"The feeding of infants, natural and artificial, with reference to the comparative value of fresh cow's and condensed Swiss milk."

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"I have selected the above subject for my thesis as one of much practical importance, and on which I feel able to write from considerable experience, without attempting to enter any field of original research for which I have neither time nor opportunity.

I need scarcely be remarked that, as nature has by the provision of organs and junctions, desires and mutual advantages, intended animals of the highest class in creation to bring up their young during the earliest months of existence by the process of lactation, it is evident that man, holding the highest position among mammals, should intelligently discern and obey the laws of health and life, and in all cases encourage the own performance of the mother's duty to provide her own offspring, if it is possible for her to undertake it. For although there may be an doubt in some cases of the mother's inability to continue to nurse throughout the usual period of lactation, which may be said to be about nine or ten months—then the attempt should be made, were it but for a few weeks or months, if such can be done without detriment to the health.
health of another or child.

In advising a mother to nurse her child, there are strong physiological, pathological, moral and special reasons, each of which it may be well, briefly, to view in turn:

I. The Physiological: these, of course, are evident, for the mammary secretion is provided by nature for the purpose; it is specially adapted in its composition to the delicate digestive organs of the infant, and contains the exact variety and amount of nutritive elements required to sustain the health of the infant in a good state of health, and to furnish material for its growth. The secretion increases in strength, that is to say, the casein becomes greater in amount as the child's body grows larger and stronger, and therefore requires more nourishment; so that for the first seven months at least of a child's life, there is quite as much food in milk as is required for physical growth of the body, and maintenance of temperature. At the age of seven or eight months, nature demonstrates that other food can be taken, as teeth now begin to appear; and the stomach now gains more muscularity. Besides the fact of the mammary secretion being a suitable food for the infant, it is a well known fact that, at this time, a woman is always in best health when nursing her child, her system being specially
specially adapted for performing that function, unless of course, she is weakened by some other cause, or the child requires more nourishment than can be supplied, so that it becomes a strain on her system.

II. The pathological reasons are shown more by what is prevented than by what is caused by a child being nursed by its mother. These pathological conditions are seen both in mother and child; in the former, from the risk of enfeeblement of the mammary glands terminating in abscess of that organ, with consequent deterioration of general health; in the latter, because nourishment is so well afforded to the somewhat feeble digestive powers, that there is less tendency to irritative diarrhoea or other derangements of the alimentary tract, and its consequent suffering and lowering of health. Even if lactation can only be carried out for a few weeks, still it is better than no sucking at all, as the child will be, if that time, better able to accommodate nourishment artificially supplied.

III. The moral and social reasons are more considered to be more sentimental than practical, but this is not the case, as unquestionably nursing draws out the affection of another to child and child to another, strengthening the ties of nature and begetting mutual comfort and confidence as contributes materially to mental as well as physical health and wellbeing. The unnatural separation of young brothers to accustom
their own children should have no countenance from a right-minded practitioner, unless for very strong reasons.

Of course while in some cases mothers are really unable to discharge the duty of suckling, in others it would be very undesirable, that they should attempt to do so, in their own account as well as their infants. Thus occasionally we see an absolute deficiency of the mammary secretion, or defect in quality from some constitutional peculiarity; we see this in some women, having the breasts preternaturally loaded with adipose tissue, or breasts wholly or partially disorganised by previous milk abscesses; and then again we see the impossibility of successful lactation in cases of anaemia, or general weakness consequent on severe starvation, or chronic protracted illness preexisting or following childbed. Then last and very important, it may be necessary for the Practitioner to dissuade a mother from undertaking to rear her own offspring, where there is the danger of transmissity to well-known pathological or syphilitic taint.

While nursing conditions may arise which alter the character of the milk and therefore necessitate its cessation at least temporarily, such as the onset of any acute disease or fever, or existence of some dyspeptic, the threatened formation of a mammary abscess, and
more especially the actual presence of fever in the milk; the return of the catamenia, or the occurrence of gravidity. The general results of these conditions are, agglomeration of the milk corpuscles, and increase in size and number of the granular bodies. * It is the duty of the medical man, therefore, to watch for any of these contra-indicating conditions, rendering the milk deficient in amount or poor in nutrition in quality, and to interdict further attempts at lactation, and to give his advice as to the best method available of bringing up an infant.

Under these circumstances it will occur to most minds that a child deprived of the comfort and support from a mother's breast should have a natural substitute in the employment of a milk-cow. This arrangement is unattainable in many cases, owing to its expense; but where it is decided on, great difficulty is often experienced in the choice of a satisfactory woman to undertake the office, there being many points in her history and condition past and present to ascertain; thus, like the source of a good stock is she in good health? and has she a good appetite and sound digestion? and is her child perfectly healthy and clear-skinned? also is she intelligent, active, kindly and good of children; and has she had some experience in the care of them? Besides, when the mother of the child is healthy, she might to
to be as like her as possible in character and appearance. Attention should likewise be paid to the condition of the breasts and the milk should be examined microscopically to see that it presents the usual appearance, i.e., if milk and casein globules, and the absence of colostric bodies. The age of the ozilch is also important; for example, a newly born infant ought not to be given to a nurse whose milk is more than three months old, and afterwards, as near as possible to the age of the child. A question which often arises is the kind of living, which a breast-fed infant to receive; the answer to this, in all cases ought to be, a plain nutritious diet, as vegetables, parinaceous food, milk, soups, with a moderate amount of animal food, depending on the child's habit, but avoiding a highly实施细则 and stimulating diet, and unless in very peculiar circumstances are stimulants.

When human milk cannot be obtained for the infant, the question then arises “what kind of artificial food is best”? Many kinds have been and are used, liquid and solid, comprising the milk of various animals and different varieties of parinaceous diet, and many of the infant's food prepared of different jins. I think no one will deny that where one kind of milk cannot be obtained, another kind is the best substitute, and may agree well with the infant, such as cow's, goats,
foals, camels, and cows. Cows' milk, however, being the most easily procured by everybody in this country, and differing only to a small extent, though on the other hand, from human milk, is from a general point of view that which is to be preferred.

It may be as well however, if I insert here a comparative table of the different milks I have mentioned, this table is drawn from Verneir and Requerel, as quoted by Dr. West in his "Diseases of Children".

<table>
<thead>
<tr>
<th>Species</th>
<th>Fluid</th>
<th>Solid</th>
<th>Sugar</th>
<th>Butter</th>
<th>Casein</th>
<th>Salt</th>
</tr>
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<tbody>
<tr>
<td>Foal</td>
<td>1032.57</td>
<td>689.08</td>
<td>110.42</td>
<td>43.64</td>
<td>26.66</td>
<td>74.24</td>
</tr>
<tr>
<td>Donkey</td>
<td>1033.38</td>
<td>664.06</td>
<td>136.94</td>
<td>35.63</td>
<td>36.12</td>
<td>54.15</td>
</tr>
<tr>
<td>Camel</td>
<td>1034.57</td>
<td>590.12</td>
<td>104.88</td>
<td>51.45</td>
<td>18.53</td>
<td>35.65</td>
</tr>
<tr>
<td>Cow</td>
<td>1033.53</td>
<td>844.90</td>
<td>153.10</td>
<td>36.91</td>
<td>36.87</td>
<td>56.14</td>
</tr>
<tr>
<td>Man</td>
<td>1040.46</td>
<td>832.32</td>
<td>167.68</td>
<td>39.43</td>
<td>34.31</td>
<td>64.18</td>
</tr>
</tbody>
</table>

This is the mean of 59 analyses. From this it will be seen that, the milk resembling the milk of the woman most closely in that of the ass, the chief difference being, that there is too much sugar and too little oil. This latter fault, in infant feeding may be remedied by the addition of one twentieth part of cream; of course this milk is a first-rate substitute for human milk, but it is not easily obtained in most parts of this country; and if when used it proves too laxative, the addition of a small quantity of lime water will remedy the tendency.
Matthews Duncan is of opinion that ass's milk is very useful, but he considers mare's milk to be even better.

However this may be, cows' milk as I have said already is a much more common and cheaper article of commerce, and therefore in general to be preferred, since it can be made to resemble human milk very nearly.

I will now describe the methods of preparing and administering it, and the cautions which require to be observed, for the successful rearing of an infant on it. As seen in the table, it contains less fluid in its composition and more casein than in human milk, rendering it too strong for use, therefore it requires to be diluted with water, as shall afterward be noticed; then as there is also too little sugar in comparison with human milk, a little should be added.

The first thing in choosing the cows' milk to be used, is to see the character of the dairy is satisfactory, that the cows are kept in cleanly stalls; that the surroundings are healthy, at least that the water supply for the cows is not drawn from a well into which deleterious matters might percolate from the proximity of a dunghill; and that perfectly clean cans are used for transmission. To avoid any doubt in this respect, it is well to have two private
Private cans in use, so that each in turn may be thoroughly cleansed before they are returned to the dairy to be refilled. Besides all this, it is desirable to ascertain from time to time, by the use of the lactometer, the real quality of the milk and cream, should there be any suspicion that water has been added to it before delivery. It is a good, though not an indispensable practice, to see that the milk be always obtained from the same cow. But whether or not, the cow selected must be in perfect health in every way, for instance, when a cow is enceinte, its milk deteriorates in quality; again, the milk from stall-fed cows, whose feed is dry, to a great extent, is not so wholesome as the milk from cows which are allowed to graze in the fields, and is unquestionably likely to irritate and cause diarrhoea in the tender infant.

When the milk to be used, is made choice of, the precautions are by no means over. The utmost care must be taken in regard to the cleanliness of the bottles employed, and the regularity of filling them before each meal. It is essential also that the milk to be used each time be prepared fresh and not allowed to stand in the bottle for any length of time, the child only taking a small portion at a time and again, also that between meals the bottle and pipe must lie in a basin of clean water.
It is well to have two bottles in use, alternately, or one by day and the other by night, so that no impurity be allowed to gather about them. As an argument in favour of the utmost strictness, being necessary in regard to cleanliness of bottles, is the fact that as a rule, bottle-fed children of the poorer classes do not thrive so well as bottle-fed children of the upper classes; the former class not being so strict either from habit or want of time.

The ordinary method of preparing cows' milk for use, in the case of a newly-born infant, is to mix one part of milk with three parts of lukewarm water, with a pinch of refined sugar or sugar of milk and a teaspoonful of cream sometimes—indeed between three and four ounces; and while the bulk, as the child grows older, may be increased an ounce or two; at the end of the first month, the milk and water may be taken in equal parts; and afterward in gradual reduction of the latter as the child grows older. In regard to the sugar, the quantity should never be increased beyond a slight sweetness, else there is danger of creating acidity, flatulence and an aphthous tongue. This mixture is generally heated or scalded to a temperature of from 40° to 45° Fahrenheit. The scalding makes it more easily digested, than if it were given cold. The best kind of bottle to use is not so important, since
Another prefer one, and some another; and also some doctors recommend one and some another; as a rule, however, one with a tube, when conscientiously used and cleaned, is better than one without, as it prevents the child from sucking too quickly, which impairs digestive power and is generally followed by vomiting. The same interference with digestive power is caused by allowing the child to have access to the breast or bottle too frequently when supply of milk not being properly rejected, before another is introduced.

A very good method of preparing cows' milk for use, is what is known as "Frankland's recessed milk," and is still as "artificial human milk." A description of this method is given by Mr. Playfair in his "Science and Practice of Midwifery" in the chapter relating to the feeding of infants. It is also described in the British Medical Journal by Mr. Clissold of Twickenham, and I understand, it is recommended by Mr. Mathewson Duncan. The object of Frankland's method is to remove one third of the casein in cows' milk, and to add one third part of sugar; but I think it best to describe it in Frankland's own words, as quoted in Mr. Playfair's work.

"Allow one third of a pint of cream milk to stand for about twelve hours, remove the cream, and add to it, two thirds of a pint of cream milk as fresh..."
"from the cow as possible. Into the one third  
of a pint of raw milk, left after the abstraction  
of the cream, put a piece of rennet about one  
fifth square. Set the vessel in warm water until  
the milk is fully curdled; an operation requiring  
from five to fifteen minutes according to the activity  
of the rennet, which should be removed as soon  
as the curdling commences, and put in  
an Egg cup, ready for use on subsequent occasions  
as it may be employed daily for a month or two.  
Break up the curd repeatedly and carefully, sep-  
arate the whole of the whey, which should then  
be heated to boiling in a small tin pan, over a  
spirit or gas lamp. During the heating a  
further quantity of rennet, technically called  
'Quelling,' separates, and must be removed by  
straining through muslin. Now dissolve 10 parts  
of powdered sugar of milk in the hot whey, and  
mix it with the two thirds of a pint of raw milk  
to which the cream from the other third was added,  
as above described. The artificial milk should  
be used within twelve hours of its preparation,  
and it is almost needless to add, that all vessels  
must be kept scrupulously clean.  

This method gives a milk almost identical  
with human milk in composition; this is  
best understood by studying Table  
next.
At first sight it seems to be a complicated process, and perhaps more than a busy mother can undertake to carry out, but I believe it is not so, and that certainly a method of giving what is required should be more generally made known and tried. It is well to add that Dr. Crichton, who recommends the use of the process, gives it as his experience that the "essence of rennet," sold in bottles will not do, but that fresh rennet must be got from the butcher.

Instead of the ordinary habit of diluting cow's milk with plain water, barley water is sometimes added with the intention of making the mixture more satisfying and nutritious, while lime water also has become quite a routine practice in order to avert acidity; but it is often, I believe, overcome with the result of excessive constipation. It is a prescription, I understand, of Dr. Matthews Duncan's to give two parts of cow's milk, one part of good barley meal, and...
barley water, one teaspoonful of lime water, a
kind of sugar, and a pinch of salt. This little
mixture is agreeable, but not sweet and if the
child becomes constipated, less milk and more
barley water is given. It is heated in small
tin pots, over the gas; two of these pots being
always in use.

If milk is too strong, constipation is generally
the result, so that it is well, on the slightest
evidence of this, to add a little fluid magnesia
or a little chloridate of soda to each bottle. An
important cause of complaint arising from
the use of cows' milk, seems to be the circum-
stance that the casein in it, tends to coagulate
in large masses, and not in flakes, as it does
in human milk; this of course must increase
the liability to indigestion with varied symptoms
of irritation of the stomach and bowels.

In having now to discuss the use of
"Condensed Swiss Milk" I cannot say, how sorry I am,
that I must forego statistics giving definite
information as to the comparative value of fresh
and condensed milks. I think it would be of much
importance were Medical Officers of Foundling Hos-
pitals to publish such statistics. As Swiss Milk has
within the last few years become very much used
in the feeding of infants, and while in many cases
Cases, with great success, in others exactly the opposite as to results. Whether this is the fault of the milk or nurse who has used it, or the fault of the article itself, it is hard to say, and equally hard and unjust, altogether to condemn any manufacturer on the strength of occasional failures; still, we cannot overlook these failures, as they may be the fault of the milk, and we must remember, that however much the advertisement of each kind may extol it and much for its purity, still we are to a great extent in the dark, and do not know exactly what milk compound we are using. For instance, we do not know, what condition of health, the animals from whom the milk was taken, were in at the time; nor do we know whether it is entirely cows milk, or mixed with that of sheep or goats, or what other fatty substance or other ingredient may be compounded with it.

The good results obtained from its use in many cases are however sufficient justification for its use, and certainly where good fresh milk cannot be obtained easily, if not under other circumstances. There are several varieties in common use, some another holding by one, others by another, as “lactium milkman”, “lactium milkmaid”, “first Swiss Alpine milk”, etc. The last named is said to have one foreign substance added, aniseptic or sweetening, and is prepared in the following way: The...
The milk is first cooled, then heated and condensed in vacuo; then, when two thirds of its water are gone at density 1.086 at 35° cent. it is enclosed in tins and bottles. Four hours are all that is required for its preparation. For use it is mixed with water in the proportion of 1 to 2. This variety is recommended by Dr. Ashley of Manchester in the British Medical Journal: he uses one heaped teaspoonful in 3 or 4 tablespoonsfuls of warm barley water, according to the age of the infant. He at the same time gives as a caution, that in a tin opened on a Friday, he found bacteria on the following Monday. He also states that after mixing the condensed milk with water and allowing it to stand, a precipitate of fine white grains is thrown down, probably calcic phosphate, indicating that lime salt are precipitated during process of condensation, and are not readily redissolved. Whether this occurs in all varieties of condensed milk or not, he does not say, but if it does, probably the nutritive properties are impaired; as in the case of some children fed on condensed milk, I have observed that there is a marked deficiency of active substance; Dr. Carmichael of Edinburgh says that in children fed on condensed milk there is a predisposition to rickets in after years.

and preparation of each meal is required, as with fresh milk. Perhaps even greater care also is required in studying the proper strength, which suits each infant, because we are ignorant of the strength of the milk we are using, as noticed above.

Mr. Gurin in his article on "Infantile Diarrhea," recommends free dilution, but states that he prefers fresh to condensed milk. Mr. Chichoty of Greenwich, whose name I have already mentioned, gives as two arguments in favor of the use of condensed milk, first, that the supply lasts longer than that of fresh milk, and secondly, that it transmits less violently; the latter of which reasons, I think is very important; as a rough test of this, I let aside in the pan a mixture of fresh milk and tepid water in equal parts, and also one of a teaspoonful of sweetened condensed milk, prepared by the Swiss-Swiss Milk Company, in twelve parts of water of the same temperature, according to directions on the tin. I tested them both, with Louis' paper at intervals of a few hours, but I detected scarcely any difference in the time taken by each to cause a red coloration of the paper; if anything, I thought the Swiss milk became red rather more quickly than the fresh.

In summing up, as to the comparative value of fresh and condensed milk, I think that for general use, fresh milk is preferable to can-
for, though both may be and are used with marked success in many cases, still the former is a new secretion and therefore not so liable to have undergone degenerative change; and because we know better with what we have to deal. I must add, however, that where either fail to do its duty, the fault, as often is not often, may lie with the administrator and in the mode of administration, than with the kind of milk employed.

Bottle feeding may be partially practised also, not entirely as a substitute for nursing, but as an adjunct for where the child cannot get enough milk from the breast during the twenty-four hours, to satisfy it, the bottle becomes a necessity and may be given once or twice a day, as in the forenoon and at night, with great advantage when the artificial mixture is attended to as I have already specified.

When another cannot nurse her own child, more especially those in the lower classes; instead of bringing it up by the bottle with carefully prepared fresh or condensed milk, it is a very common practice to use very artificial food, in what many of the older physicians denounced as the "Pin and Sheep System". The articles most commonly used are corn flour, arrow root, or sueded wheaten flour and other purely purine-accous diet. This system in the earlier months of infancy, unless amended largely with milk, cannot
cannot be too strongly condemned as a fatal error; and any degree of it, unless in the more advanced months of infancy, is a great mistake. It unfortunately has arisen from the supposition that such articles contain a great deal of nourishment, whereas in reality, they contain almost no nourishment suitable for the yeild digestion of the infant, as they are composed almost entirely of starch, and the digestive ferment, Dextrase, supplied to adults for the purpose of converting starch into grape sugar, is not developed in children till after teething has taken place, therefore the principle mass simply passes into the intestine as a source of irritation, causing griping pains, vomiting, and diarrhoea with pain, lumpy stools, and not infrequently convulsions. This in time is followed by wasting and shrinking of the child's body. These being an importunate material present in the diet, the child's own tissues are drawn on for the necessary supply, which of course fails in a short time, as there is no reserve going on to make up the waste which is taking place. Another common food is what is popularly known as breadberry; this is pieces of bread broken and soaked in milk and warm water, with a little sugar added. This diet is bad enough for an infant under eighteen months old, but not so bad as those mentioned above.
For of course the wheaten bread contains air-soluble material, and there is also a large
quantity of milk present, but being much too
solid, it is therefore irritating for an infant's
stomach and intestines. Whole wheat flour
is not so bad as the ordinary farinaceous articles
of diet, as may be seen by a glance at the accom-
panying table, which shows the proportionate
amounts of nutritive elements and heat-
producing elements.

<table>
<thead>
<tr>
<th></th>
<th>Nutritive</th>
<th>Heat Producing</th>
</tr>
</thead>
<tbody>
<tr>
<td>Milk</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>Arrowroot</td>
<td>1</td>
<td>5</td>
</tr>
<tr>
<td>Wheat Flour</td>
<td>1</td>
<td>1</td>
</tr>
</tbody>
</table>

There are many other artificial milk foods ad-
tected some of which, may—under special cir-
cumstances—be found useful, but nearly all of
them are prejudicial to the health of infants; but
the preference must be given to such as "Lilby's
Good for Infants" or "Mother's Melting" which
contain some milk fat, milk sugar, casein
and the salts found in natural milk,
besides the wheaten stuffs.

Before concluding this paper I
would quote from Dr. West, "Disease of
children" the old but interesting statistic of William
Dunn.
Drawn from the practice in three French Foundling Hospitals, regarding the comparative mortality of naturally and artificially reared children.

Lyons. Wet nurse all the time 33.7 per cent died.

Paris. Wet nurse (generally) 50.3.

Bleins. Artificially fed all the time 63.9.

Part of the time was spent in the hospital and part out at nurse.

The proportion of deaths amongst children nursed by their mothers and those nursed by a wet nurse was as 18 to 24.

This table clearly shows the disadvantage of artificial rearing.