

tonsils and adenoids have been removed in last six months; recommended on account of ear complication. The child is doing well at school.

Measurements, May, 1912:

		Average of His Age
Height (inches)	52 3/4	50
Weight (pounds)	63	60
Chest (inches)	24 1/2	25 1/10
Waist (inches)	25	....

CASE 6.—L. S., a white boy aged 9 years; breast-raised. At 2 years of age severe attack of ileocolitis; fever three weeks; prolonged convalescence. Emaciation extreme. Metabolism affected for months. Patient doing well at school.

Measurements, May, 1912:

		Average of His Age
Height (inches)	54 1/4	50
Weight (pounds)	67 1/2	60
Chest (inches)	27	25 1/10
Waist (inches)	27	....

CASE 7.—C. M., a white girl aged 8 year and 10 months; at 15 months of age severe attack of acidosis, with marked enlargement of the liver, labored breathing and prostration; inability to take any food for seven days; digestive capacity so affected by the acidosis that nutrition was seriously affected for more than a month. Patient doing well at school; an unusually active girl.

Measurements, May, 1912:

		Average at 9 Years
Height (inches)	51 1/4	49 6/10
Weight (pounds)	65	57 1/2
Chest (inches)	24 1/2	24 9/10
Waist (inches)	24	....

CASE 8.—H. C., a white boy aged 9 years and 11 months, breast-raised; brother of the patient in Case 2. At 11 months suffered from ileocolitis, complicated by acidosis, enlarged liver and labored breathing. Patient extremely ill; colitis with malassimilation for a month following, with extreme emaciation. Slow convalescence in a cooler climate. Patient active, bright, and high in his studies.

Measurements, May, 1912:

		Average at 9 1/2 Years
Height (inches)	55 1/4	50
Weight (pounds)	69 1/4	60
Chest (inches)	26	25 1/5

CASE 9.—M. A., a white girl aged 13 1/4 years; breast-raised; at 16 months suffered an attack of ileocolitis ushered in by convulsions lasting for two days. Continued high fever for two weeks; malassimilation due to intestinal condition lasting for more than six weeks. Extreme emaciation; from age of 8 to 12, patient subject at times to attacks of acid intoxication of mild degree; tonsils removed at 12 1/2 years.

Measurements, May, 1912:

		Average at 13 1/4 Years
Height (inches)	61	58 1/2
Weight (pounds)	92 1/2	91
Chest (inches)	29	27 7/10

CASE 13.—L. N., a white girl aged 10 years, 5 1/2 months; breast-raised; at 18 months of age suffered from ileocolitis complicated by acidosis, with enlarged liver, labored breathing and marked prostration. After acidosis symptoms passed off colitis accompanied by high fever continued for two weeks. Marked interference with digestion and assimilation continuing for more than a month after the child was taken to the shores of Lake Michigan; emaciation extreme.

Measurements, May, 1912:

		Average at 10 1/2 Years
Height (inches)	57 1/4	51 7/10
Weight (pounds)	86 1/2	64
Chest (inches)	26	24 7/10

Cases 10, 11 and 12 are normal so far as concerns serious illnesses and were selected because they were above the average in vigor and appearance.

The interpretation of the skiagrams, by Dr. Edmondson, is given in the legends.

Idiosyncrasy in Gout.—In no disease does idiosyncrasy, that great stumbling-block in therapeutics, make itself more evident than in gout.—Samuel West in *Clin. Jour.*

THE CALORIC REQUIREMENTS OF BOTTLE-FED INFANTS *

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There still seems to be a great difference of opinion among pediatricists as to the necessity of carefully computing the number of calories per kilogram or pound weight in every bottle-fed infant. The percentage method of feeding has so thoroughly embedded itself in the minds of American infant-feeders that the caloric requirements are usually entirely ignored or simply used as a check. As a matter of fact, this expression, "used as a check," usually means that the feeder either prescribes the food symptomatically, his experience in feeding having been great enough to allow him to guess at the quantity and strength, or he has certain rules of his own to go by. When the baby is not doing well, he reckons up the calories to see whether that individual child is getting a great deal more food than he needs or perhaps a great deal less. Another expression which is frequently used at the present time and which I have myself been guilty of using in the past is "thinking in percentages." However much a physician knows about percentage feeding, and however successful he may have been in using it, he cannot realize how much more accurate and successful his feedings would be if he would substitute for this or add to it "thinking in calories." It would hardly seem necessary to remind infant-feeders of the fact that the caloric requirements of adults have been worked out carefully and are used in a practical manner in the treatment of nephritis, diabetes, typhoid and many other conditions. How much easier it is to reckon calories in the bottle-fed baby who is fed definite quantities of milk, cream, sugar or gruels, than it is the more complicated diet of adult life!

Another criticism that I would like to make of those who do not reckon calories (and they are becoming fewer every day) is that their remarks are founded on their inexperience with this particular method. They have not followed week after week the calories of the babies which they are feeding, and therefore they do not realize the help that it will give them. They also seem to think that when they use the caloric method they do so to the exclusion of the digestibility and suitability of the food for any particular infant. This, of course, is entirely untrue, because before the infant is given the number of calories necessary for his nutrition and growth all digestive disturbances must be overcome. Even though his caloric requirements are much greater than are supplied in the food that we are giving him while overcoming the digestive disturbances, we always have in mind the number of calories which we shall eventually have to give before he will gain in weight.

It is also held by those who are not in favor of caloric methods that caloric requirements of the individual baby vary so greatly that it is impossible to determine definitely what any one child does need. It was with this idea in mind that I started the work of this present paper. My previous experience had taught me that some babies do require a great many more calories to gain on than others, and I sought some method of determining their individual caloric requirements. I

* Read in the Section on Diseases of Children of the American Medical Association, at the Sixty-Third Annual Session, held at Atlantic City, June, 1912.

therefore measured the food consumed, retained and digested each day over a prolonged period in a fairly large number of healthy infants of different ages, weights and habits of activity, and in infants in the various stages of nutritional and digestive disorders. In this way I attempted to find out the minimum amount of food on which a baby would thrive and gain in weight and the maximum amount which causes digestive disturbances or cessation of gain in weight. I then classified these babies in a rough way for practical help in

well on them and the source of error is less than when we use more complicated feedings. Milk of which the fat-content was known was used. The sugar, which from its high caloric value might easily be a source of error, was carefully measured in accurate containers which I furnished the parents. I have used either cane-sugar or malt-sugar (dextrimaltose). It may be possible that the caloric requirements of infants fed with other foods than simple whole milk mixtures differ from those of my patients. First I shall show a tabulated

TABLE 1.—FEEDING RECORD IN CASE 1, A NORMAL INFANT FED FROM BIRTH

Sugar oz.	Food		Calories			Weight		Gain in oz.		Date.	Age.
	Milk oz.	Water oz.	Total.	Per Kilo.	Per lb.	Lbs. Oz.	Kilos.	Total.	Per Day.		
0	2	8	40	12	6	7	3.2	0	0	5/23	3 days
1/4	2	8	70	22	10	7	3.2	0	0	5/25	5 days
1/2	4	16	120	37	17	7	3.2	0	0	5/28	8 days
3/4	5	16	140	50	23	7	3.2	0	0	5/30	10 days
1	6	16	240	75	34	7	3.2	0	0	6/5	15 days
1 1/4	8	14	340	103	48	7	3.4	6	1	6/11	21 days
1 1/2	10	11	380	112	50	7	3.4	2	.3	6/19	29 days
1 3/4	14	11	400	135	60	8	3.6	0	1.5	6/25	
1 1/2	14	11	400	135	60	8	3.6	0	1.3	7/2	
1 1/2	14	11	400	128	57	9	4.0	0	2	7/9	
1 1/2	14	11	400	118	54	9	4.3	14	0	7/16	
1 1/2	14	11	460	107	48	9	4.3	0	0	7/21	2 months
1 1/2	17	11	520	121	54	10	4.4	4	.8	7/30	
1 1/2	18	10	540	123	55	10	4.7	9	1	8/4	
1 1/2	18	10	540	115	51	10	4.8	5	1.2	8/6	
0	18	10	800	80	34	10	4.8	0	0	8/13	
1 1/4	18	10	540	113	51	11	5	7	1	8/20	3 months
1 1/4	18	10	540	108	49	11	5.1	3	.4	8/27	
1 1/4	21	14	600	118	54	11	5.3	8	1.1	9/2	
1 1/4	23	12	640	120	54	12	5.5	7	1.2	9/9	
1 1/4	23	12	640	116	53	12	5.6	2	.3	9/10	4 months
1 1/4	25	10	680	121	54	13	6	14	2	9/17	
1 1/4	25	10	680	113	51	13	6.2	8	1.1	9/24	
1 1/4	25	10	680	110	49	13	6.2	2	.3	10/1	
1 1/4	25	10	680	110	49	14	6.3	3	.4	10/8	
1 1/4	28	14	740	120	54	14	6.7	11	1.6	10/15	5 months
1 1/4	28	14	740	110	49	15	6.8	7	1	10/22	
1 1/4	28	14	740	109	49	15	7.1	9	1.2	10/29	
1 1/4	30	12	780	110	49	16	7.5	13	2	11/5	
1 1/4	32	10	820	100	49	17	7.7	11	1.6	11/12	6 months
1 1/4	32	10	820	106	47	17	8.1	10	1.5	11/19	
1 1/4	28	8	740	91	41	18	8.3	7	1	11/26	
1 1/4	28	8	740	89	40	18	8.5	8	1.1	12/3	
1 1/4	28	8	740	86	39	19	8.7	12	1.7	12/10	7 months
1 1/4	28	8	740	85	37	20	9.1	12	1.7	12/17	
1 1/4	28	8	740	81	35	20	9.1	2	.3	12/24	
1 1/4	28	8	740	81	35	20	9.4	10	1.5	12/31	

TABLE 2.—FEEDING RECORD IN CASE 2, A NORMAL CHILD FED FROM 1 MONTH OF AGE

Sugar oz.	Food		Calories			Weight		Gain in oz.		Date.	Age.
	Milk oz.	Water oz.	Total.	Per Kilo.	Per lb.	Lbs. Oz.	Kilos.	Total.	Per Day.		
1/2	8	20	220	48	22	9	4.5	0	0	1/28	1 month
1	16	16	440	97	44	9	4.5	0	0	2/4	
1	20	16	520	110	47	10	4.7	8	1	2/11	
1 1/2	20	16	580	123	56	11	5	10	1.4	2/18	
1 1/2	20	16	580	110	53	11	5.2	6	.9	2/25	2 months
1 1/2	20	16	580	111	50	11	5.3	0	.9	3/3	
1 1/2	20	16	580	110	49	12	5.4	4	.6	3/10	
1 1/2	22	14	620	115	52	12	5.7	8	1.1	3/17	
1 1/2	24	12	660	116	52	13	5.9	8	1.1	3/24	3 months
1 1/2	24	12	660	112	49	13	6	4	.6	3/31	
1 1/2	26	12	700	117	53	14	6.3	12	1.7	4/7	
1 1/2	26	12	700	112	49	14	6.7	12	1.7	4/14	
1 1/2	26	12	700	104	47	15	6.9	8	1.1	4/21	4 months
1 1/2	26	12	700	102	46	15	7.1	8	1.1	4/28	
1 1/2	26	12	700	98	44	16	7.4	2	.3	5/5	
1 1/2	26	12	700	94	43	16	7.4	10	1.4	5/12	5 months
1 1/2	28	14	740	100	45	17	7.7	8	1.1	5/19	
1 1/2	28	14	740	96	43	17	7.9	8	1.1	5/26	

feeding sick and well babies. For my experiments I selected babies living at home, whose mothers I could rely on for intelligence, accuracy and truthfulness. Naturally most of these were private patients, as it is notorious that bottle-fed babies do poorly in hospital wards. I myself examined the stools continuously in each case, and unless they were normal and there was no vomiting, the number of calories which they received was not considered of importance.

I have used simple milk mixtures of whole milk, water and sugar, because such feedings are digested so much more easily than top milks. The babies thrive as

feeding record of four cases, and then give the results of the rest of my cases as a whole.

CASE 1.—Normal infant artificially fed from birth. It will be seen that on the third day when it was determined that the breast-milk could not be used, I gave a mixture containing no sugar but 2 ounces of milk and 8 ounces of water, making 10 ounces of food in twenty-four hours. This contained only 40 calories in twenty-four hours, or 12 calories per kilogram, or 6 calories per pound, the child weighing 7 pounds, or 3.2 kg. The food was increased gradually, there being no gain in weight until after two weeks, when with 1 1/2 ounces of sugar, 8 ounces of milk and 12 ounces of water, the total calories had reached

340, or 103 per kilogram and 48 per pound. During these six days from June 5 to June 11, the child had gained 6 ounces, or 1 ounce per day. June 11, the weight being 7 pounds and 6 ounces, or 3.4 kg., the food was increased to 1½ ounces of sugar, 10 ounces of milk and 11 ounces of water, making the mixture which was nearly half and half milk and water. Formerly this would have been considered an irrational food for a child 3 weeks of age. This gave us 380 calories in twenty-four hours, or 112 calories per kilogram, with a gain in weight of only 2 ounces in eight days, which was not so good as during the previous week when the child was getting only 103 calories, and therefore needs an explanation. I find that babies who have apparently been more or less starved will at first gain on fewer calories than they really need; but if this food deficient in calories is continued, the gain in weight will cease. Therefore the next week I increased the calories to 135 per kilogram, or 60 per pound, with a gain of 1½ ounces per day.

or even a greater one kept up continuously until the two weeks preceding October 1 and October 8, when on 110 calories per day there was a gain of only 0.3 and 0.4 ounce a day, respectively. From then on the child gained on a greatly diminished number of calories down to 81 per kilogram, or 35 per pound. The reason for this is that the child was then over 5 months of age, and a very fat baby, weighing 15 pounds and 2 ounces, and at 7 months, 20 pounds and 12 ounces. To summarize this case, my object was to find the minimum number of calories on which the baby would make a fair gain in weight, repeatedly allowing the calories per kilogram or pound to sink down to a point at which the gain ceased. This procedure I followed in most of my other cases. I found repeatedly that during the earlier months, a child will cease to gain on less than 110 calories per kilogram, or 50 per pound.

CASE 2.—Normal child fed from 1 month of age, because of the mother's death. The weight was 9 pounds and 14 ounces,

TABLE 3.—FEEDING RECORD IN CASE 3, SHOWING DIARRHEA WITH OVERFEEDING

Sugar oz.	Food Milk oz.	Water oz.	Total.	Calories		Weight		Gain in oz.		Date.	Age.
				Per Kilo.	Per lb.	Lbs. Oz.	Kilos.	Total.	Per Day.		
1	12	12	360	86	31	9 3	4.2	0	0	5/6	2 months
1	17	17	400	109	50	9 6	4.3	2	.3	5/13	
1	20	16	520	121	55	10	4.5	10	1.4	5/20	
1½	20	16	580	128	58	10 8	4.7	8	1.1	5/27	3 months
1½	24	16	600	140	63	11	5	8	1.1	6/3	
1½	26	14	700	140	63	11	5	0	0	6/10	Diarrhea
0	26	14	520	104	47	11	5	0	0	6/14	
1½	24	16	540	108	49	11 4	5.1	4	.6	6/21	
1½	24	16	600	118	54	11 14	5.4	10	1.4	6/28	4 months
1½	24	16	600	122	56	12 8	5.7	10	1.4	7/5	
1½	24	16	600	116	53	13	5.9	8	1	7/13	
1½	24	16	600	112	51	13 5	6	5	.7	7/20	
1½	28	14	740	123	56	13 12	6.2	7	1	7/27	5 months
1½	32	10	820	132	61	13 10	6.2	0	0	8/1	Diarrhea
0	21	21	420	68	31	13 8	6.1	0	0	8/6	
1½	24	18	540	89	40	13 12	6.2	4	1	8/10	
1	26	16	640	103	47	13 12	6.2	0	0	8/14	
1½	26	16	700	113	51	14 5	6.5	9	1.3	8/21	

TABLE 4.—FEEDING RECORD IN CASE 4, THAT OF AN ATROPHIC INFANT

Sugar oz.	Food Milk oz.	Water oz.	Total.	Calories		Weight		Gain in oz.		Date.	Age.
				Per Kilo.	Per lb.	Lbs. Oz.	Kilos.	Total.	Per Day.		
¾	5	20	130	42	19	6 14	3.1	..	..	3/28	2½ months
¾	11	24	280	90	40	6 14	3.1	..	..	4/1	
1½	12	24	300	126	56	6 14	3.1	..	..	4/13	
1½	13	24	440	133	61	7 3	3.3	5	.6	4/21	3 months
1½	12	20	300	114	52	7 9	3.4	7	.9	4/28	
1½	16	20	500	147	66	7 9	3.4	0	0	5/4	
2	18	20	600	166	75	8 1	3.6	8	1.1	5/13	
						8 8	3.9	7	1.2	5/19	4 months
			Pertussis			8 8	3.9	0	0	6/16	
2	18	14	600	154	70	8 14	4	6	.8	6/23	5 months
2	22	14	680	170	75	10	4.5	18	1.3	7/7	
2	26	14	760	169	76	10 10	4.8	10	1.4	7/14	
2	28	14	800	166	75	11 6	5.2	12	1.2	7/24	6 months
2	28	14	800	154	70	12	5.4	10	1	8/3	
2	28	14	800	148	..	13	5.9	16	1.2	8/17	7 months
2	28	14	800	135	62	13 12	6.2	12	.9	8/31	
2	28	14	800	129	60	14 6	6.5	10	1.4	9/8	
2	28	14	800	123	56	14 12	6.7	6	.9	9/15	

It will then be seen that the food was unchanged for one month, and therefore as the weight increased the calories per kilogram and per pound diminished until at the end of this time they got down to 107 calories per kilogram, or 48 per pound by July 9. The child was fed from July 9 until the 16th on 107 calories without any gain in weight. The food was again increased to 1½ ounces of sugar, 17 ounces of milk and 11 ounces of water, giving 121 calories per kilogram, or 54 per pound, with a gain of 4 ounces in five days, or 0.8 ounce a day, and the following week with the increase of 1 ounce of milk, making 123 calories per kilogram or 55 per pound, with the gain of 1 ounce per day. Again the food remained unchanged for about one month (with the exception of two days when the sugar was left out through an error) until by the increase of weight the calories per kilogram had sunk to 108, or 49 per pound, when we got a gain of only 3 ounces a week, or 0.4 ounce a day. This was a repetition of the diminished gain in the week previous to July 16 on 107 calories. The following week the increase in calories to 118 per kilogram gave a gain of 1.1 ounces per day, and this gain

and the child was put on one-half ounce of sugar, 8 ounces of milk and 20 ounces of water, which gave 48 calories per kilogram and 22 calories per pound with no gain in weight. The following week the milk was increased to 97 calories per kilogram, 44 per pound, with no gain in weight. The following week, with 110 calories per kilogram, and 47 per pound, there was a gain of 8 ounces, or 1 ounce per day. This child then was kept on food representing more than 110 calories for nearly three months, until the week preceding April 21, when it had gained 5½ pounds, or an average of over 1 ounce a day throughout this period. It was then a fat, healthy baby of over 4 months of age, weighing 15 pounds and 4 ounces and, at this weight and age, gained on fewer calories. Each week the food remained unchanged, the weight, as it increased, decreasing the number of calories per kilogram or pound, until in the week preceding May 12 the child had gained only 0.3 ounce a day on 94 calories per kilogram. On increasing the calories up to 100 per kilogram, there was a gain of 10 ounces a week, or 1.4 ounces per day.

This child will go on gaining or less calories as it gets older and fatter, until it will do well on about 80 calories per kilogram, or 35 per pound. As far as the feeding itself is concerned, it will be seen that at 3 months of age the child was getting two-thirds milk and one-third water with $1\frac{1}{2}$ ounces of sugar added to the twenty-four-hour amount.

CASE 3.—Diarrhea with overfeeding. This child, 2 months of age, weighing 9 pounds and 3 ounces, did well, making good gains on 109 to 128 calories per kilogram, or 50 to 58 per pound. The week preceding June 3, the calories were raised to 140 per kilogram, or 63 per pound, and the child made a gain of 1.1 ounces per day, and stood this number of calories for one week very well. The following week, however, on the same number of calories, a diarrhea occurred. We all know that a child will stand any abuse in feeding for a number of weeks sometimes, without succumbing to the effects of that abuse, so that it was not until the second week of this high-calorie feeding that a diarrhea occurred. By cutting out the sugar and not changing the food in any other way except to boil the milk, the diarrhea was overcome in four days. On June 14, one-half ounce of sugar was added to the diet, giving 108 calories per kilogram, or 49 per pound, and we got a gain of 4 ounces, or 0.6 ounce per day, following our period of starvation. There was then a continuous gain from June 21 to July 27, on food of 118 to 123 calories per kilogram, or 54 to 56 per pound. At this time a food containing 132 calories per kilogram or 36 per pound was given, resulting in a diarrhea which was controlled in five days by cutting out the sugar and giving half milk and half water, boiled. During this period there was a loss of 2 ounces in weight. The sugar was then gradually increased and the child again began to gain on 113 calories per kilogram, or 51 per pound. I do not mean to say that overfeeding in calories alone is always the cause of diarrhea, but I think that this case proves that it may be the sole cause in some instances. At other times this child digested well the food of the same strength and quantity, and the sugar was never increased by $1\frac{1}{2}$ ounces in twenty-four hours, so that that may be eliminated as the cause of the diarrhea in this particular instance.

CASE 4.—Atrophic infant. This child, an emaciated, atrophic, marasmic, decomposition baby, weighing 6 pounds and 14 ounces at $2\frac{1}{2}$ months of age, was white, vomited a great deal, and in bad condition generally. It did not gain until the vomiting was overcome by a dilute mixture containing little sugar and of low caloric value. The week preceding April 21, it gained 5 ounces, or 0.6 ounce a day on 126 calories per kilogram, or 56 per pound. It will be seen that the food was still dilute, being one-third milk and two-thirds water, with only $1\frac{1}{4}$ ounces of sugar. The following week increasing the sugar one-fourth ounce and the milk 1 ounce raised the calories to 133 per kilogram, or 61 per pound, and there was still a greater gain of 0.9 ounce per day. This small increase in the milk and sugar shows how much the calories per kilogram may be increased by a slight change in the food in small emaciated babies, and therefore how important it is to reckon calories in all our babies, especially the very sick ones, if we do not want to overfeed or underfeed them. The following week the food was reduced to 114 calories per kilogram, or 52 per pound, and the baby did not gain at all. The next week on 147 calories per kilogram, or 66 per pound, there was a gain of 1.1 ounces per day. The next week at 166 calories per kilogram it gained 1.2 ounces per day. At this time this unfortunate baby got the whooping-cough and vomited so much of the food that the reckon of calories was of no avail, but the food was kept the same throughout the period. During this period, however, there was no loss in weight at all. The week preceding July 7, the child had 2 ounces of sugar, 22 ounces of milk and 14 ounces of water, making 170 calories per kilogram, or 75 per pound, giving a gain of 1.3 ounces per day. It was kept on this high caloric food without any digestive disturbances, the number of calories per kilogram was gradually decreased, and there was a gain of 5 pounds and 8 ounces in two months, or considerably over 1 ounce per day. The baby was then fat and continued to gain on 110 to 120 calories per kilogram for the rest of the time that I had charge of it.

It would be useless to go on citing any more of my twenty-five cases that I have followed in this way, because they all show practically the same results. The average normal baby will do well on 110 to 120 calories per kilogram. I do not consider these figures absolute, but they are at least a good guide if we will also consider the general well-being of the child, the appetite, vomiting, stools and sleep; but I would give more weight to the calories than to the symptoms, as they are far more to be relied on. In many cases that I have had it is evident that some were much like Case 3 that I have shown you, in which, if we attempt to increase the calories above the infants' needs, we get these digestive disturbances. As we all know, some babies have a tendency to diarrhea, some have a tendency to constipation and some to gastric indigestion. Such babies must be kept on the lowest caloric value that will give them a gain in weight.

It has long been known that atrophic babies require food of much greater caloric value. It has been my experience in my other cases, as in the one that I have tabulated, that the much emaciated babies will require 160 to 170 calories, whereas those who are only moderately emaciated will require 130 to 150 calories. If such babies show a tendency to diarrhea, I would not dare increase the calories so high as I have in the one that I have shown, but would be contented to have a smaller gain on 150 calories.

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ABSTRACT OF DISCUSSION

DR. G. R. PISEK, New York: I take issue with Dr. Dennett, placing myself on the side of those men whom Dr. Dennett criticized, those who do not believe in the caloric method of infant-feeding. A study of his charts shows that gain in weight was his guide to influence his variations in the caloric feeding. We can all appreciate what there is of value in this method. It tells us that a baby will not do well below a certain minimum, and that it is in danger over a certain maximum number of calories per kilo.

DR. FRITZ TALBOT, Boston: I have had the opportunity of examining the nitrogen content of cow's milk from different herds of cows and have found that it may vary 20 per cent. Furthermore, the amount of fat in the milk of the different herds varied from 3.5 to 4.5 per cent. There again was an error of 25 per cent. Such figures as these are, therefore, only relative. I use the percentages as well as the caloric means of feeding babies. I feed the individual baby and not by rule of thumb. The well babies that I see in private practice usually need about 120 calories per kilogram of body weight, whereas the babies that I see in hospital clinics need from 80 to 160 calories. I believe the individual baby should be fed according to his peculiarities, using all the information we can command; and not by a single method.

DR. CHARLES DOUGLAS, Detroit: I think that in considering this subject we should remember the age of these children, and notice that most of them were taken from an early age; we should not apply those figures to the marasmic child or the child who has been damaged by feeding. While Dr. Dennett was talking, I was running over the figures, comparing them with what I have been accustomed to do for many years, that is, so much milk daily per pound of the child's weight. Long before I commenced to use calories, which I use only as a check or measure, I had been in the habit of telling the mother that she could expect no gain in weight until she was able to give the baby each day so much per pound of weight. As soon as we reach that point, we find that the child will begin to gain. The figures are exactly the same as I have been in the habit of using right along. Whether one figures by percentage or by caloric method, the same conclusion is reached. One is really, therefore, a check on the other. We sometimes see a child who can use only a small percentage of fat; we therefore have to

run up high on sugar and protein. It is not well for us to give a diet according to any one system. We need all the systems to measure our work and see that the child is given justice.

DR. JOHN L. MORSE, Boston: If I understood Dr. Dennett I think that he said we should think in calories and not in percentages. I cannot agree with that. It seems to me that we should think in both percentages and calories, and if we are going to think of one first, we should think of percentages. If we think in calories first, we put the cart before the horse. What we really ought to do is to fit the food to the infant's digestion first, and then see if its caloric value is sufficient to cover the baby's needs. It seems to me that all these things should be taken into consideration in feeding fat to the individual baby. All my hospital charts have lines for calories per kilo just as for weight and percentages. I have found that the average baby in the first year needs between 100 and 120 calories in order to gain satisfactorily. Babies seldom hold their own on less than 70 calories per kilo, although I have seen babies that gain steadily on 50 calories per kilo. I do not know how they do it. I have seen others that were underfed on less than 160 calories.

DR. H. D. CHAPIN, New York: The main objection to the use of the caloric method is that it overlooks the principal thing we are after in managing the baby, its growth. The caloric method is of value only as a check. If we are going to make it the essential thing, we can make up a food of suet and water and get our calories right, but the actual food will be all wrong. In the young the main factor is not heat and energy-producing food, but growth-producing food. A system of calories is much more valuable in adults in estimating food values than in babies and young children.

DR. R. H. DENNETT, New York: I do not mean to put forth this theory of feeding as the only one to go by. I was misunderstood in a good many ways. I said that we should think in calories as well as in percentages, if we are using the percentage method. Of course, everyone recognizes that there is more than one successful method of infant-feeding, and we must not have our minds entirely on calories or entirely on any one thing. That is evident. In regard to Dr. Talbot's criticism of the assumption of the fat content, the error in the number of calories per kilo would be very small. I started to estimate the error; say that we did differ in our fats 0.5 of 1 per cent., the error in calories for a baby of this age and weight would be very small indeed, because of the matter of division; just as in making up percentage feedings the error in percentages is very small in the end. As to Dr. Talbot's remarks about the badly damaged child, Case 4 was one of the worst cases I have ever had the privilege of treating.

MOVING PICTURE ILLUSTRATIONS IN MEDICINE

WITH SPECIAL REFERENCE TO NERVOUS AND MENTAL
DISEASES *

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For the past five years I have been interested in the taking of moving pictures of nervous and mental diseases until at the present time I have practically completed my work in both these fields, having about 10,000 feet of film of the various diseases to which this particular specialty lends itself. Inasmuch as I have gained considerable knowledge not only in the taking of these pictures, but also in their demonstration and uses, I thought that it would be of some value if I recorded my experiences.

I shall first discuss the method of taking these pictures; secondly, the various diseases and subjects which

can be photographed; thirdly, their availability for teaching purposes, and lastly, their scientific value.

TAKING THE PICTURES

Necessarily the greatest objection to the use of this method of teaching is the expense involved; but this can be greatly lessened if advantage is taken of some points. In my first attempt the subjects consisted of hemiplegics, diplegics and other patients in whom an attempt was made to demonstrate the gait, station, etc. In this I used four or five hundred feet or more for one subject, which was entirely too much, for in the average moving picture machine the rate of illustration is one foot per second and I have found that it is vastly better to show for about a minute a particular gait or patient in whom there is only one thing to demonstrate using about sixty feet, than to exhibit for four or five minutes, because the onlooker becomes tired of seeing the same thing for more than that period. I have now adopted the plan of even cutting down that time by using twenty or thirty feet. For example, I illustrate the catatonic form of dementia praecox by having the patient appear on the screen for less than half a minute. It is vastly better to have many subjects for twenty feet at a time than to show one patient, no matter how good, for a greater length of time. In dementia praecox twenty-six patients are used to illustrate the disease.

Then again, experience teaches just what is illustrative. In one's enthusiasm one may have a subject photographed at length only to find that many of the pictures when thrown on the screen are of no value. In addition, a great deal of patience and ingenuity has to be exercised to make the patient perform unconsciously during the time that the pictures are being taken, as in photographing various forms of tics. Sometimes, however, it is in the insane patient that the greatest care needs to be exercised. I remember that when attempting to take photographs of a number of paranoiacs the camera man came near being assaulted and having his instrument destroyed. One curious experience I had with epileptics. The superintendent of the colony who very kindly placed his material at my disposal selected eighteen of the many hundred epileptics; every one had fits daily, some of them hourly. We placed these patients in the sun with the camera trained on them ready to take a photograph the instant a spasm was manifested, and yet for three hours not a single patient had a sign of a spasm and it was necessary to come the following day before we were able to obtain the photographs. Even under these circumstances it was difficult to obtain the beginning of epileptic fits.

DISEASES WHICH CAN BE PHOTOGRAPHED

So far all my pictures have been either of the nervous or of the insane. Nervous diseases lend themselves particularly to motion photography because of the gaits, tremors, convulsions and different types of tics and spasms. In the organic diseases it is easy to illustrate the method of obtaining reflexes, spastic and ataxic gaits, ataxias, tremors, etc. I have excellent photographs of all these and also of the different diseases. In some, like syringomyelia, in which there is no particular gait or station to be illustrated, it is possible to show the patient's atrophy, contractures and trophic symptoms, at the same time outlining disturbances of sensation, which can be marked on the patient with different colored chalk for the different forms of sensation; it is even possible, for example in white patients, using charcoal over areas of loss of pain and temperature sensa-

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