No. 5. Columbian Spirits, 30 cents a pint. Poison label on bottle. Denatured alcohol 30 cents a quart.

No. 6. This drug-store carried no Columbian Spirits. Wood alcohol 20 cents a pint. They inquired for what purpose the wood alcohol was to be used. Poison label on bottle. Denatured alcohol 20 cents a pint.

No. 7. Columbian Spirits, 25 cents a pint. No poison or caution label on bottle. Denatured alcohol 25 cents a quart.

No. 8. Columbian Spirits, 25 cents a pint. Poison label on bottle. Denatured alcohol 25 cents a quart.

No. 9. Columbian Spirits, 25 cents a pint. "For external use" printed on label. Denatured alcohol 75 cents a gallon.

No. 10. Columbian Spirits, 20 cents a pint. No poison or caution label on bottle. Denatured alcohol 25 cents a quart.

Although ordinary "unpurified" wood alcohol or wood spirit is also a poison, its vile taste and smell are sufficient guarantees that nobody will either drink or inhale it to any deleterious extent. For burning lamps, for cleaning brass and woodwork, etc., common wood alcohol is all right if one does not object to the odor and is unwilling to pay a few cents more for denatured alcohol. It is quite otherwise with Columbian Spirits, Cologne Spirits, Standard Wood Spirits and all the other forms of "deodorized" methyl alcohol. It is to the "pure, refined spirit for domestic use," the "perfect substitute for grain alcohol" (as the labels read) that one objects. That subtle and often unsuspected poison has not only been directly responsible for the fate of hundreds of blind people but bids fair, under present conditions of sale and manufacture, to kill and blind additional hundreds.

Although for half a century Great Britain, Germany and other European countries have yearly consumed millions of gallons of industrial grain alcohol, "denatured" by processes similar to ours, yet not a single instance of death or blindness has been reported from its occasional ingestion. This satisfactory result is due not only to dilution of the poison, whose toxic properties are much modified by the large admixture of grain alcohol, but to the fact that it is almost impossible for even the most insensitive lungs and the most hardened stomach to receive and retain enough methyl alcohol in the various denatured products to induce serious consequences. We are consequently justified in asserting that "denatured" alcohol is practically a harmless mixture and may be used for all the purposes, even as a beverage, for those who like it, without producing methyl alcohol blindness or death.

HOW WE MAY MOST EFFECTIVELY PREVENT WOOD-ALCOHOL POISONING

Whatever occupation, professional or lay, you pursue, your aid in drawing attention to the hidden evils of "deodorized" methyl alcohol and all its preparations will be most valuable if you not only avoid the use of the poison yourself but discourage its employment by your friends, acquaintances and associates. Tell them that we have an equally cheap, commercial substitute—a harmless "denatured" grain alcohol—that answers every purpose, domestic and other, of wood alcohol. Also ask your druggist why he sells the poisonous article when there is a government-authorized grain alcohol that does not expose his customers to the dangers of Columbian Spirits and other forms of wood or methyl alcohol. By thus discouraging the sale and use of "deodorized" and other forms of wood spirit you aid in that campaign of education which is the most effective agent in protecting the public body from one of the most insidious of our drug and food poisons.

7 West Madison Street.

A PLEA FOR LONGER INTERVALS IN MILK-FEEDING *

JULIUS H. COMROE, A.M., M.D.

Physician to the York Hospital, etc.

YORK, PA.

A careful and thorough review of standard medical text-books and current literature dealing with the principles of infant-feeding reveals the astonishing fact that comparatively little attention is devoted to one of the most important and vital aspects of this subject, the intervals of milk-feeding during the first year. The many thousands of general practitioners who necessarily must be guided primarily by these written expressions of experienced teachers have fallen victims to the same evil results that empiricism has produced in many other branches of medicine. The conventional two-hour intervals during the first month, gradually increased to two

TABULATED REPLIES FROM 117 PEDIATRICIANS IN THE UNITED STATES AND CANADA

Age in Months	2-Hour	2½-Hour	3-Hour	4-Hour
1	66	17	33	1
2	27	49	39	2
3	12	40	63	2
4	3	9	99	6
5	..	3	105	9
6	..	3	78	36
7	..	..	72	45
8	..	..	57	60
9	..	..	42	75
10	..	..	30	87
11	..	..	30	87
12	..	..	30	87

Are longer intervals satisfactory? Yes, 102; no, 15.

Composite chart showing natural trend for longer intervals. The line of dashes indicates the intervals computed from average text-book teachings; the solid line indicates the average intervals of 117 pediatricians in the United States and Canada.

and one-half hours until the third or fourth month and thereafter to three hours, have been copied from text-book to text-book and dismissed with little or no further consideration or comment.

In order to determine whether or not the actual practices of the pioneers in infant-feeding coincided with the preponderance of didactic and written teachings of to-day, 135 circular letters were addressed to leading pediatricians throughout the United States and Canada, preference being given to teachers in medical schools and to authors of recognized text-books dealing with this topic. A tabulation of the 117 replies received and the construction of a composite chart from these brought to light some interesting and valuable statistics, and demon-

* 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.

strated beyond doubt that the trend toward longer feeding intervals is becoming almost universal. During the first month of infancy only sixty-six, or 56 per cent., employed the two-hour intervals; seventeen, or 15 per cent., the two-and-one-half-hour intervals; thirty-three, or 28 per cent., the three-hour intervals; and one, Dr. J. P. Sedgwick, or less than 1 per cent., the four-hour intervals. From the second to the fifth months, the three-hour intervals were employed with increasing rapidity, and thereafter the four-hour intervals were favored, especially on and after the sixth month. These facts alone should at once prove the comparative uselessness and empiricism of modern text-book and possibly medical school teachings, and also emphasize the urgent necessity for some hasty revisions and additions along these lines.

That each child is a law unto itself and that the intervals of feeding must be largely an individual and not a mechanical routine matter, no one will even question. It is likewise well known that infants vary greatly in gastric capacity, in rapidity of digestion, in satisfaction as to the amount of feeding, and in susceptibility as to quality of food, etc., so that there can be no set rule regarding their feeding relative to time, quantity or quality of feedings, and each child must necessarily be fed as a unit rather than according to any inelastic fixed scheme or system. It is also agreed that delicate and premature children, and babies that have been improperly fed or who suffer from malnutrition as a result of intestinal disorders, cannot be included in any general plan of feeding. But it does seem quite apparent that overfeeding is one of the most common causes of nutritional disturbances in early infancy, and there is little doubt that this has been engendered oftentimes by the indiscriminate introduction of too many feedings in the twenty-four hours.

TIME REQUIRED FOR EMPTYING STOMACH

At this juncture it is of the utmost importance to learn the period of time that is usually required for the stomach completely to empty its contents into the pylorus. Leo made careful observations, with the aid of the stomach-tube, in thirty "normal" infants whose ages ranged from 2 hours to 12 months, and also in 104 babies who were suffering from various forms of gastrointestinal diseases. In the breast-fed he found the stomach empty in about one and one-half to two hours, and during the first week of life, in one hour. In the artificially fed infants, and especially in the older children of the series, a portion of the food was found to remain in the stomach for a somewhat longer period.

Pipping made similar examinations in twenty-nine normal infants under 3 months of age, and learned that the stomach emptied itself in about two hours.

Czerny states that cow's milk takes up more hydrochloric acid than does human milk, and in order to retain the bactericidal property of the gastric juice, which is due to the free hydrochloric acid, he urges the advisability of longer intervals between feedings, especially so when cow's milk is employed. He found that whereas the stomach of a young infant is empty after an interval of two hours, when several feedings are given in rapid succession, considerable remains of the last meal may be found even after three or four hours. This fact, in his opinion, also speaks in favor of lengthening the feeding intervals.

Pfannenstill first employed the phenyl salicylate (salol) test for the determination of the time required for food to pass into the intestinal tract. By this

method phenyl salicylate was administered, and the urine, which was collected by means of a catheter kept in the bladder during the entire period of examination, was subjected to chemical analysis every five minutes. In sixty health children the ferric chlorid reaction appeared in the urine forty to sixty minutes after the ingestion of food mixed with phenyl salicylate.

Employing the same method, von Hecker found that the time of appearance of the ferric chlorid reaction varied considerably in direct proportion to the age of the child. In my opinion this test is not a most reliable one as the elimination of phenyl salicylate, as computed by the urinary reaction, does not necessarily prove the complete emptying of the stomach contents.

Meyer, who discarded milk entirely and employed barley-water, sterilized water or normal salt solution, on the ground that with these mediums organic acids do not appear and that the presence of hydrochloric acid in its free and combined state is thus more readily determined, found that in seventeen artificially fed children the stomach was empty in one to one and one-third hours. These figures would naturally be comparatively useless in estimating the time required for milk to pass into the pylorus.

Heiman made careful studies in a series of thirty-three cases, including twenty new-born nursing infants from 3 to 7 days old, and thirteen artificially fed children ranging from 3 weeks to 7 months. In the former, practically the same quantity of gastric contents was obtained at the end of one hour as at the termination of one-half hour, and after two to two and one-half hours, 0.5 to 3 c.c. could still be recovered with the stomach-tube. In the bottle-fed babies the stomach was found empty in two hours in four out of thirteen cases; in five cases, at the end of three hours; and in the remainder, in about four hours.

According to the investigations conducted by Tobler, and Bogen and Heubner, milk passes into the pylorus in the case of breast-fed infants in about two hours, and in those taking cow's milk, in about three hours. Tobler, by employing variously colored milks, has further conclusively shown that each subsequent feeding forms a sort of layer about the earlier one, and that the food first ingested may thus be kept in the stomach more or less indefinitely if the feedings are given at too frequent intervals. This constantly recurring contamination and overburdening of the stomach may result in fermentation, and in time in gastric dilatation with a loss of tone of the muscular coats of the stomach, and even in atrophy. In their investigations with the Roentgen rays, by which as small a quantity as 5 c.c. could be determined without the aid of bismuth, Tobler and Bogen further verified the above results and found that the presence of fat considerably delays the emptying of the stomach (probably due to the inhibitory action of the fat on the secretory glands of the stomach and the long-continued closure of the pylorus) and that carbohydrates often act conversely.

Mosenthal also found that it required about two hours for milk to pass through the pylorus in the case of breast-fed children and three hours in those taking cow's milk, and the same results were confirmed by the observations of T. Wood Clarke, E. Cautley, Miller and others.

Chapin made careful observations in twenty-one babies suffering from various forms of malnutrition to determine the gastric motility. Their ages ranged from 2 weeks to 1 year (one 2 weeks, one 3 weeks, one six weeks, one 2 months, six 3 months, four 4 months, two 5 months, one 6 months, one 7 months, three 1 year). Of

nineteen patients examined, at the end of three hours only six had approximately empty stomachs, and these six, with one exception, were holding their own. In the remaining thirteen cases there was a considerable residual amount of food still remaining in the stomach after three hours. In the latter cases a positive Fehling's reaction was present in addition to curds and whey, either singly or together. In five of seven patients examined at the end of three and one-half or four hours the stomachs were entirely empty, but in the remaining two cases of this series many curds were present at the end of four and one-half hours in one case, and a few small curds in the other. In only two of seventeen patients examined at the end of two or two and one-half hours were the stomachs found empty, and in thirteen, large tough curds, or many smaller ones and whey were invariably present. On these results Chapin concludes that in a large majority of cases the feeble infant with digestive disturbances has been fed at too frequent intervals. At best, the musculature of the stomach and intestines is not highly developed during the first month of life, and less so in feeble infants. Too often a second feeding is administered before the previous meal has entirely passed into the pylorus, with the expected result that each successive feeding has become contaminated. The process of butyric acid fermentation has thereby been set up and kept in operation until, at last, a condition analogous to that of *myasthenia gastrica* is produced.

TOO FREQUENT INFANT-FEEDING

With such an abundance of evidence obtained from the most careful and painstaking observations of eminent pediatricians, even the most skeptical will not deny that the intervals of feeding as usually taught are not compatible with physiologic findings. It has been conclusively shown that the stomach in the healthy nursing babe is rarely empty in less than two hours, and that in the artificially fed, the time required is usually an hour longer. According to Chapin and others these periods are further prolonged in the case of children suffering from various forms of malnutrition. And it is reasonable to suppose that as the age increases the time required for emptying the stomach will naturally be lengthened owing to the fact that (1) the quantity and quality of food are increased and (2) as the stomach takes on greater powers of digesting its contents, its secretions act on the milk, forming compounds which remain longer in the viscus. Time should therefore be permitted for the stomach to empty itself almost, if not completely, before another feeding is given.

It is interesting to note that it is the almost unanimous finding of observers that in the artificially fed babe a decidedly longer time is required for complete emptying of the stomach. Of the ninety-three replies to the query "Do you recommend as a rule longer intervals in the artificially fed (as compared with breast-fed) infants?" forty-eight answered in the affirmative and forty-five in the negative. According to Engel, breast-milk is digested for the most part in the intestines, and to a lesser extent in the stomach, the reverse being true in the digestion of cow's milk. As a result of this physiologic fact the gastric juice of infants who are artificially fed is said to be less potent than that of breast-fed infants. For this reason mother's milk, in spite of its early high fat content, leaves the stomach more readily than does cow's milk.

OBJECTIONS TO LONGER INTERVALS

The most serious objection entered against longer intervals of feeding in early infancy consists of the

apparent necessity for administering too high quantities, as well as too rapidly increasing the strength of the milk mixtures in the artificially fed in order to maintain the required number of calories requisite for proper growth. From the statistics previously recorded and in my own experience, these objections are based more on theoretical principles than on practical observations and results. As Mosenthal has pointed out, the figures for gastric capacity, as they now are set forth in text-books, represent the anatomic capacity of the stomach; but the normal physiologic capacity, the amount of milk a child is capable of taking at one nursing, is considerably higher than these figures represent. Holt has personally determined by post-mortem measurements the average capacity of the stomach in ninety-one infants from birth to the age of 14 months, but most careful clinicians have found that the amount of milk that can normally be ingested and digested has exceeded these average figures by from 1 to 3 ounces at the specified ages, especially so where the longer intervals have been employed. Thus the average gastric capacities of infants at 1, 2 and 3 months of age are quoted respectively as 2, 3.37 and 4.5 ounces, whereas Caemerer recommends individual feedings of $3\frac{1}{3}$ ounces (100 c.c.), $4\frac{1}{3}$ ounces (130 c.c.) and $5\frac{1}{4}$ ounces (170 c.c.) during these periods of infancy, employing the three-hour intervals and seven feedings a day during the first two months, and four-hour intervals thereafter. These figures coincide essentially with my experiences. As Caemerer further states, this is in marked contrast to the usual American two-hour interval, where the three-hour interval is usually not reached until the fourth month. It is my firm belief that the results of the post-mortem findings relative to the capacity of the infant's stomach, in conjunction with the usual written and didactic teachings in reference to the size of milk-feedings, have had a strong tendency to make of the average practitioner a specific routinist in this connection.

Several factors, both anatomic and physiologic, must be considered in computing the quantity of milk the babe may be fed at each nursing. The stomach, which must be regarded as a dilated and specialized portion of the general intestinal tract, is provided with a submucosa of considerable thickness, composed of an abundance of fibro-elastic tissue which is loosely interwoven. Unlike the intestinal tract elsewhere, its muscular tunic, in addition to the usual inner circular and outer longitudinal layers, is reinforced near the cardiac end by irregular bundles of oblique fibers. Nature has evidently provided means whereby a certain degree of normal physiologic elasticity shall be allowed, thus easily permitting the accommodation of more contents than the post-mortem findings would seem to corroborate. In early infancy, especially, it is an established fact that the contents of the stomach begin to leave it shortly after nursing has begun, thus in reality adding a portion of the pylorus to the actual capacity of the stomach. That some infants have larger gastric capacities than others in direct proportion to their weight, other things being equal, seems at least reasonable. If it be true, furthermore, that when shorter intervals are employed the stomach is not completely emptied when the next nursing is begun, a smaller relative "capacity" would naturally be expected at that time of nursing. The utilization of any fixed rule governing the quantities for the individual feedings at various ages seems therefore impracticable. My clinical observations, however, in common with others, have firmly established one undeniable fact, that the average normal child fed at longer

intervals is able to ingest a larger quantity of milk than is usually prescribed, and invariably does so. This is conclusively demonstrated by actually weighing the breast-fed babe immediately before and after nursing, as well as by the administration of larger feedings in the artificially fed and a resulting progressive increase of weight in both. As a matter of fact, in my personal experience the usual normal maximum weight ordinarily attributed to the end of the first year is reached in many instances by the tenth month, and rarely later than the eleventh month, when the longer intervals of feeding have been judiciously employed. Such evidence should certainly have a tendency to diminish any grave fears that the child fed at longer intervals is unable to receive a sufficient quantity of milk to meet its demands for growth and development.

The same skepticism that exists in reference to the quantity prevails relative to the quality of the milk that must be employed. It is widely stated that in order to satisfy the economy, when greater intervals of nursing are employed, the increased strength of the milk necessary to compensate for the diminution in the number of feedings would render it much more difficult to digest. The fixed formulas variously recommended for the different periods of infancy have also been handed down, in many instances, in an empiric manner, and have frequently been responsible for an underfed baby at the hands of the automatic routinist. In this connection also, each child must be a law unto itself, and only the most careful observations of the watchful practitioner should guide him in each individual case relative to the milk formula to be employed. And here again, personal experience has shown that in the vast majority of cases infants fed at longer intervals obtain from the breast, and are able to digest when artificially fed, a milk of greater caloric value than the average baby fed at the shorter intervals can digest. With few exceptions my artificially fed babies have received a 4-7-2 mixture by the fourth month and a 4-5-3 milk not later than the tenth month. Such progress would be expected in consequence of the opportunity for complete evacuation of the stomach contents in addition to a much-needed period of absolute rest between each interval of apparently completed gastric digestion and the subsequent feeding. It has been the rare exception, rather than the rule, that infants fed on the longer interval schedule have not been able easily to digest and thrive on whole cow's milk on or before the tenth month. By the employment of the longer intervals, therefore, the above stated theoretical objections have been largely overcome, and the chief requirements in infant-feeding, namely, a quality of milk which is within the infant's power easily to digest, and a sufficient total quantity to assure a normal weight development, have been obtained.

THE VALUE OF REST

Just as time and the resulting rest are absolutely essential for the fulfillment of good digestion, just so much, if not more so, is rest required for the progressive growth and development of the baby. One well-known author, in common with many others, writes that "sleep is important for purposes of growth," and that "during the first month the infant sleeps about twenty-two hours out of every twenty-four." He then recommends ten nursings in the twenty-four hours, which will ordinarily consume a total of two to three hours. Even though the function of nursing be a reflex one, in a great measure, the frequent disturbances necessarily produced by ten feedings, in addition to the wakefulness oftentimes

produced during the daily attention to toilet, bath, etc., subtract largely from the rest the babe so much requires. In the vast majority of babies fed at longer intervals, I have noted, in addition to the more rapid but uniformly progressive physical as well as mental development, that the baby acquires a more decided resistance against the more common digestive disturbances, and even is less susceptible to the infectious diseases which so many mothers look on as being inevitable. This acquired resistance, I feel, results largely from the more absolute rest which the child actually receives, in association with the resulting complete digestion and assimilation.

SUCCESSFUL RESULTS OF LONGER INTERVALS

My own experiences with the longer intervals in milk-feeding during the first year have been uniformly and highly successful. Although never guided by any fixed schematic feeding schedule, it has been my usual custom to recommend three-hour intervals in all healthy babes of the average normal weight, permitting seven feedings in the twenty-four hours, including the one night feeding. Breast-fed babies are permitted to nurse until they are apparently satisfied, although usually a maximum of twenty minutes is ordered. In the artificially fed, after the first four to seven days, a 2-6-1 milk is often prescribed, and an average feeding of 3 ounces is permitted, considerable emphasis being laid on the necessity for very slow nursing, and the extreme vigilance of the nurse in reference to discomfort, regurgitation, etc. During the second, and rarely later than the third, month, being guided particularly by the digestive capabilities and the weight curve, four-hour intervals are ordered, permitting six nursings for the first one or two months, and five nursings thereafter. As a general rule, a 4-7-2 mixture is reached not later than the fourth month, and a 4-5-3 milk by the ninth or tenth month, after which whole milk is generally employed. In the healthy infant, weighing 9 pounds or more at birth, virtually the same general plan has been followed, except that the four-hour interval has been employed from the beginning, permitting six nursings in the twenty-four hours, until a natural rearrangement occurs, whereby one night nursing is volitionally dropped. This often happens after the second or third month. In these latter infants it has been my almost uniform experience that proportionately larger quantities as well as stronger formulas can be digested without any difficulty. And the ease with which a four-hour interval can be established and maintained is surprisingly gratifying.

The advantages of longer intervals in well-selected cases are numerous. There is undoubtedly an almost total absence of even the mildest digestive disturbances, which would naturally be expected as a result of more complete digestion and assimilation. Regurgitation is reduced to a minimum, if it is present at all, and vomiting is a rare occurrence. The dreaded colic and constipation are far less frequent, and the weeping eczemas often resulting from gastro-intestinal auto-intoxication are rarely to be observed. The infant develops a far better appetite, and obtains more as well as longer intervals of sleep, a pleasure and necessity which is appreciated and shared by the household. There is in many instances even a better, and always uniformly progressive, gain in weight as compared with the average babe fed at shorter intervals. Another, and by no means trivial advantage, associated with the longer intervals of feeding is the comparative ease with which many mothers can be influenced to nurse their infants. I refer especially to those women who are capable of supplying their babes with that food which Nature had intended

for them, but who, for domestic and especially social reasons, do not feel justified in foregoing certain duties and pleasures which frequent nursing would demand. Once convinced that a three-hour, or a four-hour interval, will not be a compromise for her own convenience but rather a benefit to her infant, the number of nursing mothers will with certainty increase, as will the number of living and healthy babes.

Before concluding, I wish to reiterate that no attempt has been made to advance a system of feeding that might be employed as a routine measure. If sufficient interest in the employment of longer intervals of feeding in early infancy has been aroused to stimulate its more common usage in well-selected cases, I shall feel that I have not labored in vain.

This paper would be incomplete without an expression of my most sincere appreciation of the kindness of the many physicians who supplied invaluable information through the circular letters sent to them, as well as an acknowledgment of my thanks to the committee who conferred on me the distinctive honor and privilege of appearing before you.

ABSTRACT OF DISCUSSION

DR. H. LOWENBURG, Philadelphia: In reply to a letter from Dr. Comroe, I said that I did not endorse long-interval feeding, largely because my individual experience did not warrant it. Dr. Comroe would have us become as dogmatic with regard to the long-interval feeding, as he accuses most physicians of being with regard to the shorter interval, as universally employed and as modified according to age. Pediatrics has not escaped the chaos in which modern medicine finds itself. It seems to be the predominant idea that we must present something new; that we must give up the old simply because it is old, its tried worth to the contrary notwithstanding. Years ago it was taught that the great trouble with infant-feeding was the protein element. We all believed it and practiced it and had our successes and our failures. Then it was taught that sugar was the disturber. Some believed it and some did not. Those who did, obtained good results; so also did those who did not believe. Now fat is the cause and there are those who can prove it so and others who cannot. It is not wise to disturb the mental equilibrium of the practitioner or to give up the practice which has been successful in private and hospital work simply because of conclusions that are reached by experimentation, the purpose of which is to prove a preconceived idea. We can prove almost anything we start out to prove. I will not give up short-interval feeding until there are better proofs as to the benefits to be derived from the long-interval feeding. My experience does not agree with Dr. Comroe's. He says that children fed at long intervals weigh more in a year than those fed at short intervals. I can show case after case in which short-interval feeding with proper food provides a steady increase in weight. My own child at 8 months weighs 22 pounds. Dr. Comroe, however, strikes the key-note of the whole feeding situation when he says that each infant is a law unto itself. If we have a case of vomiting, it stands to reason that we are going to feed that baby at longer intervals in order to rest the stomach. If the digestive process is normal, there is no reason to interfere.

DR. D. J. M. MILLER, Atlantic City: Some years ago I had the opportunity to pass the stomach tube into a number of infants, and, as I found, as a rule, that the stomach was not empty until about two and a half hours after feeding. I have fed all infants of 3 months and over every three hours. I agree with Dr. Lowenburg that the methods which have brought success in the past are the ones to follow in the present. I think that in cases of gastric indigestion with vomiting long-interval feeding is decidedly beneficial. With the ordinary healthy baby, however, I think that the method which has been the result of so many years of experience,

intervals of two and a half hours, is the safe one to pursue under 3 months.

DR. JOHN L. MORSE, Boston: I want to protest against the accusation that the American pediatricians are routinists, meaning by American pediatricians those who follow the typical American methods rather than the European. I do not believe that those who feed babies in the Eastern states are any more routinists in their methods than the Europeans and the people in the Middle West, who, as a rule, follow the European methods. We are just as willing as anybody else to feed the individual baby—in fact, more so, as it seems to me from the literature. The whole stress of Dr. Comroe's paper has been toward routine rather than away from it. I know that there is nobody in Boston who teaches, and I do not believe that any of us here teach that a baby of a certain age should be fed any special mixture. I also feel absolutely sure we in the East do not overfeed our babies and that we do not have the trouble that we are said to have. Our babies do thrive. I do not believe that in Europe or in the Middle West they can show babies more healthy or of better quality or with less digestive disturbances than we can with what is called a routine treatment, but what is really an individual treatment. The average well baby if given reasonable food in proper amount in the twenty-four hours will take care of it, whether fed once in two, three or four hours; some babies do better on four than two; others better on two than four. But when the baby is sick, then the question of gastric or intestinal indigestion comes in and one has to regulate the intervals as well as the percentages of food. It seems to me that we are both right, and perhaps we are both wrong.

DR. L. T. ROYSTER, Norfolk, Va.: It has been said a number of times that the key-note is struck in individualization, which I think is quite true. The baby used as a laboratory is perhaps an uncertain guide as to practical feeding. The anatomic content of the stomach is one thing and the physiologic content another. Given two babies of the same age and the same weight, we find a different stomach capacity. Perhaps the almost universal conception of the baby's stool is the one thing that may be a fair guide as to our conduct in feeding. But we cannot feed the baby so many grams of food and expect so many grams of stool; in other words, the baby is not a test-tube. Again, when we come to the question of measuring the contents of the baby's stomach from the standpoint of a stomach-tube, it is difficult. Perhaps the best plan is to weigh it on a carefully balanced scale. If the contents of the baby's duodenum can be secured through a catheter, it is also possible in measuring the contents of the baby's stomach after two or three hours of digestion to measure too much by getting into the duodenum.

The Eastern pediatrician does not work by rule of thumb, and those whose work I have seen have shown just as much individualization in treatment as anyone else. When I answered Dr. Comroe's letter, I answered decidedly that I had no rule.

DR. DAVID E. ENGLISH, Summit, N. J.: I disagree with Dr. Comroe on only one point: I do not feed babies with any regularity, that is, by the clock. I think how soon a baby should be fed depends entirely on how it has disposed of its last meal. A baby cannot always digest and assimilate the same amount of the same kind of food in the same number of minutes. I think that a baby should be fed when absolutely nothing else will satisfy it; in other words, when it has thoroughly digested the last meal, when the stomach has had time to rest and contract, and when the baby has cried long enough, then is the time to feed it, and it should be fed full.

DR. J. H. HESS, Chicago: Nobody has said that we should feed premature infants anything but breast-milk. And everyone here has agreed that we must feed the baby individually. Now when you have fed the baby individually and fed it breast-milk, you have pretty nearly done the whole thing. My paper, referred to by Dr. Comroe, written some months ago was not advocating a method but was simply a retrospection of a series of patients to ascertain what they had been fed. These babies had been fed individually what was seemingly

needed to make each one gain in weight. The records were preserved and some time after I went over them to see what we had accomplished. We found that the babies weighing under 1,500 gm. (and in my series eight of them weighed under 1,500 and only one weighed 2,000 gm.) had been fed 120 to 140 calories on an average; those weighing over 1,500 gm. about 110 to 130 calories. These apparently were ideal cases. I believe that premature babies to gain must be fed more than a normal baby. In our cases, none of those weighing less than 1,500 gm. gained on less than 90 calories. Three- and four-pound babies commenced to gain on 70 calories. Since that time, however, I have been feeding less frequently. I now use the three-hour intervals up to the time that the infants reach what would be a normal weight, except in the very small ones, whom I still feed every two hours with diluted mixtures, and then lengthen the interval and make up calories by concentration.

Dr. THOMAS S. SOUTHWORTH, New York: Although we realize that a number have made use of it on their own initiative in this country, a large part of the movement toward four-hour feeding has come to us from Continental centers. I think one reason is that it is better suited to the type of artificial feeding which the Continental men use. It is very much better for the use of whole cow's milk. It is also better for more concentrated mixtures than those which we ordinarily use here in short-interval feeding. In cases in which the breast-milk is scanty, however, the long-interval feeding would be disadvantageous because the breast needs more frequent stimulation to produce sufficient milk.

Dr. JOHN ZAHORSKY, St. Louis: The time in which a baby's stomach becomes empty depends on the amount given. Of course, in an infant that gets only half an ounce, the stomach will be empty more quickly than in one who gets 5 or 6. If the baby gets only 1 or 2 ounces from the mother, its stomach will be empty in an hour and a half, and it will tell you so very emphatically. When a baby is fed on a four-hour interval it necessitates one night feeding until the baby is several months old. When a three-hour interval feeding is used one can soon do without a night feeding, which gives the mother a rest. This I consider one of the advantages of a three-hour-interval feeding.

Dr. ISAAC A. ABR, Chicago: I am from the Middle West and should like to make a suggestion. I think that it is a mistake to feel that there is a Western and an Eastern pediatricist; we should feel that there is an American pediatry. We should forever abolish any idea that there is any sectionalism or any feeling that one section is better or worse than the other.

Dr. J. H. COMROE, York, Pa.: I have endeavored to make it clear that I am opposed to routineism, and in favor of individualism in the feeding of babies. In Dr. Lowenburg's reply to my communication, he stated that he had never employed the longer intervals; it must therefore be both presumptive and difficult for one having had no experience along this line to discuss intelligently a paper of this kind. Eminent pediatricians throughout the United States and Canada, from both the East and West, show that they are getting away from the rigid intervals of two, two and a half and three hours. It is reasonable to conclude that if in their experience such excellent results are being obtained with the employment of the longer intervals, the present dogmatic teachings, both in schools and in text-books, should be revised.

Sterilization of the Unfit in Switzerland.—Schlub reviews twenty-two cases in Switzerland in which operative sterilization of defectives was advocated by the legal or medical authorities or both, but for various reasons it was actually performed only in fifteen. Five different cantons contributed to the list. There has been no legislation on the subject and this is the reason why the authorities in some of the cantons have refused to apply the measure. The case histories are summarized, including the ultimate outcome, and the views of various authorities are cited, showing the growing general acceptance of the principle of sterilizing the morally unfit. Schlub's study of the subject appeared in the last *Schweizerische Rundschau für Med.*, 1912, xiii, 37.

New and Nonofficial Remedies

THE FOLLOWING ADDITIONAL ARTICLES HAVE BEEN ACCEPTED BY THE COUNCIL ON PHARMACY AND CHEMISTRY OF THE AMERICAN MEDICAL ASSOCIATION. THEIR ACCEPTANCE HAS BEEN BASED LARGELY ON EVIDENCE SUPPLIED BY THE MANUFACTURER OR HIS AGENT AND IN PART ON INVESTIGATION MADE BY OR UNDER THE DIRECTION OF THE COUNCIL. CRITICISMS AND CORRECTIONS ARE ASKED FOR TO AID IN THE REVISION OF THE MATTER BEFORE PUBLICATION IN THE BOOK "NEW AND NONOFFICIAL REMEDIES."

THE COUNCIL DESIRES PHYSICIANS TO UNDERSTAND THAT THE ACCEPTANCE OF AN ARTICLE DOES NOT NECESSARILY MEAN A RECOMMENDATION, BUT THAT, SO FAR AS KNOWN, IT COMPLIES WITH THE RULES ADOPTED BY THE COUNCIL.

W. A. PUCKNER, SECRETARY.

NOVATOPHAN.—Novatophan is ethyl 6-methyl-2-phenylquinolin-4-carboxylate, $\text{CH}_3\text{C}_6\text{H}_4\text{N}.\text{C}_6\text{H}_4\text{COOC}_2\text{H}_5$, 6:2:4= $\text{C}_{10}\text{H}_7\text{O}_2\text{N}$, the ethyl ester of Paratophan, (6-methyl-2-phenylquinolin-4-carboxylic acid).

Novatophan is a slightly yellow, odorless and tasteless, crystalline powder, melting at 70°. It is insoluble in water but readily soluble in alkalies, hot alcohol and strong acids.

If 0.1-0.2 Gm. novatophan be boiled for a short time with 0.5 Gc. sodium hydroxide solution, U. S. P., then 5 Gc. iodine test solution added and again heated, the odor of iodoform should be apparent.

If novatophan be dissolved in concentrated sulphuric acid, a light yellow solution results which on the addition of bromine water yields a reddish yellow precipitate.

If ferrie chloride be added to an alcoholic solution of novatophan a yellow, not a brown color, is produced (difference from Atophan and Paratophan).

Actions and Uses.—The same as Atophan (New and Non-official Remedies, Jour. A. M. A., March 2, 1912, p. 633) but it is practically tasteless.

Dosage.—Same as for Atophan.

Manufactured by Chemische Fabrik auf Aktien (vorm. E. Schering), Berlin, Germany (Schering & Glatz, New York). No U. S. patent or trademark.

Novatophan Tablets.—Each tablet contains 0.5 Gm. (7½ grains) novatophan.

HEXAL.—Hexal is hexamethylenamine salicylsulphonic acid $(\text{CH}_2)_6\text{N}_4.\text{C}_6\text{H}_4(\text{OH})\text{COOH}.\text{HSO}_3$.

Hexal is prepared by the interaction of an alcoholic solution of salicylsulphonic acid and an aqueous solution of hexamethylenamine.

Hexal is a white odorless crystalline powder, readily soluble in water, slightly soluble in alcohol and difficultly soluble in ether, having an acid taste.

If an aqueous solution of hexal be heated to 45 or 50 C., formaldehyde will be liberated. If the residue be now made alkaline with sodium hydroxide and again heated, ammonia will be liberated.

If to a dilute aqueous solution of hexal ferrie chloride test solution be added, a violet color will be produced.

If to an aqueous solution of hexal an aqueous albumin solution be added, a white precipitate will form. If to an aqueous solution of hexal bromine water be added, an orange-colored precipitate will be formed.

With the exception of the tannic acid test, hexal responds to the identity tests of the U. S. Pharmacopoeia for hexamethylenamine.

If 0.2 to 0.3 Gm. hexal be fused with 2 Gm. fusion mixture (sodium carbonate and potassium nitrate), the resulting mass dissolved in hydrochloric acid, the addition of barium chloride test solution will produce a white precipitate.

If 0.1 to 0.2 Gm. hexal be moderately heated with 5 Gc. concentrated sulphuric acid, a currim red color will be produced.

If calcium hypochlorite solution be added to an aqueous solution of hexal, a brown color gradually appears.

A 5 per cent. aqueous solution of hexal should not be changed by saturation with hydrogen sulphide or the addition of barium chloride solution. After acidulation with nitric acid, the addition of silver nitrate solution should produce not more than a slight opalescence.

Actions and Uses.—It is claimed that hexal has the action of hexamethylenamine combined with an anesthetic and astringent action on the inflamed mucous membranes of the biliary passages and urinary bladder without having a deleterious effect on the bladder walls.

Hexal is claimed to be useful in chronic inflammations of the bladder and in posterior urethritis from gonorrhea to pre-