SOME RECENT OBSERVATIONS ON INFANT FEEDING.

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[THE following fragment, read by desire of the East London and South Essex District of the Metropolitan Counties Branch, does not claim any originality. It was intended only to call attention to M. Budin's recent observations, and elicit discussion upon them.]

In the early summer of this year I paid a visit to Paris, mainly for the purpose of seeing my old friend, the celebrated M. Pasteur. He was then so feeble that I feared it was the last time I should see him alive, and he has since gone to his rest amid universal mourning.

While in the French capital I took the opportunity of inquiring what advances were being made in the departments of obstetrics and gynaecology, and I was particularly impressed by the admirable and original work respectively of M. Budin and M. Pozzi. I was especially interested in the clinic of M. Budin, where a series of investigations had been undertaken concerning the best way of feeding newborn infants. It is on these investigations I propose to say a few words in the present paper.

A large proportion of medical men in general practice, as well as obstetric physicians, have constantly to consider and give advice on the management of newborn children, and it is a subject which so nearly touches the affections and interests of so many households, that any fresh contribution, placing it on a scientific and successful basis, must necessarily be welcomed by all of us.

In truth, the well-being of infants is so important not only in a domestic sense, but in its relation to the State, that it may well engage the best faculties of the medical man, and not to be left, as it too frequently is, to the bungling mismanagement of ignorant and opiated nurses.

We are all aware that the mortality of children during the first year of life is very large in all countries. In certain portions of France, not more than ten years ago, it amounted to more than 50 per cent.; at Lille in 1850, it actually amounted to 89 per cent. Even in Paris, no longer than ten years ago, it was found by Dr. Lede to be more than 27 per cent. In this country the percentage is apparently not quite so large, but the Registrar-General's reports show a large preventable mortality, and the question for medical men to solve is, how these deaths of young children are to be obviated.

When we look at the domestic surroundings of the poor, the bad sanitary conditions in which we live, and the ignorance from a scientific standpoint they show of the proper methods of feeding and rearing children, we cease to wonder that so many children die in infancy; we rather wonder that so many survive. Unfortunately, of those who live, many, as the result of mismanagement in the early months of life, emerge from infancy enfeebled and stunted in growth; eventually, if they live long enough, they themselves become the parents of a degenerate race. But it is not among the poor only that newborn children are mismanaged; the children of the rich are commonly entrusted to the care of women nurses, imperfectly educated for the important duties they undertake. If they are quick enough, they generally contrive to pick up a little traditional lore from other nurses, whose sources of information are anything but scientific, and who make up for their lack of knowledge by self-assertion and deprecation of the interference of the doctor. The widest prevailing fallacy among these women is, that infant's food cannot be nutritious unless it is thick, and hence they feed infants soon after birth with various admixtures of farinaceous stuffs which the young stomach cannot assimilate.

All instructed medical men now know that some form of animal milk, without the admixture of any farinaceous material, is the most suitable food for children during the first months of life, but the difficulty hitherto has been to find with exactitude the best substitute for mother's milk, and to prevent misadventures when for any reason the child

cannot be suckled by its own mother. The researches of M. Budin and of his assistant, M. Chavane,¹ have shown conclusively that one of the chief difficulties in the artificial feeding of infants is in keeping the milk of the cow or other animal free from contagion of bacilli which are always floating in the atmosphere, and which, when introduced into the digestive organs, produce green motions and diarrhoea. Milk of every kind is found to be an admirable medium for the cultivation of these microbes, and its exposure to the air for even a short time, more especially with a warm temperature, is sufficient to favour their very rapid development. The result of imbibing these organisms, even in small quantity, is that the child is seized with diarrhoea and vomiting, and these unchecked speedily exhaust vitality and extinguish life.

MM. Budin and Chavane start with the proposition which they cannot too strongly emphasise, that of all ways of feeding a newborn infant, that of suckling by the mother or by a healthy wet nurse is the safest and the best. The substitute of a wet nurse when the mother for any reason is unable to suckle her child is much more prevalent on the Continent than in Great Britain. Even in hospitals, when a woman cannot nurse, the State provides a wet nurse, and there seems to be no difficulty in providing an adequate supply of wet nurses. M. Budin has charge in his maternity hospital of a department in which all the premature babies born in certain parts of Paris are brought together. Here are dozens of small and imperfectly developed infants, some being kept in *couveruses*, or incubators, to maintain their bodily temperature, and all except those suffering from syphilis or other diseases are nourished from the breast. I saw several of these wet nurses suckling two diminutive babies at the same time, one at each breast. Those whose condition rendered it inexpedient to put them to the breast were fed either with human milk drawn previously from a woman, or on cows' or asses' milk specially prepared for the purpose. In Great Britain there is a certain prejudice, besides the difficulty and expense of providing a wet nurse, and feeding by hand is much more universal.

Most of us know something of the difficulties surrounding hand-feeding, of the small or more serious ailments which spring up in connection with it, and the constant need of prescriptions to combat these inconveniences. But all of us may not have appreciated the true causes of these inconveniences, nor understood that they represent but another link in that chain of microbic pathology which we owe primarily to the researches of the great man who was finally interred, with such well merited honour, at the Pasteur Institute, on November 25th. We have rather been disposed in past times to attribute the derangements of digestion to that indefinite change in the milk which we call "turning sour," or to the casein of cows' milk being too strong for the infantile stomach, and the necessity of further dilution with water. This idea has been strengthened by observing the masses of undigested curd passed in the evacuations. When some other food has been added to the milk, this perchance has been blamed for the derangement.

M. Budin's researches clearly indicate that, next to mother's milk, the milk of some other animal, like that of the ass, the goat, or the cow, and this undiluted with water but properly sterilised, is absolutely the best. As the milk of the cow is the most readily available, this is used by M. Budin, and his experiments were made chiefly with cows' milk.

Since it was discovered that various zymotic diseases have been produced by drinking infected milk, various sanitary authorities have impressed upon us as a measure of precaution the necessity of always boiling milk for household purposes, and there can be no doubt that boiling is a very effective method of sterilising milk. But boiling milk has unfortunately the effect of giving it a disagreeable taste, and it seems besides to have the effect of so firmly coagulating the casein as to render it less easily digestible for the infantile stomach. The method of sterilising milk recommended by M. Budin is to allow it to remain in a bath of boiling water, a *bain marie*, as he calls it, for forty minutes. The apparatus he advises consists of a series of bottles, each capable of holding a child's meal, and furnished with india-

¹ See *Bulletin de l'Académie de Médecine*, 1893 and 1894.

rubber stoppers. These bottles are placed in a pan of water or water bath, which is kept boiling for the prescribed time. The covers or stoppers are so adapted that they allow vapour to escape during the heating process, but as the bottles cool they are drawn down into the opening by atmospheric pressure, and fit like suckers into the orifice, thus showing that they are air-tight. It is a notable fact, not generally known, that it requires a higher temperature to boil milk than water, and consequently milk can be immersed in boiling water for forty or more minutes, without being itself boiled. The temperature is, however, raised high enough to disinfect it of all the commoner germs of disease, while the flavour of boiled milk is not imparted to it; indeed, the taste is little altered from that of new milk. But the additional advantage gained is that the curd of the milk is separated into minute particles or flocculi and so softened that it does not form hard concretions in the digestive tube of the infant. It is much better adapted, therefore, for infant feeding, and is likely also to be of great use in the case of adults who have feeble digestion, or for other reasons find ordinary milk objectionable. M. Budin deprecates very much diluting milk with water or even barley water for infant feeding. He holds that it is much wiser, and more in the interests of the child, to give a smaller quantity of pure milk properly sterilised than a larger quantity diluted with water. In all the observations made in reference to this point he found that the greater quantity of fluid, necessitated by dilution, tended to derange digestion, while the normal and progressive increase of weight was not maintained. Always supposing that too large a quantity of sterilised milk was not given, and it was regulated in accordance with the age or needs of the child, there was no difficulty in the assimilation of the pure milk.

M. Budin insists that both in hospital and private practice the progressive wellbeing in the infant is best ascertained by weighing it. In his hospital the children are weighed every day, and their weight is registered, so that an increase or diminution is readily observed. He has constructed an ingenious table which serves as a register. In the first column are figures in grammes, the lowest ones at the bottom, with an ascending scale. The days and weeks are indicated along the top, and thus a curve may be traced with pen or pencil, as in temperature charts. Even under normal circumstances the weight of the child drops a little during the first week after birth, but after that time it ought steadily to advance. In the charts alluded to, whenever water was added to the milk there was always a little drop in the curve, showing that less nourishment had been absorbed, and a like drop was noticed if, perchance, the child had diarrhoea, or catarrh, or other infantile ailment, showing that nutrition was impaired. To make the sterilisation of milk effective, great care must be taken to exclude every source of infection from germs which may get access to the milk after the process is completed, either in the vessels themselves or in the apparatus used for feeding. Many of the misadventures were found to arise from lack of precaution in this respect. Sometimes the milk, after being duly sterilised, was again exposed for some time to the air before being used, and thus became again the medium for development of bacteria, more especially in a warm atmosphere. The Académie de Médecine in Paris does not think it beneath its dignity to express an opinion on babies' feeding-bottles, because it concerns a matter of vast importance to the community, and it has emphatically condemned all feeding-bottles with long and complicated tubes, because it is impossible to keep them clean and sterilised. Consequently they become the nidus for bacterial development, particularly at the joints. The simplest bottle, which can be sealed throughout is the best, but there may be great difficulty in persuading poor women to adopt them, because although a siphon bottle may be the means of poisoning her baby, yet she can put it beside the child in its cot and go about her other occupations, leaving it to absorb its nourishment automatically.

If pathogenic organisms can be prevented getting access to the digestive organs of young children, one of the most fertile sources of infantile diarrhoea would be removed and the mortality from this cause greatly lessened.

Sterilised milk seems in certain cases actually to be a remedy for infantile diarrhoea, for always supposing that a

fresh supply of irritating organisms is not poured continuously into the digestive canal, Nature will eliminate the poison up to a certain amount, and then untainted milk is retained and becomes nutritious.

If M. Budin's deductions turn out to be correct—and he is a careful and earnest observer—the use of condensed milks may to a large extent be discarded; these have crept largely into use, and no doubt are very convenient in emergencies. They may seem to answer for a time, but in my experience they are very defective sources of nourishment, and should never be employed when fresh milk can be procured. Dr. Barlow, who has written so ably on infantile scurvy, believes that by the condensing process milk loses its antiscorbutic property, and so favours scurvy in children. This may possibly occur when milk is boiled, but the risk is minimised when it is simply sterilised and not boiled.

To sum up M. Budin's conclusions, therefore, one may say: 1. That he regards breast milk as absolutely the best and safest nourishment for an infant, and that when a mother cannot nurse her own child the best substitute is a good wet nurse.

2. When artificial feeding must be had recourse to, cows' or another animal's milk sterilised by the method alluded to is by far the best substitute, but even when milk has been sterilised it must be guarded by certain precautions, and the simplest feeding bottle is the best.

3. Sterilised milk is best given undiluted with water, the quantity given to vary with the age of the child and other circumstances.

This, I presume, implies that the child is in normal health. If any derangement of the digestive organs or other abnormal condition is present, dilution with barley water or other modification of food, may be required as well as medicines.

He objects to all farinaceous forms of food during the first year of life.

The method of sterilisation of milk as recommended by M. Budin is not new, and he does not claim any originality in this respect. Inexpensive apparatus for this purpose is to be found with many instrument makers. I learned quite lately that the calves used for vaccination at the National Vaccine Institution are now fed on sterilised milk to keep them healthy. It would certainly be a satire if we were not to adopt the same measures of safety for human beings which we provide for the lower animals. Sir Dyce Duckworth, who has just returned from America, tells me that a system is gradually making way there in which medical men habitually write prescriptions, expressing the exact amount of casein of cream and of sugar which milk is to contain in accordance with the age and condition of the infant. The milk is at the same time carefully sterilised. In Boston and New York especially laboratories have been established to make up these prescriptions. Sir Dyce has furnished me with a pamphlet by Professor Rotch of the Harvard University, in which all the details are set forth with great ingenuity and clearness.

This is bringing the science of feeding children to very exact proportions, but entails great trouble and possibly expense. Budin's and Chavane's method, if generally successful, can be more readily adopted for domestic use, as it is very simple and entails little expense. The more elaborate one may be reserved for special cases or until it is more generally available.

INTERNATIONAL PRIZES IN BACTERIOLOGY.—The Argentine Medical Club of Buenos Ayres has decided to honour the memory of Pasteur by offering prizes for bacteriological research. Competitors must submit original unpublished researches relative to some point of bacteriological technique; or to the bacteriology (etiology, diagnosis, prophylaxis, and treatment) of the infectious diseases of man or animals, or to the industrial applications of microbiology. Papers, specimens, preparations, cultures, and photographs must be sent before May 31st, 1897, to the President of the Argentine Medical Club, Calle Corrientes, 2038, Buenos Ayres. Papers, which must be authenticated by a motto in the usual manner, may be written in Spanish or in French. The first prize will be a sum of £80, the second £40, the third a diploma of honour.