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INFANT FEEDING.*

BY

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ON INFANT FEEDING.

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Gentlemen,

In a town like ours, where many mothers resume their occupations almost immediately after the birth of their young, artificial or hand-feeding is very prevalent, and we are enabled in the course of our professional work to observe a large number of infants brought up in this way.

I thought it would therefore be interesting to the members of this Society, to place before you a few observations on this very important subject, and give you my views on the matter, derived from personal experience. I am anxious, however, to hear your opinion, and I trust you will fully and freely criticise any statement I may make.

Well, gentlemen, it is unnecessary for me to remind you of the delicate structures which go to form the body of the babe, nor is it necessary to remind you of the delicate action of the young stomach. I only intend, therefore, to discuss with you the best means of rearing infants, which from any cause have been deprived of their natural food, namely, mother's milk.

Without troubling you with figures, I would like to remind you of the very large infantile mortality, especially among children under the age of one year. Attention has frequently been called to this by various Medical Officers of Health, and I believe our own Officer of Health has not been behind hand, all attributing the high death-rate to injudicious feeding. The Town Council of Exeter even did not think this subject beneath its consideration, and thus drew public attention to the matter.

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Before discussing the food and its preparation, let me observe that there is a difference of opinion among medical men as to the *mode* of feeding. I have a very strong opinion that spoon-feeding is much better than the bottle. No doubt sucking is the natural method of obtaining food for the young, but I think you will admit that they do not obtain their food by sucking it through a long tube which is often choked up with filth, in the shape of curds and sour milk.

Dr. BRAIDWOOD however holds a contrary opinion, and recommends the bottle, and in his excellent little work on "The Domestic Management of Children," gives it as his opinion that the *feeding bottle* is preferable to spoon-feeding. On the other hand, "at a recent meeting of the Academy of Medicine, M. TARNIER read a paper on the subject (Infant Feeding). He began by stating that he much preferred cup or spoon-feeding to a nipple bottle, when the child cannot be fed by the mother's milk. Although condensed milk may be wholesome for adults, M. TARNIER declares that it is quite useless for young children; and he considers that nothing can be compared with the mother's milk, which is well-known to be the first food for infants. Artificial feeding has been tried in Paris with very disastrous results, as may be seen by the following statistics drawn up by M. BERTILLON:—In 1881, 60,856 children were born in Paris, of which 14,571 were sent away to be nursed, while 46,285 remained in the city; of the latter number 10,180 died, being a mortality of 22 per cent., while 5,202 of the former (nearly one-half) died of athrepsy, that is to say bad feeding. Of these 5,202 infants, 3,057 were fed with a nipple bottle. M. TARNIER then showed (1) that the lives of young children cannot be safe, unless they are fed on mother's milk. (2) If the mother's milk is insufficient, it should be *mixed* with the other. (3) Wet nursing, which is favourable for a child thus nourished, is equally dangerous for a child of that nurse. (4) Artificial nourishment is very much inferior to mother's milk, no matter how it is prepared, or what kind of milk is used. It is therefore better not to use it unless

absolutely necessary.—(*Vide Medical Press and Circular*, Vol. II., for 1882, pp. 336 & 337)."

In spoon-feeding it is necessary at the commencement to use the same kind of food that is put into the bottle. The thrusting down a child's throat bread-sop, oat-meal gruel, or bread-and-milk, is not what I mean when I speak of spoon-feeding. When spoon-feeding is adopted, it should be administered slowly and regularly, and the child gradually got accustomed to it.

If bottle-feeding is preferred, let me recommend the old-fashioned boat-shaped bottle, which has no equal; it is readily and easily cleaned, and it is not burdened with a long India-rubber tube, which can never be thoroughly freed from curds, and it approaches an artificial breast much more nearly than those we commonly see in use.

In bringing up infants deprived of their natural food, our object should be to imitate the natural food, as nearly as possible, and also the same regularity in administering it. It is very objectionable to place a baby in a cot or cradle with a teat in its mouth to suck away when it feels inclined. A baby should always be taken up to have its meals, just the same as would be done if it was suckled at the breast. Fresh milk should be put into the bottle each time the child has to be fed.

For *bottle-feeding* therefore it is necessary there should be (1) a thoroughly clean and sweet bottle; (2) food of a proper temperature; (3) a sufficient quantity of food for one meal; and (4) food of a proper quality.

Now, gentlemen, I will ask you what should be *the food for the bottle?* My reply is that for the first six months of a child's life, its food should imitate its natural sustenance as nearly as possible, and we should use fluid food. I am in the habit, therefore, of recommending cows' milk mixed with water to dilute it, and having this sterilized by boiling. Farinaceous foods should be carefully avoided during the first *six* months of infantile life.

In selecting the kind of food by which we mean to imitate nature, it is well to remember that the milk of animals differs from human milk in some important particulars, especially in regard to the amount of solid constituents and extractive matters. We have to carefully observe the amount of solids and reduce them if necessary so as to make the milk more digestible, and yet we must take care that it is sufficiently nourishing for the child.

The following Table shows the approximate quantities :—

	Water.	*Butter.*	*Caseine.*	*Sugar & Extractives.*	*Fixed Salts.*
Human	890	25	35	42	2
Cow	860	38	68	30	6
Goat	868	33	40	53	6
Ass.....	907	12	16	62	3
Mare	888	8	16	83	5

It will be seen from this table that the milk of the ass and the mare approximates and resembles human milk, but the sugar and extractives and also the fixed salts are in excess.

In a lecture on "Infant Foods," by Professor ALBERT R. LEEDS, we find the following observation :—"This is granting that woman's milk is the best infants' food, in what manner should the nature and proportions of the components be determined of any substitute, we may be necessitated to employ ? Certainly only by knowing in the first place, the average composition of human milk."

Dr. LEEDS did not agree with the previous analyses that had been made, and therefore set to work to collect samples, and analyze them for himself. The samples were, he says, "taken from healthy women, mostly young and primiparae."

The samples usually amounted to two ounces, and were the entire contents of the gland, and taken in most instances two hours after the time of last nursing. He gives the following results :—

ANALYSIS OF FORTY-THREE SAMPLES OF WOMEN'S MILK.
RE-ACTION, UNIFORMLY, ALKALINE.

	Average.		*Minimum.*		*Maximum*
Specific Gravity	1·031	...	1·030	...	1·035
Water.....	86·766	...	83·34	...	89·09
Total Solids	13·234	...	10·91	...	16·66
Total Solids not fat ...	9·221	...	6·57	...	12.09
Fat.....	4·013	...	2·11	...	6·89
Milk-Sugar	6·997	...	5·40	...	7·92
Albuminoids.....	2·058	...	0·85	...	4·86
Ash.....	0·21	...	0·13	...	0·35

The re-actions were alkaline with one exception, and this was neutral, the alkalinity remained for twenty-four hours.

He remarks, and you will be able to observe from this table that "the most striking feature in these analyses is the great range of variation in the amounts of certain constituents, more especially in the albuminoids, the maximum, 4·86 per cent. being nearly six times the minimum, which is only 0·85 per cent. The next most variable constituent is the fat, the maximum being more than three times the minimum; then come the saline matters, nearly three; the last of all the milk-sugar, which differs but little from the mean (6·997) in most samples. In other words, the most striking peculiarity in woman's milk is not the constancy but the great variability in its composition."

Professor LEEDS gives further an analysis of samples of unadulterated cows' milk, such as is sold by farmers to the citizens of New York and Philadelphia. He gives in a tabular form the following:—

ANALYSIS OF ELEVEN SAMPLES OF WHOLE MARKET MILK.

Water.....	87·7	per cent.
Total Solids	12·3	,,
,, not Fat	8·48	,,
Fat.....	3·75	,,
Milk-Sugar	4·45	,,
Albuminoids.....	3·42	,,
Ash.....	0·64	,,

For comparison, Professor LEEDS gives the tables of Professor KÖING, as follows :—

	WOMAN'S MILK.				COW'S MILK.		
	Mean.	*Min.*	*Max.*		*Mean.*	*Min.*	*Max.*
Water	87·09	83.69	90·90	...	87·41	80·32	91·50
Total Solids...	12·91	9·10	16·31	...	12·59	8·50	19·68
Fat	3·90	1·71	7·60	...	3·66	1·15	7·09
Milk-Sugar . .	6·04	4·11	7·80	...	4·92	3.20	5·67
Caseine	0·63	0·18	1·90	...	3·01	1·17	7·40
Albumen	1·31	3·39	2·35	...	0·75	0·21	5·04
Albuminoids ..	1·94	0·57	4·25	...	3·76	1·38	12·44
Ash.....	0·49	0·14	$\frac{2}{1}$	...	0·70	0·50	0·87

When we compare woman's milk with cow's milk we find the non-coaguable portion exceeds the coaguable portion in woman's milk, whilst in cow's the total albuminoids, which is coaguable by acids, is far greater than the non-coaguable portion. Its milk-sugar also largely exceeds the cow's, and the fats also are slightly more, whilst the albuminoids in woman's milk fall far below the albuminoids of cow's milk.

Again, Professor LEEDS observes, "It would seem that the best solution of the problem of artificial infant feeding is to be found in the substitution of cow's for human milk. But, inasmuch as the secretion of the herbivora is radically and in all particulars different from that of the omnivora, cow's milk must be profoundly altered, so as to simulate in the ratio and nature of its constituents human milk."

The method usually employed to render cow's milk similar to human milk is the addition of some diluent. The mere addition of water will reduce the percentage of albuminoids to the same percentage which we find in human milk, but the simple addition of water to milk will not diminish the size or compact character of the clot of cow's milk. Various attenuants may be used for this purpose—starch, arrowroot, gum, or other bland nutrient will do this partially.

Cow's milk may be peptonized and thus rendered fit for the stomach of the infant ; slight peptonization is usually sufficient. Peptonization is the conversion of a proteid into a peptone, and we have this exemplified when caseine is digested, that is, we have the complex particles broken up into smaller ones and rendered more easy of assimilation. Peptonized milk cannot be curdled, and still it presents all the nutrient ingredients—dissolved caseine, sugar of milk, and oil globules.

With reference to cows' milk, Dr. ROUTH, in his valuable work on "Infant Feeding," says :—

"Now it is clear, comparing this with human milk, that (1) the quantity of water is less in that of the cow. (2) The solid matters are in greater quantity. (3) The sugar is less in amount. (4) There is more caseine. (5) And more butter (6) The salts are also in excess."—(*Vide Opus. Cit.*, p. 297.)

Dr. ROUTH goes on to show that simple dilution will not suffice, because if it diminish the relative amount of caseine and butter, it reduces unduly the amount of sugar.

Milk for infants' food should always be fresh, for if milk be allowed to stand for some time its relative proportions will alter. Milk is also injuriously affected for nursing purposes when it is carried for a great distance by rail, and its composition varies much according to the pasture on which the cows are fed.

It is stated that in the lowlands the milk of cows is better adapted for cheese-making, as it contains a greater proportion of caseine; again, in mountainous districts it is better for making butter, as it contains more fats.

Now I think we shall all be agreed on one point, namely, that when it is desirable, from any cause, that a child should be brought up by *hand-feeding* instead of by its mother, its food should be as nearly as possible to that of mother's milk. Now to get it like this should be our object ; but it is in the method of attaining this that most of us will differ. I have been in the habit for some time of ordering cow's milk largely diluted and

boiled and the thin film removed from the top after it has cooled somewhat; and I came to adopt this method of procedure, not from chemical examination, but by observing what proportions of milk and water suited the delicate digestive powers of the infant, and if I have erred in my observations, it has been owing to the majority of my cases having stomachs of unusually weak digestive powers.

I usually recommend the milk to be obtained from one cow, and from birth up to the age of *three* months recommend the following proportions :—

Cow's milk..... 1 part
Water..... 3 parts

Mix and boil, then pour into a clean jug, add one teaspoonful of sugar of milk, or two pieces of loaf-sugar to the pint, and a little portion of salt; when it has cooled, the film to be taken from the top, and the bottle nearly filled. At *three months* old the proportions should be *one* of milk to *two* of water, and this gradually increased till the child at *six months* the proportions of milk and water are equal.

Now comes the question, is the proportion of milk to water too small? My answer would be to those who differ from me that a child will thrive on this diet, and it will rarely disagree if given by a spoon or by the bottle, providing the bottle is cleansed each time before use.

I know that some children will simply thrive on anything—bread-pap, biscuits, arrowroot, corn-flour, and the various prepared foods.

Some medical men advocate milk and water (pure and simple), but this is not like human milk, therefore, I prefer to have this boiled so as to remove the coaguable portion, and thus, to use a term of Professor GAMGEE, to sterilize it, and then add sugar of milk.

Now, with regard to these proportions, allow me to quote to you the opinion of others. I find in a letter to the *British*

Medical Journal, Vol. I., for 1884, p. 1027, Mr. N. E. DAVIES writes: "How long will it be before mothers are taught or learn this simple fact,—that if they do not suckle their offspring themselves, there is no safe substitute, until the period of teething has commenced, for the natural food of the infant but milk, and that is given in the proportion of two parts of pure milk to one of water, and to the extent of rather over a pint a day of cow's milk is healthy sustenance, and in ninety-nine cases out of a hundred this diet, with the addition of a little sugar of milk, will make a plump, rosy infant. The further addition of ten grains of carbonate of soda to each quart of cow's milk will make it keep longer, and less likely to disagree."

Mr. DAVIES also recommends the Pure First Swiss Condensed Milk as a perfect substitute for cow's milk, and for the first two or three months of infant life, he says, it should be diluted with five times its bulk of warm water and given to the extent of a tin a day.

Mr. BEATTY, in reply to this, writes:—"In my opinion one of the great faults in dry-nursing is giving the infant its food too strong, and here I must beg to disagree with Dr. DAVIES' valuable letter, not as to the kind of food but its strength. He recommends two parts of milk to one of water. Surely this is too strong for a newly-born babe. Again, with regard to condensed milk, he recommends it to be adulterated with only five times its bulk of warm water, and given to the extent of 'one tin a day.' I think there must be some error here, as an infant never ought to consume a tin of condensed milk in twenty-four hours. When the mother is unable to nurse her child, I recommend one cow's milk, well adulterated at first (1 to 3); if this agrees with the child, I have it gradually strengthened, so that when the child is six months old it is getting two parts milk to one of water."—(*British Medical Journal*, Vol. I., 1884, p. 1076.)

Also, in a letter to the *British Medical Journal*, Vol. II., 1884, p. 304, Mr. BEATTY says:—"I have been called over and over again to see infants suffering from diarrhœa and sickness,

caused by being fed on cows' or condensed milk too strongly mixed. On ordering their food to be properly diluted, the diarrhœa and sickness in most cases soon cease, and the children thrive."

Now, my experience would entirely agree with Mr. BEATTY, but it may be that I have, as before stated, met with an unusual number of infants having weak stomachs.

My excellent friend, Mr. BRADY, in the *British Medical Journal*, Vol. II., for 1884, p. 643, rather takes me to task for recommending the milk of one cow, and states that it has been proved "more than once that the milk taken from a number of cows, for any length of time, say six months, is of more uniform quality than that procured from one."

Well, I have not seen the proof of it, yet I am willing to admit that there is some reason in this; at the same time, I do not think Mr. BRADY would recommend the milk of a number of mothers to be mixed, or recommend a child to be suckled by a number of wet nurses.

The one cow's milk is liable to variation from the time of calving up to the period of again becoming dry, but the same would apply to a number of cows, and so the mixture would vary also, and the same applies to mother's milk. The composition of human milk varies from the period of parturition up to the time of weaning; it also varies according to the food and drink taken, and so also does cow's milk. It is therefore for the following reasons that I recommend the milk of one cow: (1) Usually the best cow in the dairy is selected; (2) more attention is paid to her feeding, and (3) the milk is less likely to be contaminated by the addition of impure water. I am not singular in advocating this plan, for I believe it is pretty generally adopted where it is possible to do so. Of course, the greatest attention should be paid to the milk being fresh, and this no doubt is more important than having it from one cow. Dr. ARMAND SEMPLE, in his "Mother's Guide," p. 10, says,

"The next important step is to select milk; the principal qualification—I was about to say the only one of importance—is that it should be fresh."

Dr. SEMPLE further shows that although fresh milk can be got to our dairies readily by rail, the worst thing that can happen to milk is the churning from jolting in its transit, and thus it becomes acid, and we get a train of injurious effects following its use. He recommends the milk to be tested with litmus paper before using it. He recommends also that the dairy should be visited and the hygienic surroundings of the cows inspected, and states that "some cows are noted for their milk agreeing with infants, and should the farm from which your milk supply comes have such an one, try and secure that for your own use."—(Opus cit., p. 13.)

Mr. BRADY, in his communication, further tells us that many mothers and nurses are in the habit of frequently over-feeding children, especially when the bottle is used, so that if you do not limit the quantity, the result is that every time the child cries the bottle is stuffed into its mouth. He then alleges that if this weak compound (one part milk and three parts water) be used, the stomach overloaded, no wonder the child vomits green acid water and small curd.

Now, the diluted milk which I have been in the habit of recommending is for the purpose of preventing both over-loading and over-feeding. We wish to give the child something which will be readily digested; over-loading is prevented by what Mr. BRADY appears to be in the habit of recommending, for he goes on to say that, "I have always been in the habit, and I never yet had a case that gave me trouble when my advice was adhered to, of recommending that an infant's food should consist of equal parts of milk and water for the first three months after birth, two ounces to be given in the course of two hours; any portion unused at the end of that time thrown away and a fresh supply made, but in no case is more than the measured quantity to be given. After three months the strength

may be gradually increased till it is three parts of milk at six months, and as the child grows and becomes able to assimilate more food, the quantity may be increased to three or four ounces in two hours; but in no case is the double quantity, or any portion of it, to be given during the time; if the child cry, he wants nursing, not feeding. I know of a number of children brought up in this way who, for the first twelve months of their lives, have scarcely required a teaspoonful of medicine."—(*British Medical Journal*, Vol II., 1884, p. 643.)

Now, this is sensible advice, and I have no doubt it will act, especially if the milk and water be boiled, and the thin film removed and a little sugar added. It is, however, in the minuteness of the directions for giving each meal, in the two ounces at regular intervals, that the safety comes in, but this is different to the advice of Mr. DAVIES, who recommends a quart of cow's milk a day (*Brit. Med. Journal*, Vol. I., 1884, p. 1285). Mr. BRADY'S quantity would equal twelve ounces of cow's milk, surely a wide difference.

As I have previously mentioned, I advocated diluted milk (one to three) boiled, and sugar or sugar of milk added and the coagulated caseine removed. I am sure that children do retain this and, what is more, thrive on it.

The bottle should always be cleansed before the next meal is put into it. I do not limit the meal to two ounces, but admit, if I did so, the proportions of water to milk would be too great. Now, I am anxious to show you, and hope you will pardon me for quoting so freely from the writings of others, but I am anxious to prove to you that attention to the preparation of the food is the secret of the success which should attend hand-feeding. Dr. ARMAND SEMPLE says, "If a child is to be entirely bottle-fed, it can be fed at first every *two hours*, and then it is well to increase the amount of water to a little more than one-half, gradually increasing the quantity of the milk as the digestion improves and the child gets stronger." ("Mother's Guide," p. 15.)

Mr. BEATTY, whose opinion I have previously quoted, sent me the following extract from a letter which he had received from the late Dr. ANGUS MACDONALD, of Edinburgh, a well-known authority on children's diseases. He says: "From much practical experience I have been led to adopt your views about the need of diluting cows' milk and also condensed milk. For infants I recommend a *small* teaspoonful of condensed milk to a bottle two-thirds filled with rice-water or barley-water. I always tell the nurse to watch the effect on the child. If the milk is too strong it causes looseness of the bowels; if too weak the children fall off in flesh. I teach to dilute cow's milk at first largely; as the child is able to digest it and gets older, the milk is made stronger gradually. I have seen most disastrous results from imperfect feeding of infants, and quite agree in your views as to its being the main cause of infantile illness. I find it exceedingly difficult to get either nurse or mother to believe that milk only can give rise to solids. I have a constant fight with them on this point, that farinaceous foods, besides being indigestible in the tender mouths when salivary glands are in abeyance, can even when digested only give rise to heat and not tissue formation of afibrine character."

We remember that:—

"*The solubility of the ingredients in various milks forms an important element in the success with which the different milks may be substituted. The human milk must be regarded as the type of perfection in its constituents and the properties of those constituents.*"

It is generally admitted that the caseine of mother's milk forms a soluble compound, and not a hard curd, unless there is excessive acidity of the stomach, and it is owing to the small proportion of caseine which asses' milk contains that renders it more easily assimilated by the delicate stomach of the child.

Dr. BENSON BAKER says:—"Milk with proportionately less nutritive matter is better adapted to sustain a child in vigorous health than when given in a richer and more concentrated form. It is not uncommon to find children that do not

progress on milk and water; it is then customary to lessen the amount of water and increase the milk, from the idea that the food is too poor. As a rule, no proceeding could be more disastrous to the child. If the milk had been further diluted, the curse of the complaint, viz.: the inability to digest the concentrated solids would have been restored. The reason why human milk agrees so much better than other milk is because it is so much diluted and the cheesy substance more soluble. It is on this account that asses' milk succeeds so well. For all ordinary feeding, cows' milk answers very well, provided that care be taken to make it as nearly like human milk as possible. Human milk contains little more than half the quantity of cheesy matter that is found in cows' milk, hence the necessity for freely diluting it with water. Cows' milk should be mixed with half its bulk of pure, soft tepid water. The following proportions of added ingredients approximate the proportions and properties of human milk, and generally answer well (sometimes a little more water is required during the first few weeks of infant life):—Cow's milk, half-a-pint; water, the same quantity; a small teaspoonful or sixty grains of sugar of milk, and two grains of phosphate of lime, and the addition of two teaspoonful of cream, if the quality of the milk be good; but when the milk is poor or skimmed, or such as is known as London milk, then the quantity of cream must be at least doubled. *Cows' milk, thus modified, is rendered very nearly like human milk, both in the proportion of its constituents and its solubility.*"

Mr. Edmund Owen, F.R.C.S., Eng., and one of the Surgeons to St. Mary's Hospital and the Children's Hospital, Great Ormond Street, states, in a lecture delivered at the International Health Exhibition, the abstract of which will be found in the *Lancet*, for 1884, Vol. II., p. 270:—

> "The lecturer said that he was apprehensive lest preserved milk should entirely usurp the place of fresh milk in the nursery. At present it was far too widely employed, and he entirely failed to see how it could form a more

wholesome diet for infants—as some maintained it did—than the fresh article. He could no more believe this than the adult would thrive better on tinned American meat than on fresh sirloin. For babies, cow's milk, which should be always fresh, should be mixed with an equal or *even greater bulk* of warm water, in which a lump of white sugar and a pinch of salt had been dissolved; the fresh milk was an excellent antiscorbutic, and it was therefore always needed. Often when he had been assured that cow's milk could not be retained by the infant stomach, he had been able to demonstrate to the contrary by mixing even as much as double the quantity of water with it. In summer-time water might be added to the mixture."

Besides the methods of preparing milk which I have just mentioned, there are various other modes of preparing artificial food. Dr. ASHBY, of Manchester, speaks highly of the "Cream mixture," originally suggested by BIERDERT, and which consists of varying proportions of cream, water, milk, and sugar, the amount of milk varying according to the digestive powers of the infant. For a newly-born child, or one suffering from gastro-intestinal catarrh, no milk is added, the cream supplying sufficient nutriment.—(*Medical Chronicle*, for May, 1886, p. 112.)

Dr. MEIGS' food for infants is also highly spoken of, but the trouble in preparing the same is a great drawback. I will give you the method in full:—

"Dr. ARTHUR J. MEIGS has devised a new food, with which he states he has attained very good success in as many cases as he has had the opportunity of trying it. He says that it contains the same elements as are found in human milk, and in more nearly the same proportions than any other food heretofore recommended. It consists of two parts of cream, one of milk, two of lime-water, and three parts of a solution of sugar of milk, of the strength of 17¾ drams to the pint of water. The milk to be used should be good, ordinary cow's

milk, and the cream such as is usually sold in cities, and not too rich, containing about 16 or 17 per cent. of fat. The quantity of this food taken by a new-born infant should be two or three fluid ounces, every two hours. The best way to prepare and use this food is to get five or six packages of milk-sugar, containing 17¾ drams each; the contents of one of these to be dissolved in a pint of water, and each time the child is to be fed, let those be mixed together, and then warmed; three tablespoonfuls of the sugar solution, two of lime-water, one of cream, and one of milk. This makes about enough for a meal, and as much of this as the child does not take should be thrown out and a fresh mixture made for the next feeding."

Dr. WALKER, of Spondon, Derby, recommends, in the *Lancet*, Vol. II., 1884, p. 320, Dr. FRANKLAND'S method of preparing artificial human milk:—

> "The preparation of this artificial milk is accomplished in about ten minutes, and it will be gladly undertaken by even 'the lazy nurse,' for the sake of the better health and rest acquired by the baby thus nourished. To prepare it, allow half-a-pint of new milk to stand for about twelve hours; remove the cream and add it to one pint of new milk, as fresh as possible. Into the half-pint of skim-milk put a piece of rennet about an inch square, to be obtained from the butcher. Let the vessel be in warm water till the milk is fully curdled, which requires from five to fifteen minutes, the rennet being removed as soon as curdling commences, and put into an egg-cup for future use, as it can be employed daily for a month or two. Break up the curd thoroughly and separate the whole of the whey, which should be rapidly heated to boiling, when a little more caseine separates and may be removed by straining. 165 grains (about two teaspoonfuls) of powdered sugar to be dissolved in this (not whey), and the sweetened fluid added to the pint of new milk (and cream). It is then ready for use."

In the *Medical Chronicle*, of June, 1886, p. 226, I find the following note :—

"The Digestion of Milk.—*Therapeutic Gazette*, March, 1886—Dr. M. Richmaun draws the following conclusions from a number of elaborate experiments as to the digestibility of milk in the human stomach :—(*Deutsche Med. Zertung*, No. 82, 1885). (1) Boiled milk leaves the healthy stomach more rapidly than an equal quantity of unboiled milk. (2) The digestion of boiled milk is more rapidly accomplished than that of unboiled milk. (3) The coagulation of unboiled milk in the stomach is complete in five minutes. (4) This coagulation is not caused by the acid of the gastric juice, but by the influence of a special ferment (milk-curdling ferment). (5) The acidity of the gastric juice is at first due almost solely to lactic acid, and, later in the process of digestion, to the presence of hydrochloric acid. (6) Hydrochloric acid first appears in perceptible amount forty-five minutes after the ingestion of half-a-pint of milk. (7) For the first hour and a quarter after the ingestion of milk the acidity gradually increases, and then decreases, until the milk has entirely left the stomach. (8) The curds of caseine in digestion of boiled milk are much softer than in the digestion of uncooked milk."

It is now time I brought my remarks to a close. I have purposely avoided mentioning any of the various patented preparations, or foods, which are too numerous to mention, believing as I do that cow's milk makes the best artificial food for infants deprived of their natural sustenance.

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ECTOPIA VESICÆ AND OTHER IMPERFECTIONS OF DEVELOPMENT IN A NEW-BORN INFANT.

By Francis Ogston, Jun., M.D., *Assistant to the Professor of Medical Jurisprudence in the University of Aberdeen.*

(Plates II. and III.)

About the middle of the winter session of 1880-1 Mr W. S. Lunan, one of our students, brought to the College an infant which had been born in the neighbourhood a few days previously, and which had died soon after its birth.

The child, a male, was about the average length and weight, and, as regards its general appearance, was fat and well formed. On examining it, however, it presented several abnormalities which must be described in detail.

External Appearances.—The central part of the anterior wall of the abdomen was occupied by an irregularly triangular smooth patch, of a purplish colour, resembling rather mucous or serous tissue than true skin, exactly, in fact, like the investing membrane of the umbilical cord with which it was continuous, the apex of the triangle being upwards, and a little below the tip of the ensiform cartilage, and its base a little above a line drawn between the two iliac crests. From a point about a third from its apex, sprang an apparently normal umbilical cord (Pl. I. *a*).

Bounding this patch, inferiorly, was a narrow belt of normal skin, varying in breadth from one-twelfth to one-fourth of an inch, and continuous laterally with the skin of the sides of the abdomen.

Underneath the belt of skin a semilunar mass was to be seen, divided into three portions by two vertical depressed lines (Pl. I. *b*), its lateral portions resembling in appearance the patch *a*, and its central portion bright red, velvety, protruding, and plicated. On examining it minutely it was seen to be an everted bladder, with two slit-shaped openings near its upper part (*ureters*), and towards its lower part, on the right side, a wart-like excrescence, about the size of a split pea, apparently the right lobe of the prostate gland; but there was no rudiment of the left lobe.

On exploring the lowest portion of the bladder an opening rather more than a quarter of an inch in diameter was found,

which admitted a probe for some distance; this opening communicated with the rectum.

Below the lateral divisions of the mass *b*, the two halves of a cleft penis appeared, each with a well-formed half scrotum, but of course no trace of urethra (Pl. I. *c*), and underlying them the two divisions of a cleft scrotum (Pl. I. *d*), but no testes could be felt in them.

The raphé of the perinæum showed no rudiment of a rectal opening.

Internal Appearances.—In the mouth, throat, and thorax, there was nothing abnormal; but in the abdomen the following abnormalities were found:—

The umbilical cord, on being laid open, was seen to have an umbilical vein, of larger dimensions than usual, and *one* artery which apparently divided at the navel to form the two hypogastric arteries. The umbilical vein penetrated the upper surface of the liver, about a quarter of an inch behind its anterior margin, and then ran its usual course.

On turning up the lower surface of the liver (Pl. II. *g*) it had the usual appearance of division into lobes, but there was *no trace* of the gall bladder or its duct.

The stomach (Pl. II. *a*), was of the normal size, and in the vertical position in which it is found in the fœtus; it terminated in the duodenum, which was continued into the jejunum. These portions of the small intestine were about sixteen inches in length, and so far normal that they had a proper mesentery and glands.

The jejunum, however, at its lower end terminated in a somewhat reniform dilated *cul-de-sac* (Pl. II. *c*), about four inches in length, and an inch and a half in breadth at its greatest diameter. This sac was rounded at its upper end, and somewhat pointed at its lower, its upper one-fourth being free, as was its lower half, while between these two parts it was attached by a mesentery about an inch in breadth, with rather large mesenteric glands. At this part the jejunum communicated with it, by gradual enlargement of its canal, and with no semblance of a valve at the point of communication. The sac reminded one of the adult stomach, with the jejunum entering it like the œsophagus, only that there was no pyloric aperture, its lower end being closed. It was half filled with a substance having all the appearance of well-formed meconium.

The intestine ended here—no trace of the colon being found.

The rectum, which had been seen to open into the lower part of the bladder, was prolonged upwards for about two inches and a half, terminating in a somewhat constricted blind end. It was lying free in the pelvis, not bound down to the sacrum, and had no connection with the small intestines (Pl. II. *e*).

The spleen (*b*), the kidneys (*d* and *h*), the suprarenal capsules, and the pancreas were normal in size, and in their usual position.

A ureter sprang from each kidney, but instead of terminating in the bladder, ended in a blind end in the subperitoneal tissue at the side of the bladder, at the point where the obturator foramen should have been, having thus no connection with that viscus. (The lines *d*, in Plate I., terminate nearly at the points where they ended.)

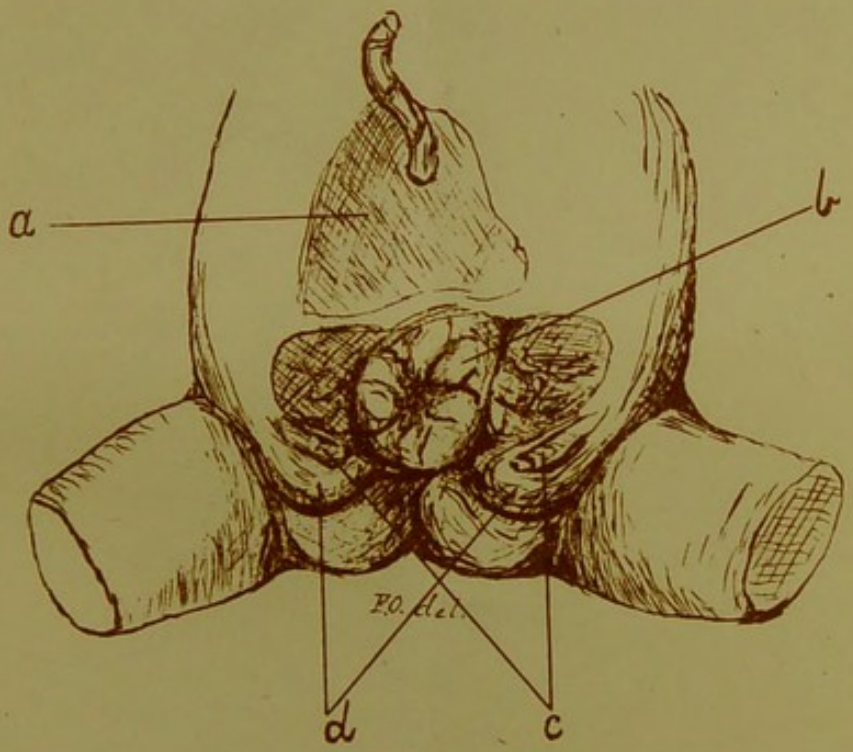
The openings in the bladder into what appeared to be the ureters had no connection with the kidneys, but ran up under the peritoneum of the anterior wall of the abdomen, and ended blind—the right one near the umbilicus, and the left one half way to this point.

The right testis had just entered the inguinal ring, the left lay still behind the kidney. The Wollfian bodies were seen behind the kidneys, the left being the larger of the two.

The bony pelvis was deficient anteriorly, the pubic portions of the ossa innominata and the ascending ramus of the ischium being absent.

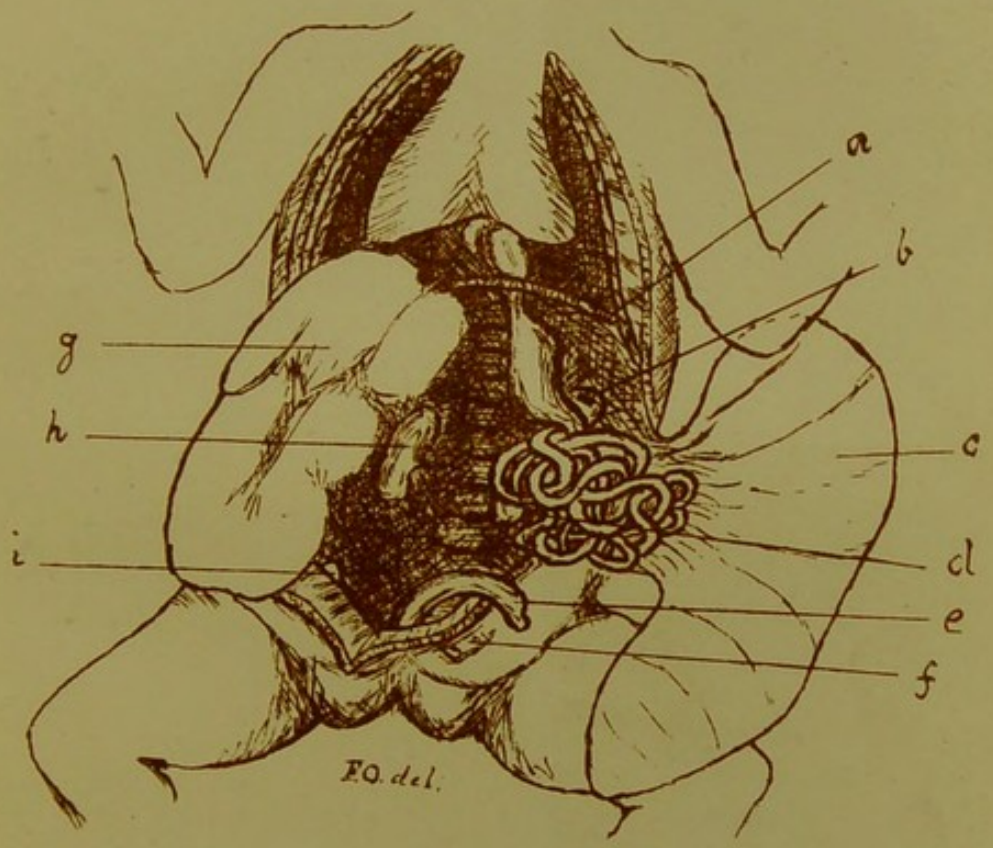
In the parts *a*, and the lateral portions of *b* (Pl. I.), the abdominal muscles were all but absent, being merely represented by a few shreds of muscle, with hardly any continuous connection, the abdominal integuments there consisting of rudimentary skin and serous membrane (peritoneum).

I neither can nor shall make any attempt to explain this curious case. It would seem as if there had been two if not three interruptions in its development, one affecting the bladder and rectum, with their appendages, giving rise to the defect known as ectopia vesicæ, with epispadic cleft, and cleft penis and scrotum, accompanied by the very usual non-descent of the testes; another affecting the intestinal tract, which appeared to have ended at the point of connection with the yelk sac by the vitello-intestinal duct; and the third, which had given rise to the non-formation of the gall bladder.



External View

I



Internal View

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