Ray Peat's Newsletter

It is easier to build strong children than to repair broken men. **Frederick Douglas**

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Adaptogenic Milk

There are different ways of adapting to an environmental challenge: becoming less, or becoming more, reducing our needs, or increasing our abilities. The creative insights of individuals have accumulated as a culture, and the cultural generalizations have provided adaptive advantages. Our bodies are constantly having experiences, and generalizing from them in the way they respond; these generalized responses can limit or expand our vitality. These generalizations are expressed in our anatomy, physiology, and ecosystems, with changes in immunity, metabolism, gene expression, and behavior.

The dominant reductionist philosophy of science denies that generalization is an objective process, and has strenuously attacked the idea that intention or purpose guides biological, biochemical and genetic changes. To the extent that objective meaning is absent, the ideology of Popperian methodological individualism can be imposed. Applied to the theory of food and nutrition, this ideology insists that our nutritional requirements are genetically determined.

In medicine, through most of the 20th century, this meant that a pregnant woman's nutrition was said to be relevant only to her personal health, and not to the fate of the developing baby. When a woman's toxemic pregnancy produced a defective baby, the official explanation was that the baby's genetic defects caused the toxemia. The research that showed that the infant's brain development and its future health and longevity were determined by the quality of the mother's nutrition was ignored, denied, and suppressed by official, state licensed medicine.

It was in that pseudoscientific environment, with the guidance of corporate lobbies, that the dietary recommendations of the U.S. Department of Agriculture were developed, starting just before the beginning of the 20th century and culminating in the 1990s in the Food Guide Pyramid, which recommended, for example, 6 to 11 servings of grain, and 2 to 3 servings of milk, cheese, or yogurt. During the great depression, their income-ranked diets probably helped to prevent some deficiency diseases, but the main effect of the government's nutritional guidance has been to reinforce the medical establishment's view that disease is caused primarily by heredity and germs, and not by environmental factors such as malnutrition and pollution.

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At the end of the second world war, a neighbor of ours returned from the Pacific with malaria, and he found the symptoms were prevented when he drank goat milk regularly. To continue receiving disability payments he had to have periodic examinations, and during one of his hospital visits he had an episode of fever. His family brought him the goat milk that he would have normally been drinking, but the hospital wouldn't permit him to drink it. The fever worsened, and he died in the hospital. A few years later, medical journals began investigating why people who drank milk were resistant to malaria; experiments showed

that rats infected with the parasite were protected by a milk diet (Maegraith et al, 1952).

Some people theorized that milk contained something that killed the parasites, or lacked something that the parasites needed to survive. 65 years later, the issue is still being discussed.

Questions of health are necessarily questions about the deteriorating environment.

One of the reasons that conventional science couldn't build on the knowledge of ordinary people is that it was blindly committed to the idea that an ordinary diet containing all of the "essential nutrients" was adequate, that it was perfect, even if it was associated with a high incidence of infectious and degenerative diseases, since those diseases were the result of defective genes or known pathogens or still undiscovered pathogens. Defining the organism and the environment in accord with its ideology of mechanistic reductionism, official science has radically misrepresented the nature of organismic adaptation.

Maybe it wasn't that milk was therapeutic, but that the standard "adequate" diets were pathogenic. Phosphate, which predominates in grains, beans, nuts, meats, and fish, increases our production of parathyroid hormone, while calcium and magnesium inhibit its production. This hormone, which increases with age, suppresses immunity, and in excess it causes insomnia, seizures, dementia, psychosis, cancer, heart disease, respiratory distress and pulmonary hypertension, osteoporosis, sarcopenia, histamine release, inflammation and soft tissue calcification, and many other problems. Drinking milk lowers parathyroid hormone, relative to the diets that chronically stimulate its production. **There has been very little attention given to the optimal level of parathyroid hormone, as opposed to the "normal range."**

Empires, from the Pharaohs' to the present, have been based on a grain economy, which made it easy to concentrate wealth and power. As a result, a grain-based diet is woven into the culture of empire so deeply and complexly that it can hardly be examined impartially. Many people react to questions about the safety of grains as if their religion were being criticized.

The image of an Egyptian pyramid is an appropriate symbol for a food guide that encourages a disproportionate consumption of grains. Another interesting symbol was the presence of George Plimpton as the figurehead for the Anti-Dairy Coalition's "NotMilk" campaign. "The coalition, including its spokes-Jeremiah, George Plimpton, would have you believe that milk causes heart disease, cancer, infections, asthma, allergies and tuberculosis" (Lemonick, 1998). From 1953 until his death in 2003, Plimpton was editor of the CIA-funded Paris Review, their "agent of influence" for cultural change.

In the 1950s I saw research showing that infant mortality varied directly with the price of milk. More recent research suggests that such an effect can still be seen in many low-income countries. There is pressure to eliminate federal subsidies for milk production. That would undoubtedly reduce milk consumption, which is already declining faster in children than in adults, and the per capita consumption in the US is now less than one glass per day. **US subsidies for grains and soybeans are now 20 times greater than for milk.**

The cells of the mammary gland, in receiving substances from the blood, are selective in what they accept, allowing nutrients and protective substances to be concentrated, and reducing the concentration of many toxins that the blood has absorbed from the intestine.

Norman Pirie, a famous biochemist and virologist, wrote a book pointing out that leaves are vastly better protein sources than grains. "Advocacy of leaf protein as a human food is based on the undisputed fact that forage crops (such as lucerne) give a greater yield of protein than other types of crops. Even with conventional food crops there is more protein in the leafy parts than in the seeds or tubs [tubers] that are usually harvested." (Pirie, 1942, 1971). He wasn't able to

persuade any government or large corporation to develop a process for large scale extraction of food protein from foliage, but his work helped to clarify the ecological and economic contexts of nutrition, and there is increasing interest in using waste foliage instead of soybeans as a protein supplement in animal feed.

Phosphate, which predominates in grains, beans, nuts, meats, and fish, increases our production of parathyroid hormone, while calcium and magnesium inhibit its production.

Leaves contain many substances that can be harmful and that interfere with the digestion of protein and other nutrients, for example tannins and polyunsaturated fatty acids. The basic process of extraction that Pirie suggested was grinding, pressing, and precipitating the protein with heat. With that process, much of the protein remained in a form that can't be digested by people. Using a process similar to the fermentation of cabbage into sauerkraut, green foliage such as cornstalks, grass, and alfalfa can be stored as silage for use as animal feed during the winter. Besides losing some of the nutritional value, the formation of lactic acid in silage limits the amount that can be used by ruminants, since lactate, like tannins and PUFA, poisons some of the enzymic processes of the rumen, the organ that makes it possible for ruminants such as cows, sheep, goats, camels, and llamas to efficiently assimilate the nutrients of indigestible plant materials

Artificial rumens have been designed to convert waste foliage into food for humans, but so far, ruminant animals are the most efficient means of producing a non-toxic food--milk--from leaves. Calculations of the production costs of different types of food usually neglect the cost of environmental degradation, soil loss from plowing, nitrate pollution of water, air pollution, long range health effects, etc. Perennial forage crops such as alfalfa can reduce direct costs of production (tillage and fertilizer) and indirect costs of pollution.

The insoluble proteins of leaves are enclosed in the fibrous cell walls, in which the cellulose is linked with lignin, making it especially resistant to enzymic breakdown. The rumen supports the growth of a complex culture of bacteria, fungi, and protozoa, that can break down cellulose, lignin, and protein, when the right organisms are present, and their enzymes aren't poisoned. This system of microorganisms converts the cellulose, lignin, and protein into a nutritious mixture of sugar, fat (97% saturated), peptides, and biomass, which is released into the intestine to be digested, by processes similar to those of other animals. The presence of the bacteria that hydrogenate PUFA is essential, since the high PUFA content of leaves and grains would stop the breakdown of the plant proteins, but these bacteria themselves are susceptible to PUFA toxicity (Maia, et al., 2010).

The blood and the liver act as a buffer between the intestine and the various specialized tissues and organs, with the serum albumin having a major function in binding and transporting a variety of nutrients and potential toxins. (In milk, lactalbumin and other proteins have analogous binding functions.) Between the blood and the tissue cells, the extracellular matrix and the lymphatic system form the crucial environment for the cells, the real *milieu interieur*, through which they can communicate with each other, with some independence from exterior problematic situations. In this permissive medium, their intrinsic tendencies can be expressed.

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The cells of the mammary gland, in receiving substances from the blood, are selective in what they accept, allowing nutrients and protective substances to be concentrated, and reducing the concentration of many toxins that the blood has absorbed from the intestine. For example, the fungal toxin found in wheat and bread,

ochratoxin, is reduced by 75-80% between the blood and the milk (Muñoz, et al., 2014).

Although milk has some of the properties of the other body fluids, blood and lymph, its functions begin in the digestive system, with an instructive and supportive action, preparing the intestine's defenses against the environment. **The plant substances that are destroyed in the rumen—tannins, lignin, and PUFA—are cumulatively toxic to the intestine. Besides being nearly free of these, milk contains substances that promote the absorption of essential nutrients,** though it might be better to think of it as providing nutrients without things that injure the intestine and interfere with the absorption of nutrients. For example, lactose has the reputation of increasing the absorption of calcium and zinc (especially in people who are lactose intolerant), but ordinary sucrose or fructose has a similar effect, at least when compared to the alternative carbohydrate, starch (Artus, 1975).

Natural starches are always associated with the plant's defensive substances, as well as with nutrients, and those defensive chemicals are often specific inhibitors of animals' digestive enzymes. When a food isn't quickly digested by the animal, it supports the growth of bacteria in the intestine. In grains, the starches are likely to be associated with storage proteins (such as gluten), lignin and cellulose, and polyunsaturated fats, and these are harmful to the intestinal cells, apart from their interference with the process of digestion and assimilation of nutrients. Any food that provides simple nutrients, without causing inflammation and blocking enzymes, will support the animal's normal development, without activating stress responses.

When the organism is free from threats and stresses, with a permissive *milieu interieur,* and is able to just "be itself," what does it do? The integral nature of the animal involves a defining field, a shaping influence, and it's this field that organizes developmental and transgenerational changes in form and function such as those seen in Marion Diamond's study in rats, in the 1960s, under the influence of stressful or enriched environments, and hormones. In her studies, and in Zamenhof's experiments with chickens, in an optimized environment the brain developed to a degree previously unknown in those animals. The brain is an expression of the organism's unity and vitality, and with its sensory systems, it integrates metabolism, body composition and internal environment with the external environment.

In these experiments, single substances -progesterone, glucose, or glycine which was converted into glucose (Zamenhof and Ahmad, 1979)—increased brain growth, by increasing either the supply of energy or the ability to use energy effectively. Milk provides lactose, which is metabolized quickly into glucose, and small amounts of other substances, including progesterone and thyroid hormone, that favor its efficient use. During the time when young mammals are being nursed, their brain growth is extremely fast, continuing the rapid intrauterine brain growth, when those same substances were provided.

. . . drinking milk almost daily, rather than "less than four times a week," reduced vascular dementia by 65%

Computers are said to "process information," and nervous systems are often analyzed as if they were computers; however, nervous systems, like living systems in general, process *substance* meaningfully, not just information. Every nervous system, every bit of living stuff, exists as part of a bigger life supporting system, or "ecosystem," and the larger system is shaped by the way its components process substance. V.I. Vernadsky emphasized the importance of high-metabolizing brains for the stability of the Biosphere which sustains them. As the Noosphere concept, based on Vernadsky's work, was developed and popularized by Teilhard de Chardin it took on an abstract quality that has obscured Vernadsky's sense of urgency in recognizing our shared metabolisms throughout the Biosphere. Questions of health are necessarily questions about the deteriorating environment.

There have been several studies showing that drinking milk protects against dementia or milder "cognitive impairment" (Kliem and Givens, 2011; Crichton, et al., 2010; Chan, et al., 2013; Ahmadian-Attari, et al., 2014; Ozawa, et al., 2014). **For example, drinking milk almost daily, rather than "less than four times a week,"**

reduced vascular dementia by 65% (Yamada, et al., 2003). When animals are exposed to pollution, their fats accumulate oil soluble toxins, such as DDT and dioxins, and in those situations low-fat milk will be safer than full-fat milk or cheese. Nevertheless, milk fat generally contains a lower level of toxins than body fat and fat meats. Historically, cow's milk has been an important factor in protecting children from radioactive isotopes such as strontium-90, since the ratio of calcium to strontium is increased as the contaminated forage or grain is processed by the cow.

Many doctors are telling their patients that drinking milk will cause kidney stones or will calcify their arteries. It's actually a low intake of calcium that increases the risk of kidney stones: "Higher dietary calcium from nondairy or dairy sources is independently associated with a lower kidney stone risk" (Taylor and Curtain, 2013). The main mechanism involves the harmful effects of the parathyroid hormone, and the fact that this hormone is inhibited by increased intake of calcium (Bergenfelz,et al.,1993), magnesium,and vitamin D.

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US subsidies for grains and soybeans are now 20 times greater than for milk.

A deficiency of these has consequences much worse than kidney stones. When vitamin D or calcium is deficient, or when phosphate is excessive, and in hypoglycemia and stress (Ljunghall, et al., 1984), parathyroid hormone increases. This can lead to softening of bones, and hardening of soft tissues, especially arteries, sometimes brain, skin and other organs. Parathyroid hormone increases blood pressure, even before the calcium stiffening is detected. During the night, parathyroid hormone usually rises (Radjaipour 1986; Logue 1989, 1990; Fraser, 1998), and especially during aging, this causes a significant loss of calcium from the bones. Having a large part of the day's calcium at bedtime reduces the nocturnal rise of PTH and calcium loss from bones (Ohgitani, et al., 1997; Morfis, et al., 1997).

The obesity epidemic that began about 40 years ago in the US has paralleled the decreasing milk consumption. Studies in both animals and humans have shown that a moderate increase in calcium and vitamin D reduces obesity and increases the metabolic rate, and a fair amount is kno/wn about the mechanisms involved. Several studies have found that milk drinkers are less likely to be overweight than milk avoiders. In middle age, milk avoiders gain weight steadily, while those drinking milk regularly lose a small amount of weight (Davies, et al., 2000; Teegarden, 2003; Heaney, 2003; Zemel, 2003). The reduction of parathyroid hormone by increased calcium and vitamin D is closely related to reduced obesity, and to the health problems associated with obesity—hypertension, insulin resistance, heart arrhythmias, depression, and various inflammatory conditions.

Surgeons will say many things to get customers, but one website promoting removal of enlarged parathyroid glands makes the interesting comment that they see an average of three women per day who are going bald from hyperparathyroidism. "The longer they have hyperparathyroidism the more hair they lose" [https://www.facebook.com/Parathyroid/photos/a].

In vitro experiments with hair follicles show that parathyroid hormone ends the growth cycle. Prostaglandin D2, associated with hair loss, is released from mast cells, and parathyroid hormone is an activator of mast cell degranulation. Hair growth has a 24 hour cycle, and the long cycle of hair shedding and renewal seems to be regulated by the genes involved in the daily cycle (Lin, et al., 2009). It's possible that the daily cycle of parathyroid hormone is responsible for progressive hair loss, as it is for progressive loss of calcium from the bones; many people notice a copious loss of hair mainly in the morning. If this is the case, then a glass of milk at bedtime might have the same protective effect on hair loss that it has on bone loss.

Hair loss, like obesity or hypertension, should be taken seriously, as an indication of a systemic metabolic problem. The metabolism of the hair follicle contains clues to aging, tissue regeneration, and cancer. Milk contains multiple

factors that lower parathyroid hormone, and other stress-related hormones.

According to a 2009 study, federal support in 2008 for biodiesel and ethanol production (largely from soy and corn) was more than $9.5 billion (Lewis, 2009). Without those subsidies, fuel might be a little more expensive, but replacing millions of acres of soybeans and corn with perennial pastures, increasing grazing, would reduce the cost of milk considerably. It could also improve the quality of milk and of human health.

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