Seibert (A.)

# A Reform in Artificial Infant-Feeding,

WITH AN

## Improved and Inexpensive Sterilizer and Nursing-Bottles.*

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ALL food entering the body above its physiological quantities is useless for nutrition, a hindrance to digestion, and a danger to health. This fact, known to the medical men of all countries, so important to the welfare of all, and particularly to that of the bottle-fed babies, has been disregarded to such an extent that it really seems surprising to find that, while animated discussions have been carried on for decades in medical journals and text-books regarding the proportion of milk and gruel, casein, sugar and fat, and nearly every authority has given to the world his own proportions, not until lately have any of them thought it important enough to give precise data concerning the quantity of food to be taken. Gerhardt (in his text-book on Diseases of Children, 1887) does not even mention the word quantity in his chapter on nutrition. Jacobi (in his book on Intestinal Diseases of Infancy and Childhood, 1887) makes the following statements concerning the quantity of food to be given to infants: "Practically it is not very difficult to regulate the quantity of nourishment taken. *Healthy children will fix the proper limit themselves.* The same rule will apply, with slight differences, in an equally good condition of health, for the nourishment artificially prepared. But it is impossible to lay down as a uniform rule that some particular quantity must be considered as normal for all children." "*The child ought to drink from the breast or bottle until it has had enough.*"

This state of affairs has left a wide field for every practitioner, midwife, and mother to individualize, and the result has been that, almost without exception, every artificially fed infant has been overfed. The ordinary nursing-bottle contains six or eight ounces at least, and this quantity was and is still given to the new-born as well as to the

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three-months-old baby, and when the youngster begins to regurgitate food, becomes dyspeptic and constipated and even loses flesh, the comparative merits of the proportion of fat, sugar and casein are considered and the different methods of the authors are tried, one after the other. At last some patent food is resorted to, and, as the weak stomach finds it less laborious to overcome the large quantity of this pseudo-food than that of diluted milk, the mother and the doctor are once more convinced that this patent food has saved the life of the baby.

Biedert (in the ninth edition of Vogel's text-book, 1887) makes this statement: "The amount of food regulates itself so that food is never given oftener than every two hours; and if the child keeps quiet, wait still longer, and give less if the child vomits, and more if it shows ravenous hunger."

Escherich was the first to call attention to this deficiency in precise regulations as to the quantities in infant-feeding. In a table arranged to correspond with the tables and figures of Pfeiffer (Wiesbaden), who determined the quantities of milk taken by nursing infants by weighing his own baby before and after nursing during a whole year, Escherich gives precise figures as to quantity and proportionate dilution of the milk according to the *age* of the children. His volumetric method of artificial infant-feeding (Wien. klin. Woch., No. 40, 1889) is certainly an improvement, and if the bottles devised by him, showing the exact amounts and proportions of milk and water, would be used as he has directed, not alone according to the months but even the weeks of life the child has existed, no doubt many little ones would be all the better off for it. But his method is an ideal one, and therefore deals with ideal mothers who will put just so much food in the bottle large enough to hold much more, no matter how much their offspring clamor for more, and will never think that "a child ought to know best when it has had enough," and never act accordingly; and he deals with ideal children, all of one size and one weight, who always gain in flesh and in proportions of stomach-capacity according to the rules laid down in Gerhardt's text-book on Diseases of Children, Vierordt's Physiology, and Pfeiffer's tables, never varying in the least.

But mothers *will* give their infants more food without hesitation if they only notice that the youngster keeps on sucking its finger after the bottle is empty, and especially if a large bottle is given them to feed with; and the infants will *not* invariably increase their digestive power and the capacity of their stomachs according to text-books and tables; they will even be born with different-sized stomachs, and will not gain in flesh and weight as Escherich seems to believe, but will arrange that en-

tirely according to circumstances coming up during these twelve months of life — circumstances that either promote or retard the digestive ability, size of the stomach, and weight of the child. Only one thing really does keep on increasing steadily, and that is the age of the infant. Escherich makes the same error that Fleischmann and Ahlfeld committed when both weighed children of the same age to determine the amount of food taken by them. Their results were far from even, which led Jacobi (Intest. Diseases, p. 86) to the following sarcasm: "Can there be anything more exact? Both forget that the nursing, which occupies a child fifteen to thirty minutes, represents no invariable quantity, and that the whole quantity can not be found at any time entirely in the stomach."

In venturing to answer this question of the father of modern infant-feeding I hope not to be deemed impertinent when I say that there is something more exact, and these experimenters did not succeed, and could not succeed, because they weighed out the stomach capacity of babies of one age and not of one *size* and *weight!* This is not exact and never will be, *for the weight and size of infants of the same age vary as do their faces, and hence necessarily the capacity of their stomachs also.*

For the last two years I have paid more attention to the stomach capacity and digestive power of infants than formerly, and, seeing large numbers of children run down by disease, retarded in growth by improper food and feeding, or naturally small by heredity, and, on the other hand, children above the usual size and weight and yet of one age, it naturally occurred to me that it would be entirely improper to regulate their food so as to give them all the same quantity. And so I took to weighing these infants, and was at first astonished to find them vary so much in weight. Thus, it has been nothing unusual to see two infants in the same hour at my clinic corresponding in age and varying in weight so as to show the one to have fourteen and the other but seven pounds of body-weight. The second conclusion I came to, after having weighed a greater number of infants, was that it was quite easy to determine the bulk of food a child could take, or, better, ought to take. The success of arranging the feeding in this manner was very gratifying, and so gradually I was able to arrange a table in my mind similar to the one you have in your hand, which has since guided me in determining the quantity and composition of food. Since October, 1888, I have frequently written out this table on the blackboard in the Children's Department of the New York Polyclinic for the benefit of my class; so in reality this is not a new method with me.

It would have hardly occurred to me that others did not, to an extent at least, work in the same direction, had it not been for one of

# HOW TO FEED AN INFANT,

**Devised by A. SEIBERT, M. D.**

Never use a larger bottle than the one indicated by the child's weight.

| WEIGHT IN POUNDS. | NUMBER OF BOTTLE. | SIZE OF BOTTLE. | AMOUNT | | | TIME OF FEEDING. | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | OF MILK. | OF GRUEL. | OF SUGAR | HOW OFTEN | IN 24 HOURS | FROM 6 A M TO 6 P M | FROM 6 P M TO 6 A M |
| 6, 7 and 8 | I. | 3 ounces. | 1 ounce, or 2 tablespoons full | 2 ounces, or 4 tablespoons full | ½ teaspoon full | 1 bottle full every 2 hours | 8 bottles | 6 bottles | 2 bottles |
| 9 and 10 | II. | 4 ounces. | 1½ ounce, or 3 tablespoons full | 2½ ounces, or 5 tablespoons full | ½ teaspoon full | 1 bottle full every 2 hours | 8 bottles | 6 bottles | 2 bottles |
| 11, 12, 13 and 14 | III. | 5 ounces. | 2½ ounces, or 5 tablespoons full | 2½ ounces, or 5 tablespoons full | ¾ teaspoon full | 1 bottle full every 2½ hrs | 7 bottles | 5 bottles | 2 bottles |
| 15 and 16 | IV. | 6 ounces. | 3½ ounces, or 7 tablespoons full | 2½ ounces, or 5 tablespoons full | ¾ teaspoon full | 1 bottle full every 2½ hrs | 7 bottles | 5 bottles | 2 bottles |
| 17 and 18 | V. | 7 ounces. | 5 ounces, or 10 tablespoons full | 2 ounces, or 4 tablespoons full | 1 teaspoon full | 1 bottle full every 3 hours | 6 bottles | 5 bottles | 1 bottle |
| 19 and 20 | VI. | 8 ounces. | All milk and 1 teaspoon full of sugar | | | 1 bottle full every 3 hours | 6 bottles | 5 bottles | 1 bottle |

Directions:—Weigh the naked baby, and then find the amount and composition of its food and the manner of feeding on the table.

THE **WEIGHT**, NOT THE AGE, OF THE INFANT DETERMINES ITS FOOD PROPERLY.

the latest articles of Escherich (Wien. klin. Woch., No. 40, 1889), in which he pleads for reform in artificial infant-feeding in reference to the amount of food. As mentioned before, he adheres to the method of feeding according to the *age* of the children. Escherich does not even mention the fact that the capacity of the infantile stomach varies very considerably in children of the same age. On a closer inspection of recent writings on infant-feeding, I found that Biedert (in Vogel's text-book, 1887) remarks: "In case the digestion is very easily disturbed, a more exact regulation of diet would be necessary, so as to give two hundred cubic centimetres of properly diluted milk to every kilo of the child's weight." Rotch, in the August number of the Archives of Pædiatrics, 1889, thus calls attention to the different sizes of infantile stomachs: "Of the different causes which regulate the gastric capacity, the *weight* of the infant has the greatest influence, and it is perfectly possible for a poorly developed infant of small weight to have a gastric capacity no greater than a normally developed infant of half the age."

These few remarks made by Biedert and Rotch are all I could find bearing directly on our subject. The determination of the bulk of food by weighing infants before and after nursing was practiced long ago, but no one has been so exact as Pfeiffer, of Wiesbaden (Jahrb. f. Kinderheik.), with his own child. But in arranging our table we could not go by this one case, as it was that of a healthy child of medium weight. The figures I present in this table are the result of careful notes on about two hundred different children. The manner of obtaining the figures was simple enough. After weighing the child, the composition and bulk of food were ordered, the latter usually being considerably smaller than before. If regurgitation of food, constipation, and dilatation of the stomach and the intestines, with restlessness at night and occasional wind-colic, would not disappear, then the bulk and strength of the food were diminished still more, until the apparent normal boundary line was reached. This was done in all cases. The increase in the food was not ordered until increase in weight had previously indicated it. Whenever the bulk and strength of the milk mixture was increased too rapidly, the infant would invariably indicate this by regurgitating the superfluous amount.

Handled in this manner, I have often had the pleasure of seeing infants get well and thrive on three ounces of food that had heretofore been stuffed and starved with five ounces of diluted milk, sterilized and often peptonized in the most approved style. I am at a loss to see why the dilatation of the stomach in infants, which indicates the true condition of affairs in every case as distinctly as the Indian figure shows the cigar-store and the red-white-and-blue pole the shop of the hair-cutter,

has been, is, and probably will be for some time to come, overlooked by the medical attendant. No doubt Escherich is right when he makes the statement that insufficient training of medical students regarding even the very fundamental principles of pædiatrics has been the chief cause of the slow progress of this branch of medicine, and the sceptic and conservative feeling among general practitioners regarding anything new, and, in particular, any tables and charts.

My figures do not alone pertain to healthy but also to convalescent children. If an infant ten months old has been reduced to seven pounds by ailments of any kind, but three ounces of food at the utmost are indicated. If you give more, that baby will vomit, and, at best, not pick up nearly so quick as if handled properly.

On the other hand, a child weighing ten pounds at birth ought to have more and stronger food than one weighing three to four pounds less. The talk about some children of the same size eating more than others is but talk. It takes no more food in one body to keep up the same functions than in another, *provided these bodies are of the same size and do the same amount of work.*. Infants do about the same amount of work, so their weight is the only guide left.

I have nothing more to add regarding this method of determining the amount and composition of food for artificially fed children. It is only a new method in detailing and specifying what the most conscientious authorities in pædiatrics have long ago emphasized, and over and over again urged upon the minds of medical men. No doubt my table is deficient, and others will sooner or later make changes, and necessarily it will in each case be left to the physician to individualize; but, on the whole, I do think that this reducing artificial infant-feeding to "facts and figures" will prove a step in the right direction (as Dr. A. Jacobi has been kind enough to call it), and may serve as a practical medium in impressing physicians and parents with the important necessity of not giving infants more food than their stomachs will hold, and of only giving such mixtures as can be digested and assimilated with ease and benefit.

To practically carry out this idea, I deemed it necessary to at first do away with all of the nursing-bottles now in use, including not alone the well-known flat arrangement with the long rubber tube, invented only for promoting the laziness of mothers, but also the Soxhlet bottle, which is entirely too large for the new-born and entirely too small for children weighing more than fourteen pounds. Escherich had this same notion exactly at the same time (his article on his new apparatus arriving here while my sample bottles were being made), but he designed large nursing-bottles, graduated by marks. For reasons given

before, I did not deem it wise to furnish mothers with larger-sized bottles than the size and weight of their offspring indicates, and therefore I designed *six different sizes of bottles*, ranging from three to eight ounces.

Following up the idea of not leaving any part of this feeding method to the judgment of mothers and nurses, I had the bottles properly marked so as to show on the one side the precise mark up to which milk should be filled in, and the word "milk" impressed below this mark. This simple arrangement permits the omission of first pouring the milk into measures, as designated by Soxhlet and Escherich, or of using a tablespoon of doubtful cleanliness. On the other side of the bottles the direction will be found: For child weighing (so and so many) pounds.

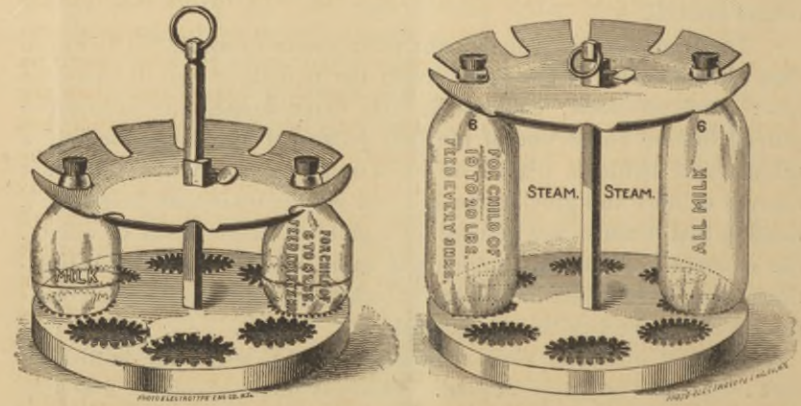
These specifications may seem unnecessary to some, but I believe that when Goethe in his Faust made the remark, "For all that you have *black on white*, contentedly may carry home," he once more proved himself to be one of the best judges of human nature. If a proper-sized bottle is placed in the hands of a mother, if the exact amount of milk and gruel is marked and written upon that bottle, and, besides, that it must only be used for a child of a certain size or weight, the chances are that this mother will more readily follow these directions than if they were not there "black on white," warning her constantly not to disobey this written rule.

My next object in view necessarily was to design the bottles so that they could be easily cleaned. This was simple enough. I merely did away with the long neck, so that with a pencil, for instance, we may easily touch any part of the interior of the bottles. The neck I had so constructed as to leave not a particle of space between the stopper

and its glass surrounding, a decided deficiency in the Soxhlet bottle, which leaves a furrow of sufficient size to retain a portion of the milk, which, after sterilizing, must invariably decompose later in the day, especially in warm weather, and while the child is drinking must necessarily reinfect the milk passing over it before it enters the mouth and stomach of the infant.

The question of a proper and cheap way of closing the sterilized bottles had, up to date, not been solved, as Escherich wrote but a few weeks ago. The stopper designed by me answers all purposes well. It is simple, practical, and cheap. The furrow in its lower third allows the steam to escape during the process of sterilizing, and by a simple turn the bottle is closed air-tight. This is not alone an improvement on the Soxhlet stoppers on account of being less expensive, but because the aseptic condition of the food is more perfect, as after boiling twenty minutes no glass stoppers are put into the bottle, which, handled by the unclean hands of the mother, are brought in direct contact with the food again, thus creating a possible danger for reinfecting the food and harming the child. The ten minutes of further boiling after the glass stoppers are pressed in (during which time they often fly out and fall on the stove or even the floor) is too short a time to kill any germs that undoubtedly have entered the bottle, as Hüppe (Arbeiten aus dem Reichsgesundheitsamt) showed as early as 1884.

The tray I designed holds the bottles in position and permits the steam to surround them at all sides during the process of sterilization.




This tray is so constructed as to be movable and to be fitted for all sizes of these bottles. The holes in its lower part are so constructed that the steam courses up directly in close proximity to each bottle, but

its chief virtue lies in the fact that it may be placed in any ordinary pot used for cooking in every household, thus again doing away with a greater expense and another object for care and work for the mother.

My method of sterilizing is the following: After the bottles are properly filled the rubber stoppers (which fit all sizes) are put into the openings so as to leave the upper end of the furrows or gutters just above the rim of the bottle, allowing steam to escape. Then two cupfuls of water are put into the pot (or the Soxhlet tin pail or the Arnold cooker), the lid is placed on the pot, and the latter placed over a brisk fire. Within five minutes steam appears under the lid of the pot, and counting from its appearance, the pot is left in position thirty minutes (in cool weather, from November 1st to May 1st). The pot is then removed, the tray is taken from the pot, and the stoppers are turned tightly into the bottles, and the food is safely sterilized.

Hüppe, in 1884, showed that steam-sterilizing was far more effective than that done by boiling in water.

My tests I made with milk thus handled proved this to be correct. In warm weather (from May 1st to November 1st) I deem it necessary to steam fully forty-five minutes, as the milk brought then to the houses of city people is in a far more advanced stage of decomposition than in winter time. (See my report on Cholera Infantum and the Weather, Med. Record, March 24, 1888). To do this it is necessary to use three instead of two cupfuls of water for steaming.

The warming of the bottles is also done by steaming. A circular piece of wood or pasteboard, large enough to cover any ordinary tin pint or quart measure (as used in every household), is cut in so as to have an opening wide enough to admit the neck of the bottle to the center of the board, so the bottle is suspended in the tin hanging over the water. A small quantity of water is put in the tin, this placed on the gas, oil, or ordinary stove, and in exactly a minute and a half the bottle is warm enough for drinking. Any one who, like myself, has had any personal experience in getting up at night and "warming the bottle for the baby," will appreciate this simple device, for it takes fully fifteen minutes to do this according to Soxhlet's method. But this steaming is not alone safer for the food and child, but also safer for the bottles, as there is no chance at all for cracking them by placing them suddenly into hot water, as so far has always been done by cooks, nurses, and mothers to accelerate the proceedings.

It is my plan to have all druggists in the populous districts sell this apparatus, and to have them weigh the children for the inhabitants of the tenements, and accordingly to determine the exact size of bottles needed in each case. The arrangement is made that the druggists will

take back the smaller bottles and give the next size when indicated, with an apditional charge of about twenty-five cents.

This brings us to the price of this apparatus. With a written sigh, Escherich exclaims in his last article that the Soxhlet apparatus is too expensive, and therefore does not reach those that need it most—the poorer classes. My apparatus—which in every respect but in the fundamental principle of sterilizing in bottles is new and decidedly more exact and less troublesome to handle—has been devised for the special purpose of becoming the infant-feeder for the laboring classes, among whom infant-mortality in summer time has baffled the skill of medical men and health authorities for ages back.

It is Soxhlet's idea to sterilize milk in small bottles for infant-feeding, and his apparatus has done much good in preventing infants getting sick and dying of milk-poisoning; but it costs five dollars, and therefore is entirely too expensive for the working classes, not to speak of the outlay of frequently buying new bottles to replace those cracked during boiling in the water-bath. It is patented in Germany, and has been imitated and is sold at the same figure here, though nothing is paid to the patentee.

Escherich's improved sterilizer has been spoken of, and will be hardly less expensive. His bottles are large and graded by lines, and, to my mind, can hardly be used with success by any but very careful mothers. He closes his bottles with the nipples or with cotton (not absorbent)—a manner unfit for practical and ordinary handling.

The Arnold cooker leaves the choice of bottles to the mother, and in that respect must be called a backward step, though the steaming is an improvement.

The six-ounce bottles, filled with sterilized milk, that have lately been brought in the market here, are entirely too large for infants and ought not to be used for infant-feeding, aside from the fact that their price would only suit very rich people, who pay $1.20 each day for this food.

Following the advice of Professor A. Jacobi and Professor J. Lewis Smith, who have both been kind enough to inspect my sample apparatus, the firm of Eimer & Amend (corner of Eighteenth Street and Third Avenue) have cut down the price of my apparatus, so that it can be retailed all over the land at $1. It includes the tray, eight bottles with stoppers, and two nipples.

It is not patented and will not be patented, and if imitated abroad, as I sincerely hope it will be, it will push its way, naked and pure, for what it is worth, as a present to the children of the poor man all over the world, from a member of the New York Academy of Medicine, which deems it improper to patent articles used for the prevention and cure of disease.

*Directions for Steaming.*—Fill the bottles up to the mark with pure, fresh bottled cow's milk, obtained from a milkman and not from a store, early in the morning, and above the mark with barley or oatmeal gruel, or plain, fresh water. Then add sugar. After filling the bottles as directed, place them in the tray; then put rubber stoppers on them, so as to leave a *small opening at the side of the stopper;* then put two to three teacupfuls of water in any clean pot ten inches wide and eight inches high, place the tray in it, cover it with the lid, and place it over a strong fire. In *cool* weather (November 1st to May 1st) steam fully *30 minutes*, in *warm* weather (May 1st to November 1st) steam the bottles *fully 45 minutes.* During steaming the lid of the pot remains closed. Then remove the pot from the fire, uncover it, and *turn stoppers tight into* the bottles. *Never* open a bottle until feeding-time. Bottles are best kept in a cool, dry place.

*Directions for warming a Bottle at Feeding-time.*—Pour four tablespoonfuls of water in an ordinary tin quart measure; then put the neck of the closed bottle through a round piece of pasteboard or paper, big enough to cover the opening of the tin; place the perforated half of a blacking-box in the tin so as to serve as a second bottom; loosen the stopper, place the tin on the stove, and steam for two minutes; then remove the stopper and put the nipple on the bottle.

*Caution.*—Never put the bottles in the water on the bottom of the tin, as they will crack instantly.

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