I have in the short sketch given above purposely refrained from entering into details which are of a purely local nature. Conditions are bound to vary from country to country and from tract to tract. I have therefore attempted a general indication of the malady and of its manifold ill-consequences tending to arrest the progress of the country, solely with a view to focus your attention on it. I have considered it enough to bring this subject to this enlightened body of Scientific Agriculturists though it has been discussed in the press and on the platform by several persons on previous occasions.

But I am not so vain as to think that the results can be achieved in a day or even in the lifetime of this generation. It is true, I dream of what may be possible in the future, but at the same time I feel I do not dream hopelessly though I am aware that "farming is anything but a get-rich-quick occupation. It is physically hard work for most, brain work for all and a constant source of anxiety" and farmers themselves who are directly concerned are not so unpractical as to hope for quick results.

# EXTRACT.

## Health in the Milk-Can.

(By Professor J. ARTHUR THOMSON,)

Milk is an almost perfect food, especially for those of tender years. Its perfection lies in the facts that it is readily digestible, that there is almost no waste, that it conduces to gastric education, and that it contains all the different kinds of food—namely, proteins, carbo—hydrates, and fats, plus a little pinch of salts and a great deal of water.

The limits to its perfection are two-fold; there is nothing to chew and milk is a good culture-fluid for various kinds of microbes, which are sometimes deadly. If we give a dog all the kinds of food that are theoretically necessary, but all in liquid form, the dog will die. The dog requires something to chew and enough solid stuff to keep the muscles of the food-canal in good tone. So, if we give our dog protein food in the form of raw white of egg, carbohydrate food in the form of syrup, and fatty food in the form of oil, and if we add some water, salts in solution, and necessary food-stuffs or vitamins, we are giving the creature all that its living matter theoretically

requires for sustenance, and yet sooner or later we kill our dog. Yet we know that in its early days the puppy flourished on its mother's milk and doubled its weight in the first nine days. The milk diet is almost perfect for early growth and development but it does not work well when the strenuous business of life begins and high explosives are required.

*Milk as a Factor in Evolution.* The necessity for milk among mammals requires thinking over. There are some precocious birds, like chicks that run about and pick up food on the day of their hatching. This implies either a valuable legacy of ready-made nutritive instincts, or very rapid learning under parental tuition. But mammals are on a somewhat different track; in the majority of cases they are born very helpless. Apart from the reflex action of sucking, they have. to begin with, few capacities for getting food; the kitten's instinct to catch mice is not usually liberated before the second month. The young mammal is born with a very unprejudiced brain, very quick to learn, and with considerable capacities for new departure.

*Brain Development.* It is important to prolong the period of brain-development after, as well as before, birth ; and to extend the time of *learning*, before responsibilities begin to press: and ***hence the importance of milk***. It is a handy form of food ; it can be had at frequent intervals ; it suits the still tender food-canal. In the case of carnivores and insectivores in particular, the supply of the characteristic flesh and insects is precarious and young mammals must be fed often. Moreover, in many cases, the young mammal remains for a while in such a helpless state that it could not easily tackle, even with the mother's help, the kind of food that is characteristic of the adult. We must rememeber that the new born kangaroo or other marsupial within its mother's pouch cannot even suck. The milk has to be forced down its gullet. They say that young otters have to be taught to like fish and they have to feed for a long time on milk before they touch flesh. We begin to see that milk has been an important factor in the evolution of the clever mammals. It made the prolongation of infancy possible.

But we must look more closely into the physiology of milk if we are to understand its singular perfection as a food for the young mammal. All living matter is a mixture of porteins in a colloid state, and the only kinds of food that afford materials for building-up and sustaining the living tissues of the body are proteins. Now cow's milk contains 3–4 per cent of proteins, such as casein and the proteins of milk are the very best that young mammals can get. For it has been shown that 63 per cent of milk proteins are retained for

growth, whereas, if we take the very valuable protein of wheat, only 25 per cent can be utilized for growth. It is important to notice that surplus protein materials can hardly be said to be storable in the body, except as part of the living tissue. So it will not do to give the young mammal, say a human baby, a generous supply of milk one day and none the next. A daily supply of protein food is essential.

*The Perfect Food.* Besides the proteins there is milk-sugar, which supplies energy for muscular activity and heat for maintaining the temperature of the body. What is not used at once can be stored in the form of animal starch or fat. But there is fat in the milk itself, and its *role* is like that of the sugar. There are likewise salts that are necessary for bone-making and for keeping up a proper balance in the fluids of the body. There are also some white blood corpuscles in a living condition in fresh milk. Last but not least, there are the accessory food substances of vitamins which are apparently indispensable to health—the gilt that seems essential to the gingerbread. We repeat. *milk is a perfect food.*

*Varieties of Milk.* The question arises at once, how such a perfect food has come into existence; and the answer must be that milk is the long result of time. Mammals have a monopoly of milk giving, but we know that the milk glands are specializations of the more ordinary skin glands, like the sebaceous-glands which keep the fur sleek and the sweat glands that have mainly to do with regulating the temperature of the body. It is very interesting to go back as near the biginning of mammals as we can go, to the egg-laying Monotremes of Australia, Tasmania and New Guinea. In the Duck-mole the milk oozes out by numerous pores on a patch of the mother's skin, and the young one licks this. There is nothing to suck.

In the Spiny Anteater, the openings of the milk-glands are enclosed within a temporary pocket where the egg is placed by the mother and where it hatches. In this case, the milk has been studied and it is interesting to find that while it is very rich in proteins, it has little or no sugar. and it has no phosphate salts. In other words it is very different from ordinary milk and it gives us an indication of secretion that came before milk and that was not up to the level of milk. Those mammals succeeded whose milky secretion was effective in supplying the wants of the young ones, and those that did not supply effective milk doomed their race to extinction.

It is noteworthy that the milk of mammals is very individual or specific, being suited to particular needs, Thus the dolphin's

milk has 43.8 per cent. of fat as against the cow's 4, and abundance of warmth-giving fat is obviously very appropriate for a mammal born and suckled in the cold sea. It is interesting also that the first milk the new born mammal gets is much richer than the ordinary milk and this is also as it should be. We must not think of milk as perfect from the first; it is like everything else, the outcome of changing and sifting, trying and testing.

*Fluctuations in Cow's milk.* Just as man has reared breeds of poultry that lay throughout a great part of the year and produce a number of eggs that would surprise the ancestral Jungle Fowl from which all our poultry have sprung, so man has reared cows that give large quantities of milk throughout long periods, after a fashion unknown in wild Nature. The cow's prolonged lactation is "unnatural" and the out come of man's selective breeding. It depends on an inborn or constitutional quality, but it is modifiable by nutritive and environmental conditions. The fluctuations in the yield have been the subject of much study and they require it.

But besides the fluctuations in yield there are fluctuations in the composition of the milk; and this is a matter of great importance. It has been proved up to the hilt that the young children of Britain are not at present obtaining the quantity of milk that they require, and it is all the more important that in its making its *quality* should be good. The value of cow's milk for young children depends on its having the proper proportions of proteins, sugar, fat and other constituents. So, human nature being what it is, there have arisen legal standards, deviations from which are punishable. Thus saleable milk must contain 3 per cent of fat and 8.5 per cent of solids not fat.

*Hard on the honest dealer.* The question is an intricate one, but we must remember the warning against those through whom offences come. It is possible to push somewhat theoretical considerations too far, with the result that a dealer in milk may be made an offender in spite of his thoroughly honest intentions. Milk is a variable secretion, changing with time of milking, with the age of the cow, with the time of year, with the treatment of the commodity, and so on. In bulked milk from large herdsIthe variations tend to cancel one another but it may be quite otherwise in a small herd. For this reason some authorities hold that 8.25 per cent. for solids not fat would be a more practical and fairer limit than 8.50. But it is only with the general idea of allowing for normal variability that we are much concerned.

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