SOCIETY PROCEEDINGS

PHILADELPHIA PEDIATRIC SOCIETY

President, JULIAN M. LYON

[May 10, 1938]

RECENT RESEARCH PERTAINING TO THE GENERAL AND NUTRITIONAL PROPERTIES OF MILK.

O. F. GARRETT stated:

The most important of all human foods is milk. It is practically the only food of the newborn child; it is basic in the diet during the time the child is growing to adulthood, and it forms a large portion of the diet of the adult, either as milk or in such forms as cheese, butter, ice cream and cooked foods. Not only is it the most important food in the normal diet from birth to death, but it almost invariably is the one food called on to sustain and nourish the human body during lapses from good health. Its sugar, fat, proteins, minerals, vitamins and pigments and their unique properties in nutrition have been the subject of unlimited, untiring and unfinished research throughout the world.

The old conception that milk is milk, wherever one finds it, can no longer hold. The quality of milk from various sources is as variable as the quality of most other foods from different sources. This is just as true of the nutritional quality of milk as it is the sanitary quality. The term "quality" itself implies possibility of degree. It is for this reason that the efforts of research workers and of many practical dairymen are being directed toward the production of milk of ever finer quality.

Bang's disease, or bovine abortion, in milch cows not only has created a health hazard because of its association with undulant fever in human beings but has been a source of economic loss to the dairyman. Vaccination of calves with strain 19, of low virulence, has met with considerable success in controlling this disease, although this procedure is still more or less in the experimental stage.

The mammary disease known in this country as mastitis has become the source of tremendous losses to dairymen in the form of decreased production of milk and loss of badly infected animals from the milking herd. Various surveys have estimated that between 25 and 40 per cent of the dairy cows in the eastern part of the United States have infections of the udder in one stage or another. In a large percentage of the cases there may be no health hazard. However, the New Jersey Agricultural Experiment Station has begun an extensive investigation of the whole problem.

The health of the cow and the quality of the milk are dependent to a large extent on the type and quality of feed.

On the assumption that grasses and legumes in their green form are the natural food of the cow, research workers at the New Jersey Station

and elsewhere have bent their efforts toward providing this feed throughout the year. Grasses and legumes are now cut and stored for winter feeding by being converted to grass silage with molasses, without being cured into hay as in the past.

The benefits of feeding grass silage not only are economic but are reflected in the quality of the milk produced. That color is an economic factor in the sale of milk has long been known and made use of by competitive dairymen. Its importance as a nutritional factor, however, is just beginning to be realized as the result of recent important research.

Milk produced in the spring of the year, while the cows are in green pastures, is a pleasing golden yellow. This color holds fairly well until the late winter months, when most of it disappears.

Since, as is now known, carotene is provitamin A, the feeding of grass silage during the winter months results in better nutrition of the cow and consequently in milk of better quality, as evidenced by a higher yellow color and a greater potential vitamin A content. Recent research at the New Jersey Station has shown that grass silage is superior to beet pulp, corn silage or alfalfa hay of good grade in maintaining a yellow color in milk.

On the other hand, green feeds, well preserved grass silage and good hay are excellent sources of good flavor in milk if they are fed according to the directions just given. It has been shown recently by ANDERSON, of Rutgers University, and by others that there is a close relationship between the amount of carotene in the feed and the disappearance of an " oxidized," or " tallowy " flavor from the milk.

The feeding of roughages which have retained a large portion of their carotene during the winter months helps to eliminate this flavor. Grass silage has proved especially good in this respect.

A tallowy flavor in milk may be caused by contamination of the milk with metals such as copper, nickel and iron. Minute amounts of these (as little as one part per million) will cause the trouble. Copper is the worst offender; therefore, it is absolutely essential that all metal surfaces with which the milk is to come in contact should be free from it.

Exposure of bottled milk to sunlight, even for only a few minutes, produces a tallowy flavor. Longer exposure results in a burnt flavor. This phenomenon is perhaps more likely to occur in cold than in warm weather.

When the vitamin C content is high the milk seems to retain its good flavor much better than when the content is low. Unfortunately, there seems little likelihood of increasing this vitamin in milk by feeding. On the other hand, pure vitamin C is being synthesized commercially and since its cost has greatly dropped recently, perhaps it may be economically added directly to the milk in the same way that vitamin D is being added in some states.

Since milk normally has too low a vitamin C content to provide sufficient protection even though a quart per day is consumed, it seems reasonable to expect that addition of the synthetic product directly to the milk will provide an excellent and constant source of this vitamin.

DISCUSSION

CHARLES F. CHURCH: As physicians we are interested in three questions regarding milk: Is it clean? Is it safe? To what extent does it meet the nutritional requirements of man?

Clean milk implies healthy cows; the environment must be so sanitary that the product is kept clean, and the distribution must be maintained in a sanitary manner.

Safe milk implies that bacteriologic and other contaminations of milk are at a minimum. In this country bovine tuberculosis has almost ceased because of the satisfactory control of most of the larger herds, but this is not true in England, for instance, where bovine tuberculosis is a major problem. As to Bang's disease: While the organism was discovered in 1895, it was not until 1924 that the connection between *Brucella abortus* and undulant fever was made; now the diagnosis of undulant fever in man is made increasingly. In the period from 1924 to 1929, 250 milk-borne epidemics of the disease were reported in this country. These involved 10,000 patients, with 371 deaths. Typhoid fever was the main disease, accounting for 177, or about 74 per cent of these deaths. Thus it is apparent that in the milk-borne epidemics there are other factors than the health of the cows, because typhoid fever is not transmitted by cows. Handling of milk is of primary importance. This does not much concern the large cities; but in smaller communities, where milk distributors have small plants not subjected to sanitary control such as that employed in the larger distribution plants, it is certainly a hazard. Pasteurization, while it is one of the most important safeguards against the unsanitary quality of milk, is a protection only if applied at the right point: in other words, after the contamination has taken place. If the contamination takes place after pasteurization the process is no help whatever. Seventy-one per cent of these 250 epidemics were due to the presence of the disease in the dairy farm or the distributing plant.

As to the nutritional requirements of milk a number of researches on the quality of the proteins in cow's milk and in human milk have shown the two to be practically identical. There is one exception, however, and that is the amount of cystine. Practically all the cystine present in cow's milk is in lactalbumin. Cow's milk contains relatively little cystine, and in order to make cow's milk equivalent to human milk it would be necessary to add this substance. This may be of practical importance, although not necessarily. The minerals, calcium and phosphorus are present in such prominent amounts that it is almost impossible, as all know who have attempted to calculate diets without milk, to obtain a diet that is satisfactory in calcium and phosphorus without including milk or milk products. There is a good reason for not making milk the vehicle for all the requirements of man. As GARRETT has stated, the addition of copper or iron alters the flavor.

The importance of the size of the curd certainly cannot be overestimated, for it has a direct relation to the digestibility of milk. I believe that WOLMAN would say that this remains to be proved. There is evidence that the size of the curd is an important factor in digestibility.

The flavor of the milk has received attention, and I need not go into that again. Of particular interest is the effect of milk and other dietary ingredients on resistance to infection. There is as yet comparatively little evidence on this point. WILSON in a recent paper in the *Journal of Diary Research* compared the effect of raw and that of pasteurized milk on resistance of mice to infection and found there was no difference in the two.

PAUL B. CASSIDY: In St. Vincent's Hospital in this city, up to 1926 a fair grade of pasteurized milk was used, and a large number of deaths resulted from gastro-enteritis. In 1926 certified milk was secured, with a great reduction of such deaths.

J. D. LEEBRON: DR. GARRETT, does the type of cow make any difference in the milk? The common breeds, I believe, are Ayrshire, Holstein, Guernsey, Jersey and Durham. From personal experience I think that there is some difference.

O. F. GARRETT: So far as flavor is concerned, feed is more important than breed. As far as I know, although I should not want to go on record about this, no one breed produces better milk if fed under like conditions. With regard to flavor and color of milk, the breed does make a difference. Milk of the lowest color comes from the Holstein breed, milk which you all know is the lowest in fat. Guernsey cows produce the highest color, even with the same feed. Recently my co-workers and I attempted to study the carotene in milk and found that carotene depends more on breed than on feed. Some cows convert a small portion of their carotene into vitamin A (the carotene is recognized as yellow color in milk) and then secrete into the milk a larger part. The Holstein cow does the opposite, converting a large portion into vitamin A and secreting into the milk only a small portion. On a pound per pound basis, the Holstein cow produces milk proportionately as high in carotene as the Guernsey with identical feeds. The color is not necessarily an indication of the amount of vitamin A so long as more than one breed is concerned. With one breed only, color is an indication.

LESLIE A. CHAMBERS: The consensus seems to be that milk with a high level of casein and of butter fat (Jersey and Guernsey) likewise has high curd tension and that more dilute milk has lower curd tension.

JOSEPH STOKES JR.: DR. GARRETT, has there been much evidence concerning increase of vitamin B in milk by feeding various foods containing vitamin B? Since in most cases mastitis in cattle is recognized, has sulfanilamide been tried in treatment?

O. F. GARRETT: Milk is fairly low in vitamin B, including B_1 As for effective feeding, I do not know any results whatsoever. Apparently vitamin B_1 is not essential for cows. If it is, they probably do not depend much on feeds for it and apparently do not put much of it into milk.

As for the second question, sulfanilamide has been studied. Just this week or last an article appeared giving first hand information. Our experience has been that the results were absolutely negative. I might say they were worse than that, for we killed 2 or 3 good animals with

this drug. Since that time we have learned more about it. Extensive studies have been carried out at State College in connection with the Merck Institute. In the light of some of the knowledge gained and some of the general knowledge applied to human beings, perhaps there is some progress in destroying streptococcic infections in the udder. I do not know just what advance has been made. We gave too massive doses when we started working with animals with definite mastitis. There was some destruction of mastitis with decrease in count of the organisms, but at the same time we caused a great increase in fever and decided decrease in the flow of milk and finally destroyed the animals. In the light of the latest information, however, sulfanilamide may prove to have some practical application in controlling mastitis in cattle.*

CENTRAL ADVISORY BOARD OF HEALTH
THE CHOLERA DANGER IN INDIA
VALUE OF INOCULATION

Necessity for using only Genuine Vaccine

The increase in the incidence of cholera in a number of Provinces and States during 1938 has been a subject of serious concern to nearly all public health departments in India and it is not surprising that the subject came under exhaustive discussion at the Medical Research Conference held in Delhi in December and at the second meeting of the Central Advisory Board of Health in Madras in January. In 1938 the recorded attacks and deaths from cholera in British India totalled approximately 3,23,243 and 1,58,010 respectively, the worst affected provinces having been the United Provinces with 70,000 cases and 34,000 deaths, the Central Provinces with 94,000 cases and 43,000 deaths and Bengal with 86,000 cases and 45,000 deaths. The Punjab reported 8,600 cases and 4,600 deaths during the same period.

The value of inoculation against cholera is now generally recognised and the number of inoculations carried out in India shows a large regular increase over the last few years. Recent research work under the Indian Research Fund Association has thrown considerable new light on the nature of the cholera organism. It has been shown that there are in nature many organisms which resemble the cholera organism but do not cause the disease. It is, therefore, of the greatest importance that the vaccine used for protection against cholera should be prepared from the genuine cholera organism. The Central Advisory Board of Health at its meeting in January recommended that this fact should be made widely known throughout India, not alone to health officers, medical officers and private medical practitioners but also to the general public.

The Cholera Advisory Committee of the Indian Research Fund Association considered the question of the sources of supply and the

*Reproduced from the *American Journal of Diseases of Children.*

nature of anti-cholera vaccines used in the several provinces in India. The vaccines used in the different provinces are obtained from (*a*) laboratories under the control of the Central and Provincial Governments or their public health departments, and (*b*) commercial firms. Examinations which have been carried out on cholera vaccines available in the market in India during the last 18 months have indicated that in certain cases these vaccines have not been prepared from the strains of the true organism. The view of the Cholera Advisory Committee, which was accepted by the Medical Research Conference, is that no protection against cholera can be expected from the use of such vaccines.

It is by no means certain that those engaged in the manufacture of anti-cholera vaccines are all sufficiently acquainted with recent bacteriological findings. At the same time it would be disastrous if the people of India lost their belief in the value of anti-cholera inoculations. It is, therefore, the duty of all health officers, medical officers and private practitioners to ensure that the cholera vaccine they use possesses a high protective value. With that object they should assure themselves that it is manufactured from a suitable strain of organism in accordance with the recommendations made in 1936 by the Cholera Advisory Committee regarding the technique of manufacture of cholera vaccine and the strains to be used.

For the purpose of ensuring that the vaccine is made from correct strains, it is recommended that those employed in the manufacture of the vaccine in India should be strains tested and issued by certain specified laboratories which have been continuously engaged in the study of the cholera vibrio. The Directors of the Central Research Institute, Kasauli, the Calcutta School of Tropical Medicine and the King Institute, Guindy, have expressed their willingness to issue suitable strains to all laboratories, including those of commercial firms, for this purpose. Copies of the recommendation made by the Cholera Advisory Committee in 1936 can be obtained from the Office of the Public Health Commissioner with the Government of India.*

*By courtesy of the Public Health Commissioner with the Government of India.