Thesis for M.D.

Infantile Mortality, Nutrition and Feeding

By

Thomas Malcolm Murray B.M.
M.R.C.S. Eng. 1883

Almound Bank
Mid Calder
Edinburgh Health Lectures —
Dr Clouston, 1883-84, page 47

Liquor Bode — Keating's Cyclopaedia
Vol I, page 135

Dr Sklund — Keating's Cyclopaedia
Vol I, page 135
No fact is better known to the medical profession than that the first year of life constitutes the period of greatest mortality. That is the period when the child cannot help itself. It is dependent on its parents and guardians for all its wants. If a child passes this period it may survive in spite of bad or careless treatment.

This fact is borne out by statistics taken from all countries.

In this country during the first year of life 1 in 6 children born one dies = 16 2/3 per cent. One fourth of all deaths are those of children in the first year of life = 25 per cent.

Signor Bodie says in Europe 20% of children born die in the first year; 10% in the first month; 73.3% of the remainder die before the 5th year.

Dr. Ehkund of Stockholm says in Europe 25% of all deaths occur under one year, 9 in 10 larger cities of the United States 50% of children born die during their first year.
Bernheim Winkel — Diseases of Children. Starr, 1894, p. 68

Scènet — Diseases of Infancy and Childhood. Lewis Smith, 1851, p. 24
Bernheim from an extensive series of statistics places the mortality of the first year of life at 37\(\frac{3}{10}\)%.

Winkel says 10\% of children die before the eleventh day of life, 17\% during labour, 3\(\frac{3}{10}\)% as a result of injury during labour, 7\% during the first month after birth contracted at or after birth.

Lückel says "Here die during the first month after birth four times as many children as during the second month after birth and almost as many as during the entirety of the two years that follow the first year, although even then the mortality is high. The tables of mortality prove in fact that 70% of the children born die before the first month has been completed."

We have here a series of facts which ought to set one thinking as to how such a very serious state of matters may be remedied.

In many cases high death rates are due to conditions which cannot be
removed, but they are also partly due to the ignorance which prevails in these matters which can be removed.

The death rate is highest in cities and manufacturing and mining districts and lowest in rural districts. Amongst the poor it is almost double that amongst the rich.

Amongst the various causes of infant mortality are the following:

1. Congenital malformations of formation of internal organs, e.g. Hydrocephalus, Acyanosis, Cyanosis.

2. Congenital weakness. The younger the child the sooner are the vital powers exhausted. This cannot altogether be altered. Many of these cases are due to early marriages, frequent child bearing, intemperance on the part of one or both parents, and often to the character of the employment of the parent or parents.

3. Hereditary disease or predisposition, syphilis, leprosy, or tuberculosis. This is often
Diseases of Infancy & Childhood
J. Lewis Smith 1881 page 28.
found in the town than in the country. By appropriate treatment of parents these conditions ought to be largely corrected.

4. Ignorance as to feeding, hygiene and general management of children. This is perhaps the cause of the largest number of deaths as it is the most fruitful source of infantile ailments, \(70\%\) being said to be due to this cause. More children are brought up in town than formerly due to consequence of inanition or indigestible food diarrhoea, emaciation and death may result in pertussis or tubercular ailments, or a cachexia or feebleness of the system may arise which without engendering actual disease renders those affected less able to resist it when induced by other causes.

City nursing is more fatal than country nursing. In frameless hospitals the mortality is very high. At Parthenay agues where wet nursing...
Lewis Smith's dreams of infancy & childhood. 1881, page 28.

was employed, the death rate was 35% to 33.7%: while in Paris, Rheims, and where dry nursing was employed, it was 50.3% to 53.9% to 85%. In New York until wet nursing was introduced, it almost reached 100%.

Careless management as regards clothing increases the liability to local disease from exposure to cold or extremes of weather. Routh says: 

"amongst the most pernicious influences to young children besides we may include cold.

5. Acute infectious diseases claim many victims particularly in crowded districts. This is a wilful neglect of ordinary precautions, parents professing not to believe in infection being carried and having an idea that it is necessary for all children to have all infectious diseases. Convalescents are very often allowed to mix freely with those not affected. In contrast to this notion Dr. Whitelegg makes the following remarks—"To shield
"a child against infection during the first few years of life there is a double gain; every year of escape from Scarlet fever renders him less and less susceptible, and secondly if he should ultimately take the disease every year that the attack is deferred reduces the danger to life which it brings. In other words attacks of Scarlet fever become both less severe and less frequent with every year after the 5th year, for in the 5th year the liability is less than in the 6th year but the risk to life in case of attack is very great." The same reasoning applies with almost equal force to Measles, whooping-cough, etc.

6. Residence in unhealthy localities, damp dark alleys, crowded dirty tenement-houses, small empty space in houses, seldom ventilated, always draughty, floor sometimes simply the earth or cold-tiled, with children often half dressed playing about, for a result diarrhoea, diphtheria, typhus fever.
According to cutting from newspaper.

Similarly in large centres has lead to a very great increase in infant mortality, I would almost appear to be a direct incentive to crime. At an inquest held lately at Ayr, upon an infant who had died, it was ascertained by the secretaries of the National Society for Prevention of Cruelty to Children pointed out that in that town 9 district nearly half of the children ill-treated or neglected were known to be insured. The insurance money amounting to £2,681.

8. The use of drugs to keep infants asleep while the mother is at work is a frequent experience in manufacturing districts is often a cause of death.

Baby-farming, infanticide, overlaying of infants, or accidents, pretty much exhaust the list of causes of death, many of which have only to be mentioned for that a remedy suggests itself.
Registers in charge of
their respective registers.
In going over the death registers of the two parishes (Kirknewton and Middle) which I am more intimately acquainted, I observed a difference between a rural population and a largely mining as regards infant mortality is very striking. In the period 1855-65 (inclusive) the population was agricultural, the mortality of children of 5 years and under was 32.8% and of 1 year and under 21.7%. In the period 1885-95 (inclusive) mining has been in full swing and the mortality has risen to 46.4% and 36.0% respectively.

In 1861 the population was 2,938 with a death rate of 20.6 per thousand. In 1891 6,481 with a death rate of 18.4 per thousand with a large increase of population the total death rate has diminished but the number of children who succumb in the first 5 years of life has enormously increased, close upon half of the total deaths occurring in children of 5 years and under.

I have drawn at a table showing
### Combined parishes of Kirknewton, Mid Calder

<table>
<thead>
<tr>
<th>Period</th>
<th>Total Deaths</th>
<th>5-Year Funds</th>
<th>1-Year Funds</th>
<th>Influenza</th>
<th>Scarlet Fever</th>
<th>Smallpox</th>
<th>Tubercular</th>
<th>Lobar Pneumonia</th>
<th>Cholera</th>
<th>Zymotic Diseases</th>
<th>Misc. Causes</th>
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<tbody>
<tr>
<td>1855-65</td>
<td>505</td>
<td>166</td>
<td>110</td>
<td>25</td>
<td>27</td>
<td>26</td>
<td>4</td>
<td>8</td>
<td>6</td>
<td>14</td>
<td></td>
</tr>
<tr>
<td></td>
<td>per cent</td>
<td>32.8</td>
<td>21.7</td>
<td>22.7</td>
<td>24.5</td>
<td>23.6</td>
<td>3.6</td>
<td>7.2</td>
<td>5.4</td>
<td>12.6</td>
<td></td>
</tr>
<tr>
<td>1885-95</td>
<td>1113</td>
<td>571</td>
<td>201</td>
<td>86</td>
<td>77</td>
<td>88</td>
<td>33</td>
<td>36</td>
<td>52</td>
<td>29</td>
<td></td>
</tr>
<tr>
<td></td>
<td>per cent</td>
<td>46.4</td>
<td>36.0</td>
<td>21.4</td>
<td>19.2</td>
<td>21.9</td>
<td>8.2</td>
<td>8.9</td>
<td>12.9</td>
<td>7.2</td>
<td></td>
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</tbody>
</table>

If the same circumstances had existed in the latter period as in the former with the exception of increased population, the subsequent increased number of deaths of undernoted figures would have been the number—

| 1885-95    | 1113         | 363          | 242          | 63         | 59            | 57       | 8          | 17               | 13      | 20              |             |

Comparing the actual deaths with the probable deaths brings out very strongly the increased waste of infant life.
The number of deaths at all ages, at 5 years under, at 12 years under, with particular as to cause of the number occurring under each. To bring out more distinctly the cause of infant life I have made a calculation of the number of deaths which have occurred in the latter period 1885-95 had the same circumstances prevailed, with the exception of increase of population.

There is great increase under all heads, but it is most striking in the case of enteric, typhoid, diseases & enteritis.

For this altered state of matters, there are certain reasons. The character of the population has largely altered. In the pit villages are to be found many of the more ignorant classes who live in a very dirty, filthy condition, having no idea of hygiene matters either as regards themselves or children. Then again there is more intemperance amongst both men and women particularly.
Amongst the latter with consequent neglect of their infants, several cases of overfeeding and infanticide have occurred. Apart from intemperance there is a great deal of ignorance, carelessness of parents as to feeding, clothing, the general management of children, and a great increase in the number of artificially fed children with the usual tarpaulin system of giving any kind of food. This is also great carelessness with regard to hygienic diseases. Erroneous ideas as to teething are also responsible for many deaths.

We shall take up the most important of these in detail.

**Anti-hygienic conditions** play an important part in causing both a general lower tone in infants as well as death. Many families live in one-roomed houses, but even when they have two rooms the second is often not used (unless they keep lodgers) all lodging together for eating, sleeping, accommodation.
In many lousy lodgers are to be found, no attention being paid to the cubic space in deciding how many people ought to be accommodated. As miners work in what is called the "eight-hours' shift," it is not unusual to find a bed occupied almost continuously by three sets of men. Rooms are seldom if ever ventilated with a consequent irritation of atmosphere.

Besides, clothes-washing operations very generally take place in the house as well, the children perhaps lying about on a cold wet floor, or in a lot exposed to draught and damp atmosphere. Infants who do not succumb to such conditions often get into more or less chronic ill-health and later on from some acute disease. Tubercular diseases have become common more common due in part to antiseptic conditions improper feeding to a great prevalence of whooping cough, measles, intestinal catarrh.

Syphilitic diseases have increased to a very large extent. The
greater aggregation of children at present as compared with the scattered population of former times being an important factor.

One death of an infant from Small-pox occurred in 1855 but there has been an entire absence of it since as a cause of death. In the period 1855-65 there were 1 fatal case of Measles 3 of Scarlet fever but no cases of Croup. Diphtheria, a Whooping cough.

In 1885-95 there were 18 fatal cases of Measles, 19 of Whooping Cough, 7 of Scarlet fever 7 of Diphtheria 1 Croup.

Even when not immediately fatal troublesome sequelæ may supervene causing chronic ill health or a fatal result later on.

*Parental neglect signifies*

as to feeding, clothing & general management must be credited with causing by far the greatest amount of sickness & death amongst infants.

A healthy child suckled by its mother if she is of sound constitution
In average health rarely if ever suffers from disorders connected with bowel, but too often children are quickly put upon other food getting as the parents say “a bite or cup of whatever is going”, a bit of bread or meat or plum pudding it may be, gastrointestinal troubles or general ill health developing as a consequence.

Parents unless told by their medical attendant have as a rule no definite idea of the proper kind of food for an infant to be brought up by hand, nor the amount at each nursing, nor the number of nursings. It is often found that although instructions have been laid down they have either never been kept or no change has been made in the character of the mixture in the course of months it may be with inevitable deterioration of health.

The popular feeding bottle with its long tubing to which are almost impossible to keep clean is very much to blame for many of the ailments of infants
partly due to decomposition of milk from imperfect cleaning. Partly due to the child being left down galleries to feed itself, sick at the time when the milk is finished. 

The milk when brought into the house is generally kept standing uncovered in the living room without any precautions, I may be in close relation to soiled napkins or other discharges. As is well known, diphteria is very readily developed in milk or any food of which it is a component. The very essentials for its prevention being wanting viz. compulsive cleanliness with every vessel containing milk or used in the preparation or administration of food a rapid action is set up with gastro-intestinal irritation. 

That children should be hardened by exposure to cold is another widely spread notion as a very frequent cause of death as children are more sensitive than adults to changes or extremes of temperature. bronchitis, pneumonia, gastro-intestinal disease resulting. 

Many mothers are much given to
Vogel - Knowledge Encyclopedia
Vol I page 383.
Hanging about in cold or draught places, and infants with bare heads, hands, arms, feet, legs. On the other hand, an excessive coddling is not to be pursued. Seething is indirectly the cause of very many deaths. Bronchitis, vomiting, diarrhoea, convulsions, skin diseases being considered by parents to be natural elements in the process are neglected. Vogel says "mild diarrhoea of 5 or 6 evacuations in 24 hours is very beneficial to teething children, for cerebral affections are nearly most easily prevented." It is not to be wondered at that ignorant people are careless about diarrhoea in teething infants when once an authority holds this opinion.

Convulsions without specific cause being given have increased very much. In large number of the cases may be assumed to be due to tuberculosis. Anickly constitution is the most frequent cause of convulsions and tuberculosis a further stage in the down grade.
Having examined into the various causes of infant mortality let us briefly consider how it may be remedied.

In the first place all dwelling houses and surroundings must be put into a thoroughly sanitary condition. In general in the 16th century when little attention was paid to sanitary matters the probability of life at birth was only 5 years, but in the 18th century it rose to 20½ years. This was simply due to external circumstances. Sanitary conditions in general have improved but there is still room for improvement.

Quarantine regulations in infectious cases must be more strictly enforced.

Lastly and most important of all the gross ignorance which prevails among parents and guardians as to the feeding, clothing, general management of infants must be remedied. In many cases with which I am acquainted the lead of the nurse has more knowledge and care for
The feeding, rearing of dogs, birds than his wife did as regards their children.

By means of lectures I have tried to spread a knowledge of these subjects among parents, but unfortunately as is usually the case those who attended were those who least required it. And so, many periodicals devote space giving information regarding the care of infants in this way a great deal of useful hints are published but the more ignorant seldom see these papers & would probably not act upon the rules laid down in them.

In the face of such a loss of infant life it is clearly the duty of the State to take immediate steps.

Many County Councils are now providing technical classes in hygiene, nursing, ambulance, etc., but family calls prevent the attendance of the poorer mothers at these classes even if they had the desire. Classes in physiology are held in many schools.
Clemency

Christie of Clifton
now, it cannot fail in time to have effect in reducing mortality rates, but in the meantime something more urgent is necessary.

It has been proposed by Mr. Clewes (Brit. Med. Jour. Feb. 27, 1946) that a list of suggestions should be printed on the back of every birth certificate distributed to every parent at the registration of his child. He suggested information having reference to infant food, its kind, quality, quantity, times to be given, etc. Another suggestion has been made by Dr. Henry Christie of Clifton (Brit. Med. Jour. Feb. 27, 1946), the formation of a nursing aid society in various districts with lectures to be given every week. The aim of the society is to get ladies to visit all infants who are in out-patient lists at hospitals, dispensaries, other social, religious, or charitable institutions where the managers will allow it; to train district visitors to get the trained ladies to visit and instruct the mothers.

Such suggestions are worthy of more than a passing consideration.
Hygiene of Children

Hygiene is the science that deals with the preservation of health. The essentials for the well-being of children are suitable diet, cleanliness, plenty of warmth, fresh air, sunlight, exercise.

Cleanliness. To be healthy, children must have their bodies clean. Those who are not regularly washed and whose clothes are seldom changed must inhale the products of their decompositions and be injuriously affected. Many forms of skin disease are due to dirtiness of skin or to dirty irritating napkins. In giving a child a bath it is better to immerse it as this is most effective. The temperature should not be much below that of the skin, nor much above, soaps being used and a little friction applied. As well as having the child clean its whole surroundings must be kept in a like condition.

Warmth is essential to the very existence of a child which has little power of resisting cold. For this reason...
requires warm clothing. Every child is supplied with a certain amount of nerve force to maintain the different functions of the body. If an excessive proportion of this force is used up in keeping up the heat of the body as in the case when too much is left bare, the other functions must suffer.

In infants under a year old a broad flannel abdominal bandage, a knitted or worsted band extending from hips to neck is useful in keeping the abdominal organs warm and aiding digestion. All underclothing should be of flannel because applied frequently changed to ensure cleanliness. It is a great mistake as well as cruel to attempt to harden children by wilful exposure of their person. From interference with the cutaneous circulation passive internal enfeebles may be produced which in turn may cause gastro-intestinal symptoms and other troubles.

As children are very sensitive to cold the temperature of their room should be
about 70°. I am going outside, extra clothing should be put on as I return and returning inside. The head must be protected from cold by a close fitting thick cap or from the direct rays of the sun by a broad brimmed straw hat.

Fresh air and sunlight are of the utmost importance. Indoors the rooms should be as sunny as possible with plenty of fresh air, as deficient ventilation lowers the vital and nutrition of the growing child.

Children should be put every day when the weather is fine, even in winter if well wrapped up, but in damp rainy weather the house is the safest place.

Light is one of the principal sources of energy activity without which neither plants nor animals can grow in a healthy state. Scanty diseases of chest are more fatal in children than adults. Careless standing about of nurses with infants in their arms is a frequent cause of them, as well as a habit of letting
children roll about on cold damp draughty floors, or on damp grass outside.

Amongst the nursing classes infants are taken out when they are much too young; some doctors do not allow children born in the late autumn a winter to be taken out until nearly four months old.

A certain amount of muscular exercise is necessary for development of the proper performance of the digestive functions. Before they can stand infants may be placed on their back on a bed with their clothing loosely applied and allowed to kick and turn about at pleasure.

When older creeping gives sufficient exercise, but care must be taken to prevent over-fatigue and exposure to damp or draughts.
Infant Feeding

In all classes of life a much greater amount of time, expense and thought is given proportionately to the preparation of food for the adults of the family than for the infants. This is a mistake both from a humanitarian and economical point of view, for the infant is more susceptible to irregularities of diet with their resulting suffering than the adult. Moreover once the habit of symptoms usually called dyspeptic is established infinitely more trouble and expense are entailed than if more exact methods of feeding had been adopted before the digestion was disturbed.

Milk is the food for infants and for the first six or eight months it ought to be the only food; addition being made to this as digestion progresses, but for the first two years milk should be the mainstay.

Every mother should make it her duty as it is her privilege to nurse her baby at the breast unless for special
Keating's Cyclopedia Vol I p.52
Russow: Keating Cyclopedia Vol I p.55

Kerr

Koplik: "The Hospital" April 11/46
Page 25.
delicacy or disease. Furthermore, in some cases, a child suffering from syphilis or tuberculosis might not thrive as well as breastfed children. If tuberculosis has been detected in the mother, it is best to breastfeed.

Breastfed children tend to grow more steadily than those fed by other means. Rudnoff has shown that breastfed children grow 2-8 centimeters more during their first year than those who are bottle fed. The most rapid period for infants is the first month or two. So it is highly desirable to keep the child at breast for as long as possible, if not wholly, able still retain the breast as a supplement if milk properly prepared.

Kerr (1879, see 1745) insists on the inferior value of cooked milk as compared with uncooked. Milk consists largely of living cells which the body is able to absorb alive and retain the nutritive without change. This view is supported by Koplik (1879, Jan. 16) who states that the unabsorbed antigen in the feces is much greater after a
meal of cooked food after one of raw milk. May not this be one reason why breastfed children appear to thrive better than artificially fed ones.

Mother's milk is adapted to the infant's digestive function for its development by:

1. Temperature 98°-100° F
2. Alkaline reaction
3. Chemical constitution

Besides the mother's breast has advantages over any artificial apparatus - it 1. Provides a first supply of food at proper intervals
2. Prevents fermentation of the food before it enters the infant's stomach, being sterile
3. Insects the action of necessary digestive fluids.
4. Avoids a vacuum by collapsing as it is gradually emptied of fluid continuously.
5. Is self-regulating.

It has been calculated that a
Mother's breast yields one pint of milk in 24 hours for the first few weeks. This quantity is gradually increased until in the later months it reaches three pints. If the mother cannot nurse her child when practicable a good wet nurse is to be preferred to artificial feeding. The best test being in the size, weight, and general development of her own child. He must be between 20 and 30 years of age and of good health. His temperament, temper, and mill should correspond in age, temperament, and race. If the infant she is to suckle. When for whatever reasons it is necessary to bring up a child by hand the ideal of food must be the mother's milk. We must try as far as possible to imitate this standard. In choosing an artificial food it must be of a form suited to the physiological condition of the digestive function in infancy. During the early months they (infants) have little power of digesting starch; the saliva not flowing freely until the eruption.
Hertner - Year Book Treatment.
1896, p. 155

Matthes Cyclopaedia Vol I
Page 307.

Dieter - Chaddles artifices
Feeding 1st page 64
The diastatic ferment is not fully developed in the pancreatic secretion until the child is one year old. Therefore there is small power of digesting starchy food. From some experiments by Henbner (Berl. klin. Woch. 1910, 93) it would appear that digestion of complex carbohydrates in early life is more complete than was formerly supposed. The stomach cannot deal with solids as mass, they must be in a state of minute subdivision.

To a substitute for mother's milk that of the cow treated so as to correspond as nearly as possible with human milk is almost universally used. In parts of France notably Brittany infants amongst the peasantry are fed directly to the cow's udder apparently with good results. Lueter has shown that milk as it comes from the cow is sterile but becomes quickly infected by the hands of the milkers, utensils, air of byres etc.

Milk very readily undergoes fermentation. Pasture is a great source
Dr. Coffies - Keating's Cyclopaedia
Vol I page 301.

Dr. Trowneend - Keating's Cyclopaedia
Vol I p. 200.

Sims Woodhead - Brit. Med. Journal
Feb 1st 1896.
Of danger in spreading infectious diseases, as Typhoid fever, Diphtheria, Tuberculosis. For these reasons it is best to sterilize or partially so all milk coming into the house more particularly if for children. Dr. Jeffries of Boston remarks "It is a curious fact that while older people are chiefly fed on sterilized food, that is cooked food, infants are fed on food peculiarly adapted by its composition to fluid state to offer a fine for bacteria."

Sterilization destroys the germs of fermentation destroying according to Dr. Jamsen (quoted by Roter) not only the putrefactive bacteria but changing and driving off tyrotoxin or all poisons produced by these bacteria.

There are various methods for sterilizing milk. The following being the practical directions given by Dr. Sims Woodhead for the domestic sterilization of milk:

1. The quantity of milk should never be more than the quantity of cold water by which it is surrounded; it is an
advantage, in fact, to have a somewhat larger bulk of water than of milk, to allow for evaporation.

2. The milk should not be cooked in, but should be stirred from time to time, but the water may with advantage be covered, in order to prevent evaporation. This, of course, is arranged for in special milk sterilizing pans.

3. The water should be boiled over a good brisk flame in order that the best results may be obtained. The heating process should be continued until the temperature throughout the milk has risen to from 190° to 198°. In most cases this takes place at the end of about twenty-five minutes, but in order to be perfectly safe it may be recommended that every quart of milk treated in this fashion should be heated for half an hour, that is, for about twenty minutes after the water in the outer pan has begun to boil.

Epidemics of dysentery, scarlet fever and smallpox have been
Home Home - "The Hospital"
April 11/96 page 25

Royal Commission on Tuberculosis -

Dr. Martin - Brit. Feb 14/96

R. Woodhead - Brit. Feb 16/96
traced to the milk easily retarding its putrification and much effectually stops any danger. Horne House is of opinion that typhoid is only thus conveyed when the milk is contaminated by a patient suffering from the disease. That scarlet fever, diphtheria may be derived from the other hand from disease in the cow itself. Tuberculosis has also increased enormously. Milk has been shown to be a very potent cause of it. See the Report of the Royal Commission on Tuberculosis by Sydney Martin, F.R.S. Woodhead. Dr. Martin is of opinion that when tuberculosis affects the internal organs of cow the milk is not affected but in all cases in which the udder is tuberculous the milk becomes infectious if possesses a virulence which must be described as extraordinary. Dr. Woodhead concludes from his experiments that milk from tuberculous udders is in all cases possessed of the power of setting up
A. Pagonisky - War Book of
Material 1895, page 190
tubercular insects even when mixed with a considerable quantity of sound milk. He found that the exposure of even virulent milk-tubercules to a temperature of 185° F for five minutes is sufficient to render it innocuous, although the same material brought rapidly to a temperature of 194° F still retains some power to infect.

As a result of sterilisation the odour and taste of the milk are altered, but children readily get accustomed to it.

A more serious objection has been raised by Dr. The anti-septicic property preserved by pasteur milk is lost. This property is also found in fresh meat and is inferred to exist in a combination of organic acids with fat.

A. Baginsky gives some analyses which tend to prove that milk treated by Scheele's method contains a larger quantity of inorganic phosphoric acid than fresh milk, that the incidence is still greater in milk which has been
Barlow

Northrup & Crandall - B.M.?
Spittree June 16/94

Rensly - Year Book of Teflamè
1846 page 155.
really sterilized (as tested bacteriologically). According to [Barlow in his Madras Law Lecture, 1879], sterilized milk may be one of the artificially prepared foods for infants which cause fever, although the proprietary foods are the great offenders especially those prepared with water remixed with a small amount of en's milk. He says "I think there is reason to suspect that the boiling of en's milk prolonged sterilization (especially at high temperature) lessens in some degree its antisepsic quality. When the condition (septicemia) arises it is quickly cured by past milk, beef juice or orange juice."[Northrup Trauball, New York Med. Ann. May 24, 1874] from a study of a series of thirty-six cases of seiriny confirms Barlow's experience.

It is best simply to sterilize what milk may be required for twelve or twenty four hours. Rew [Rev. d. med. d'env. 1877 p. 48] has shown that in
Driff's Analysis - Chadle's Artificial Feeding of Infants
page 19.
Sterilised milk when kept, the fat passes out of emulsion & cannot be emulsioned again by shaking. This change begins to be rapid after the milk has been kept for a week & at the end of a fortnight nearly half the fat is on the surface. Deficiency of fat may cause constipation in infants.

Having decided upon cow's milk as the best substitute for mother's milk we had better compare their composition & characteristics so as to be able to modify cow's to resemble human milk as nearly as possible. For this purpose I have taken S. Duff's analysis of human milk as given in Chollet's book on infant feeding.

<table>
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<th>Human Milk</th>
<th>Cow's Milk (average)</th>
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<tbody>
<tr>
<td>Protein</td>
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<td>Fat</td>
<td>2.41</td>
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<td>Lactose</td>
<td>6.39</td>
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<td>0.34</td>
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<td>Water</td>
<td>88.91</td>
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The solids in cow's milk are greater, but it is not so much the greater amount of solids as the character of its casein which renders cow's milk more difficult to digest than human milk whose casein coagulates in light flocculent masses as compared with the hard lumps of curd. The mere addition of water does not change this character of the curd it only makes the casein less in proportion to the clots smaller. Sterilized milk appears to clot in less masses.

The addition of barley water increases its digestibility by mechanically breaking the casein into a multitude of fine particles being in this way more easily attacked by the gastric juice.

A deficiency in cow's milk must be made up by the addition of sugar of milk.

Insufficient matter in cow's milk is soluble in human, calcium phosphate being very much in excess. Every 2 lbs. is necessary to add time.
Budin de Lavalle - Year Book of Metamorph 1875 page 186

Eveline B. Keating's Encyclopedia vol I page 307
water to milk to lessen acidity. Being
here is this success?
The acidity of cows' milk may
be neutralized by the addition of
bicarbonate of soda.
Sterilized milk, when suitably
treated according to the age of the child,
diluted with boiled water and the addition of milk sugar and bicarbonate of soda is the simplest and best substitute
for mothers milk.
Undiluted sterilized milk has
been largely used in France by M.M. Benedict and Charanne, but
we have not sufficient data nor ex-
perience of its use upon which to
advise this method. Their success
may be due to the small quantities ad-
dministered and the care exercised with regard to the feeding ap-
paratus. As far back as 1887
(Zeitschrift für Kindernahrung, 1887) monthly announ-
cements having successfully fed a baby
of ten weeks old a nonmodified sterilized
milk—one quart per day.
Condensed milk is perhaps the most popular substitute partly in account of its cheapness, the ease with which it can be prepared. Children brought up on it get fat at ease, let large or small. Although large they are far from strong, have little power to resist disease often cut their teeth late are liable to drift intowickets. If properly diluted it is more digestible than fresh unboiled cow's milk. The casein coagulating in smaller masses. It cannot be used for a long period without danger but it is useful in preparing the way for more nutritious food in cases of difficult digestion. The objections to the long continued use of condensed milk are—1. its large excess of sugar, more of cane sugar which has to be converted into grape sugar before it can be absorbed, which is liable to ferment, lactic acid being formed in excess causing indigestion of the stomach, flatulence, diarrhea. 2. its deficiency in fat which is necessary for digestion to keep up the bodily heat.
3. The absence of the anti-scarlatine
element from it.

4. Its want of uniformity in quality.

One part of milk to nine parts of water
will, the addition of one teaspoonful of cream
for every ounce of the mixture, make up
for want of fat, makes a very fair sub-
citute for a time.

Reptonised milk

This consists of cow's milk and its
albuminoids partially or wholly predigested
by means of an extract of pancreas soda.

It is of use as a temporary food
in gastro-intestinal disturbance or as
a transition food between human
and cow's milk. It can also be used
safely for a short period, a month or so.

Chadwell has seen very good results from it.

It enables the digestion from want of
exercising its function to be done by its bitter taste. The
reptonising process should be gradually
reduced until it is discontinued altogethers.
Srivastava - Keating's Cyclopedia
Vol I page 273

Fowkes - Keating's Cyclopedia
Quantity of Food

In deciding the quantity of food to be given to an infant not only is the age of importance but also its weight. From Semkein's observations in the Children's Hospital, St. Petersburg, he has deduced the rule that "The greater the weight the greater the gastric capacity."

Fromlowsky (Journ. Phys. xiv. St. Peterb., 1870) says that the activity of growth of the infant's capacity can be represented by the ratio of 1 for the first week:

\[
\begin{array}{c|c|c|c|c|c}
2 & 2 & 4 & 8 & 12 & 16 \\
3 & 3 & 6 & 12 & 16 & 20 \\
\end{array}
\]

From this it follows that the quantity of food requires to be rapidly increased in the first six or eight weeks little change up to the fifth or sixth month, a considerable increase in quantity usually taking place between the fifth and tenth months.
There are no absolute quantities to be given to a child but the following may be taken as an average—
1st month equivalent of 125-203 of human milk
31.
24. 30.
11.
30. 35.
later
35. 45.

or to put it another way 11 to 2 ounces every 2 to 3 hours gradually increased to 3 ounces every 3 hours after the first month.

For a child under a month or even a little older the usual proportion of milk to water is 1 to 2, or immediately after birth 1 to 3. This is not up to the standard of human milk but infants as a rule do well on this for a little time. The proportion of milk should be gradually increased.

Two parts of milk to one of water or barley water with 3% of milk sugar or a pinch of bicarbonate of soda fulfills most of the essential conditions; the water must be sterilized. Barley water should not be used which has been made more than 12 hours.
Roth - Keating's Cyclopaedia
Vol I page 326.
Mergo - Dr. page 321.
<table>
<thead>
<tr>
<th></th>
<th>Human Milk (Caff)</th>
<th>Cow's Milk diluted with 1 part water to 2 of milk</th>
</tr>
</thead>
<tbody>
<tr>
<td>Protein</td>
<td>2.35</td>
<td>2.916</td>
</tr>
<tr>
<td>Fat</td>
<td>2.41</td>
<td>2.332</td>
</tr>
<tr>
<td>Lactose</td>
<td>6.39</td>
<td>2.934</td>
</tr>
<tr>
<td>Salts</td>
<td>.34</td>
<td>.468</td>
</tr>
<tr>
<td>Water</td>
<td>88.51</td>
<td>91.350</td>
</tr>
</tbody>
</table>

Whole milk should not be given until the 6th month. Antitoxin seems to flag a little beef juice soon puts it right.

Meigs and Rock devised a preparation of milk for infants but as they entail some trouble in making it is impossible to get many people to use them. Besides they are not up to Dr. Caff's Standard of human milk.

<table>
<thead>
<tr>
<th></th>
<th>Meigs' mixture</th>
<th>Rock's mixture</th>
</tr>
</thead>
<tbody>
<tr>
<td>Protein</td>
<td>2.35</td>
<td>1.21</td>
</tr>
<tr>
<td>Fat</td>
<td>2.41</td>
<td>3.50</td>
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<tr>
<td>Lactose</td>
<td>6.39</td>
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<tr>
<td>Salts</td>
<td>.34</td>
<td>.75</td>
</tr>
<tr>
<td>Water</td>
<td>88.51</td>
<td>88.35</td>
</tr>
</tbody>
</table>

Meigs' mixture and Rock's mixture are comparable in composition to human milk.
Carnichael's Disease in Children 1892, page 294
For an infant during the first six weeks Carmichael recommends the following:

Two ounces of fresh milk are diluted with three ounces of water or barley water in which a teaspoonful of milk sugar is dissolved to which two teaspoonfuls of fresh cream and a small piece of bicarbonate of soda are added. After sterilisation an ounce of lime water is added. The mixture is ready for use.

Up to eight months the child should have nothing but milk, but about this time a meal of oat flour (kina) or entire wheat flour (Chapman) may be given once a twice a day in addition to milk; or milk thickened with pure, or well boiled flour or potato may be given for a change. An occasional addition of semolina food, or beef juice may be given even earlier than this, as it appears to be digested. Towards the end of the year bread crumbs or gruel or slightly boiled egg may be added to the diet.
There are certain proprietary foods which are very popular, but they are of low nutritive value.

Mellin's food is perhaps the best known among popular. It is a cereal food with its starch converted into soluble starch acetate. The per centages of the mixtures which are derived from Mellin's food itself are exceedingly insignificant. The fat being inappreciable. The albuminoids so low as to be of little value for nutrition. The ash small. The sugar only 1/24th woman milk sugar. When milk is added equal quantities of milk make with 3% of Mellin's food called the fat is still too low. The sugar is almost half.

Nestle's food. This is condensed milk mixed with a cereal with its starch unaltered. A mixture of one part of the food to ten of water contains a large quantity of starch, practically no fat, albuminoids very deficient. Sugar only about half the standard.
Camurich's Soluble Food contains only 2.78% of solids and is therefore deficient in all points.

Just a word as to feeding bottles. Their care. They mostly in use are objectionable on account of their accessories being so difficult to keep clean. The only kind that should be allowed is the old fashioned long flattened kind with a teat at one end and no tubing. The inside is smooth with no corners where specks of milk can remain cause decomposition of the milk. It has the advantage of being easily cleaned. The further advantage of not permitting of the child to be laid down to feed itself, thus getting milk slowly as quickly hot or cold.

In feeding the child should be kept in a half reclining position. The bottle being held at just horizontally then tilted to presenting the infant drawn in a traveling air. Rest should be given at intervals.
an empty bottle.

After each feeding the bottle must be thoroughly sealed then filled with a solution of bicarbonate of soda (1 teaspoonful to 1 pint) in water allowed to stand until next required when it must be rinsed out with cold water. The teat should be of soft flexible rubber, cervical in shape as being more easily everted & cleaned.

From the foregoing pages I have drawn the following conclusions:

1. An agricultural neighbourhood is most healthy than towns, or mining or manufacturing communities.
2. Antibacterial conditions play a most important part in mortality particularly infantile.
3. Ignorance as regards the nursing management of infants is the greatest cause of the mortality.
4. There is urgent need for the authorities taking up the education of the people on these matters.
5. There is a great responsibility resting upon medical men in laying down definite instructions in all cases coming under their care, in seeing that these are properly carried out.

Too often instructions are given in an off-hand way & treated in a like manner by the parents.

6. There ought to be a frequent & strict inspection of all dairy stock, buildings, utensils—a weeding out of tubercular & unhealthy cows, an insistence upon proper sanitary conditions as regards the housing & feeding of the animals as well as regards all utensils connected with the dairy.
Books made use of—
3. Lewis Smith's Diseases of Infancy and Childhood.
6. Cheadle's Artificial Food and Food Diseases of Infants.
8. The West's Book of Treatment.
10. Medical Journals.
11. Death Registers of the Parishes of Kilmelton & Mid Calder.