

PROGRESS IN PEDIATRICS

REVIEW OF THE LITERATURE ON THE FEEDING AND GASTROINTESTINAL DISEASES OF INFANTS FOR THE YEAR 1914-1915 *

GRACE MEIGS, M.D.

WASHINGTON, D. C.

BREAST FEEDING

1. Von Torday: *Jarb. f. Kinderh. (ref.)*, 1914, lxxix, 373.
2. Pritchard: *Am. Med.*, 1914, xx, 327.
3. Misch: *Ztschr. f. Säuglingsschutz*, 1914, vi, 56.
4. Bahrdt: *Ztschr. f. Kinderh.*, 1914, x, 129.
5. Brodsky: *Arch. f. Kinderh.*, 1914, lxiii, 161.
6. Craige: *Jour. Am. Med. Assn.*, 1915, lxiv, 502.
7. Rietschel: *Ztschr. f. Geburtsh. u. Gynäk.*, 1914, lxxv, 732.
8. Jaschke: *Ztschr. f. Geburtsh. u. Gynäk.*, 1914, lxxv, 736.
9. Leo-Wolf: *Arch. Pediat.*, 1914, xxxi, 363.
10. Deresse: *Ztschr. f. Kinderh. (ref.)*, 1914, viii, 508.
11. Hill and Simpson: *Proc. Soc. Exper. Biol. and Med.*, 1914, xi, 82.
12. Hill and Simpson: *Am. Jour. Physiol.*, 1914, xxxv, 361.
13. Editorial: *Jour. Am. Med. Assn.*, 1914, lxiii, 2292.
14. Myers: *Jour. Am. Med. Assn.*, 1914, lxiii, 1179.
15. Van der Bogert: *Arch. Pediat.*, 1915, xxxii, 35.
16. Neff: *Jour. Am. Med. Assn.*, 1914, lxiii, 1181.
17. Duke: *Publication U. S. Children's Bureau*, No. 9, *Infant Mortality Series No. 3*.
18. Hirsch: *Monatschr. f. Geburtsh. u. Gynäk.*, 1914, xxxix, 64.
19. Lateiner-Mayerhofer and Progulski: *Oester., Sanitätsw.*, 1914, xxvi, 1.
20. Rohmer: *Reichmed. Anzeiger*, 1914, xxxix, 225.
21. Churchill: *Jour. Am. Med. Assn.*, 1914, lxiii, 1799.

As in previous years, much has been written about breast feeding. While many authors have shown again by statistics the relation of breast feeding to a low infant death rate others consider this fact as well established, and are chiefly concerned with the practical difficulties presented by many cases of breast feeding.

Technic

Von Torday¹ and Pritchard² emphasize the fact that the regular mechanical stimulation to the breast, caused by the sucking of the infant, is very important for a plentiful milk-supply. A regular routine in lactation is considered very important by Pritchard for establishing an automatism in milk secretion; nevertheless he believes that

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the longer interval at night should be used. He emphasizes the importance of the nervous element in milk secretion; and he believes the fact that the higher nervous centers have so undoubted an influence on milk secretion can be utilized therapeutically.

Misch³ has found that it is impossible to maintain an abundant milk-supply for any length of time when the stimulation to the breasts is insufficient, as in cases in which the mother nurses her infant only three times daily. With four feedings daily better results are obtained.

Bahrtd⁴ measured the amount of suction exerted by a nursing infant, with the object of discovering the reason why some infants nurse badly. He found that the suction necessary to obtain a flow of milk varied widely; that the normal infant could suit the suction exerted to what was necessary; and that infants who nursed badly exerted less pressure than was necessary. These children showed a failure to adapt the pressure to the breast.

Brodsky⁵ has studied the amount of milk secreted daily by seventeen wet-nurses in whom the breasts were completely emptied after nursing. This method he recommends as tending to maintain the milk supply. The proportion of the milk removed to that nursed was 3.4 per cent. to 46 per cent. The average daily amount secreted by the wet nurses varied from 577 gm. for 77 days to 3,500 gm. for 339 days. The highest daily quantity was 5,400 gm.

The intervals between feedings generally recommended are three or four hours. Craige⁶ recommends a three hour interval, with one night feeding until the third or fourth month, after which time all night feedings should be discontinued. Some babies, he believes, do better on four hour intervals. Overfeeding due to too frequent feeding he finds very common among breast-fed babies.

In feeding new-born infants, Rietschel⁷ believes that the intervals should be shorter; he warns against the systematic method so often advised of feeding new-born infants only five times in twenty-four hours, for he finds that many of these children thrive better on six to eight feedings in twenty-four hours.

Jaschke⁸ disagrees with this view, and advises even in new-born infants five feedings in the twenty-four hours. If the amount of milk taken is insufficient, he advises that the breasts should be pumped, and that this milk be given after each nursing.

Leo-Wolf⁹ also recommends less frequent intervals of feeding for the new-born infant. On the first day the baby should not be nursed at all, and on the second day once or twice, while water ad libitum is given. The number of feedings is increased on the third day to three, on the fourth to four; and only on the fifth day is the infant to be nursed every four hours during the day.

Deresse¹⁰ does not find insufficient amount of breast-milk to be the principal cause of inability of mothers to nurse their infants. Among one hundred mothers, in only twenty was the cause either insufficient amount of milk or disease.

All writers seem agreed that galactogogues have no influence in increasing the supply of breast milk. Hill and Simpson¹¹ have investigated the effect of the injection of the extract of hypophysis on the milk secretion of cows. This has been found by some writers to have a very marked effect. The authors found that there was a decided increase in milk secretion, with a rise in the percentage of fat. This was very temporary, and was present only in the first few hours after the injection; later the changes were counterbalanced, so that the examination of the daily amount showed no changes from the normal. They^{12, 13} have lately made the experiment on the human subject, injecting 20 mg. of the commercial preparation intramuscularly. This was followed in ten minutes by a marked increase in the amount of milk secreted. The fat was also increased, being 5.5 per cent. as compared with 3.4 per cent.

Nutritional disturbances on breast-feeding are considered by Myers¹⁴ as not infrequently due to faults in the mother's diet. In this he disagrees with many recent writers, among them Van der Bogert,¹⁵ who believes that any food, whether or not it contains acid, may be allowed unless it causes indigestion in the mother. Myers reports three cases illustrating his theory, where restlessness, diarrhea, or colic in the infant disappeared when fruits and vegetables were omitted from the diet of the mother. The food giving most disturbance he finds to be those containing the largest amount of high flavors; among these he includes fruits, spices and highly flavored vegetables. Fruit both cooked and uncooked has proved injurious. He has noticed a great variation in the sensitiveness to these substances as displayed by different babies, or by the same baby at different ages. He advises that from the beginning of lactation until the end of the first month the use by the mother of the foods named should be limited; and that after this time the addition of vegetables and fruit to the diet should be made very cautiously, only one new article being tried at a time.

Neff¹⁶ advises that in certain disturbances in breast-fed infants, especially in those characterized by abdominal distention, colic, fretfulness, loose stools, and failure to gain, fat-free breast milk should be tried. He believes that it is also indicated in many cases with vomiting, both in those with and without pyloric obstruction, in cases of infantile eczema and of congenitally weak and premature infants. The infants are allowed to nurse a few minutes at the breast, this serving to keep

the milk secretion active. After each nursing all the remaining breast milk is expressed from the breast; this is kept on ice till the cream is separated; the skimmed breast milk is then given as supplementing each nursing.

Studies in the Distribution of Breast Feeding and Its Relation to Infant Mortality

Hirsch¹⁸ studied the histories of the feeding of all of the children of the women visiting the ambulatorium of the Frauenklinik at Munich, and found a very low rate of breast feeding: 57 per cent. of the children were not nursed at all; only 33 per cent. were nursed longer than one month; 20 per cent. longer than three months, and 13 per cent. longer than six months. The influence on the infant death rate was shown by the fact that of those who died, only 3 per cent. were breast-fed over six months, while 74 per cent. were not nursed at all.

The statistics from the Lemberg clinic, reported by Lateiner-Mayerhofer and Progulski,¹⁹ show a marked contrast, as here the proportion of babies breast-fed is very high. Only 10 per cent. of the infants were nursed less than six months, while 55 per cent. were nursed one year and many longer. Mixed feeding, which was often injudicious, was frequently given, almost regularly after the sixth month. The mortality among the breast-fed was 16 per cent., among the artificially fed 34 per cent. The authors call attention to the fact that though breast feeding is so general in Galicia (as illustrated by these figures) the infant death rate is very high, being over 20 per cent. This high rate they attribute to the very bad economic and hygienic conditions. They believe that hygienic instruction of the inhabitants could accomplish much.

Rohmer²⁰ found in Cologne that among married women from 82 to 69 per cent. nursed their babies. Of illegitimate infants, only 31 per cent. were breast-fed after the sixth week.

Among 100 French women who were unable to nurse their infants for some reason, Deresse¹⁰ found that in twenty insufficient milk or disease was the cause, in seventy-three the social position of the mother, in seven egotism or the prejudice of the mother.

Churchill²¹ has studied the relation of the feeding of breast milk to the mortality in an infant hospital for a period of three years. He found that the rates of mortality among the infants exclusively breast-fed and those fed exclusively on cow's milk were 36.3 and 36.9, respectively. This practical identity in the rate could be explained by the fact that the infants who had received exclusively breast milk were on an average younger and weighed less than those who had received cow's milk. The death rate of the babies receiving cow's milk who were of equally low weight was considerably higher than that of the infants receiving breast milk.

ARTIFICIAL FEEDING IN GENERAL

22. Pritchard: Brit. Jour. Child. Dis., 1914, xi, 49.
23. Heubner: Ztschr. f. Kinderh., 1914, xi, 81.
24. Samelson: Ztschr. f. Kinderh., 1914, xi, 86.
25. Mayerhofer and Roth: Ztschr. f. Kinderh., 1914, xi, 117.
26. Gittings: Arch. Pediat., 1914, xxxi, 696.
27. Chapin: Jour. Am. Med. Assn., 1914, lxiii, 1177.
28. Mendel: Jour. Am. Med. Assn., 1914, lxiii, 819.
29. Osborne and Mendel: Jour. Biol. Chem., 1914, xvii, 325.
30. Osborne and Mendel: Jour. Biol. Chem., 1914, xvii, 401.
31. Editorial: Jour. Am. Med. Assn., 1914, lxiii, 247.
32. Niemann: Jahrb. f. Kinderh., 1914, lxxix, 274.
33. Mendel: Biochem. Bull., 1914, iii, 156.
34. Osborne and Mendel: Jour. Biol. Chem., 1914, xvi, 423.
35. Funk: Ergebn. d. Physiol., 1913, xiii, 124.
36. Funk: Die Vitamine, Wiesbaden, 1914.
37. Funk: München. med. Wchnschr., 1913, lx, 2614.
38. Schaumann: Arch. f. Schiffs- u. Tropenhyg., 1914, xviii, 125; Ztschr. f. Kinderh. (ref.), 1914, viii, 115.
39. Wheeler and Biester: AM. JOUR. DIS. CHILD., 1914, vii, 169; Wheeler: AM. JOUR. DIS. CHILD., 1915, ix, 300.
40. Peiser: Berl. klin. Wchnschr., 1914, li, 1165.
41. Smith: Arch. Pediat., 1914, xxxi, 784; LeWald: AM. JOUR. DIS. CHILD., 1915, ix, 1261.
42. Kerr: New York Med. Jour., 1915, ci, 296.
43. Variot: Ztschr. f. Kinderh. (ref.), 1914, viii, 281.
44. Müller and Schloss: Med. Klin., 1914, x, 276.
45. Müller and Schloss: Jahrb. f. Kinderh., 1914, lxxx, 42.
46. Leopold: AM. JOUR. DIS. CHILD., 1914, viii, 196.
47. Friedenthal: Berl. klin. Wchnschr., 1914, li, 727.

For the determination of the proper amount of food to be given, the caloric method is again advised by many authors. Several of these draw attention to Howland's work which showed that the caloric needs of infants making active movements and crying is greater than those of infants at rest. Pritchard²² believes that infants who are overheated by too warm rooms or too thick clothing require less food than infants properly cared for.

Heubner²³ states that to obtain in the artificially fed infant a rate of gain equal to that in the breast-fed a higher number of calories is required. Samelson²⁴ does not agree with this conclusion.

Mayerhofer and Roth,²⁵ basing their statements on observations of twenty-three infants so fed that they show very good weight curves, conclude that a perfect uniformity in the caloric needs of infants does not exist. There are many infants who gain best when the calories given fall below the standard of 100 calories per kilogram of body-weight recommended by Heubner; other infants thrive only on an energy quotient far above 100. Heubner's standard, they consider, is the best foundation for the comparison of different forms of food.

The fact that the caloric needs vary with different infants is also emphasized by Gittings;²⁶ he finds that atrophic children especially

require a higher energy quotient than that corresponding to their weight. He believes that a caloric standard is a useful check in artificial feeding; for if the caloric value is much above or below the average, harm will result in the majority of cases. In Chapin's²⁷ opinion, the experiments on animals showing the different results obtained with different foods which yield the same number of calories should be a warning not to ascribe too much importance to the caloric method.

The interesting experimental studies made this year as to the influence of different food elements on nutrition and growth, and on the disturbances produced by the absence of certain necessary substances or vitamins in food, have been frequently commented upon in pediatric literature.

Chapin²⁷ believes that in infant feeding the facts brought out by experimental studies in nutrition should be borne in mind; that a food may be very unscientific (even though exactly prepared with some supposed chemical or caloric requirement in mind), in case some necessary element has been omitted. He warns against the intricate and profound chemical manipulation of food, and believes that the latest scientific studies point favorably to great simplicity in the preparation of artificial food for infants. In feeding he believes that cow's milk should be simply diluted in the right proportion for the age, keeping in mind the fact that none of the ingredients, protein, fat or carbohydrate must be long reduced below what is known to be their average content in human milk.

The important studies of Osborne and Mendel^{28, 29} have thrown much light on the problems of the nutrition of the growing infant. Of the amino-acids into which the ingested protein is broken down during digestion and metabolism, almost all are necessary for growth; only certain ones are, however, necessary for maintenance of life. Tryptophan is one of the latter. Zein, contained in maize, does not contain tryptophan, and does not maintain life in animals if fed as the only protein. If tryptophan is added to the food, the animals will live. Lysin has been found by these authors to be essential for growth. Gliadin, which is deficient in lysin, maintains life in adult animals, but will not cause growth in young animals. If lysin is added to this diet the animals grow. Zein, which lacks tryptophan, is also lacking in lysin; Mendel concludes that this fact explains why corn is poorly suited to the growing individual. Proteins like casein, lactalbumin and egg vitellin, which in nature are concerned with growth, are rich in lysin; these, with edestin from hemp seed, are capable of satisfying the nitrogenous needs of all states of development. For growth certain fats have been found by these investigators^{28, 30} to be essential. Growing animals fed on isolated food substances with fat in the form of

lard, stopped growing; growth, however, was restored if butter fat was added. Butter fat, egg yolk and cod liver oil contain the ingredient which promotes growth; almond oil and lard do not. The former foods, they remark, have long had the reputation of being efficient foods. They believe that it is improbable that their special potency resides in the triglycerids present. Their work has been commented on³¹ as throwing light on the experiments of Niemann³² in adding butter fat to the diet of infants.

The tendency to grow is, according to Mendel,³³ dependent on hereditary factors; food gives a range of play, but does not influence it permanently. Osborne and Mendel in their experiments on rats, have by various means stopped growth, without causing a permanent loss of ability to grow. They conclude that the tendency to grow apparently does not disappear until the fundamental tendency of the organism is used up.

The term "vitamine" was first used by Funk to describe certain substances present in food in small quantity but necessary to nutrition "which can not be expressed in terms of protein, fat and carbohydrate, or in calories of energy" (Mendel²⁸). Mendel believes that classing these unknown substances under the name of vitamines does not explain the disturbances arising from their absence from the diet. Funk^{35, 36, 37} has written much on the subject. He describes vitamines as crystalline bodies of very complicated structure containing nitrogen, which can be isolated by different precipitating agents. These bodies are necessary for life; they are thermolabile and are present in very small amounts. They are biologically if not chemically associated. Vitamines are present in the polishings of rice and in milk. Among avitaminoses or deficiency diseases, due to a lack of vitamine in the food, he classes beriberi, scurvy, Barlow's disease, pellagra and rachitis, *Mehlnährschaden* and many other syndromes.

Schaumann³⁸ considers that Funk's conclusions in regard to all these diseases are theoretical, and have not yet been proven.

Wheeler and Biester³⁹ have studied experimentally certain proprietary foods used in infant feeding with the object of determining whether they will sustain life and growth when used as exclusive foods; and if not whether the fault lies in a lack of the essential amino-acids, or in the absence of essential accessory substances or vitamines.

Many authors warn against one-sided diets; especially against those very rich in carbohydrate but poor in fats which have been extensively used. Chapin²⁷ believes that the withdrawal of the fats brings with it especial danger of rachitis.

Niemann³² believes that fat in the diet is especially necessary for the accumulation of body fat; and that the diets very rich in carbohydrate

tend to decrease immunity. Peiser⁴⁰ reminds us that the feeding of normal infants on diets poor in fat and rich in carbohydrate is not "economical"; and that the resulting increased water content of the body tends to lower the immunity.

Technic

Smith⁴¹ believes the posture of the baby during feeding is very important; and advises that immediately before and after feeding the baby should be held upright in order that swallowed air may be expelled. Many infants, he finds, swallow large quantities of air with their feeding. With the baby in the recumbent position fluid gravitates to the posterior portion of the stomach covering the cardiac orifice; the air therefore cannot escape through the esophagus, and leads by pressure to vomiting and colic.

ARTIFICIAL FEEDING OF THE NORMAL INFANT

The simple milk dilutions, so widely used, are very little discussed in the literature.

Kerr⁴² favors top-milk mixtures. Variot⁴³ gives during the first five or six weeks one part of water to two of milk; in the third month one part of water to three of milk; at the fourth to the fifth month milk is given undiluted. Müller and Schloss⁴⁴ give directions for the preparation in the private house of the most important of the milk mixtures.

Two foods were described in this review last year which had been suggested as being superior to the simple milk dilutions in feeding the normal infant: Friedenthal's milk and the whey-modified milk of Schloss. Both have been developed on the principle of imitating breast milk as nearly as possible. Müller and Schloss⁴⁵ criticize the article by Bahrtdt on Friedenthal milk, on the grounds that according to Bahrtdt's analyses the salts in this milk do not resemble, as they are supposed to do, those of breast milk either in total content or in the relative proportions of the various salts; and that the clinical results reported are inconclusive because there were but few young infants fed on the mixture, and because the duration of the feeding was too short. They describe the stages in the development of the "whey-modified milk" of Schloss. They have found that a simple dilution of milk and cream with the addition of potassium chlorid forms a food very similar in composition to that of human milk, both in absolute salt content, and in the relationship of the various ions. They have found that milk-sugar, which they added at first, often leads to bad results, especially in infants' hospitals; they have therefore added dextrin and maltose as the carbohydrate. They discuss the various attempts which have been made during the development of infant feeding to produce an artificial food similar to breast milk.

Leopold⁴⁶ has described his results in the use of the whey-modified milk of Schloss. The preparation of the two mixtures prescribed by Schloss are once more described.

Mixture A, for infants under three months, consists of:

Twenty per cent. cream.....	140	c.c.
Whole milk	140	c.c.
Water	700	c.c.
Potassium chlorid	0.2	gm.
Dextrin and maltose.....	35.0	gm.
Flour	15.0	gm.
Nutrose or plasmon.....	5.0	gm.

In Mixture B, for infants over three months: the flour is omitted, and the dextrin and maltose is increased to 50 to 70 gm.; otherwise mixtures A and B are the same. During the past year Leopold has given this feeding to fifty-four infants, varying in age from 2 days to 13 months. Sixteen were under 1 month. Two died; one from double otitis media, one from peritonitis. The milk was given in the same amounts as breast milk. The stools were alkaline, yellow, homogeneous and pasty. Leopold has found that infants over 6 months do not gain well on this feeding. He considers that the food is especially indicated for very young infants for whom breast milk is not obtainable. Of the fifty-four cases, in thirty-six the result was good; in ten fairly good, in eight poor. He concludes that the results with this feeding are much better than with any other method of artificial feeding.

Friedenthal⁴⁷ writes that in foods for infants the correlation of salts is more important than the total ash content of the milk. The low salt content of human milk is the optimum for the normal child.

ARTIFICIAL FEEDING OF THE SICK INFANT

48. Lichtenstein: *Hygiea*, 1914, lxxvi, 17; *Monatschr. f. Kinderh.* (ref.), 1914, xiv, 7.
49. Modigliani: *Pediat.*, 1914, xxii, 405.
50. Di Cristina: *Pediat.*, 1914, xxii, 161.
51. Langstein: *Jahreskurs. f. ärztl. Fortbild.*, 1914, v, 54.
52. Sluka and Sperk: *Wien. klin. Wchnschr.*, 1914, xxvii, 833.
53. Aschenheim: *Therap. Monatsh.*, 1914, xxviii, 435.
54. Kern and Müller: *Berl. klin. Wchnschr.*, 1913, 1, 2237.
55. Soldin: *Berl. klin. Wchnschr.*, 1914, li, 794.
56. Leichtentritt: *Arch. f. Kinderh.*, 1914, lxiii, 61.
57. Rost: *Arch. Pediat.*, 1914, xxxi, 849.
58. Beck: *Med. Klin.* 1914, x, 149; *Ztschr. f. Kinderh.* (ref.), 1914, viii, 129.
59. Lust: *Ztschr. f. Kinderh.* (ref.), 1914, viii, 129.
60. Moro: *Ztschr. f. Kinderh.* (ref.), 1914, viii, 129.
61. Ostrowski: *Jahrb. f. Kinderh.* (ref.), 1914, lxxix, 374.
62. Wegener: *München. med. Wchnschr.*, 1914, lxi, 359.
63. Kamnitzer: *Deutsch. med. Wchnschr.*, 1914, xl, 855.
64. Bosworth and Bowditch: *AM. JOUR. DIS. CHILD.*, 1914, viii, 120.
65. Miller: *Arch. Pediat.*, 1914, xxxi, 772.
66. Eaton: *Arch. Pediat.*, 1914, xxxi, 452.
67. Dunn: *AMER. JOUR. DIS. CHILD.*, 1915, ix, 225.
68. Dunn: *Boston Med. and Surg. Jour.*, 1915, clxxii, 167.

Albumin Milk

The value of this food and its substitutes in the feeding of sick infants is once more attested by many authors. Lichtenstein⁴⁸ reports fifty cases, for the most part cases of severe nutritional disturbance, treated with albumin milk. The results were in the main very good. He found it possible usually to change to another diet after two to three weeks.

Modigliani⁴⁹ reports good results with albumin milk in the feeding of six infants with dyspepsia, intoxication and balance disturbance, as shown by a gain in weight, cessation of fermented stools, and the appearance of fat-soap stools. Two breast-fed infants with dyspepsia recovered when albumin milk was fed as a supplementary food. The results when albumin milk was used in the feeding of eight new-born infants were very bad.

Di Cristina⁵⁰ has had more favorable results in feeding albumin milk to normal infants. He used it also in all cases of nutritional disturbance. In chronic dyspepsia he has seen a prompt improvement in all the symptoms; in these cases where the weight remained stationary fat and sugar were added.

Langstein⁵¹ writes that for severe cases of nutritional disturbance albumin milk is superior to casein calcium milk. Sluka and Sperk⁵² found that feeding with albumin milk was more successful with dispensary cases than with hospital infants. The poor results with the latter they ascribe to "hospitalism."

Substitutes for Albumin Milk

In all the preparations the object has been to obtain a mixture with a low salt and sugar content, and a high percentage of protein and calcium.

With regard to the many substitutes for albumin-milk, Finkelstein (see Footnote 137) writes that he prefers those which contain casein in fine, freshly precipitated flakes. The powdered casein preparations, such as casein calcium, plasmon, etc., may become hard and tough.

Aschenheim⁵³ has suggested a new modification of albumin milk.

Kern and Müller⁵⁴ have also proposed a new substitute. One liter each of buttermilk and water are boiled together and the amount filled up to two liters. The mixture on standing shows a precipitation of the casein, and a formation of clear whey; 1125 gm. of the whey are removed, and 125 gm. of 20 per cent. cream are added to the remainder, together with sugar from 5 to 7 per cent. The advantages claimed for this food are its freshly precipitated casein and its content of lactic acid.

Soldin⁵⁵ has prepared a similar protein-rich food. Half a liter of milk is allowed to sour; the cream is removed, and the milk is warmed

to 40 C. The casein which is precipitated is separated by a sieve, and is then added to 0.5 liter of sour milk and 0.5 liter of water or flour water with sugar. The food is prepared easily and is cheaper than albumin milk. The clinical results have been good.

Leichentritt⁵⁶ describes the preparation of Engel's modification of albumin milk, which was reviewed last year. His results with this feeding were good, as he shows by case histories.

Casein-calcium milk has been used to a considerable extent.

Rost⁵⁷ reports fifty-six dispensary cases of summer diarrhea treated with a mixture prepared according to Stoeltzner's directions. Of the casein-calcium preparation 20 gm. are added to $\frac{1}{3}$ of a pint of milk; $\frac{2}{3}$ of a pint of milk is heated; the cold solution is added and the whole brought to the boiling point; one pint of boiled water or cereal decoction is added. Rost rarely added sugar (in the form of dextrin-maltose) before the third day. The histories of the cases show that the results were, in the main, good. Twenty-seven showed gain in weight. Rost recommends this food on account of the simplicity of the preparation and its cheapness as particularly useful in the treatment of dispensary cases.

In acute and sub-acute dyspepsia Beck⁵⁸ has had as good results with casein calcium milk as with albumin milk; in intoxication, however, the results have been less good. Lust,⁵⁹ in discussing Beck's report, states that his own results with casein-calcium milk has been very unequal. He does not believe that this preparation replaces albumin milk. Moro,⁶⁰ too, found that in older infants and less severe cases the results were excellent; he has seen some bad effects of casein-calcium milk in other cases.

Ostrowski⁷¹ fed with casein-calcium milk forty-nine infants with the different nutritional disturbances; his results were very good. Wegener⁶² used this food successfully in twenty-two cases. Kamnitzer⁶³ reports eighteen cases in which casein-calcium milk was used; two very young infants with intoxication died. In the others, however, there was improvement, the stools becoming formed on the second to fifth day. Langstein⁵¹ has noted, in slight and moderate cases of nutritional disturbances, results with casein-calcium milk equal to those of albumin milk; in severe cases, as already noted, albumin milk is superior.

In connection with these methods for increasing the proteid content of a milk mixture, the preparation of dry powdered paracasein, as described by Bosworth and Bowditch,⁶⁴ is interesting. Very large quantities of this substance, when fed to an infant, led to no toxic symptoms nor fever.

Other Diets

The diets of the group including albumin milk and its substitutes are in general recommended chiefly for those disturbances ascribed to the harmful action of too high concentrations of sugar and salt. For disturbances associated with an intolerance for fat, other diets are recommended.

For these cases Miller⁶⁵ and Eaton⁶⁶ write of the good effects of a diet rich in protein and carbohydrate, and poor in fat. Miller⁶⁵ gives at first a diet with a very low percentage of fat (0.5 per cent.) moderate protein (from 1.3 to 1.5 per cent.) and high carbohydrate (from 5 to 6 per cent.). The fat is increased very slowly, the proteid and carbohydrate more rapidly. On this diet infants show putty-like stools and make a marked improvement. Eaton⁶⁶ also reports infants doing well on a diet with very little fat. For cases of fat intolerance, both acute and chronic, Dunn^{67, 68} advises a diet rich in protein (3 per cent.) with moderate carbohydrate (7 per cent.) (which should be in the form of maltose) and very low fat. For some cases he considers breast milk essential. Niemann,³² basing his method on his theory that injury by fat is due to its content of the lower fatty acids, recommends feeding infants with fat intolerance on mixtures made up from skimmed milk and washed butter. By washing butter thoroughly, and kneading it as the wash water is renewed eight or ten times, it may be largely freed from the lower fatty acids. He has used the following diet:

500 gm. skimmed milk.
500 gm. 5 per cent. flour water (mondamin).
50 gm. malt extract.
50 gm. washed butter.

Peiser⁴⁰ has made experiments to determine which fats are best tolerated by infants. Using buttermilk with flour as the medium, he has added (usually for eight-day periods) different kinds of fats: cod liver oil, salt-free butter, 15 per cent. cream and many other oils. The impression gained from his results is that cod liver oil is tolerated the best, butter and cream the least well.

THE ETIOLOGY OF NUTRITIONAL DISTURBANCES OF INFANTS

69. Heubner, W.: Arch. f. exper. Path. u. Pharmakol., 1914, lxxv, 435.
70. Rietschel, Heidenhain and Ewers: München. med. Wchnschr., 1914, lxi, 648.
71. Lövegren: Ztschr. f. Kinderh., 1914, xii, 110.
72. Moro: Jahrb. f. Kinderh., 1914, lxxix, 645.
73. Hahn and Moro: Jahrb. f. Kinderh., 1914, lxxix, 664.
74. Hayashi: Jahrb. f. Kinderh., 1914, lxxix, 674.
75. Klocman and Moro: Jahrb. f. Kinderh., 1914, lxxix, 676.
76. Luna: *Pediatria*: 1914, xxii, 88.
77. Gismondi: *Pediatria*, 1914, No. 4; rev. Arch. *Pediat.*, 1915, xxxii, 151.
78. Sherman and Johnes: Arch. *Pediat.*, 1914, xxxi, 749.

79. Southworth: Jour. Am. Med. Assn., 1914, lxiii, 1375.
80. Freudenberg: Monatschr. f. Kinderh., 1914, xiii, 141.
81. Schlutz: Journal-Lancet: 1914, xxxiv, 178.
82. Brüning: Jahrb. f. Kinderh., 1914, lxxix, 305.
83. Thomas: Biochem. Ztschr., 1913, lvii, 456, 473.
84. Bahrdt and McLean: Ztschr. f. Kinderh., 1914, xi, 143.
85. Huldschinsky: Ztschr. f. Kinderh., 1913, v, 475.
86. Benjamin: Jahrb. f. Kinderh., 1914, lxxx, 545.
87. Lesné: Ztschr. f. Kinderh. (ref.), 1914, viii, 117.
88. Lust: München. med. Wchnschr., 1913, lx, 2720.
89. Lust: Jahrb. f. Kinderh., 1913, lxxvii, 383.
90. Lawalschek: Prag. med. Wchnschr., 1914, xxxix, 185.
91. Hayashi: Monatschr. f. Kinderh., 1914, xii, 749.
92. Modigliani and Benini: Policlinico, 1914, xxi, No. 51; (rev.) Jour. Am. Med. Assn., 1915, lxiv, 475.
93. Poulsen: Jahrb. f. Kinderh., 1914, lxxix, 77.
94. Uffenheimer: Jahrb. f. Kinderh., 1914, lxxx, 543.
95. Uffenheimer: Jahrb. f. Kinderh., 1914, lxxix, 92.
96. Liwschiz: Dissertation, Munich, 1913.

The two main causes of the nutritional disturbances in infancy, food and bacterial infection, have been discussed as in previous years.

The influence of the various foodstuffs in the etiology of the nutritional disturbances of infants is always a fruitful subject of discussion in pediatric literature.

Influence of Food and Foodstuffs: Salts

The whey salts in cow's milk are considered by most German writers as being extremely important in causing nutritional disturbances.

The much-mooted question of salt fever is still debated. Heubner,⁷⁰ although acknowledging the importance of the freshness and sterility of the diluting fluid in preventing a rise of temperature after the subcutaneous injection of salt solution, still believes that the results of certain experiments speak for the action of an excess of sodium chlorid in causing fever.

Rietschel, Heidenhain and Ewers⁷¹ deny that all cases of fever arising after the subcutaneous injection of salt solution may be ascribed to bacteriotoxic substances in the distilled water used, and believe that in some cases an inorganic constituent such as copper may be the cause. In proof of this theory they report that 58 per cent. of the infants injected with freshly distilled solutions which had been boiled with bits of copper showed a rise in temperature.

Finkelstein has believed that the alimentary fever occurring in young infants and in those with nutritional disturbances after the taking by mouth of salt solution is caused by a biochemical action of the salt on the organism, and not, as thought by some authors, that this fever is due to bacterial factors, becoming active after an injury to the intestinal epithelium by the salt. Lövegren⁷² believes that this question

can not be settled clinically; he has therefore subjected it to experiment. In healthy dogs, during the height of digestion, he has injected salt and sugar solutions directly into the mesenteric veins, thus excluding any action of the salt on the intestinal epithelium. In these operations the greatest care was used to maintain asepsis; the solutions used were made from freshly distilled water and then autoclaved; for most of the distillations a glass apparatus was used. Experiments were made with hypertonic, hypotonic and isotonic salt solutions, with distilled water, with lactose and dextrose solutions, and with other solutions. In eleven cases in which a hypertonic solution was injected there was ten times a rise of temperature; one case with hypotonic solution also showed a rise; while in one case each injected with an isotonic solution and with Ringer solution the reaction was weak. He concludes that in his experiments the fever must be due to a direct action of an anisotonic solution on the body cells.

It does not seem excluded that the rise in temperature (averaging 1.1 C.) may not have been due to the operative procedure; the two cases used as controls, in which an isotonic solution and Ringer's solution were injected, which showed but a slight rise in temperature, seem insufficient.

Moro⁷² and his co-workers^{73, 74, 75} have made an interesting series of experimental studies in regard to the action of whey salts on the intestinal epithelium.

Carbohydrate

Luna⁷⁶ writes that infants with a flatulent dyspepsia, and positive fermentation test as applied to the stools reveal an intolerance of carbohydrate. These children should be fed very little carbohydrate and much albumin.

In regard to which form of sugar is least likely to cause nutritional disturbance, Gismondi⁷⁷ believes that a healthy child is able to digest lactose, saccharose and maltose equally well. He proposes giving a mixture of the three varieties, the object being not to exceed the limit of tolerance of each kind. Sherman and Johnes⁷⁸ have tested the various sugars for their effect on the gastric secretions of fifteen infants. They conclude from their results that malt sugar in the form of dextrin maltose is at least twice as stimulating to gastric secretion as milk sugar or cane sugar.

That starch has a protective action against the injurious effects of both sugar and fat is claimed by Southworth.⁷⁹ He does not agree with the view that the beneficial results obtained by the use of starch gruels is due solely to their prevention of the formation of tough curds. He believes that there are several ways in which starch may influence digestion. The protective action of starch is shown by the benefit

derived from its use in malt-soup, which contains a high proportion of sugar. He believes that the slow breaking down of starch gives less opportunity for fermentation.

The symptom complex of *Mehlnährschaden*, due apparently to a diet consisting too exclusively of carbohydrates, has been much discussed. Funk, as previously stated, has included this disturbance among the "avitaminoses" or deficiency diseases. This view has been opposed by Schaumann, and especially by Freudenberg.⁸⁰ The latter finds fault with Funk's hypothesis, which attributes to a lack of vitamins a disease so plainly associated with a lack of many of the constituents of a sufficient food. Schlutz⁸¹ reports a case illustrating the hypertonic form of this disease. A child 14 months old, fed for two months on a gruel without milk, developed edema, stiffness and contractures, but recovered on breast milk. Brüning⁸² has contributed to our experimental knowledge of this disturbance. White rats, fed on a one-sided carbohydrate diet, showed on an analysis of the body tissues a greater amount of water and a higher relative amount of salt. He shows that these findings correspond with the clinical condition in *Mehlnährschaden*.

Niemann³² and Peiser⁴⁰ comment on the reduction in immunity caused by a one-sided carbohydrate diet. This loss of immunity has frequently been commented on. Thomas⁸³ found that young pigs fed chiefly on carbohydrate showed a marked lessening of resistance to tuberculosis, while those fed chiefly on protein showed a limitation of the tuberculous process. Langstein¹¹³ remarks on this work as being an experimental confirmation of the clinical facts recorded by him of the especially favorable course of infections, especially of tuberculosis in infants, when protein forms a large part of the diet. He warns, however, against drawing conclusions from experiments.

Fat

Two nutritional disturbances are ascribed to a high percentage of fat in infant-feeding: an acute, and a chronic disturbance.

Dunn^{67, 68} describes cases showing an intolerance for fat, which he believes are caused more often originally by an overfeeding with carbohydrate than by one with fat. These cases are frequently ones of extreme malnutrition. They show their lack of tolerance for fat by the facts (1) that they do not gain in weight on diets low in fat, yet when it is added give evidence of failure to absorb it by the presence of free fat or excessive soap in the stools, and (2) that a further increase in fat in the diet leads to acute disturbances with vomiting, diarrhea, and frequently with collapse. The treatment recommended by Dunn for these cases has already been spoken of.

Niemann³² describes the two classes of disturbance caused by fat:

acute disturbances associated with diarrhea and chronic disturbances or *Milchmährschaden*. There is some ground for believing that the reason why cow's milk fat is so much more apt than the fat of breast-milk to cause disturbances of both types is the fact that cow's milk contains more of the lower volatile fatty acids. In proof of this theory he shows that children who cannot take milk-fat with safety may be fed large amounts of oil, and that the best oils are those low in the lower, volatile fatty acids.

The relation of the volatile fatty acids to the nutritional disturbances is a very complicated one. Bahrđt and McLean⁸⁴ have studied this subject. They have shown that diet influences greatly the content of the stools of normal infants in free volatile fatty acids. In those of breast-fed infants the percentage was high; in those of artificially fed infants free volatile fatty acids are absent. In the stomach contents of normal infants on the two types of feeding the proportions are, however, reversed; in the stomach contents of infants on cow's milk there is from three to six times as much volatile fatty acid as in those of infants on breast milk. This result may probably be explained by the fact that the origin of the volatile fatty acids is quite different in stomach and in intestine. In the stomach they arise normally almost exclusively by a fermentative splitting of pre-formed butyric or caproic; of this breast milk has less than cow's milk; in the intestine the acids are formed mainly by bacterial action on the sugars and also on the higher fatty acids. The authors found no free volatile fatty acids in the stools even when sugar or cream were added to the diet of artificially fed infants. These acids were found, however, to be present free in every case in the stools of artificially fed infants with acute nutritional disturbances and in such concentration that the authors believe that these acids have some pathologic action in stimulating peristalsis.

Huldschinsky⁸⁵ studied the content of volatile fatty acids in the stomach contents of infants with gastro-enteritis, or suffering from overfeeding. He reports that rarely was there an increase as compared with the stomach contents of normal children. He believes that these acids can only be looked on as injurious in cases in which the stomach is already disturbed in function.

Protein

There has been little written this year in regard to a directly harmful action of protein in the diet of infants.

Benjamin⁸⁶ found that large doses of "plasmon," a preparation of protein, caused protein fever in infants. Lesné⁸⁷ writes of acute cases of alimentary hypersensitiveness, both slight and severe, usually induced by eggs and cow's milk. The severe cases showed a

rapid pulse, fall in temperature and collapse. Lust⁸⁸ warns against the common practice of feeding egg albumin water in the treatment of acute nutritional disturbances in infants. In the course of his experiments in regard to the permeability of the intestinal tracts of infants to unchanged protein, he fed twenty normal infants the white of one-half to one egg; in a few cases that of two eggs. Sixteen of the children showed some gastro-intestinal symptoms; some showed frequent thin stools. Three infants showed edema and urticaria.

Lust's⁸⁹ work was reviewed last year. To discover whether or not protein passes through the intestinal epithelium unchanged he used the following test: The urine and in some case the blood serum of the infants fed on certain proteins were tested with a serum having a strong precipitation titer for the protein which had been fed. He found that in cases of acute and chronic nutritional disturbances in infants, egg albumin frequently passed through the intestinal wall unchanged.

Lawatschek⁹⁰ has had similar results, using the same tests. Among twenty-nine older infants tested, in cases of slight nutritional disturbance, he found no passage of unchanged protein; in severe disturbances, he obtained markedly positive reactions. He believes that there is a parallelism between the degree of the reaction and the outcome of the disease, and believes that the test may be used to determine the prognosis. Lawatschek, like Ganghofner and Langer previously, found that new-born infants up to the tenth day constantly gave evidence of the passage of unchanged foreign protein through the intestinal wall. All of the new-born infants who did not vomit the egg albumin gave positive reactions.

Hayashi⁹¹ has attempted to determine the limit of tolerance of the intestine of twenty-eight normal infants for egg albumin, using the same technic as Lust. He has found that when from 15 to 20 gm. egg albumin are given to the normal infant, the unchanged proteid can usually be demonstrated in the urine. This limit of tolerance he has not found to undergo much change during the first year. In infants with exudative diathesis and in infants who have recovered recently from acute nutritional disturbances he finds a lessening of tolerance. Modigliani and Benini⁹² have made similar tests to determine whether the casein of cow's milk ever passes the intestinal wall unchanged. They obtained positive results in the case of infants, both new-born and older infants with gastro-intestinal disturbances who were fed on cow's milk.

The question of the presence of casein and paracasein in the stools of infants has been studied still further by Poulsen,⁹³ Uffenheimer⁹⁵ and Liwschiz.⁹⁶

INFLUENCE OF BACTERIA ON NUTRITIONAL DISTURBANCES

97. Day and Gerstley: *AM. JOUR. DIS. CHILD.*, 1915, ix, 233.
98. Young: *Arch. Pediat.*, 1914, xxxi, 753.
99. Breuning: *Jahrb. f. Kinderh.*, 1914, lxxx, 98.
100. Metchnikoff: *Ann. de l'Inst. Pasteur*, 1914, xxviii, 89.
101. Bertrand: *Ann. de l'Inst. Pasteur*, 1914, xxviii, 121.
102. Bertelot: *Compt. rend. hebd. de l'Acad. d. sc.*, 1913, clvi, 1567.
103. Blühdorn: *Monatschr. f. Kinderh.*, 1914, xiii, 37.
104. Schild: *Monatschr. f. Kinderh.*, 1914, xiii, 51.
105. Schelble: *Jahrb. f. Kinderh.*, 1914, lxxix, 507.
106. Armstrong: *Jour. Am. Med. Assn.*, 1914, lxiii, 200.
107. Bobillier: *Thèse de Paris*, 1913, No. 327; *Ztschr. f. Kinderh. (ref.)*, 1914, viii, 191.
108. De Buys: *Jour. Am. Med. Assn.*, 1914, lxiii, 1806.
109. Archibald: *Jour. Trop. Med.*, 1914, xvii, 161.
110. Morse and Talbot: *Boston Med. and Surg. Journal*, 1915, clxxii, 171.
111. Peyri-Rocamora: *rev., Arch. Pediat.*, 1915, xxxii, 159.
112. Logan: *Jour. Path. and Bacteriol.*, 1914, xviii, 527.
113. Editorial: *Jour. Am. Med. Assn.*, 1914, lxiii, 952.
114. Basten: *Ztschr. f. Hyg. u. Infektionskrankh.*, 1914, lxxvii, 282.

That bacteria may cause gastro-enteritis in infants seems now to be a well-established fact; especially is this true of the type of case showing symptoms resembling dysentery. Still unsettled, however, is the question of the relative importance of bacteria in all cases of diarrhea. Morse and Talbot¹¹⁰ believe that when large numbers of bacteria of the dysentery group or streptococci are found in the stools of cases showing marked disturbance of the intestinal tract, they are in most instances the cause. The presence of a few of these organisms in the stools in diarrhea does not, however, prove that they are the cause, because they may be present in small numbers in the stools of normal infants.

Day and Gerstley⁹⁷ have attempted to reconcile the conflicting theories of the cause of infantile diarrhea by showing that different types of cases have different causes. Twenty-two cases of severe diarrhea observed by them are classified into: food disturbances, of which there were two; cases of infectious diarrhea, of which, also, there were but two; and parenteral infections, eighteen cases. The cases of infectious diarrhea were caused by the gas bacillus.

Young⁹⁸ reviews the research work of the Boston Floating Hospital during the last few years on the subject of infectious diarrhea in infants. Though clinically the cases show the same picture, they may be divided according to the cause into cases caused by the dysentery bacillus, and those caused by the gas bacillus. The treatment varies according to the cause. In cases caused by the dysentery bacillus, after sterile water for twenty-four hours a 5 per cent. lactose solution is given until the temperature is normal and blood has disappeared from the stools. In extreme cases 2.5 per cent. dextrose

solution is given subcutaneously. Cases caused by the gas bacillus, on the other hand, require a food containing little sugar and a high protein content. The observations of different years show a seasonal variation both in the type of organism and in the degrees of virulence of the same organism.

Breuning⁹⁹ examined 117 cases of diarrheal disease in infancy and early childhood for the presence of "paratyphus B." as the cause. In eleven cases the serum was found to agglutinate this bacillus. Three patients were under 1 year. One baby of 6 months developed a metastatic abscess in the shoulder which showed a pure culture of "paratyphus B." bacilli. Breuning advises that more frequent bacteriological examinations should be made in case of acute gastroenteritis in infants.

Several French observers believe that the *Bacillus proteus vulgaris*, especially in conjunction with other bacteria, may frequently cause infantile diarrhea. Metchnikoff¹⁰⁰ has come to this conclusion, after a series of bacteriologic examinations of stools of infants showing intestinal disturbances. This etiologic significance is present especially when the *B. proteus vulgaris* is associated with another of the intestinal bacteria. The *B. proteus* was also found in normal infants who acted, according to Metchnikoff, as carriers.

Among fifty-five cases of diarrhea examined by Bertrand¹⁰¹ in the summer of 1912, the *B. proteus vulgaris* was found in all; among twenty-four normal children only twice.

Bertelot¹⁰² agrees with the theory of Metchnikoff.

Several authors have described cases of bacillary dysentery. Blühdorn¹⁰³ during 1912 and 1913 saw twenty-four cases in infants and young children. The clinical symptoms were frequently the same as those of disturbances caused by food; severe cases especially, showed a marked resemblance to cases of alimentary intoxication. The cases of dysentery were, however, markedly contagious; sugar was absent from the urine, and breast-fed children were frequently attacked. In different epidemics the following types of cases were observed: simple intestinal catarrh; cases associated with a grip infection; cases without fever, but showing mucus and sometimes blood in the stools; and very severe cases, occurring usually in atrophic children with symptoms either of decomposition or of intoxication. In the treatment, after emptying the gastro-intestinal tract, sterile water is given for a short period, which should not be continued too long in cases debilitated by a long continued cereal water diet. Whey has been used for several years, with good results. Blühdorn advises an examination for the bacilli in all cases suspicious of dysentery. In intoxication the disease should be suspected if the condition does not yield when all food is withdrawn.

Schild¹⁰⁴ made the bacteriologic and serologic examinations, determining the diagnosis in the cases reported by Blühdorn. The bacilli found belonged culturally to the group of pseudo-dysentery bacilli. Some of these strains were agglutinated by well-known races; those isolated from cases in one epidemic, however, could not be identified with any known race of pseudo-dysentery bacilli either by complement fixation or agglutination. Complement fixation was found to be a very sensitive test for the identification of different strains of bacteria.

Schelble¹⁰⁵ reports sixteen cases of acute nutritional disturbances occurring simultaneously in the form of an epidemic among the twenty infants in an institution. Parenteral infection in these cases could be ruled out as a causative factor; the author agrees, however, with Meyer that this is the most frequent factor in nutritional disturbances of infants in institutions. All sixteen infants affected were taking the same milk; the four infants spared did not receive this milk. The stools of the infants affected showed no typhus, paratyphus or dysentery bacilli, and agglutination tests were negative. The author was undecided as to the cause of this epidemic.

The influence of flies in causing infantile diarrhea through the carrying of infection has been the subject of much popular propaganda; the experimental studies in proof of this theory are, however, very few. That carried out by the Bureau of Public Health and Hygiene of the New York Association for the Improvement of the Poor and reported by Armstrong¹⁰⁶ is therefore especially interesting. In the Italian district of the Bronx two areas were selected; in each there were 311 families with 1,725 individuals in one area and 1,744 in the other. The general conditions in the two areas were similar, and there were about the same number of breast-fed infants in each. In one area all known measures for protection against flies were taken; doors and windows were screened, manure was treated with iron sulphate, fly traps were placed, oral and written instructions were given, supplemented by moving picture films. Records of morbidity in the two areas for the period between July 21 and September 13 are interesting. The cases of diarrhea in children under 5 years were twenty in the area protected against flies as compared with fifty-seven in the unprotected area; the total number of days of sickness among these children from this cause were 273 in the protected area and 984 in the unprotected. Armstrong emphasizes the necessity of continuing the investigation on a larger scale and for a longer time.

Amebic dysentery, according to Bobillier¹⁰⁷ is very rare even in the tropics in infants under 2 years, but has been observed in France. Emetin works well in small doses. DeBuys¹⁰⁸ reports eight cases in

young children; the two youngest were 4 years old. The treatment was emetin.

Archibald¹⁰⁹ saw two patients aged 2½ years and 8 months in the same family. For a 2-year-old child he advises emetin 0.01 gm.

Bacteriology of the Normal Stools

Morse and Talbot¹¹⁰ have summarized the literature in regard to the bacteriology of the gastro-intestinal tract in infancy. Peyri-Rocamora,¹¹¹ Logan,^{112, 113} and Basten¹¹⁴ have studied this subject.

INFLUENCE OF PARENTERAL INFECTIONS ON NUTRITIONAL DISTURBANCES

115. Langstein: *Jahresb. f. ärztl. Fortbild.*, 1914, v, 57.

116. Stolte: *Jahrb. f. Kinderh.*, 1914, lxxx, 213.

117. Triboulet: *Med. Infant.*, 1914, xxii, 73.

118. Grünfelder: *Ztschr. f. exper. Path. u. Therap.*, 1914, xvi, 141.

119. Langstein: *Ztschr. f. Kinderh. (ref.)*, 1914, viii, 54.

120. Czerny: *Ztschr. f. Kinderh. (ref.)*, 1914, viii, 144.

121. Kowitz: *München. med. Wchnschr.*, 1914, lxi, 1321.

The work of Meyer on "hospitalism" was reviewed last year. Langstein¹¹⁵ refers to this work as proving that the bad influence of hospitals on infants does not depend solely on infections of the intestinal tract or on insufficient care; but depends especially on infections of the respiratory passages ("grip"). These infections predispose greatly to nutritional disturbances, and are so prevalent in infants' institutions that hardly a child remaining for some time in the institution is spared. He writes that nutritional disturbances when occurring together with "grip" should be treated not by taking away the food, but by feeding with albumin milk.

These views of Langstein and Meyer with regard to the cause of "hospitalism" in infants are questioned by Stolte.¹¹⁶ He believes that more important than infections, in causing the poor results with infants in hospitals, is the lack of personal and individual care. An experiment was made in the children's clinic at Berlin to imitate the care usual in a private home; each infant was put into the special care of one nurse, who was instructed to give wide play to the infants' likes and dislikes as to food. The results were excellent; there was gain in weight, as well as improvement in general condition, color and activity. He concludes that it is possible in a hospital by using this method to achieve as good results as those obtained in private homes.

Triboulet¹¹⁷ writes of the predisposition to nutritional disturbance associated with certain infections. In uncomplicated pneumonia he believes that the intestine is not necessarily affected; but in severe

pneumonia he has found a regular connection with diarrhea, as also in cases of pneumonia complicated by purulent pleuritis, otitis and peritonitis.

Grünfelder¹¹⁸ has studied experimentally in dogs the effect of acute infections on the secretion of gastric juice. The formation of Pawlow's "blind stomach" was accomplished in two dogs; fever and infections were induced by causing localized abscesses or by insufflating infectious material into the nostrils. The amount of gastric juice secreted during the infections was found to be greatly reduced; it was more slowly secreted, and showed a diminution in hydrochloric acid. Grünfelder believes that these findings are parallel to the nutritional disturbances occurring in infants in the course of acute infections.

Pyelocystitis is referred to by Langstein¹¹⁹ as being very frequently associated with anorexia, which may be so marked that feeding by gavage must be resorted to.

The fact that nutritional disturbances likewise predispose to certain infections is referred to by Czerny,¹²⁰ especially with regard to paravertebral pneumonia. Kowitz¹²⁰ believes that acute alimentary disturbances predispose greatly to pyelocystitis in infants.

RELATION OF HEAT AND OTHER FACTORS TO INFANT MORBIDITY AND MORTALITY FROM NUTRITIONAL DISTURBANCES IN SUMMER

122. Schreiber and Dorlencourt: *Arch. de méd. d'enf.*, 1914, xvii, 1.
123. Breyer: *Ztschr. f. Kinderh. (ref.)*, 1914, viii, 158.
124. Prinzing: *Wien. klin. Rundschau*, 1913, xxvii, 678.
125. Japha: *Ztschr. f. Kinderh.*, 1913, vii, 518.
126. Heiman: *Arch. Pediat.*, 1914, xxxi, 466; *AM. JOUR. DIS. CHILD.*, 1914, viii, 138.
128. Helmholtz: *Jour. Am. Med. Assn.*, 1914, lxiii, 1371.
129. Nicolaysen: *Monatschr. f. Kinderh. (ref.)*, 1914, xiv, 10.
130. Rohmer: *Ztschr. f. Säuglingfürs.*, 1914, vii, 329, 385.
131. Epstein: *Beth. z. med. Klin.*, 1913, No. 9.

For the last few years many studies have been made, especially by German authors, on the subject of the direct action of hot weather in causing nutritional disturbances in summer in infants.

Schreiber and Dorlencourt¹²² have observed in young dogs exposed to very high temperatures the same symptoms as in infants with heat prostration.

Many German authors have shown in the last year that housing conditions which favor a high indoor temperature predispose to infantile diarrhea. Breyer¹²³ and Prinzing¹²⁴ again bring forward evidence in proof of this theory. Japha,¹²⁵ from results in work at infant consultations, concludes that pure milk cannot protect infants in summer from the dangerous effects of high temperatures, and that

housing improvements and instruction in general hygiene are necessary for this purpose. Heiman^{126, 127} has made the experiment of cooling artificially in summer a ward used for infants with nutritional disturbances. The temperature of the room was during the forty-two days of the experiment from 5 to 11 degrees below the outside temperature. Thirteen patients were treated; none of these were premature or moribund infants, as in such cases the treatment seems not to be indicated. One infant died, twelve recovered. Control observations could not be made. Heiman gained the impression that the infants so treated were more comfortable than infants in the other wards.

Helmholtz¹²⁸ has made an interesting study of the relation of high indoor temperatures to high body temperature of infants, and to the mortality and morbidity of infants in summer. Maximum and minimum temperatures were recorded in the homes of the forty-six infants studied; a daily call by a nurse was made, the condition of the infant was noted and its temperature taken. In the thirty-nine attacks of dyspepsia observed in twenty-nine infants, there seemed no definite relation between high room temperature and gastro-intestinal disturbance. The average room temperature of the day before and of the day of the onset of the dyspepsia was 89 F. Very high maximum indoor temperatures were observed; in ten cases temperatures over 105 were recorded. The indoor temperatures exceeded the outdoor frequently by marked amounts; once by 40 degrees and five times by 30 degrees. There was, however, no constant relationship between fever in the infant and a high room temperature; as in 80 per cent. of the cases the infants showed in spite of a high temperature in the house a normal range of body temperature. Among the six cases which terminated fatally, only one or two could be ascribed to the direct effect of heat. Helmholtz calls attention to the fact that the clothing of infants varies greatly, and that clothing may act very intensely in producing fatal heat retention, this having been shown recently for experimental animals in the Sprague Institute Laboratory by Drs. McClure and Sauer. He concludes that the study would indicate that an improper adjustment of the individual to the surrounding temperature, rather than the height of the temperature, increases the mortality from gastro-intestinal diseases in summer; and that the aim should be to educate mothers to keep their infants cool in summer.

Nicolaysen¹²⁹ has analyzed the statistics of the deaths of infants from diarrhea in Christiania. He found that several such deaths frequently occurred in the same house in the same year. Of six houses in which especially many cases occurred, only one showed

conditions which might lead to overheating; the remaining five showed good ventilation. He concludes that these findings speak for an infectious cause of infant diarrhea, and believes that flies are very important in spreading the disease.

The work of Armstrong¹⁰⁹ with regard to the relation between flies and infantile diarrhea has been mentioned.

Rohmer¹³⁰ has made an interesting investigation of the relative importance of different forms of feeding and of housing conditions in causing infant diarrhea in summer. In a number of streets of the older section of Cologne, where the infant mortality was very high, he visited regularly all the infants born, and noted the conditions. Breast-feeding he found to be fairly prevalent; 40 per cent. were breast-fed for nine months. Of children breast-fed in the second half year, 80 per cent. were healthy; of infants not breast-fed or insufficiently breast-fed, 18 per cent. only were healthy. As the summer was a cool one the relation of the temperature of the house to infant diarrhea could not be studied. Rohmer believes that the house itself is not most important, but rather the fact of how the house is used and how the baby is cared for.

Epstein¹³¹ considers as still unsettled the question as to the cause of the action of summer heat; he believes that a high summer temperature is only one factor together with a number of other causes.

NOTES ON NUTRITIONAL DISTURBANCES

- 132. Czerny: *Jahrb. f. Kinderh.*, 1914, lxxx, 601.
- 133. Schloss: *Arch. Pediat.*, 1914, xxxi, 924.
- 134. Knox and Tracy: *AM. JOUR. DIS. CHILD.*, 1914, vii, 409.
- 135. Holt: *Arch. Pediat.*, 1914, xxxi, 455.
- 136. Holt, Courtney and Fales: *AM. JOUR. DIS. CHILD.*, 1915, ix, 213.
- 137. Finkelstein: *Ztschr. f. ärztl. Fortbild.*, 1914, xi, 101.
- 138. Bernard: *Dissertation*, Leipzig, 1913; *Ztschr. f. Kinderh. (ref.)*, 1914, viii, 127.
- 139. Hess: *Jour. Am. Med. Assn.*, 1914, lxii, 452.

Czerny¹³² has studied the heart findings in infants with acute nutritional disturbances. A phenomenon which has been much discussed is the fact that before death in certain cases only one heart tone is heard. Czerny has always maintained that this tone is the first.

Among 195 cases of infants with nutritional disturbances varying from the mild to the severe type, Schloss¹³³ found twenty-seven cases with sugar in the urine. This sugar was usually galactose or dextrose. A hyperglycemia accompanied the melituria in most of the cases.

Knox and Tracy¹³⁴ have determined the excretion of phosphates in the urine of infants on various forms of feeding, and in the course of nutritional disturbances. They conclude that deductions as to the

nature and severity of such disturbances cannot be drawn merely from the amount of urinary phosphorus present.

The chemical analyses of the stools of infants with disturbances of nutrition, as well as those of normal infants, have been made by Holt,¹³⁵ and by Holt, Courtney and Fales.¹³⁶ Loose stools contained from about 100 to 200 c.c. of water per day, very loose stools over 200 c.c. The fat in very loose stools was about two and a half times that in normal stools; 64 per cent. of the fat was neutral fat in loose stools as compared with 39 per cent. in normal stools. About two and a half times as much protein was lost daily in loose stools as in normal. Of the salt elements the chlorin, potassium and sodium were much higher in proportion in the former than in the latter; 84 per cent of the total intake of ash was lost in loose stools, as compared with 40 per cent. in normal stools. The latter striking condition is commented on by the authors as giving suggestions for treatment.

Alimentary Intoxication

Finkelstein,¹³⁷ in a summary of his teachings with regard to the various disturbances of nutrition in infancy, states his belief that both decomposition and intoxication are due to disturbances in the metabolism of water. In the treatment the attempt must be made to stop the loss of water, and to favor a new storing up of water.

Bernard¹³⁸ found that an increase in the refractometric value of the blood is the rule in intoxication. He believes that this is due to an excretion of water in excess of the excretion of salt.

In severe gastro-intestinal disturbances of infants, especially in intoxication, Hess¹³⁹ advises the drop method of giving fluid by mouth, as aiding the administration of the large amount of water necessary in this condition. The apparatus used is similar to that in common use in the instillation of liquid into the rectum, except that a rubber nipple with a small hole is substituted for the hard rubber rectal tip. The flow from the nipple can be so adjusted that the child receives from 25 to 30 drops per minute. The infant is encouraged to suck at the nipple the greater part of the day. Water or hypotonic salt solution may be given.

LACTIC ACID BACILLI

140. Berry: *Arch. Pediat.*, 1914, xxxi, 525.

141. Bendick: *Jour. Am. Med. Assn.*, 1915, lxiv, 809.

142. Miscellany: *Jour. Am. Med. Assn.*, 1914, lxii, 1835.

Berry¹⁴⁰ has used cultures of lactic acid bacilli in twenty-four cases of acute intestinal indigestion characterized by slight fever, vomiting and liquid stools. Some of the patients were treated simply by the administration of the bacilli; others were treated by change

in diet, and medicines in addition. He concludes that the best results were obtained when the tablets were used together with a proper change in the diet and an initial dose of castor oil. The bacilli were administered in the commercial tablets, one tablet four times daily, or in severe cases one tablet every three hours. The classification of such cases as those treated as cases of putrefactive fermentation is at variance with most theories in regard to the etiology of this type of dyspepsia.

The commercial preparations of the *B. bulgaricus* have been studied by Bendick.¹⁴¹ He has found many specimens sterile on culture; the majority show but a small fraction of the number of living organisms represented by the manufacturer. A broth culture is the most active form of preparation. He recommends that preparations should be marked with the date of manufacture, and should always be kept in the ice-box.

A bulletin of the Department of Agriculture¹⁴² discusses preparations of lactic acid bacilli. The most successful commercial preparations are the liquid forms, but dry forms are more convenient for transportation. A method devised by the Department of Agriculture consists in freezing cultures and then drying them over sulphuric acid.

GASTRIC DIGESTION OF INFANTS

- 144. Hahn: AM. JOUR. DIS. CHILD., 1914, vii, 305.
- 145. Schackwitz: Monatschr. f. Kinderh., 1914, xiii, 73.
- 146. Davidsohn: Monatschr. f. Kinderh., 1914, xiii, 182.
- 147. Aron: Jahrb. f. Kinderh., 1914, lxxix, 288.
- 148. Huenekens: Ztschr. f. Kinderh., 1914, xi, 297.
- 149. Ladd: Boston Med. and Surg. Jour., 1914, clxx, 518.

Many publications this year have been on the subject of the concentration of hydrochloric acid in the infant's stomach, and of the possibility of peptic digestion.

Hahn¹⁴⁴ reviews some of the previous work on this subject. Pepsin is activated in the stomach by a certain concentration of hydrochloric acid. The concentration of acid depends on the concentration of dissociated hydrogen ions; this cannot be determined accurately by titration. The methods of determination used by Michaelis and Davidsohn, the indicator and electrometric methods, are reliable. The concentration of hydrogen ions is expressed by the symbol (H), in gram ions. It has become customary to abbreviate the small decimal fractions used by means of a negative coefficient of 10; for instance $10^{-1} = 0.1$; $10^{-2} = 0.01$; $10^{-5} = 0.00001$, etc. The optimum (H) for pepsin digestion is 1.6×10^{-2} , while at (H) 1.0×10^{-5} pepsin is inert. The latter is, however, the optimum reaction for rennet and gastric lipase. Hahn has found the concentration of 1.0×10^{-5} quite constantly in the stomach contents of artificially fed infants at the height of

digestion. Determinations were made on ninety-four specimens from thirty-seven infants on artificial feeding (one-third cream-milk and two-thirds milk). The stomach contents for examination were removed by catheter as completely as possible, at the height of digestion.

Schackwitz¹⁴⁵ considers that the examinations previously made by Davidsohn and others have been too few to prove that the concentration of hydrochloric acid is insufficient for peptic digestion in the infant's stomach. He agrees that the physicochemical method of determination is the only accurate method; and has used this method in 137 examinations of the stomach contents of sixty infants. He finds the concentration to vary between very wide limits, so that he cannot agree with Davidsohn that the low concentration $(H) = 1.0 \times 10^{-5}$ is constant in infants.

Davidsohn¹⁴⁶ responds by calling attention to the work of Hahn,¹⁴⁴ confirming his own earlier findings. He explains the difference in results by the fact that while he and Hahn regularly removed for examination all of the stomach contents obtainable, Schackwitz removed only 1 or 2 c.c. As the degree of acidity may differ widely in different regions of the stomach, this method may lead to error.

Aron¹⁴⁷ has suggested that in explaining the low concentration of acid found in the infant's stomach we must consider whether there is an insufficient secretion by the stomach, or whether the acid is not combined with the milk. In experiments to test the power of cow's milk and of human milk to bind acid, he has found that cow's milk binds much more acid than human milk. He draws attention to the fact that Hess found free hydrochloric acid present in the stomach of a new-born child before any food was taken. Aron believes that it is chiefly the binding of acid by milk which determines the low acidity usually present in the stomach contents of the infant.

Huenekens¹⁴⁸ has studied the acidity of the gastric contents in infants and young children when meat is given. Examinations were made on five children, aged respectively $9\frac{1}{2}$, 13, 17 and 20 months and 5 years. Determinations of the hydrogen ion concentration according to Davidsohn were made. In each case one determination was made after a feeding with milk, and one after a meat and vegetable feeding. After the milk feeding a low degree of acidity was found for two reasons: milk has little stimulating power on acid secretion, and it binds acid to a marked degree. After the feeding with meat the acidity in the stomach contents of the infants $9\frac{1}{2}$ and 13 months old was slight, so that no peptic digestion could occur; in the three older children, however, there was a marked increase in the concentration of acid. Huenekens concludes that without special

reason meat should not be given to children before the second half of the second year.

Ladd¹⁴⁹ has continued his studies of the motility of the infant's stomach as shown by Roentgen ray. The administration of a large amount of alkaline fluid hastens the emptying of the stomach; this was observed when from 25 to 50 per cent. of the whole feeding was lime water, or when 0.84 per cent. of sodium bicarbonate to 200 gm. of milk mixture was given.

PYLORIC OBSTRUCTION

150. Holt: Jour. Am. Med. Assn., 1914, lxii, 2014.
151. Reuben: Arch. Pediat., 1914, xxxi, 809.
152. Langmead: Proc. Roy. Soc. Med., 1914, vii, 93.
153. Cautley: Proc. Roy. Soc. Med., 1914, vii, 92.
154. Hess: AM. JOUR. DIS. CHILD., 1914, vii, 184.
155. Hess: Ergebn. d. inn. Med. u. Kinderh., 1914, xiii, 530.
156. Hess: AM. JOUR. DIS. CHILD., 1914, vii, 428.
157. Peiser: Monatschr. f. Kinderh., 1914, xiii, 121.
158. Reuben: Arch. Pediat., 1914, xxxi, 782.
159. Ruhräh: Am. Jour. Med. Sc., 1914, cxlvii, 474.
160. Richter: Jour. Am. Med. Assn., 1914, lxii, 353.
161. La Fétra: Arch. Pediat., 1914, xxxi, 761.
162. Downes: Jour. Am. Med. Assn., 1914, lxii, 2019.
163. McKechnie: Canad. Med. Assn. Jour., 1913, iii, 566.
164. Lewis and Grulec: Jour. Am. Med. Assn., 1915, lxiv, 410.
165. Scudder: Ann. Surg., 1914, lix, 239.
166. Lillenthal: New York Med. Jour., 1914, xcix, 723.
167. Hougardy: Ztschr. f. Kinderh. (ref.), 1914, viii, 511.
168. Liefman: Monatschr. f. Kinderh., 1914, xii, 714.
169. Oberwarth: Ztschr. f. Kinderh. (ref.), 1914, viii, 18.
170. Lichtenstein: Dissertation, Berlin, 1913: Ztschr. f. Kinderh. (ref.), 1914, viii, 232.
171. Knöpfelmacher: Ztschr. f. Kinderh. (ref.), 1914, viii, 77.

Diagnosis of Hypertrophic Stenosis and Pylorospasm

The difficulty of the differentiation of cases of pyloric obstruction into cases of pylorospasm or of organic stenosis is commented on by most of those writing this year on this puzzling subject.

Holt¹⁵⁰ has proposed to substitute for the preceding classification a division of these cases into mild and severe. He points out the fact that there has always been great difference of opinion as to the symptoms which may be considered diagnostic of pylorospasm and those diagnostic of organic stenosis. The suggestion that a palpable tumor is a sign diagnostic of stenosis has not been accepted; nor has the theory that recovery without operation necessitates the diagnosis of pylorospasm. Holt believes that a definite persistent spasm of the pylorus without stenosis has yet to be proved, though a temporary spasm may occur. The two elements of spasm and hypertrophy are in his opinion present in each case, the essential difference in the cases

being one of degree only. The term "pylorospasm" should, therefore, be dropped, as it has led to confusion, especially in regard to indications for operation. He analyzes the symptoms of pyloric obstruction on the basis of fifty-seven cases observed by him. The great majority of these infants (fifty-two) were breast-fed; forty-nine were males.

The suddenness of the onset was noted in thirty cases, in many almost the hour of the beginning of the trouble being fixed. This fact he ascribes especially to the important part played by spasm. Vomiting began in four-fifths of his cases in the third, fourth and fifth weeks. The tumor he found to be more easily palpable during or immediately after vomiting; it persisted in some cases for weeks and even months during convalescence. The general mortality in his cases was 55 per cent.; of twenty-eight patients operated on fourteen died; of twenty-nine on medical treatment seventeen died. The indications for operative treatment he believes depend on the degree of severity of the obstruction; this is shown by the continuance of vomiting and loss in weight, and by the gastric retention, measured by aspiration of the stomach three hours after a meal. Roentgenoscopy he has found to be misleading. In the medical treatment he advises lavage twice daily, and careful feeding with a breast-milk not rich in fat; from 1 to 3 ounces of milk every three to four hours are usually given. After operation hypodermoclysis of normal saline solution with 4 per cent. dextrose is useful. Feeding with breast-milk should be begun after four hours; at first 2 drams every two hours are given; later the amount is gradually increased.

Holt's suggestion that the cases should be classified as mild or severe is considered very useful by Reuben,¹⁵¹ as he believes that the treatment depends on the severity of the case. In his opinion, however, two distinct types of pyloric obstruction occur, the spasmodic and hypertrophic, although their differentiation is not important for treatment. In proof of this fact he states that a few of the cases which during life have shown all the symptoms of pyloric stenosis, have presented at necropsy a perfectly normal pylorus. Speaking for spasm are a neuropathic history, presence of bile in the vomitus, intermittence of the symptoms, sudden and spontaneous cure, absence of palpable tumor, or, if a tumor is present, its variation in size and shape. Reuben uses Hess' duodenal tube as an aid to diagnosis; he has found in spasm a resistance at the same point, which is felt to relax suddenly. Failure to pass the catheter after repeated attempts means a marked stenosis; a mild degree of stenosis cannot be distinguished from spasm. He considers that operation is contraindicated when the duodenal catheter can be passed.

In the discussion of a case reported by Langmead,¹⁵² where the presence of vomiting, visible peristalsis and a palpable pylorus were sufficient in his opinion to show that a true stenosis existed, Cautley¹⁵³ expressed his belief that these symptoms were not definite evidence that a hypertrophic stenosis was present. Hess¹⁵⁴ remarks on the great difficulty found by all writers on the subject in diagnosis of pylorospasm from organic stenosis or simple vomiting. He uses as a test the passage of a No. 15 (F.) catheter into the duodenum; and in all cases in which this is possible, assumes that organic stenosis is so slight that it can be disregarded from a clinical point of view. Elsewhere¹⁵⁵ he remarks that failure to pass the catheter after repeated attempts does not absolutely exclude spasm; in two or three cases of spasm he has been unable to enter the duodenum. As an aid to passing the catheter into the duodenum in cases of spasm he advises¹⁵⁶ the giving of a little water through the tube into the stomach, after which the pylorus may frequently be passed. He has reported twenty cases of pylorospasm. In not one of these was a palpable tumor present, and he believes that tumor has never been noticed where hypertrophy was not found. He calls attention to the fact that pharyngospasm and cardiospasm are frequently associated with spasm of the pylorus. Visible peristalsis, he believes, is not necessarily a sign of organic stenosis, or even of pylorospasm; he has noticed it in cases in which neither was present.

Peiser,¹⁵⁷ in his use of Hess' duodenal catheter, has found difficulty in proving that the duodenum has been entered, and considers that the successful passage of the tube does not always contraindicate operation. In disagreement with Hess' statement that palpable tumor of the pylorus is associated only with hypertrophic stenosis, Reuben¹⁵⁸ reports a case which he diagnosed as pylorospasm, in which the duodenal catheter was passed and recovery later occurred though a palpable tumor was noticed; and Liefman,¹⁶⁸ among forty-six cases of pyloric spasm, noted a tumor in six cases.

Ruhräh¹⁶⁰ believes that a change in the size of the tumor under the palpating finger is a sign that the obstruction is spasmodic, or at any rate that spasm is the most important element. He advises operation as early as possible in cases of hypertrophic stenosis.

One can but agree with Holt that there is as yet no agreement in regard to the essential diagnostic signs and symptoms of spasm and hypertrophic stenosis.

Hypertrophic Stenosis and Operative Treatment.

Richter,¹⁶⁰ however, believes that the cases can be distinguished after a long enough period of observation, and that borderline cases do not occur. Of the twenty-two cases in which the author operated

(eleven having been previously reported) nineteen were organic stenosis, three pyloric spasm. Among his cases also, boys were in the majority; all were first-born except one. The onset of vomiting was in the second or third week and was sudden. He considers the Roentgen-ray examination misleading, as the entrance of bismuth into the intestine does not speak against hypertrophic stenosis. The mortality of his cases was very low, being 13 per cent. The eighteen children who recovered developed normally.

La Fétra,¹⁶¹ too, states that he has found the Roentgen ray misleading and unessential in the diagnosis of pyloric stenosis.

Downes¹⁶² considers that operation is indicated whenever a diagnosis of hypertrophic stenosis has been made; but operation should not be performed in cases of pyloric spasm.

According to MacKechnie,¹⁶³ the two conditions of spasm and organic stenosis are distinct, but an absolute diagnosis can not always be made by palpation; therefore he advises an operation in cases with marked decrease in weight. He reports six cases treated surgically.

Lewis and Grulee¹⁶⁴ report the pathologic findings at the pylorus in an infant who died of pneumonia eight months after a successful operation. An enlargement at the pylorus was found of approximately the same size and consistency as of that seen at operation, indicating that no change had occurred in the tumor. They believe that gastro-enterostomy is well borne by infants if performed rapidly and without trauma. Among five patients operated on there were no deaths.

Scudder¹⁶⁵ reports seventeen operative cases, nine of which had been reported before. There were three deaths, making a mortality of 17 per cent. A table shows the normal development of those who recovered, one having been observed for eight years. Roentgen examination in these children showed that the food continued to pass through the operative opening.

Lillenthal¹⁶⁶ and Hougardy¹⁶⁷ have reported cases of stenosis with recovery after operation.

Pylorospasm

Hess¹⁵⁴ has reported twenty cases of spasm. He has described¹⁵⁶ a duodenal catheter furnished near its tip with a small collapsible balloon, which may be inflated with air after the introduction of the catheter into the duodenum, thus effecting the retention in place of the catheter for as long as twenty-four hours. He has used this catheter in a few mild cases of spasm for duodenal feeding; he has not yet made enough experiments with pronounced cases of pylorospasm to be able to draw conclusions.

Liefman¹⁶⁸ has studied the symptoms and history of forty-six cases of pyloric spasm and six cases of habitual vomiting occurring during three years in the Dresden Säuglingsheim. The mortality was 10.8 per cent. Forty per cent. of the cases were among girls; only fifteen patients were breast-fed; twenty-eight were first-born children. The onset was from the first to the sixth week, twelve cases beginning in the third week. That a pyloric tumor was present in six cases has been mentioned. In the latter history neuropathic symptoms were noted only in one-half the cases. The general development was normal.

Oberwarth¹⁶⁹ reports twenty cases of spasm; all the patients recovered on medical treatment. He considers important the regular rectal instillation of 200 gm. of breast-milk daily.

Ruhräh¹⁵⁹ in cases of pylorospasm advises stomach washing several times daily, using 0.8 per cent. sodium bicarbonate solution if much mucus is present. He considers atropin the best medical treatment.

Lichtenstein¹⁷⁰ reports fifteen cases of pylorospasm in infants. Knöpfelmacher¹⁷¹ reports a case of pylorospasm favorably influenced by papaverin.