafy green vegetables, carrots, sweet potatoes, winter squash and cantelope in adequate amounts to supply a child's daily needs. . . " —Dr. Attwood's Low-Fat Prescription for Kids by Dr. Charles R. Attwood

"Vitamin A's toxicity depends on its form. Only retinol and the other varieties found in animal foods are capable of doing much harm. Carotenoids, the vegetable sources of vitamin A, don't seem to be toxic even when extraordinarily large amounts are consumed." —The University of California San Diego Nutrition Book by Paul Saltman, PhD, Joel Gurin and Ira Mothner

"The carotenes. . . are the main source of vitamin A." Basic Food Chemistry by Frank E. Lee, PhD "Yellow, deep orange/red and dark green vegetables and fruits. . . are high in vitamin A. . . " —The Breast Cancer Survival Manual by John Link, MD

"Vitamin A taken too enthusiastically can be toxic, since it is stored in the liver. Beta-carotene, however, is not converted into vitamin A unless the body requires it, and you cannot suffer from toxic levels of it." —The Endometriosis Answer Book by Niels H Lauersen and Constance deSwaan

**VITAMIN A—THE MIRACLE NUTRIENT**

Vitamin A supplementation of children in Asia and Africa has been extremely effective in reducing the rates of infection, diarrhea, anemia and blindness (Reuter's 2/12/01). African and Asian children receiving vitamin-A supplements grow faster, have better hemoglobin values and die 30-60 percent less frequently than nonsupplemented peers (J Nutr Jan 1989 119(1):96-100).

**Vitamin A supplementation can reduce the incidence of malaria.** Children in Papua New Guinea given high doses of vitamin A had a 30 percent lower incidence of malaria than those receiving a placebo (The Lancet, 1999, 354:203-9).

**Vitamin A plays a vital regulating role in the immune system.** Vitamin A deficiency leads to a loss of ciliated cells in the lung, an important first line defense against pathogens. Vitamin A promotes mucin secretion and microvilli formation by mucosa, including the gastrointestinal tract mucosa. Vitamin A regulates T-cell production and apoptosis (programmed cell death) (Nutrition Reviews 1998;56:S38-S48).

**HIV transmission is closely correlated with levels of vitamin A in mothers.** A study in Malawi, Africa found that mothers with the highest levels of vitamin A had an HIV transmission rate of just 7.2 percent (Celia Farber, "A Timely Firestorm," www.ironminds.com).

**Treatment with megadoses of vitamin A (100,000 IU per day) resulted in a 92 percent cure rate of menorrhagia (excessive menstrual bleeding) at Johannesburg General Hospital in South Africa (S Afr Med J 1977).**

**Lack of vitamin A interferes with optimal function of the hippocampus, the main seat of learning.** Scientists at the Salk Institute for Biological Studies in San Diego, California, found that removing vitamin A from the diets of mice diminished chemical changes in the brain...
considered the hallmarks of learning and memory (Proc Natl Acad Sci, Sep 25, 2001 98(20):11714-9).

Natural vitamin A helps reconnect retinoid receptors critical for vision, sensory perception, language processing and attention in autistic children. Use of cod liver oil helps children recover from autism due to the DPT vaccine. The pertussis toxin interferes with retinoid receptors in the brain (Med Hypothesis, Jun 2000 54(6):979-83).

Vitamin A can be helpful in the treatment of psoriasis. Researchers found that patients suffering from severe psoriasis had low blood levels of vitamin A (Acta Derm Venereol Jul 1994 74(4):298-301).

In stroke victims, those with high levels of vitamin A are more likely to recover without damage (The Lancet, Mar 25, 1998, pp 47-50).


Vitamin A was used successfully by Dr. L. J. A. Loewenthal, to combat tropical ulcers in Uganda (S Afr Med J Dec 24 1983 64(27):1064-7).

Vitamin A has also been used successfully to treat a skin condition called Kyrle's disease (Cutis Dec 1982 30(6):753-5, 759). Elderly persons who consume adequate vitamin A are less prone to leg ulcers (Veris Newsletter Dec 1999;15(4):5).

Chronic vitamin-A deficiency causes degeneration of the structures of the ear. Decreased auditory function in humans is associated with low vitamin-A levels. (Arch Otorhinolaryngol 1982;234(2):167-73).


**SOURCES OF VITAMIN A**

Listed below are approximate levels of vitamin A in common foods, in IUs per 100 grams:

- High-vitamin cod liver oil 230,000
- Regular cod liver oil 100,000
- Duck liver 40,000
- Beef liver 35,000
- Goose liver 31,000
It should be noted that these amounts can vary according to how the animals are fed. Weston Price noted a huge variation in vitamin-A content of butter according to the season. In addition, absorption of vitamin A varies according to the food. Research carried out during the 1940s indicates that vitamin A is more easily absorbed from butter than from other foods.

The US Recommended Daily Allowance of vitamin A is currently 5,000 IU per day (and may possibly be lowered to 2500 IU per day). From the work of Weston Price, we can assume that the amount in primitive diets was about 50,000 IU per day, which could be achieved in a modern diet by consuming generous amounts of whole milk, cream, butter and eggs from pastured animals; beef or duck liver several times per week; and 1 tablespoon regular cod liver oil or 1/2 tablespoon high-vitamin cod liver oil per day.

ARE CAROTENES SAFE?

Are carotenoids safe in large doses, as claimed? Dependence on carotenoids for vitamin A calls on large reserves of enzymes to make the conversion. In their fascinating book Nutrition and Evolution, Michael Crawford and David Marsh note that in animals, "if any function can be delegated to another organism it leaves the disk space free to perform some new function or to perform an old one better." The cat species does not synthesize vitamin A from carotenoids. "If they had to synthesize their own vitamin A . . . it would take up a significant amount of their disk space." Cats get vitamin A from their prey, whose ability to synthesize vitamin A from carotenoids compromises other functions, such as night vision and quickness of movement. While medical orthodoxy claims that consumption of large amounts of carotenoids has no downside, it is possible that dependence on carotenoids for vitamin A, even in those who are good converters, compromises other biochemical functions in subtle ways.

The so-called nontoxic betacarotene supplements contain a synthetic form of carotene, just one of 50 or 60 carotenoids found in the typical diet. The biological activity of synthetic betacarotene is much lower than that of the natural complexes of carotenoids and, in fact, may put stress on the immune system. Studies with humans and rats given synthetic betacarotene found an increase in white blood cells. In cancer trials, synthetic betacarotenes were not found to be protective. In fact, in one study, patients given synthetic betacarotene had worse results than controls (NEJM April 1994 330:(15);891-895).

About the Authors

Mary G. Enig, PhD is an expert of international renown in the field of lipid biochemistry. She has headed a number of studies on the content and effects of trans fatty acids in America and Israel, and has successfully challenged government assertions that dietary animal fat causes cancer and heart disease. Recent scientific and media attention on the possible adverse health effects of trans fatty acids has brought increased attention to her work. She is a licensed nutritionist, certified by the Certification Board for Nutrition Specialists, a qualified expert witness, nutrition consultant to individuals, industry and state and federal governments, contributing editor to a
number of scientific publications, Fellow of the American College of Nutrition and President of the Maryland Nutritionists Association. She is the author of over 60 technical papers and presentations, as well as a popular lecturer. Dr. Enig is currently working on the exploratory development of an adjunct therapy for AIDS using complete medium chain saturated fatty acids from whole foods. She is Vice-President of the Weston A Price Foundation and Scientific Editor of *Wise Traditions* as well as the author of *Know Your Fats: The Complete Primer for Understanding the Nutrition of Fats, Oils, and Cholesterol*, Bethesda Press, May 2000. She is the mother of three healthy children brought up on whole foods including butter, cream, eggs and meat. See her website at [http://www.enig.com/trans.html](http://www.enig.com/trans.html).

**Sally Fallon** is the author of *Nourishing Traditions: The Cookbook that Challenges Politically Correct Nutrition and the Diet Dictocrats* (with Mary G. Enig, PhD), a well-researched, thought-provoking guide to traditional foods with a startling message: Animal fats and cholesterol are not villains but vital factors in the diet, necessary for normal growth, proper function of the brain and nervous system, protection from disease and optimum energy levels. She joined forces with Enig again to write *Eat Fat, Lose Fat*, and has authored numerous articles on the subject of diet and health. The President of the Weston A. Price Foundation and founder of *A Campaign for Real Milk*, Sally is also a journalist, chef, nutrition researcher, homemaker, and community activist. Her four healthy children were raised on whole foods including butter, cream, eggs and meat.