these rural districts and in cotton mill villages were due to infection with hookworm, a large number of people so infected have been treated and restored to health.

The economic considerations involved in this widespread disease have so impressed various medical and state authorities that we may expect to see at an early date a systematically directed movement against its eradication. Every girl and every mother, who is freed of this malady, adds by just so much to the prospective and to the actual nursing force of the country.

These facts, coupled with the fact that mothers are to-day better prepared and are better informed, seem sufficient to justify the taking of a rather optimistic view of the situation, and for believing that our women will be able to prove by any test their fitness for maternity. On the other hand, it can not be denied that there are still in this country thousands of infants deprived, for one reason or another, of breast milk. I sincerely believe that if we, individually and collectively, were to make an earnest effort to increase both the production and the saving of breast milk, we could reduce this number to a very considerable degree.

When any digestive disturbance in the nursing is reported to the physician it is his duty to be as painstaking and as diligent in his investigations as he is when the baby happens to be artificially fed. He must not only examine the child's actions and investigate the hygiene of the nursing act, but he should look into the life and the habits of the mother herself. Does she lead a sedentary life or is society—social entertainments and social dissipation—making inroads on her nervous system? Is she a slave to household drudgery, who is compelled to drink innumerable cups of tea, coffee or other stimulants in order to keep on her poor, tired feet? Is she constipated and anemic? Has she a decayed tooth or an ingrowing toe nail?

No detail should be regarded as too insignificant in this investigation. Whether it be pain, or work, or play, whatever is immoderate or intemperate in the life of a mother will be reflected in her milk, whether she indulges in a too exciting game of bridge or has merely engaged in a hair-pulling dispute with the lady on the next floor, the effect on the milk will be equally bad.

None of these things implies that mother's milk is thrown out of the normal more easily than cow's milk. All of them, however, may indicate that we protect and take care of our cows better than we do the mothers of our babies. I believe, moreover, that every day there is good breast milk going to waste, which, if it were but saved and directed toward hungry mouths, would be enough to give every starving baby in the land a square meal and a square deal!

I would not discourage or minimize the noble work now being done by noble men to create a supply of clean cow's milk. It is, perhaps, not without tenuity that I suggest that there is something twisted in our arrangement of preventive medicine when we organize ourselves into milk commissions, the sole purpose of which is to overcome difficulties encountered in securing an ample supply of pure cow's milk, while we have no similarly organized body devoting its attention to the many perplexing problems of the human milk supply.

So long as this condition lasts there is a possibility that our knowledge of the cow and of cow's milk will exceed our knowledge of the mother and of mother's milk—the possibility of our becoming better equipped as veterinarians than as physicians.

Provided its organization could be effected, multiple duties would devolve on a body constituting itself a breast milk commission. Besides a deeper study into the physiology and the pathology of lactation and the influence effecting this function, such a commission might undertake to secure *reliable* statistics relating to the ability of mothers to nurse; to disseminate knowledge relating to the hygiene of nursing; to initiate a propaganda combating the many superstitions surrounding lactation. Such a commission could devise plans for creating a regulated and organized corps of wet nurses and might even make feasible the establishment of depots at which bottled breast milk could be sold. There is nothing in the last suggestion that I regard *bizarre* or impossible. With several marantic infants I have been able to demonstrate bottled breast milk as being both practical and beneficial.

FAILACIOUS STANDARDS EMPLOYED IN ARTIFICIAL INFANT FEEDING.*

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It will not be disputed, that before the science of artificial infant feeding can become an established fact, elementary principles must be worked out which every one can accept, not because they are supported by authorities, but because their correctness can be demonstrated. In other words, the principles must be able to stand alone.

All sciences have passed through a formative period, when what we now know are their basic principles were discussed and disputed. The attitude of some of the old scientists and physicians, as for instance, those who would never admit that the blood circulated, may seem strange in the light of present day knowledge. But to-day we are still in the formative period of the science of infant feeding, and there is danger of the present day physician falling into the same attitude, for there are a number of doctrines concerning infant feeding which are clearly erroneous, but which are stoutly maintained by many pediatricians. These doctrines must be recognized as wrong and be abandoned before satisfactory progress can be made. It is admirable not to be easily carried away, but it is equally commendable to abandon a belief that is wrong.

There is remarkable analogy between the pioneers in the subject of artificial infant feeding and the old alchemists. The alchemists were searching for the philosopher's stone that would change base metals into gold. While they did not find this stone, they made many discoveries that were used later on in laying the foundations of our wonderful modern chemistry. The early workers in scientific infant feeding sought to make an artificial human milk, and, like the alchemists, failed to attain their object. But they also made many discoveries, whose significance has not yet been fully realized, but which, when systematized and correlated, will eventually develop into the science of infant nutrition.

The alchemists had no conception of the change of form and properties the chemical elements may undergo

* Read in the Section on Diseases of Children of the American Medical Association, at the Fifty-ninth Annual Session, held at Chicago, June, 1908.

when they form combinations, and made gross physical appearance their standard. For instance, they imagined that sulphur and gold were nearly alike because they had the same color.

The early scientific infant feeders were similarly misled, and thought to make human milk from cow's milk by making it look and taste like human milk, and have the same reaction.

We now know that physical appearance is of little value as a standard in chemistry, and it is by their chemical and physiological properties, not their appearance, that the various substances used in infant feeding must be judged. As an illustration of how misleading judging by taste and appearance may be, we might take codliver oil and a palatable emulsion of codliver oil. Judging them by appearance and taste they are wholly unlike and would never be placed in the same class. Superficially they differ widely, essentially they are alike.

In the practice of infant feeding there are used many substances which differ greatly in form and appearance, but which are essentially the same; and certain terms are applied indiscriminately to widely differing substances. The result of this judging by appearances and using terms loosely has led to the establishment of some so-called standards which are clearly fallacious and which are not and can not be followed in practice, even by those who have advocated them.

It is the object of this paper to show wherein some of these standards are fallacious. By standard is meant the basis or principle on which practical feeding is supposed to be based. If the true principles on which practice is based are recognized, a great amount of progress will have been made.

STANDARDS.

Let us glance over a few of the standards that are employed.

It is an accepted standard that Nature should be followed. What is following Nature? Some say one thing and some another.

1. The simplest standard heard of is, give the infant milk. If its mother's milk fails, give it cow's milk, goat's milk, or ass's milk, but follow Nature and give milk.

2. The next advanced standard is, that all milks are composed of the same ingredients, but in different proportions, and changing the percentage composition will practically convert the milk of one kind of animal into that of another.

3. Another standard is that human milk is composed of fats, carbohydrates, proteids, mineral matter and water, and the infant's food should contain these ingredients in the same proportions.

4. A favorite standard has been that cow's milk was acid and human milk alkaline, and therefore 5 per cent. of lime water should be added to cow's milk to give it the same reaction.

5. A newer standard is that the difference between human milk and cow's milk is due to the fact that they contain casein or caseinogen and lactalbumin in different quantities and relative proportions, and that these relative proportions are definite for each milk.

6. It is a widely accepted standard that human milk is sterile and cow's milk contains bacteria and therefore the cow's milk should be sterilized or pasteurized before being given to infants.

7. Another standard is, that of gain in weight of the infant caused by a given food.

8. A recent standard is that the infant needs food that will produce a certain number of calories depending on the size of the infant.

It is not uncommon to meet with all of these standards in use at the present time. Any one engaged in post-graduate teaching knows this to be a fact. To those who have specialized in infant feeding it will not be necessary to say that the standard, give milk because the mother gives milk, is based on superficial observation and does not take into consideration the possibility of all milks not being alike. The standard that all milks are composed of the same ingredients, but in different proportions, has not been found to be correct, for after percentages have been readjusted, the original physical properties of the different milks remain unchanged. No one has yet transmuted cow's milk into human milk by changing its percentage composition.

The standard that human milk is composed of fats, carbohydrates, proteids, mineral matter and water, and that the infant's food should contain these ingredients in the same proportions, is too broad, as under it any form of food could be employed, meat, vegetables, bread, etc., as all of these foods contain fat, carbohydrates, proteids, mineral matter and water. This standard merely states that the infant's food should contain the elementary food substances without which life could not be maintained.

The standard that as human milk is alkaline and cow's milk acid, 5 per cent. of lime water should be added to cow's milk for infants, fails in practice, for 5 and 10 per cent. of lime water is recommended to be added to diluted milk which oftentimes makes the amount added to the whole milk 100 per cent. or more. Lime water or other alkali has a specific action on the milk, altering or preventing its curdling in the stomach by rennet or pepsin. The practice may be very good, but the standard is worthless and masks the true purpose and value of lime water in infant feeding.

The standard that was brought forward after the weakness of many of the previous standards was recognized, viz., that it was the relative proportions of casein or caseinogen and lactalbumin that made the difference between milks of different species, is not undisputed. In the first place, casein or caseinogen does not seem to be the same for each kind of milk, and then, Van Slyke has shown by analyzing the milk of hundreds of cows that there is no constant ratio between casein and lactalbumin in cow's milk as was supposed. The quickest and surest way to satisfy oneself as to whether the caseins in human milk and cow's milk are the same is to add rennet and a very small quantity of dilute acid to specimens of human milk and cow's milk and note the resulting curds. Those who read books and compare authorities may have doubts, but those who perform the experiment will be convinced that the standard is wrong.

The standard that as human milk is sterile and cow's milk contains bacteria, cow's milk used for infants should be sterilized by heating, can not be maintained, for we know of the use of buttermilk made by adding lactic bacteria to milk, and it is lauded as a remedy for intestinal disorders for which sterilized milk was thought to be ideal at one time; and even giving bacteria to infants has been reported as successful. That the food must not contain bacteria is a standard that evidently can not be maintained.

VALUE OF FOOD.

As to judging the value of an infant's food by the gain in weight it produces, a standard that is decidedly misleading is employed. According to this standard a mixture containing 3 per cent. fat, 7 per cent. carbohydrates and 5 per cent. proteids is just as good as one containing 3 per cent. fat, 6 per cent. carbohydrates and 1.5 per cent. proteids, if it produces the same gain in weight. Gain in weight may result from storage of fat and water, or in an increase of blood, tissue and bone. True growth consists in an increase of tissue, not in laying on fat, and in reality means storing up proteids. If the food is poor in proteids true growth can not occur, although a gain in weight may be made from the storing of fat produced from the fat and carbohydrates of the food. The fat, anemic, condensed milk baby is an illustration of the fallacy of judging the value of the food by the gain in weight it produces.

The caloric standard of feeding will be shown to be decidedly fallacious. The caloric is a measure of heat, and the number of calories a food will yield is determined by burning it. An ounce of food containing 1 per cent. fat will yield 2.8 calories; 1 per cent. proteids, 1.23 calories; and 1 per cent. carbohydrates, 1.23 calories. From these figures it is easy to calculate the number of calories an infant's food will yield when its percentage composition is known, and below are eleven formulæ, each of which yields the same number of calories. Many more could be shown.

Each ounce of the following formulæ yields seventeen calories.

	Proteids.	Fat.	Carbohydrates.	Calories.
1 oz.	.50	3.0	6.5	17
1 oz.	1.0	3.0	6.0	17
1 oz.	1.5	3.0	5.5	17
1 oz.	2.0	3.0	5.0	17
1 oz.	2.5	3.0	4.5	17
1 oz.	3.0	3.0	4.0	17
1 oz.	3.5	1.0	8.0	17
1 oz.	2.0	1.5	8.0	17
1 oz.	3.0	1.5	7.0	17
1 oz.	3.0	2.0	6.0	17
1 oz.	2.0	2.0	7.0	17

An infant does not use its food for heat production primarily, but for tissue building, and the question is not how much heat will the food produce, but can it produce good tissue? For heat production any one of the above formulæ is as good as another; for producing growth and for practical feeding there is room for choice.

Allowing the infant needed the food for heat, how many calories would it need? How much coal will heat a house? It will depend on the outside temperature, that is, on the loss of heat. In hot weather, the infant produces more heat or calories by moving its muscles and its internal organs than it needs and has to excrete heat, and consequently would practically need no food at all. Such a standard could never be successfully employed in practice.

It will probably always be necessary to use milk in feeding infants; adjusting percentages more or less accurately will never go out of practice; alkalies will have their use; it will be a long time before pasteurization or sterilization is not practiced; the use of small quantities of casein, as in whey mixtures, will always be useful at times; the gain or loss in weight of infants will still have to be watched, but some of the theories on which these procedures have been based will have to be abandoned.

Why can we not take the successful methods of practice, ascertain the principles involved in their use, and

from these build up the science of infant feeding? It would become simple and could easily be grasped, and the efforts now devoted to supporting various theories could be used in other fields.

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THE GOSPEL OF TOP MILK.*

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Babies are the most philosophic people. They thrive or die, crow or wail without regard to the half million or more books and pamphlets which have been written about them in all countries in the course of a century. As I can not mention all the authors or compilers, I shall in justice to them or in sympathy with them, not inculpate a single one, not even myself, though I am by no means innocent. You may imagine that many of the topics discussed from year to year were not always new to anybody, except to the last contributor, and that quite often the very simplest fact had to be rediscovered by the latest writer because the literature of yesterday or of fifty years ago happened to be unknown to him. My paper will be brief, though emphatic; more, it may even not contain anything a well-informed medical person will not know. If that be so, I may be considered less a teacher than a missionary.

I wonder how often you have met with cases like that which was sent me by a colleague in good standing and of long practice. He wrote: "This little girl, 21 months old, had nearly normal temperatures in the forenoon, that is about 99 F. and 101 F., and more every afternoon these three weeks and perhaps longer. Nothing to account for it. Please find out and advise."

CASE.—First baby, 21 months old, was nursed three months, then brought up on the bottle. Sleeps pretty well; first meal 7 a. m., raw milk 9 ounces; 9 a. m., the juice of an orange; 11 a. m., 9 ounces of raw milk; 1 p. m., some beef juice (for some time past); 4 p. m., 9 ounces of raw milk; 6 p. m., broth and bread; 9 p. m., 9 ounces of raw milk. Most of the food was raw, rich and unmixed milk, and the number of feedings seven; that is at least two too many. The baby is fat, rather flabby, weighs 29 pounds, is quite intelligent, walks with difficulty. Some rickety curvature of the lower extremities, epiphyses swelled, thymus rather large, systolic murmur, the exact location and extent of which can not be made out on account of the baby becoming discontented; urine negative, slight indicanuria only, constipation. Requires frequent enemas; feces rather hard, round, mostly of a light color, shining, contains neither mucus nor blood, sometimes is malodorous. In the early months of life the head perspired much, the occiput lost its hair, the large fontanelle closed at 18 months, the first teeth appeared toward the end of the first year, constipation set in about the third month. No pain anywhere or at any time.

Diagnosis.—You recognize at once early rachitis with cranio-fabes, adiposity and muscular incompetency, in consequence of the latter early (not congenital) constipation and delayed walking. Peristalsis insufficient to move the intestinal contents, and the excess of fat in the undiluted rich milk resulted in ample saponification, with slow absorption and enough local irritation to cause a "chronic enteritis." The local intestinal hyperemia was increased by the incompetency of the cardiac circulation.

Treatment for the Present.—A large tepid daily euema of 7:1,000 salt water; addition in equal parts to the milk, scalded,

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