

A FRESH LOOK AT MILK

by Francis M. Pottenger, Jr., M.D.

There are a number of vital factors in fresh milk not generally known, in addition to its content of known nutrients



A philanthropist mused, "I must find out why the bones of my high producing Jerseys get soft, why they develop arthritis and have to be slaughtered." He was a man of action so he sought scientific help to answer the problem. At the first Annual Science Conference to be held at his farm in 1933, the preliminary report was made. This group of scientific men, primarily ecologists of varying disciplines, believed that the finest bottle of milk could only be produced through a thorough understanding of the biological cycle of healthy soil, plant, and animal with judicious return to the soil of the elements removed. It was with that concept he attempted to provide a milk product of the highest quality which, in turn, would take its place in the optimum diet of man. The goal is so aptly expressed by him in the archives of the scientific work of the farm.

"The driving force behind the efforts at the farm has been the thought to accomplish something for humanity."

The men who, under the guidance of Erf, set forth to produce the environment necessary to raise the finest of cattle which could give milk that would be most adequate for man were imbued with the idea that to accomplish this end the soil must be living and complete in all of its constituents to produce the finest pastures, corn, sprouts, and other feeds. To supply any deficiency the ad-

dition of minerals and conservation of vitamins for these animals must in turn be optimum if the cow was to reach her maximum physiological perfection.

Search for Vital Factors in Fodder

They set about to grow the finest fodder from a biological standpoint. To test their product at each step they fed the resulting milks to laboratory animals. They sought ways and means of preserving the optimum amount of the grass juice factor and the other vital elements in their feeds. Their experiments ran the gamut of the addition of chemicals, of freezing, drying, and of curing, in order to find the methods of treating the hays and other feeds in order to preserve the maximum amount of vital food elements. During the winter months, in particular, when pastures were not available, they sprouted corn to provide the factors of freshness, vitamins, and enzymes for the cattle. They studied the effects on the cows themselves as well as upon the milk which they gave. When the rat was fed the various milks, it showed how the tooth developed normally or abnormally depending upon the feed of the cattle. The experimentors added the use of the ultraviolet lamp to irradiate the cattle in order to give them a greater amount of the short rays. Likewise, they irradiated the milk, testing each step as they went. They thought in terms of how to make the animals most contented and employed the radio, the exercising wheels for the bulls and other innovations, all with the one purpose in view. They placed small amounts of nitrogen

and carbon dioxide in the milking system to prevent oxidation. Sanitation was always at the top of the list and bacteriological studies were continually made to assure the purity of the milk. They developed the milking parlor where the public could see the process. The greatest of care was taken by the herdsmen, and young men from throughout our land came to learn of the advances in animal husbandry practices at the farm. Scientific experiments to find the important factors within the feed and milk were conducted in the laboratories of the investigators. The quest of quality was ever foremost in their minds.

High Standards Abandoned

The work of these men is recorded in nine volumes.¹ The most prophetic portion of all the work and the summation of its importance is found in Part II of Edition II, "Feeding Dairy Cows With Special Reference to the Green of the Grass," by Erf, 1937, which expressed forebodings of the problems confronting the milk industry today. During the 24 years since this was written a great change has taken place in the American public and its philosophy, and a new social order has arisen in which QUALITY HAS GIVEN AWAY TO QUANTITY. Even those in high places spend their time trying to explain that one bottle of milk is just as good as another, that the meat from one steer, although it may taste a little differently has no difference in food value; that the quantity, not quality, is the important thing. Following the predictions of Erf, when the health of the cattle fails, the nutritional factors of milk will decline and partly metabolized food nutrients will produce sensitizations not only in the cow but in those who use the milk. His prophecy of the production controls and practices predicted the proscription in some medical-dental quarters. Among these attitudes are the following:

1. Milk and milk products increase blood cholesterol and cause atherosclerosis or hardening of the arteries.

2. Milk produces pyorrhea.

3. Milk will cause the calcium to leave bones, bringing about osteoporosis and arthritis.

4. Milk causes obesity.

5. Milk causes abnormal calcium deposits.

6. The use of milk after weaning is abnormal.

7. Cow's milk is not a fit food for human infants.

8. Milk causes allergies.

Cholesterol. That milk causes a problem of cholesterol is largely based on the premise that the ingestion of cholesterol and deposit of cholesterol are the same. The biochemist using tracer elements has been able to show the fallacy that the ingestion of cholesterol will elevate cholesterol in the body. Extensive use of quality raw milk, cream, and eggs, over years of time with tuberculous patients failed to produce hypercholesterolemia and atheroma.

2. and 3. **Pyorrhea and Arthritis.** Experiments initiated at the farm showed that pasteurized milk produces pyorrhea in the cat and imperfect development of the rat incisors. In a similar manner poor quality and/or heat treated milk caused osteoporosis and certain types of arthritis in the cat and rat; likewise, inadequate feeds caused arthritis in the cow.

4. **Milk Causes Obesity.** Only the excessive use of milk may cause obesity.

5. **Milk causes abnormal calcium deposits.** Though not carried on at the farm, the work of Wulzen² and co-workers made a very significant contribution to our knowledge of the destruction of the anti-stiffness factor present in unheated milk and cream. The loss of this factor produces abnormal deposition of calcium in many organs and parts

of the body. Her series of articles explains abnormal calcification from sub-optimal milks.

6. **Weaning.** Weaning is largely an academic question inasmuch as milk drinking and the use of milk products by adults is a very common practice throughout the world. Certain primitive people have continued to nurse, especially the male infant, as long as 3-5 years.

7. **Cow's milk is not a fit food for infants.** That the formula is better than human milk or cow's milk is based on misconception that milk is only fat, protein, carbohydrate, vitamin and mineral. It does not take into consideration other factors that are present both in breast milk and cow's milk. The use of entirely synthetic milks has recently come to the fore inasmuch as such combinations can be manufactured more cheaply and apparently are very stable. Some infants are unable to digest cow's milk. They are not just allergic but actually do not have the digestive enzymes to handle milk. Many (but not all) such infants properly treated will be able to drink milk if the proper enzymes are added to the formula.

8. **Allergies.** There are those who have become sensitized to subquality milks; some can never be desensitized. Therefore, milk should not be a part of the diet of these people; and because of the almost universal use of milk some individuals are seriously handicapped in their normal social behavior. This group of people constitutes a rather large segment of adult population. Many victims are not aware of their sensitivity. When under medical care until desensitized, this group frequently ceases to be milk consumers.

The use of fluid milk is on the decline both in total quantity and per capita usage. If the medical-dental restrictions

of the use of milk now recognized are to increase, the effect on a large portion of the American farming community can be disastrous involving other industries as well.

What Have We Done to Milk?

What is wrong with cow's milk? Is it possible that a food that has nurtured man since the earliest agrarian times from one of, if not the first, domesticated beasts, has suddenly become harmful to him? Is our fear of milk, and I refer primarily to cow's milk, a psychopathic whim on the part of a great segment of the American society, or is it real? Is it something we have done to the cow, her flesh and milk, that is reflecting unfavorably on us, her consumer? Erf answered these questions.

At the annual conferences such expressions as "Milk can only be as health giving as the health of the cow that produced it." "Trace elements each contain important catalyzing effects on other foods and elements." "Improperly metabolized feeds interfere with the health of both the cow and the consumer." "An allergic cow can produce allergic humans."

Good milk produced by healthy animals was injured even by simple aeration, not only the process of pasteurization. To establish this point, Erf reports the following experiment: Milk drawn into a bucket from one-half of the udder of a group of cows birthing twin calves was fed to one of her calves, while other calves were allowed to nurse on the other one-half of the udder of each dam. The second group was superior physically to those fed from the bucket.

Those who were stimulated by the efforts of this farm with their early experiments showed why ordinary milk produced allergy while good milk did

not. They showed what happened to the teeth. They showed how and why osteoporosis resulted from improper bone metabolism. Kitchin of Ohio State University showed the differences in the enamel and dentine of rats, and Lyman, the difference in the bone ash of the femur and the dental structures of the rats fed milk from properly and improperly fed cattle. Pottenger also showed the difference in calcium and phosphorus in rats and cats fed the raw, pasteurized, boiled and sweetened-condensed milk.

Grass Juice Factor

Throughout the history of the farm every effort was made to save the grass juice factor and at all the early conferences a discussion of this factor was an important part of the agenda. Peruse the volumes of the transactions of the scientific meeting at the farm to see the unfolding of the story. Though Wulzen and van Wagendonk, isolated the antistiffness factor as such from raw cream and plant juices, the workers here were close on the trail.

Pasteurization Harms Fats

Of the modern criticism of milk, only the cholesterol story was not answered. The answer was simple. A life time consumption of clean, fresh, raw milk from healthy cattle does not produce metabolic disease in man. Cholesterol is not the villain, but the villain is what man does to cattle. I can add a few medical observations. Dairy products fed in large amounts including raw cream and raw butter do not produce atheroma, do not raise the blood cholesterol, while the highest grade pasteurized produce does.

Unless the dairy industry is to awaken and again recognize the principle of Coit and the practices of Erf, it will give way to the chemist and engineer and forget that, so far, only God has made life. Like dogs and horses, the dairy cow will become the pet of the curious, to be

preserved in zoos like the Texas Longhorn.

It is enlightening to see the trend of thought as expressed in the scientific report from the farm. During the earlier editions the trend of thought was in full accord with the following expressions of health. The World Health Organization³ defines health as follows: "The state of complete physical, mental and social well being and not merely the absence of disease and infirmity." As expressed by the National Research Council⁴ in 1943, "This (nutrition) becomes distinctly significant if one recognizes that health has quantitative characteristics involving efficiency reserves and the capacity not only to avoid diseases but to attain maximum inherited potentialities."

Function of Diet

My own definition of optimal diet is that which would provide man with the nutrients essential to regenerate body cells; to enable him to mature regularly as determined by normal osseous, physical and mental characteristics; to resist diseases; to reproduce his kind in homogeneity, and to enable him to produce a livelihood for himself and his family.

Under the tutelage of Erf the stress was toward optimum health. So it was that the well-being of the cows was of real consideration. How good is a cow? Is her brisket thin? Is her thyroid small? Does her fur have a sheen? How does the rap of the fist over her rump resound? Are her ribs hard after the lactation period so they cannot be indented with the examiner's fingers? Are her eyes clean and clear? Are her legs trim? Is she calm and contented? These were points that our mentor showed us and I can attest how aptly they apply to the human being.

Since the death of Erf, far more reliance on the cure rather than prevention seems to be stressed.

Some Diseases Irreversible

Though the finest raw milk may greatly improve the nutrition of an individual, it alone or in combination with the best food obtainable cannot always undo damage once done. Nothing was more clearly set forth than in experiments reported at these science conferences. In answer to the dentists and orthopedic physicians that milk causes demineralization of bones, there is no question that pasteurized milk and milk from poorly fed cattle produces osteoporosis in the experimental animal. With biologically inadequate milk the scientists were able to produce periodontitis, commonly known as pyorrhea, with loss of supporting bone and teeth. Once bone is destroyed by poor metabolism and secondary infection, it may repair with scar, but it is no longer the original bone; and a tooth lost can only be artificially replaced. Thus one can readily see that optimum nutrition including the finest milk will not restore injured tissue to optimum physiological function.

In a similar manner once allergy has been established by the use of inferior milk products, the finest of food may not be able to overcome that allergy at once, even though the new dietary intake of the individual consists of the finest foods; and it may require months of rehabilitation before the individual ceases, if ever, to show the reaction formerly caused by the product. However, there are those who can consume cheese and not fluid-milk. There are those whom butter does not bother and those who cannot take the protein element. The rare sensitivity is to the protein, while occasionally the fatty acids may be the offender.

Fear of milk-borne infection still pervades the professional thought of the day in spite of the advent of the wonder drugs. The basic fundamental principle of the World Health Organization that

man should be able to resist his environment is more of an utopian theory than a practice. Then, too, the great fear of animals and the diseases that they may transmit to man over-shadows all other thinking. The point of view that animals that produce food for man should be healthy, free from disease and, likewise, capable of maintaining themselves in optimum health in their imposed environment which in turn should be designed to provide optimum health for man, is lost. Rather than strive for such an utopia, the sanitarian and physician reply, "Man is not capable of carrying out such a concept," and fear takes over. How has man existed these thousands of years? The reply, "He was hardier and only the most fit survived." In our fear must we allow to go unchallenged our reliance on practices of production that may render a most valuable food dangerous to the consumer, and in turn may destroy an important industry?

Synthetic Milk

Must we allow our technologists to tell us in the words of Firman Bear speaking about soils at a recent meeting of the Friends of the Land⁵, "Tell us what you want and we will provide it." Synthetic milk may taste like milk, look like milk and serve as a partial food. Reconstituted milk and cream may look like the product, but they do not serve the same biological purpose. Artificial ice cream looks and tastes like the real material to some, and sometimes has more or less caloric value. A large distributor of milk once said to me, "I would not sell a quart of milk if I did not have to for I can make milk for less than two cents a quart." But before we accept the food technologists' product, let us make sure that it has been proven just as good. Let us make sure that he does not use increase in weight as his criterion of excellence of growth, but that he uses homogeneity of offspring and excellence of physical and biological

performance as the criteria. These studies cannot be run in 30 days or even one year. It will require years before a synthetic product can be proved. The technologist says this will block progress. No, it will not block progress, it might save a large segment of the human race from much illness and unhappiness.

Resume. Anyone who will take the time to read the nine volumes of the history of the farm will find that the criticisms of the physicians of today who feel that milk is a food interfering with good human nutrition have been answered therein. The greater part of this answer is given in Erf's general discussion in the second half of Volume Two. Here he discusses the importance of the health of the cows with reference to the quality of milk given; the effect of incompletely digested food stuffs by the cow on the consumer; the effect of the destruction of the producer distributor; the effect of law and bureau on the quality of milk. He quotes the early work of Lyman and Kitchin on the study of the composition of the bones and teeth and why the teeth break down. Some of these were empirical observations and

today we tend to throw such observations overboard as being unscientific.

The dairy farmer, if he wants to survive, would do well to return to the precepts of Coit and Erf, and talk about **QUALITY MILK NOT JUST PRICE**. He must be able to show that his practices produce a product that will raise the finest of animals. That the anti-stiffness factor, the proper minerals, fats, proteins, enzymes, and antibodies are all present in the amount necessary to raise the finest of boys and girls. This requires cleanliness and devotion to the cause of health, not the eight hour day nor the dollar alone.

BIBLIOGRAPHY

1. William R. Keenan, Jr., History of Randleigh Farm, Vols. 1 to 9. Private printing, Lockport, N.Y.
2. Van Wagtendonk and R. Wulzen, Vitamins and Hormones, Vol. VIII, 1951. Academic Press, Inc., New York, N.Y.
3. Constitution of World Health Organization, p. 3, Chronicles of World Health Organization, 1:29-43, Geneva 1957.
4. Inadequate Diet and Nutrition Deficiencies in the U. S., Their Prevalence Significance. Bul. National Research Council. No. 109, p. 36, Nov. 1943.
5. Antioch College, Yellow Springs, June 28-29, 1958.

FAT-SOLUBLE VITAMINS

ANTISTIFFNESS FACTOR

A critical review has been presented by Dasler (1).

Chemical nature.—Ross, van Wagtendonk & Wulzen (8) reported the preparation, from cane juice, of a compound with a tentative formula $C_{28}H_{46}O$, which alleviates the stiffness induced in guinea pigs on certain experimental diets. From the ultra violet spectrum they conclude that the substance is a sterol. Dasler (1) doubted the purity of the product.

Oleson, Van Donk, Bernstein, Dorfman & SubbaRow (6) had previously found ergostanyl acetate to be active, a finding which was confirmed by Petering, Stubberfield & Delor (7), although they had to use much higher doses. Dasler & Bauer (2) could not confirm the antistiffness activity of ergostanyl acetate, and Dasler (1) points to the great difficulties involved in the assay.

Symptoms.—Perhaps the most interesting recent development is the observation by Wulzen & Plympton (10, 11) that guinea pigs reared on stiffness-producing diets finally become deaf, as demonstrated by inability to react with ear flicking to suitable auditory stimuli. Krueger, Wulzen & Leveque (4) showed that the deafness is due to distortion and pathological

calcification of the auditory complex. Among these abnormalities were reduction and irregularity of the depression for the paraflocculus, reduction of the size of the internal acoustic meatus and of the facial canal, thickening of the wall of the bulla and of the cochlea, obliteration of the tympanic cavity, and elongation of the external acoustic meatus by a second or even a third white hard incomplete annulus around the meatus. The auditory ossicles were often deformed and sometimes embedded in a hard white amorphous papillated mass having the appearance of sugar candy concretions. A series of skulls of guinea pigs exhibiting these malformations were exhibited at the 18th International Physiological Congress in Copenhagen in 1950.

Harris & Wulzen (3) described the following anatomical changes in guinea pigs reared on the stiffness-inducing diet: a peculiar type of arteriosclerosis, necrosis, and calcification of the skeletal muscle and myocardium, deposition of calcium salts in the smooth muscle of the gastrointestinal tract, in kidneys and liver, development adjacent to bones and joints of abscesses that frequently become calcified. Hamsters reared on the same diet did not develop these symptoms.

Weimar & Wulzen (9) described blood changes belonging to the syndrome hypochythemic, normochromic, and normocytic or macrocytic anemia, reduction in number of red cells in circulating blood, increased sedimentation rate for erythrocytes, leucocytosis.

Possible relation to human pathology.—Lansbury, Smith, Wulzen & van Wagtenonk (5) state that experimental production of a collagen necrosis disease with calcinosis by means of a deficiency diet is of interest to the rheumatologist and suggests the possibility of a nutritional factor in the pathogenesis of some of the collagen diseases.

ANTISTIFFNESS FACTOR

1. Dasler, W., *Chicago Med. School Quart.*, **11**, 70-73 (1950)
2. Dasler, W., and Bauer, C. D., *Proc. Soc. Exptl. Biol. Med.*, **70**, 134-35 (1949)
3. Harris, P. N., and Wulzen, R., *Am. J. Path.*, **26**, 595-615 (1950)
4. Krueger, H., Wulzen, R., and Leveque, P., *Abstracts Communs. 18th Intern. Physiol. Congr.*, 316-17 (Copenhagen, 1950)
5. Lansbury, J., Smith, L. W., Wulzen, R., and Wagtenonk, W. J. van, *Ann. Rheumatic Diseases*, **9**, 97-108 (1950)
6. Oleson, J. J., Van Donk, E. C., Bernstein, S., Dorfman, L., and SubbaRow, Y., *J. Biol. Chem.*, **171**, 1-7 (1947)
7. Petering, H. G., Stubberfield, L., and Delor, R. A., *Arch. Biochem.*, **18**, 487-94 (1948)
8. Ross, L. E., Wagtenonk, W. J., van, and Wulzen, R., *Proc. Soc. Exptl., Biol. Med.*, **71**, 281-83 (1949)
9. Weimar, V., and Wulzen, R., *Federation Proc.*, **9**, 134 (1950)
10. Wulzen, R., and Plympton, A. B., *Proc. Soc. Exptl. Biol. Med.*, **72**, 172-74 (1949)
11. Wulzen, R., and Plympton, A. B., *Federation Proc.*, **8**, 173 (1949)

“A FRESH LOOK AT MILK”
from *Modern Nutrition*, Vol. 15, No. 11,
November, 1962

and

“ANTISTIFFNESS FACTOR”
from *Annual Review of Biochemistry*, Vol. 20, 1951

Reprinted by
LEE FOUNDATION FOR NUTRITIONAL RESEARCH
Milwaukee 1, Wisconsin

Reprint No. 27A
Price - 10¢

"Note: Lee Foundation for Nutritional Research is a non-profit, public-service institution, chartered to investigate and disseminate nutritional information. The attached publication is not literature or labeling for any product, nor shall it be employed as such by anyone. In accordance with the right of freedom of the press guaranteed to the Foundation by the First Amendment of the U. S. Constitution, the attached publication is issued and distributed for educational purposes."