

PROGRESS IN PEDIATRICS

RECENT PROGRESS IN ANATOMY, PHYSIOLOGY AND PATHOLOGY OF CHILDHOOD

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ANATOMY AND CONGENITAL ANOMALIES

Growth.—There remains much uncertainty as to just what are to be regarded as normal height and weight for children of different ages. A conference for the purpose of adopting a uniform table of weight and height for children of various ages was held in 1920, and was attended by representatives of leading associations and departments of the government interested in child welfare. The findings of this body will be of much interest.

Pooler¹ reviews some factors influencing growth in infancy and childhood.

Weber² has made a survey of sixty-two cases of congenital heart defect in children in the Universitäts-Kinderklinik, Berlin. He states that he was unable to discover any characteristic malnutrition or stunting of growth in the children with cardiac anomalies. It was evident, however, that children with congenital cyanosis, and especially those with symptoms of congestion in various organs, were more subject to deranged nutrition than other children with congenital cardiac disease. Children with dyspnea, especially in combination with cyanosis, likewise showed evidence of malnutrition. Hypotrophy was not found to be a constant accompaniment of congenital heart defects and no constant relation was found between the two conditions. Hypotrophy was nearly always associated with the presence of other defects, so that it was thought necessary to look farther back for the destructive agency. However, in some cases, no damaging factor could be discovered other than the congenital heart defect.

An interesting example of oxycephalia and dwarf growth is reported by Isola, Butler and Fournier.³ The patient was 21 years of age and 1.3 m. tall, totally blind, with reducible exophthalmus and horizontal nystagmus. The skull showed scattered depressions where the con-

1. Pooler, H. W.: Some Factors Influencing Growth in Infancy and Childhood. *The Child*, 1919, 396. *Abst. Arch. Pediat.* **36**:505, 1919.

2. Weber, A.: Growth and Nutrition of Children with Congenital Heart Defect, *Monatschr. f. Kinderh.* **18**:205, 1921.

3. Isola, A., Butler, C., and Fournier, J. L. Mussio: *An. de la Fac. de méd., Montevideo* **5**:255, 1920.

volutions of the brain had exerted abnormal pressure on the inner table, inducing rarefaction. At the age of 2 years, vomiting and headache were followed by progressive loss of vision. The retrospective diagnosis is that an attack of hydrocephalus injured the pituitary early in life and the dwarf growth was secondary to this.

Reuben⁴ describes, with photographs, an interesting example of adiposity in a breast-fed infant. Physicians who had seen the child regarded this as a case of dispituitarism, but the cause was found to lie in the excessive fat content of the mother's milk, from 6 to 7 per cent.

Anomalies.—A notable case of situs inversus viscerum totalis is described by Lineback.⁵ Karashima, in 1912, in describing a case of situs inversus totalis, gave a catalogue of such cases up to his time, something more than 200 cases. Lineback's specimen was a near-term female fetus selected from the dissecting material at the University of Chicago. No data could be found regarding its history, it weighed at the time of study, 3,000 gm. and all the general outward appearances were good. The case is interesting because of the great number of anomalies, some of them anomalies of reversion. The fully developed body was served by a heart of an early embryonic state. The real value of the case is in the positive data it offers to the problem of placing the causative factor for such anomalies. Trauma, from various sources, in late embryonic life, might explain external deformity, and some kinds of internal derangements, but Lineback finds it difficult to see its effect on reversion. Nor does he think applicable Mall's view that monsters are products from normal embryos "by influences which are to be sought in their environment." More appropriate, in his opinion, is the use of the term "cytoplasmic variation," in which it is suggested that in the germ cell there is predilection for the ultimate form of the body, which at least influences these malformations. Attention is directed, then, to an earlier, a very early period in development. The present case is thought to afford proof, as instanced by reversed anomalous aortic branches, primitive heart, reversed root of the lungs and azygos veins, and the relationship of the pancreas and the unrotated intestines, that these anomalies have their causative factor operating at a very early embryonic period.

Goldstein⁶ has made a study of a monster with the olfactory lobe and most of the hind brain missing (arhinencephalia) which is

4. Reuben: Adiposity, Cerebral versus Lacteal, Arch. Pediat. **36**:636, 1919.

5. Lineback, P. E.: An Extraordinary Case of Situs Inversus Viscerum Totalis, J. A. M. A. **75**:1775 (Dec. 25) 1920.

6. Goldstein, A.: Arhinencephalia Monstrosity, Ztschr. f. Kinderh. **25**:328, 1920.

thought to confirm the assumption that pressure or traction from the amnion is responsible for such deformities, as also cyclops monstrosities.

Congenital Aneurysm.—Goehring⁷ reports a case of congenital aneurysm of the posterior aortic sinus of Valsalva with an anomaly of the aortic cusps. Six cases of aneurysm of the sinus of Valsalva are recorded in the literature. In Goehring's case the aneurysm projected into the right auricle so as to produce a tricuspid insufficiency, which was the chief clinical manifestation. Sudden progressive heart failure with dyspnea, cyanosis and absence of the radial pulse during six hours before death, was probably related to the rupture of the aneurysm.

Thymus.—In 78.25 per cent. of 115 cadavers of young children examined by Canelli,⁸ the thymus appeared in two lobes; in 74.77 per cent. of the cases the thymus was in the thorax. The water content of the gland seemed to be in inverse proportion to the age of the patient; while the weight after desiccation increased with the age.

Park and McClure's⁹ study on the effect of thymus extirpation in the dog is most interesting in this connection. The experimental literature of thymus extirpation is reviewed with unusual care. Many earlier assumptions are shown to be unfounded.

Heart.—K. Preisich¹⁰ gives figures for the size of the heart in infants and children from thirty-five child cadavers.

Diaphragm.—DeBuys¹¹ reports an anomaly of the diaphragm with a gastro-intestinal obstruction.

Intestine.—Robbin¹² reports the results of a study of the length of the large and the small intestine in young children.

Mammary Glands.—A study by Meyers¹³ deals with the development of the mammary glands from their earliest appearance until the period of pregnancy.

7. Goehring, C.: Congenital Aneurysm of the Aortic Sinus of Valsalva, J. M. Research **42**:49, 1920.

8. Canelli, A. P.: Anatomy and Pathology of the Thymus in Young Children, *Pediatrics*, Naples **28**:753, 1920.

9. Park, E. A. and McClure, R. D.: The Results of Thymus Extirpation in the Dog with a Review of the Experimental Literature on Thymus Extirpation, *Am J. Dis. Child.* **18**:317, 1919.

10. Preisich, K.: Size of the Heart in Young Children, *Jahrb. f. Kinderh.* **92**:400, 1920.

11. DeBuys, L. R.: A Case of Anomaly of the Diaphragm with a Gastric and Intestinal Obstruction, *Arch. Pediat.* **36**:360, 1919.

12. Robbin, L.: The Length of the Large and the Small Intestine in Young Children, *Am. J. Dis. Child.* **19**:370 (May) 1920.

13. Meyers, J. A.: Studies in the Mammary Gland. VI. The Development of the Mammary Gland from Its Earliest Appearance Until Period of Pregnancy, *Am. J. Dis. Child.* **18**:4 (July) 1919.

Wernstedt¹⁴ reports the findings at necropsy in two infants with congenital stridor, comparing the findings with those in other infant cadavers. In one of the two cases the lumen was abnormally narrow. The other case seemed to be an instance of functional disturbance.

Esophagus.—Morse¹⁵ reports two cases of congenital stricture of the esophagus.

Extremities.—Nuzzi¹⁶ tabulates the details of eighty-one cases of congenital deformity of one or both legs due to congenital absence of the tibia, including three operative cases from the Rizzoli Institute. It is advised that amputation be postponed as the growth of the child will modify the stump. The details of conservative intervention vary from case to case as there are usually other deformities. Those of the knee and ankle are generally secondary, which facilitates functional use of the limb.

A paper by Ried¹⁷ deals with congenital malformation of the spine, and Stern¹⁸ reports an instance of congenital absence of both clavicles. In Stern's case no other anomaly was found and the condition seemed to be one affecting only the male line of the family (seven affected), the females escaping.

An instance of congenital absence of the right femur in an uniovular twin is reported by Harrison.¹⁹

The association of acrocephaly with deformities of the extremities is considered by Park and Powers.²⁰

Urogenital.—MacKenzie²¹ reports an instance of congenital malformation in which two testes and a uterus are described as being present in the right portion of a scrotum.

Pybus²² reports a case of congenital urethrocele, and Thompson²³ cites an instance of ectopic urinary bladder.

14. Wernstedt, W.: The Pathological Anatomy of Congenital Stridor, Hygiea, Stockholm **82**:609, 1920.

15. Morse, J. L.: A Report of Two Cases of Congenital Stricture of the Esophagus, Am. J. Dis. Child. **19**:144 (Feb.) 1920.

16. Nuzzi, N. O.: Chi. d. Org. di Movimento **4**:164, 1920.

17. Ried, C. D.: Congenital Malformations of the Spine, New York State J. M. **19**:161, 1919.

18. Stern, W. G.: Congenital Absence of Both Clavicles, J. A. M. A. **73**:1526 (Nov. 15) 1919.

19. Harrison, V.: Uniovular Twin with Congenital Absence of Right Femur, Virginia M. Month. **46**:54, 1919.

20. Park, E. A. and Powers, G. F.: Acrocephaly with Deformities of the Extremities, Am. J. Dis. Child. **20**:235 (Oct.) 1920.

21. MacKenzie, D. W.: Congenital Malformation: Two Testes and Uterus in Right Portion of Scrotum, Canad. M. A. J. **9**:641, 1919.

22. Pybus, F. C.: Case of Congenital Urethrocele, Brit. J. Child. Dis. **16**:87, 1919.

23. Thompson, R.: Case of Ectopic Urinary Bladder, Brit. J. Child. Dis. **16**:80, 1919.

Eye.—Sixty-four cases of hereditary congenital ptosis, which conformed to the mendelian rule for dominance, are reported by Briggs.²⁴ Middleton²⁵ tabulates the congenital conditions affecting vision found in examining a large body of troops.

PHYSIOLOGY

Nutrition.—Rich²⁶ reports on the direct nutritional work done in the public schools of Chicago. The increasing cost of living, sending more and more children aged 14 into the ranks of the workers, led to the discovery that 53 per cent. of the children aged 14 applying for employment certificates were from 7 to 21 per cent. below the weight of the average child of that age, that these children, when they were employed, could not carry on their normal amount of work, and that because of this they lost their jobs, became discouraged and gravitated into becoming rolling stones, thus easily falling prey to vicious and criminal companions.

The Board of Education determined to ascertain the effect that direct nutritional work would have on pre-industrial children in giving them the requisite bodily fitness for the labor they must perform.

To meet the standard of the Employment Certificate Bureau of the Chicago Public Schools the child of 14, in order to obtain a working certificate (with a few exceptions) must measure 57½ inches in height and weigh 80 pounds. (This applies also to children who intend going into the high school but wish to work during the vacation period).

Five public schools in both foreign and native localities were selected for the experimental work. The groups included children who were given milk, rest periods in cots, noonday lunches, and graduated physical exercise under a director (children of an "open window" school), children who were given milk but no rest period, children who were given neither milk nor rest periods, but simply instruction to be carried out at home, and combinations of these methods.

A chart was prepared to meet the needs both of the public schools and of the employment certificate bureau. It was formulated in such a way that comparative gains both in height and weight are seen at a glance. A certificate of graduation (filling the requirements of the employment bureau) was given each child, signed by the physician in charge, the nutritional worker, and the principal of the school. This was presented with the other papers (birth certificate, etc.) to the

24. Briggs, H. H.: Hereditary Congenital Ptosis; Report of Sixty-four Cases Conforming to Mendelian Rule for Dominance, *Am. J. Ophth.* **2**:407, 1919.

25. Middleton, A. B.: Congenital Conditions of the Eye Affecting Vision Among Troops Examined at Camp Travis, Texas, *Am. J. Ophth.* **2**:377, 1919.

26. Rich, K. B.: Nutritional Work in Public Schools, etc., *J. A. M. A.* **75**:226 (July 24) 1492 (Nov. 27) 1920.

employment certificate bureau when the child applied for its working certificate, which gave it dignity at once and caused the document to be prized highly.

It was found that the children prefer to consider the matter their own business—their first real “job” in life—and that they get coöperation at home when they feel the need of it. The nutritional worker had little effort to expend in reaching the parents, and the question is raised whether or not the children who assume the responsibility for their own improvement will not do better than those for whom the effort is made by others.

While some of the classes for whom milk was provided made good gains, those who had no milk also gained well. It seemed quite probable that, as school interest is further developed, fully as good results will be obtained without the necessity of providing milk during the school sessions. Rest periods were taken at home, and early hours for retiring were observed, this being part of the responsibility that the class members assumed.

Many physical defects were corrected, the consent of the parents being obtained, in many cases, by the children themselves.

One of the interesting points brought out in the work is that underweight previously was thought to result largely from bodily defects—diseased tonsils and teeth, adenoids, flat foot, etc.—hence, strictly a medical question. In the experiment, however, it was found that as the children gained in weight they appreciably gained in height without any medical care whatever.

One child sent to the clinic by the public employment bureau was 2 inches under height and 10 pounds under weight; in four months he gained $2\frac{1}{2}$ inches in height and weighed 84 pounds. Others made equal gains.

The development of the work indicates that undernourished children may be placed in three groups: (1) infants and young children up to the age of 6 years; (2) children from 6 to 13 years, and (3) boys and girls from 13 through the period of high school education. The handling of the first two groups is an expensive undertaking, requiring the coöperation of the parents and many visits of a capable worker, and seems best done by organizations outside of the school system. The third group, on the contrary, is found to be controlled almost exclusively through the proper presentation of the problem to the individual student, and through his own interested effort to become physically and mentally fit. “It is largely a question of psychology, and presents a great opportunity for character building.”

A re-examination recently made of two of last year’s classes (1919) seems to justify the theory that boys and girls of the pre-industrial

age should be taught, primarily, by leading them to assume the responsibility of their own welfare.

The Kansas City experiment was rather different.²⁷ Following the influenza vacation, the children of fifty-five grade schools were weighed and measured by the classroom weight-chart method of the Child Health Organization. The prevalence of malnutrition corresponded with that found elsewhere. It was decided to take the school that showed the highest percentage of children who were more than 10 per cent. under weight by the standard table of Wood, and see what would be the effect of an intensive health service for the "malnourished" children. The school selected showed 41 per cent. of its children more than 10 per cent. underweight.

The children came from families of men earning from \$50 to \$200 a month, and almost entirely American. The services of an antituberculosis society were utilized, including medical and dental attention, nurse's service, open window schoolroom, shower baths, and mid-morning and midafternoon lunch, followed by naps. Circumstances happened to divide the underweight pupils into two almost equal groups—112 who were given school feeding and 109, identical in respect to physical condition as nearly as could be determined, who were considered the "control group." A trained nurse gave her entire time to this demonstration group, visiting every home, carrying the recommendations of the physician, and soliciting the cooperation of the mother. The home dietary was investigated, and such instructions given the mother as conditions seemed to warrant.

The school feeding given the demonstration group was planned to supplement the home dietary, and to supply "about half (from 1,000 to 1,200 calories) of the necessary daily ration." The principle of "protective feeding" as developed by McCollum was followed. Each child received from 1 to 2 pints of milk with cereal and fruit every day, and the remainder of the 1,000 to 1,200 calories was variously supplied in soups, vegetables and sandwiches. Cocoa was frequently served, with occasional treats of cookies and milk chocolate. The cost of the food averaged 6½ cents a meal (April, May, June, 1919).

After the first month, each pupil who lost weight was given an extra half pint of milk, and during the last month each child who had lost weight was given in addition to the half pint of milk, 100 calories of dates, raisins or chocolate, some of the group by this time receiving up to 1,800 calories of school feeding a day. The pupils ranged from the kindergarten to the sixth grade.

27. Brown, M. A.: A Study of Malnutrition of School Children, J. A. M. A. **75**:27 (July 3) 1920.

No child was dropped from the group for any cause. Those who were absent for several weeks on account of infectious diseases, or who were in the hospital for tonsil and adenoid operations, gained enormously on their return to the class; but failed to make the normal gain for the whole period. One girl with badly diseased tonsils, which her parents refused to have removed, made little gain. Two failures were directly traceable to adverse home conditions; one child moved away. In yet another case, the only adequate reason for failure to gain was thought to lie in the fact that the child had too little rest and play, as she attended a religious school after public school hours. One boy would not gain; the more he ate, the thinner and stronger he became; he played on the baseball team and was apparently in the best of health; it was concluded that he was one of the "naturally thin" children one hears about.

The weight curves of the children of the feeding groups showed these features: (1) An initial rise, no matter what the medical or social condition of the child, and an apparent response of the underfed tissues of food. (2) A failure to gain in the next month, so that by the end of it half the group were receiving extra food. (3) A rise in the third month (June). Factors other than purely metabolic ones, weather, etc., may have played a part in these fluctuations.

As a result of this nine-and-a-half weeks' experiment, these children, in spite of adverse conditions and handicaps unremoved, gained 278 per cent. (normal gain 100 per cent.), or 302 per cent. gain over the "control group," and the school which had ranked lowest (fifty-fifth) in the spring, ranked third in September.

Blanton²⁸ writes of the mental and nervous changes caused by malnutrition among German children.

Changes in the teeth of children due to nutritional disturbances are discussed by Sinclair²⁹ and by Castilla.³⁰

Those who assert that good health is purchaseable must take into consideration the cost of providing adequate nutrition and the limitations of income. On the basis of the prices of April, 1920, the director of a league for preventive work, in Boston, calculated the cost of providing a minimum allowance of essential nutrients for a family of five as \$11.50 per week. This would allow, for the man, 3,400 calories a day, including 100 gm. protein, 1 gm. calcium, 2 gm. phosphorus, and 16 gm. iron, with an abundance of vitamins. A more liberal, safer,

28. Blanton, S.: Mental and Nervous Changes in School Children of Trier, Germany, Caused by Malnutrition, *Mental Hygiene* 3:343, 1913.

29. Sinclair, J. F.: Influences of Diet Affecting Second Dentition, Penn. M. J. 12:789, 1919.

30. Castilla, C. R.: Changes in Teeth of Children from Nutritional Derangement, *Semana méd.* 26:599, 1919.

allowance is placed at \$14, or 60 cents a day for each adult.³¹ Since the date of this calculation there has been a very material decline in the cost of these essentials; the figures must be modified from time to time as prices return toward the prewar level.

Milk.—The “misuse of milk” in the diet of infants and young children was discussed at the meeting of the American Pediatric Society, and the view was advanced that following propaganda by popular writers many mothers are forcing milk in such large quantities on their children that it becomes a positive menace to health, particularly in the group of children between the ages of 1 and 6 years. In receiving a diet so largely composed of milk, the child is deprived of minerals that should come to it in fresh fruits, vegetables and cereals, as well as the vitamins and antiscorbutic properties of the foods. Hoobler³² advocated limiting the amount of milk to one pint daily after the child is 15 months old.

Bergeim³³ reports upon a study of coagulation of milk in the human stomach.

Sommer and Hart³⁴ found that the main factor in the heat coagulation of fresh milk is the composition of the milk salts. Apparently casein requires a definite optimum calcium content for its maximum stability. The calcium content of casein is largely controlled by the magnesium, the citrates and the phosphates present.

In fresh milk there is no relation between titratable acidity and heat coagulation. Acid fermentation in milk lowers the coagulating point by changing the reaction and by lowering the citric acid content. (However the titratable acidity of fresh milk samples varies so widely that it is impossible to determine the extent of acid fermentation by titration. Therefore, it is impossible to use the acidity of milk as a criterion of coagulability.)

Difference in concentration accounts partly for the difference in coagulation of fresh milk samples. Hydrogen ion concentration is not the determining factor in fresh milk coagulation. Nevertheless it is a factor in fresh milks, and in commercial milks it may become an important factor.

31. Gillett, L. H.: A Minimum Food Allowance and a Basic Food Order, *J. Home Econ.* **12**:319, 1920.

32. Hoobler, R. B.: *Tr. Am. Pediat. Soc.*, 1920.

33. Bergeim, O.: Fractional Study of Coagulation of Milk in Human Stomach, *Am. J. Physiol.* **48**:411, 1919.

34. Sommer, H. H. and Hart, E. B.: Heat Coagulation of Milk, *J. Biol. Chem.* **40**:137, 1919.

Dennis and Talbot³⁵ have studied the lactose, fat and protein content of woman's milk. Talbot states³⁶ that the caloric value of lactose is 3.7, and not 4.1, as taught.

C. U. Moore³⁶ writes on re-establishment and development of the breast milk flow.

From Munich it is reported that the use of surplus mother's milk in hospitals has brought the danger of adulteration with cow's milk or dilution with water, as the women furnishing such milk are paid a good price for it. Kappeller and Gottfried³⁷ state that if as much as 20 per cent. cow's milk or 10 per cent. water has been added, the adulteration may be detected by changes in the Umikoff reaction, in the refraction of light, and in the precipitation of casein.

Légrand³⁸ reports instances in which, after puppies had been drowned, the dog suckled an infant. In one case he advised utilizing the large female dog he noticed under a gypsies' wagon, when he saw that the gypsy twins he had delivered not long before were being fed on unsanitary soup. The animal served with evident delight, and the infants thrived. An instance is cited to show that lactation can be kept up for from five to six months.

Proteins.—Further evidence that the proteins contained in the commonest cereals are essentially equivalent is found in recent work by Osborne and Mendel.³⁹ Wheat was contrasted with barley, rye and oats in experiments in which these served as the sole sources of protein for growth, and it was concluded that the proteins of the four cereals studied are not widely different in efficiency as sources of nitrogen for growth. All, however, need a supplement to provide certain inorganic elements and fat soluble vitamin.

All the common cereals are readily digestible by man, and all have virtually the same energy value. A 100 calory portion varies only from 25 gm. for oatmeal (dry flakes) to 29 gm. for rice. A choice of one cereal rather than another is to be made on grounds of transportability, personal preference, etc., rather than on grounds of nutritional value.

It appears that nine tenths of the protein requirements of maintenance of the adult human organism may be met with protein derived

35. Dennis, W., and Talbot, F. B.: A Study of Lactose, Fat and Protein Content of Women's Milk, *Am. J. Dis. Child.* **18**:93 (Aug.) 1919.

36. Moore, C. U.: Reestablishment and Development of Breast Milk, *Arch. Pediat.* **36**:609, 1917.

37. Kappeller and Gottfried: Adulteration of Human Milk, *Münch. med. Wchnschr.* **67**:813, 1920.

38. Légrand, A.: Dog's Milk for Infants, *Nourrison* **8**:223, 1920.

39. Osborn, T. B. and Mendel, L. B.: Nutritive Value of the Proteins of the Barley, Oat, Rye and Wheat Kernels, *J. Biol. Chem.* **41**:275, 1920.

from cereal grains (wheat, maize and oats), the remainder being furnished by milk or fresh fruit.⁴⁰

Many interesting facts about the proteins of animal and plant life are given by Kennaway.⁴¹ These giant molecules, the most complex of organic substances, occur only in association with living matter. The number of different amino-acids that enter into their formation is limited, but as there are about seventeen commonly found, the possibility for variation by combination and arrangement is practically unlimited. Why other and related amino-acids are not found in nature and do not enter into the formation of proteins is unexplained; as is the fact that proteins usually contain amino-acids with two, three, five or six carbon atoms, and four carbon amino-acids are not found. All the amino-acids of animal proteins are synthesized by plants and bacteria, and if animals have any slight capacity to synthesize amino-acids and proteins it is but very limited and of little significance as a usual source of proteins. No single amino-acid has been found in animals that is not present in plants. And in the simplest organisms that have yet been analyzed—yeast, moulds and certain bacteria—are found virtually all the known amino-acids of animal and plant proteins, with the exception of the sulphur containing cystin. Moreover, the simplest organisms now existing apparently do not contain a series of amino-acids any more primitive than that present in the higher organisms, except, perhaps, as regards the inclusion of cystin. It would seem that any struggle for existence among simple organisms selecting other series of amino-acids must have taken place in an immensely remote period, leaving the present apparently stereotyped series of utilizable amino-acids as the stable outcome. From extremely simple inorganic salts, bacteria and plants, e. g., yeast growing on a medium containing ammonium tartarate, can synthesize extremely complex protein molecules so rapidly that a new cell is formed in a few hours; the chemical processes cannot be followed.

Evidence that cystin is essential for growth in higher organisms (dogs) is presented by Lewis.⁴² Under conditions of low protein intake, he finds that serum albumin with a high cystin content, is more effective in maintaining nitrogenous equilibrium than is casein, a protein low in cystin content. On the other hand, when casein is supplemented by cystin, it becomes as efficient as serum albumen.

40. Sherman, H. C.: Protein Requirement of Maintenance in Man and the Nutritive Efficiency of Bread Protein, *J. Biol. Chem.* **41**:97, 1920.

41. Kennaway, E. L.: Notes on the Evolution of Protein, *Chemical News*, **120**:13, 1920; *Ed. J. A. M. A.* **75**:744, 1920.

42. Lewis, H. B.: Metabolism of Sulphur. III. Relation Between Cystin Content of Proteins and Their Efficiency in Maintenance of Nitrogenous Equilibrium in Dogs, *J. Biol. Chem.* **42**:289, 1920.

Whether ammonium salts, such as ammonium chlorid, acetate and citrate, can replace protein as a source of nitrogen for the tissues, and serve as "protein spacers," has been subjected to further study by Gessler,⁴³ at Heidelberg. True protein contains sulphur as well as nitrogen, and organic sulphur is quantitatively as indispensable to the organism as is organic nitrogen. When protein disintegrates, substances containing sulphur appear in the excreta, and there is a parallelism between the two elements. If ammonium salts lead to protein sparing, the loss of sulphur should be decreased correspondingly. This, Gessler finds, is not the case. Apparently, proteins built up by plants and animals, even though expensive and at times difficult to procure, are essential for supplying this element of human nutrition.

Hanke and Koessler⁴⁴ report the results of study on the recurrence of histamin in casein, blood serum, and fresh beef hypophysis. By means of a colorimetric method, it is possible to detect accurately quantities of histamin (B-imidoazolyethylamin) as small as 0.1 mg. in protein and protein containing matter. It could not be demonstrated in 40 gm. casein or in 75 c.c. human blood serum; and when added to either substance before hydrolyzing, it could be recovered quantitatively. Histamin is not found in perfectly fresh beef hypophysis. Casein contains a depressor substance that is similar to histamin pharmacologically. Peptone shock and histamin shock are not identical.

The foremost representatives of disintegration of protein in the body appear to be the amino acids. They are formed on a large scale during, for example, resolution in pneumonia. They circulate in the blood and are formed rapidly into urea, and excreted, and do not remain unconverted. With the appearance of convincing evidence that urea can be formed in tissues other than the liver, there has arisen some question whether the liver is so important in the disposition of the products of protein katabolism as had been supposed. Stadie and Van Slyke⁴⁵ have investigated this. In acute yellow atrophy, organ systems other than the liver are not prominently involved, at least histologically. Opportunity is thus afforded to test the effect of the injury to the liver on urea formation.

It is found that the rapid autolysis of liver tissue liberates amino-acids in large amounts, and they then appear in the blood to a degree not equalled in any other human condition. The urea content of the

43. Gessler, H.: Zur Frage des Wesens der Stickstoffretention bei Fütterung mit Ammoniaksalzen, *Ztschr. f. Physiol. Chem.* **109**:280, 1920.

44. Hanke, M. T. and Koessler, K. K.: Studies on Proteinogeneous Amins, etc., *J. Biol. Chem.* **43**:527, 1920.

45. Stadie, W. C., and Van Slyke, D. D.: The Effect of Acute Yellow Atrophy on Metabolism and on the Composition of the Liver, *Arch. Int. Med.* **25**:693 (May) 1920.

blood is not increased correspondingly. For some reason the amino-acids are not deaminated as rapidly as they should be; they circulate and are excreted as such. From these facts, it is assumed that the liver bears an important part in the deamination of amino-acids and the production of urea, and one that cannot be assumed by the rest of the body.

The use of low protein diets in the treatment of certain affections of the skin is familiar. Shamberg⁴⁶ has utilized this treatment in psoriasis, and it has been extended to other dermatoses. Blackfan,⁴⁷ most recently, has advocated the entire withdrawal of protein from the diet of children who are hypersensitive to protein and who are unable to take various foods without the development of eczema, urticaria, asthma, etc.

The reduction or complete removal of protein from a diet throws a great burden on the carbohydrate tolerance of the body and this may not always be harmless.

Michael⁴⁸ points out that this treatment in a prediabetic (adult at least) may lead to diabetes. Frequent blood sugar estimations should be made, as potential diabetes will usually manifest itself through hyperglycemia.

E. Nassau⁴⁹ reports experiments to show that in infants whose weight has long kept stationary on a diet with apparently abundant protein it is possible to cause them to thrive and increase in weight by increasing their protein about fourfold. This was done by adding, for example, to a two-thirds milk mixture, 2 per cent. of a commercial albumin preparation, to an amount corresponding to 6 gm. protein per kilogram body weight, as contrasted with 1.8 gm. per kilogram in natural feeding. The findings with large groups of infants are tabulated. The failures were only in infants with acute intestinal indigestion. Indicanuria did not appear under increased protein intake as long as bowel functioning was regular.

Food Dislikes.—The influence of acquired food dislikes of childhood, and the resultant faulty nutrition, to diseases of middle life is considered by C. H. Rice.⁵⁰ He thinks that, while not capable of immediate scientific demonstration, "not a few cases of such affections of middle life as hypertension, chronic Bright's disease, visceral ptosis,

46. Shamberg and others: Summary of Research Studies in Psoriasis, J. A. M. A. **63**:729 (Aug. 29) 1914.

47. Blackfan, K. D.: Protein Hypersensitiveness in Children, Am. J. M. Sc. **160**:341, 1920.

48. Michael, J. C.: A Menace in the Low Protein Diet, Arch. Dermat. & Syph. **2**:455 (Oct.) 1920.

49. Nassau, E.: Proteins in Infant Feeding, Ztschr. f. Kinderh. **26**:270, 1920.

50. Rice, C. H.: Relation of Required Food Dislikes of Childhood to Diseases of Middle Life, J. A. M. A. **75**:100 (July 10) 1920.

gastric and duodenal ulcers, etc., are but the remote, graver manifestations of deficient diet. The commonest offense he finds in children of 4 years up living almost exclusively on carbohydrates, and with a positive dislike for milk, eggs, fresh meats or green vegetables. Such children in the South eat much bread and syrup. Talbot thinks dislikes occur in a certain group of children on a good well balanced diet. In his experience, food dislikes come in certain types of families. They come in the type of family in which there is a history of asthma, eczema and hay-fever, and sometimes urticaria. Anaphylaxis may be present, and treatment in desensitization may be desirable.

Butter-Flour Mixture.—Continental writers devote considerable attention to the use of butter-flour mixtures in infant feeding. The Czerny-Kleinschmidt mixture is given as follows: butter, 7 gm.; wheat flour, 7 gm.; sugar, 5 gm.; warm water, 100 gm. The butter is stirred over the fire until it foams and all the odor of butyric acid has disappeared. The flour is then cooked with it over an asbestos plate until the whole mass is a light brown. The warm water and sugar are then added, and the whole mixture is boiled and strained. While still warm, the mixture is added to milk in the proportions of 1 to 2 or 2 to 3. Not more than 200 c.c. per kilogram of body weight is given to the infant, and usually less.

The weight curve resembles that of the breast fed infant. It is said that neuropathic infants with the exudative diathesis and eczema thrive on the mixture, while those with the exudative diathesis and eczema alone do not thrive on it. Plantenga⁵¹ reports favorable experiences with the mixture, and gives the histories of thirty-one babies thus fed.

Nieman and Foth⁵² state that the butter-flour mixture seems to be adapted for artificial feeding of infants without severe nutritional disturbance, but for whom ordinary milk mixtures are not suitable, and that it is contraindicated where there is present acute diarrhea, or sudden great loss in weight, or acute rise in temperature from digestive disturbance.

Vitamins.—Satisfactory growth has been obtained in young rats on diets in which the almond, English walnut and filbert, respectively, furnished the essential source of protein in the ration. These nuts may also serve as the sole source of water soluble vitamin for young

51. Plantenga, B. P. B.: Butter Flour Mixture in Infant Feeding, *Jahrb. f. Kinderh.* **92**:375, 1920.

52. Nieman, A., and Foth, K.: The Butter-Flour Mixture, *Jahrb. f. Kinderh.* **93**:137, 1920.

rats, apparently affording abundant quantities. Their proteins furnish the necessary nitrogenous complexes for the elaboration of milk in rats.⁵³

According to Osborne and Mendel⁵⁴ the fresh juices of the edible parts of the orange, lemon and grapefruit contain water soluble (B) vitamin. Their potency is quite similar to that of comparable volumes of cow's milk. It is not lost by suitable modes of desiccation. A sample of grape juice was not equally efficient. Water soluble vitamin is contained also in the edible portions of apples and pears, but in relatively less quantity. Prunes appear to be richer in this factor.

Fat soluble vitamin, on the other hand, seems to be present in the juices of citrus fruits only in traces, if at all.

Daniels and Loughlin⁵⁵ report that lard and cottonseed oil contain appreciable amounts of the fat soluble growth stimulant, but it is demonstrable only when fairly large amounts are fed.

The use of orange juice and its relation to the supply of vitamin has been studied by Byfield and Daniels,⁵⁶ and by Givens and McClugage,⁵⁷ while Gerstenberger and Champion⁵⁸ report on its constipating qualities.

Hart⁵⁹ and his associates present evidence to show that the concentration of antiscorbutic vitamin in milk is dependent on the diet, summer pasture milk being richer than winter or dry feed milk. Whereas half an ounce of the former added to the basal ration protected a guinea-pig against scurvy (others required more), at least three times this amount of dry feed milk was needed. Barnes and Hume⁶⁰ compare the antiscorbutic properties of fresh, heated and dried cow's milk.

53. Cajori F. A.: Some Nutritive Properties: of Nuts; Proteins and Content of Water Soluble Vitamin, *J. Biol. Chem.* **43**:583, 1920.

54. Osborne, T. B., and Mendel, L. B.: Occurrence of Water Soluble Vitamin in Some Common Fruits, *J. Biol. Chem.* **42**:465, 1920.

55. Daniels, A. L. and Loughlin, R.: Fat Soluble Growth Providing Substances in Lard and Cottonseed Oil, *J. Biol. Chem.* **42**:359, 1920.

56. Byfield, A. H. and Daniels, A. L.: The Antiscorbutic and Growth Stimulating Properties of Orange Juice, *Am. J. Dis. Child.* **19**:349 (May) 1920; **18**:546 (Dec.) 1919.

57. Givens, M. H. and McClugage, H. B.: The Antiscorbutic Property of Fruits. I. An Experimental Study of Dried Orange Juice, *Am. J. Dis. Child.* **18**:30 (July) 1919.

58. Gerstenberger, H. J. and Champion, W. M.: The Constipating Qualities of Orange Juice, *Am. J. Dis. Child.* **18**:88 (July) 1919.

59. Hart, E. B., Steenbock, H., and Ellis, N. R.: Influence of Diet on Antiscorbutic Potency of Milk, *J. Biol. Chem.* **42**:383, 1920.

60. Barnes, R. E., and Hume, E. M.: Comparison Between Antiscorbutic Properties of Fresh, Heated, and Dried Cow's Milk, *Lancet* **2**:323, 1919.

Givens and McClugage⁶¹ report data concerning the antiscorbutic value of white potatoes subjected to various temperatures and treatment.

Canned tomato, according to Hess,⁶² is the most serviceable antiscorbutic for artificially fed infants. It is well borne and comparatively inexpensive. He recommends it unreservedly in doses of 1 ounce a day. He regards canned tomatoes, from a nutritional standpoint, as a palatable solution of the three vitamins.

Mendel,⁶³ on feeding rats, finds daily doses of approximately 1 gm. of dried tomato serve as the source of fat soluble vitamin. As about 0.1 gm. butter fat would be otherwise necessary as an addition, the illustration indicates the relative richness of some of the edible vegetable products in fat soluble vitamin.

The antiscorbutic properties of raw beef have been studied by Dutcher⁶⁴ and coworkers. Additions of water extracts representing 5, 10, 15 and 20 gm. raw beef to a diet for guinea-pigs, of oats, water and an amount of milk sufficient to improve the diet but insufficient to prevent scurvy, did not affect the time of onset of scurvy or prolong the life of the animals. Animals receiving orange juice and beef extract presented an excellent condition.

Whipple⁶⁵ claims that the water soluble B in cabbage is not destroyed by boiling for from thirty to sixty minutes, or by boiling with acid or alkali; and that not more than one half is lost in the cooking water from cabbage and onions boiled for thirty minutes.

Miller⁶⁶ finds that the vitamins in carrots are not destroyed by heating at 115 C. for forty-five minutes. That in navy beans was reduced 40 per cent. by heating at 20 C. for thirty minutes, but the beans were somewhat overcooked. A similar loss was caused by cooking in sodium bicarbonate solution (0.5 per cent.). A large proportion of the vitamin was present in the cooking water. Muckenfuss⁶⁷ discusses the excretion of the vitamins.

61. Givens, M. H., and McClugage, H. B.: Antiscorbutic Property of Vegetable. II. Experimental Study of Raw Dried Potatoes, *J. Biol. Chem.* **42**: 491, 1920.

62. Hess, A. F.: Antiscorbutic Vitamin, *New York State J. M.* **20**:209, 1920.

63. Mendel, L. B.: Fat Soluble Vitamin. *Ibid.*, *New York State J. M.* **20**: 212, 1920.

64. Dutcher, R. A., Pierson, A. M. and Biestor, A.: Vitamin Studies. V. Antiscorbutic Properties of Raw Beef, *J. Biol. Chem.* **42**:301, 1920.

65. Whipple, B. K.: Water Soluble B in Cabbage and Onion, *J. Biol. Chem.* **44**:175, 1920.

66. Miller, E. W.: Effect of Cooking on Water Soluble Vitamin in Carrots and Navy Beans, *J. Biol. Chem.* **44**:159, 1920.

67. Muckenfuss, A. M.: The Excretion of the Vitamins, *Arch. Pediat.* **36**: 80, 1919.

Drummond⁶⁸ recommends that the somewhat cumbersome nomenclature introduced by McCollum (fat soluble A; water soluble B) be dropped, and that these substances be spoken of as vitamin A, B, C, etc. Omission of final "e" from the word makes it acceptable under the scheme of classification adopted by the American Chemical Society, which permits a neutral substance of undefined composition to bear a name ending in "in," the termination "ine" indicating that it is of a basic character.

Carotin.—Hess and Meyers have reached the conclusion that a yellow discoloration of the skin, resembling mild jaundice, except for the involvement of the sclerae, may be brought about by the ingestion of carotin. As this substance is widely distributed through a mixed diet, being a constituent of almost all our vegetable foods (carrots, spinach, oranges, egg yolks, etc.), "carotinemia" would occur most readily in those using a large amount of vegetable foods. These authors think that this pigmentation of the skin cannot be rare, and no doubt has been frequently overlooked or confused with mild grades of icterus, or attributed to some obscure metabolic disturbance. The discoloration of the skin is accompanied by a yellowing tingeing of the blood serum and plasma, and in certain cases of the urine. The pigment in the blood was identified as carotin.

Cholesterol.—In experiments on the relation of the preformed cholesterol in the food to the total cholesterol metabolism in infants, reported on by Gamble and Blackfan,⁶⁹ it was found by comparing carefully the intake and excretion of cholesterol that this substance is excreted in infants' stools without undergoing a change to coprosterol to an appreciable extent. A method for determining cholesterol in samples of milk and of stool is described.

Manganese.—Manganese was found in all tissues of the body examined by Reiman and Minot.⁷⁰ They have developed a method for the analysis of manganese in blood and tissue which is more rapid and has fewer sources of error than methods heretofore employed, and they present a series of results for the manganese content of human tissue obtained from fourteen necropsies. The liver carries the largest amount, averaging 0.170 mg. per hundred grams wet tissue.

68. Drummond, J. C.: The Nomenclature of the So-Called Accessory Food Factors (Vitamins), *Biochem. J.* **14**:660, 1920.

69. Gamble, J. L. and Blackfan, K. D.: Evidence Indicating a Synthesis of Cholesterol by Infants, *J. Biol. Chem.* **42**:401, 1920.

70. Reiman, C. K. and Minot, A. S.: Manganese Quantitation in Biologic Material, Manganese Content of Human Blood and Tissues, *J. Biol. Chem.* **42**:329, 1920.

Sugars.—Miller, Bergeim, Rebfuss and Hawk⁷¹ studied the effect of ingestion of sugars and candies on gastric secretion. They found that small amounts (10 gm. cane sugar or glucose) do not appreciably inhibit either gastric secretion or evacuation. Large amounts (3 ounces of cane sugar or glucose in concentrated solution) markedly depressed secretion and delayed the emptying of the stomach.

Candies act in proportion to their sugar content and the amounts of them ingested. This tendency is influenced by flavoring substances and added food ingredients, milk, egg, chocolate, etc., which stimulate gastric secretion. Candies should be eaten not before, but after meals. For children, hard candies which must be sucked, are preferable to cream candies because of the smaller quantity of less concentrated sugar solution derived from them. Peppermint oil used as a flavoring agent delayed stomach emptying. Chewing caramels gave rise to more voluminous gastric secretion, but delayed evacuation. Licorice gave rise to fairly abundant secretion but remained in the stomach three hours. The addition of honey to bread did not delay evacuation, but acid production was somewhat depressed.

Greenthal⁷² states that the urine of all normal infants contains a determinable amount of reducing sugar. The amount is directly proportional to the amount of sugar ingested, and not dependent on the volume of urine. When the intake of sugar is constant, the excretion of sugar, both fermentable and unfermentable, is constant. As the amount of sugar in the diet is increased, the total urine sugar increases, the increase being chiefly in the fermentable portion.

Fats.—Further results in their series of studies on the fat metabolism of infants and children are reported by Holt⁷³ and his collaborators. In the first paper of the series (1919), it was pointed out that reliable figures on the composition of stools of breast-fed infants are particularly scanty. The same investigator has seldom reported on the examination of many stools, and the majority of the results came from countries in which the living conditions and methods of feeding differ from those prevailing in this country. As many clinical conclusions regarding methods of feeding are drawn from the appearance of the stool of breast fed infants and a comparison of other stools with these, it seems most desirable to get reliable figures.

71. Miller, R. J., Bergeim, O., Rebfuss, M. E. and Hawk, P. B.: Influence of Sugars and Candies on Gastric Secretion, *Am. J. Physiol.* **53**:65, 1920.

72. Greenthal, R. M.: Urine Sugar in Infants, *Am. J. Dis. Child.* **20**:556 (Nov.) 1920.

73. Holt, L. E., Courtney, A. M. and Fales, H. L.: A Study of the Fat Metabolism of Infants and Young Children, etc., *Am. J. Dis. Child.* **17**:241 (March) 1919.

Holt's first observations were made with a view to answering the following questions: (1) What is normally the percentage of total fat and what is the distribution of the fat as soap, free fatty acids and neutral fat in the stools of healthy breast fed infants? (2) What is the difference in fat content and distribution of fat between normal and abnormal stools? (3) Does the amount and distribution of fat in the stools of healthy breast fed infants vary with the per cent. of fat in the milk and with the amount of fat intake?

The material examined consisted of forty-eight collections from thirty-four different infants from 10 days to 10 months of age. Thirty of these infants were well-nourished and, with few exceptions, gaining normally. In the larger number of these cases the appearance of the stools was that typical of normal breast fed infants, largely yellow, granular or pasty, very acid to litmus, with acid, aromatic, not unpleasant odor. Others had abnormal stools—green, watery with much mucus.

In thirty-two of the cases studied the percentage of fat in the mother's milk was determined. It varied from 0.9 to 6.4 per cent. No constant relationship was found between the percentage of fat in the milk and the percentage and distribution of fat in the stool. There was, possibly, a slightly higher fat percentage in the stools of infants who were receiving milk higher in fat, but the distribution of fat in the stool did not seem to be influenced by the percentage of fat in the milk taken.

A range of fat absorption from 90.3 to 99.2 per cent. of the intake was found in healthy breast fed infants.

Notwithstanding this high absorption of ingested fat, the fat content of the stools of normal breast fed infants, according to Holt's observations, averaged 34.5 per cent. of the dried weight and frequently was as high as 50 per cent.

The soap fat in the best stools predominated over the other forms of fat, averaging 57.8 per cent. of the total fat, as determined in the dried stool. The average stool of the normal breast fed infants showed a soap fat of 43.1 per cent. of the total fat, as determined in the dried stool, which would correspond to over one-third of the total fat of the fresh stool. The neutral fat in the best stools averaged 15.9 per cent. of the total fat; in the average stool the neutral fat was 20.2 per cent. of the total fat. (The amount of neutral fat was not affected by the drying process.)

In general, Holt thought the stools were more nearly normal when the fat intake was high. Or, in other words, the normal condition in breast fed infants seemed to be a high fat intake. As the stools departed slightly from normal the fatty acids were found to be

increased at the expense of the soap fat; and in those which were markedly abnormal the neutral fat was raised at the expense of the free fatty acids.

With respect to the fat content, abnormal stools were found to be of two classes: (1) Those containing much mucus with a low fat content, and (2) diarrheal stools, in which the fat percentage is high, the result of poor absorption. Under abnormal conditions the percentage of the total fat which is in the form of soap is regularly low, while the neutral fat is high.

A second study⁷⁴ dealt with the conditions obtaining in the stools of infants fed on modifications of cow's milk. Here 128 specimens of feces were examined from seventy-two infants whose ages ranged from 2 to 18 months. It was found that in the stools of children fed on cow's milk neither the total fat nor the distribution of fat was affected by drying, a distinction which, however, might not hold in the case of acid diarrheal stools.

As the gross appearance of stools is commonly used by pediatricists as their chief guide in infant feeding, the stools were grouped in several classes according to this:

(a) Those of the type generally considered normal, formed or semiformed, smooth and homogeneous, not hard nor dry, and showing no signs of mucus. (These infants were all in good condition and gaining weight.)

(b) Those that were hard, or dry and crumbly, that is all stools that might be regarded as constipated. Most of these infants could be classed as normal healthy children; the rest though under weight were doing well at the time.

(c) Stools that were softer than normal.

(d) Stools that were not normal in appearance, being none of them smooth and homogeneous, and all showing fat curds or mucus, or both, in considerable amount, though not sufficiently loose to be classed as diarrheal. (The digestion of these children was not quite normal, and a large proportion of them subsequently developed diarrhea.)

(e) Diarrheal stools of various grades of severity. Those were arranged in two groups according to the amount of water in the daily stools, those containing more than 200 gm. being classed as severely diarrheal. Most of these children were very ill and the digestion of all was markedly abnormal.

It was found that the fat retention of infants taking cow's milk averages 88.6 per cent. of the intake, in contrast with the 95.8 per cent. retention of those taking breast milk; and that, therefore, the daily

74. *Am. J. Dis. Child.* **17**:423 (May) 1919.

loss of fat by infants fed on cow's milk is over twice as great as that lost by those taking breast milk, even though the actual amount of intake is somewhat less.

There was no striking relation between the fat intake and the percentage of the intake retained, except when the intake was abnormally low. The average percentage of the fat retained with normal stools was 91.3 per cent. of the intake. The retention was but little lower when the stools were somewhat harder or softer than normal, or were not homogeneous, or contained more or less mucus without being distinctly watery. As the water in the stools increased, the percentage of retention dropped markedly, reaching in severe diarrhea 58.4 per cent. of the intake.

No definite relationship was shown between the daily fat intake and the percentage of fat or the distribution of fat in the stool. The distribution of the fat showed wide variation according to the type of stool.

The average fat percentage of the dried weight in normal stools was 36.2. The hard, constipated stools showed no variation from this figure. In the stools not quite normal in appearance, the average fat percentage was slightly lower. In severe diarrhea, the fat percentage of dried weight was much higher, reaching an average of 40.7 per cent.

The soap percentage of total fat was very high in both normal and constipated stools, averaging 72.8 and 73.8 per cent., respectively. As the stools became less normal in appearance the soap fat diminished rapidly and averaged in the loose stools only 30.6 per cent. of the total fat, in the diarrheal stools 12.4 per cent. and in those of severe diarrhea only 8.8 per cent. of the total fat.

The neutral fat was less than 10 per cent. of the total fat in normal and constipated stools. It increased as the soap fat diminished and in diarrheal conditions made up about 60 per cent. of the total fat in the stool.

The free fatty acids constituted about 17 per cent. of the total fat of normal and of constipated stools. It was increased somewhat as the stools became less like the normal and in diarrheal stools was over 30 per cent. of the total fat of the stool.

A more general statement of the findings is that stools which are normal or very nearly normal in appearance show very high average values for soap, and it is only when stools show in their gross appearance evidence of digestive disturbance that the average values for soap drop below 50 per cent. of the total fat; in diarrheal stools the soap forms a very small proportion of the total fat.

The fatty acids form the next larger proportion of the total fat in good stools, the lower neutral fat indicating excellent splitting of the ingested fat. In diarrheal stools the proportion of neutral fat is greatly increased, forming, on the average, more than half the total fat.

A third study gives the findings as to fat percentage and distribution in the stools of older children receiving a mixed diet. The material examined consisted of 134 collections of feces of sixty-two children, ranging for the most part from 18 months to 5 years of age. The larger number of the children whose stools were examined were in normal condition, both as to general health and digestion. Certain abnormal children are considered separately.

The greater number of the observations reported were made on the stools of children on a diet consisting of considerable amounts of solid food and usually a pint or more of milk. In a food column accompanying the data in individual cases are enumerated those articles of the diet which contained any considerable amount of fat, such as milk, butter, eggs, cod liver oil, etc. The remainder of the diet consisted of carbohydrate foods, vegetables and fruit.

The stools were grouped according as they were constipated, normal, or not normal. The last named were, all but one, distinctly abnormal in appearance; all were acid in reaction, some extremely so; many contained considerable mucus; almost all contained undigested food and several showed evidences of fermentation. A stool was regarded as normal when it was smooth, homogeneous, not hard, showing no mucus or undigested food. The reaction of such stools to litmus was in the majority of cases decidedly alkaline; in a few it was amphoteric; in no case was it distinctly acid.

It was found that normal children on mixed diet retain on the average about 94 per cent. of the fat intake, regardless of the type of stool. The average actual retention was about 38 gm. daily. Those children taking little or no solid food, with a smaller fat intake, showed a lower actual and a somewhat lower percentage retention than did those on a general mixed diet. The highest fat loss occurred in the stools of children whose diet contained the smallest proportion of solid food and the largest proportion of milk. The average fat loss in the stools of normal children varied between 2.6 and 3.0 gm. in all the groups studied. In no group studied was there found any constant relation between the amount of fat intake and either the fat percentage of dried weight or the distribution of fat in the stools. A close agreement was found in the composition of normal and constipated stools when the diet was similar.

In the normal or constipated stools of older children whose diet consisted of milk alone or milk with bread and cereal, the fat percentage

of dried weight averaged 30.7, which is lower than the average found for similar stools of infants taking modifications of cow's milk. The soap percentage of total fat averaged 60.9, which was somewhat lower than that found in the stools of the infants. (The intake of salts, particularly those of calcium, may have some significance in determining the character of the stools, especially affecting the distribution of fat.)

The normal and the constipated stools of children on a mixed diet showed almost identical average values both for fat percentage of dried weight and for distribution of fat. The fat percentage of dried weight averaged 18.0 and 20.1 per cent., respectively, and the soap averaged 45.1 and 47.9 per cent., respectively, of the total fat—values much lower than those found when the diet contained little or no solid food.

In the acid abnormal stools of children on a mixed diet the fat averaged 15.1 per cent. of the dried weight. Both the fat percentage of dried weight and the soap percentage of total fat were much lower than in normal stools and the values for fatty acid and for neutral fat were higher.

Of the abnormal children studied, six were rachitic, and eleven were suffering from chronic intestinal indigestion, several being examples of intestinal infantilism. The rachitic children showed a slightly larger fat loss in the stools than did the normal children; their intake, however, was higher. Their actual retention, therefore, equalled or exceeded that of the normal children, and their percentage retention was only a little lower than the normal average.

In this study it is found that in the normal or constipated stools of older children whose diet consisted of milk alone or milk with bread and cereal, the fat percentage of dried weight averaged 30.7. The fat percentage of dried weight averaged 34.7 in the alkaline stools, and 24.6 in the acid stools. The values found were higher than those found for corresponding types of stools in normal children. The proportions of soap, fatty acids and neutral fat were not significantly different from those for normal children.

In the stools of children suffering from chronic intestinal indigestion the fat loss was very great, averaging 7.3 gm. daily in the alkaline stools and 8.0 gm. in the acid stools; and both the actual and the percentage retention were much lower than usual. The percentage of the intake retained averaged 79.1 when the stools were alkaline and 77.7 when they were acid. When the intake of fat was very high, the actual retention was usually as high as that found for normal children. The fat percentage of the dried weight of stools of children suffering from chronic intestinal indigestion was much

higher than for normal children, averaging 36.4 per cent. for alkaline stools and 35.3 per cent for acid stools. And the distribution of the fat was changed in that the average percentage of neutral fat was lower in both alkaline and acid stools, and the fatty acids higher, much higher when the reaction of the stools was acid.

In the case of the rachitic children, the fat percentage of dried weight averaged 34.7 in the alkaline stools, and 24.6 in the acid stools. The values thus were higher than those found for corresponding types of stools of normal children. The proportions of soap, fatty acids and neutral fat were not found to be significantly different from those for normal children. The fat intake of these children was larger than that of the normal children and their stools showed a slightly larger fat loss. Their actual retention equalled or exceeded that of the normal children, and their percentage retention was only a little lower than the normal average.

Vegetable Fats.—The digestion of some vegetable fats (nut butter and corn oil) by children on a mixed diet is the subject of a fourth study.⁷⁵ The observations would indicate that those two vegetable fats are valuable foods for children, are exceedingly well borne, and are apparently digested and absorbed with ease. The stools did not differ essentially in appearance from those of children receiving mainly milk fat, although usually somewhat softer. Except when large quantities of corn oil were taken, the fat percentages of the dried stool differed but little. The soap percentage of total fat in the stools was usually a little lower and the neutral fat a little higher with vegetable fat.

The belief seemed warranted that these articles may safely be introduced into the regular diet of children, and that to a considerable degree they may be substituted for the more expensive milk fat given as milk or butter.

As these vegetable fats are deficient in the "fat soluble A" vitamin of McCollum, which is necessary for normal growth and maintenance, they should never entirely replace milk fat in the diet. The authors also point out that the fact may not be without significance that of six children, from 80 to 95 per cent. of whose fat intake was vegetable fat, two developed styes and two others eczema on the face, which disappeared when the diet was changed to include milk fat.

Langworthy and Holmes⁷⁶ are cited as having tested the digestibility of vegetable fats in adults and having found that, with the excep-

75. The Digestion of Some Vegetable Fats by Children on a Mixed Diet, *Am. J. Dis. Child.* 18:157 (Aug.) 1919.

76. U. S. Dept. Agricul. Bull. 505, 1917, etc.

tion of cocoa fat, all those tested, including cocoanut and corn oil, were digested quite as well as milk fat.

Calcium.—The calcium metabolism of infants and young children, and the relation of calcium to fat excretion in the stools was also studied.⁷⁷ As current views on these matters are often contradictory and rest most frequently on observations that are very few in number, effort was made in this study to include a sufficient number of individuals, from twenty to thirty in each series.

It was found that the total absorption of calcium oxid varied, in general, with the weight of the child; the per kilogram absorption did not vary regularly with either the age or the weight. The excretion and the absorption of calcium were in general dependent on the amount of calcium intake, from 35 to 55 per cent. of the intake being absorbed.

The average absorption of calcium oxid by healthy infants taking modifications of cow's milk was 0.09 gm. per kilogram of body weight.⁷⁸ Since the average absorption of calcium oxid by breast fed infants was about 0.06 gm. per kilogram, it may be assumed that 0.06 gm. per kilogram is the minimum normal for infants taking modifications of cow's milk.

The daily total excretion of calcium in the stools ranged from 0.34 to 1.06 gm., averaging 0.70 gm. Since the excretion and absorption of calcium were, in general, dependent on the amount of calcium intake, from 30 to 55 per cent. being absorbed, it appeared necessary, in order to insure the average absorption of 0.09 gm., that the intake of calcium oxid should be, at least, 0.19 gm. per kilogram; to insure an absorption equal to the average found for breast fed infants the intake should be at least 0.13 gm. per kilogram. When the intake of calcium oxid was very low, less than 0.10 gm. per kilogram, the absorption of calcium oxid was less than the normal calcium requirement of the body.

The best absorption was obtained when the calcium intake bore a definite relation to the fat intake, that is, when the food contained from 0.045 to 0.060 gm. calcium oxid for every gram of fat, and when at the same time the fat intake was ample, not less than 4.0 gm. per kilogram.

The relation of calcium excretion to soap excretion was not constant. Whereas, the excretion of soap was directly related to the type of stool, that is, to the water content and reaction of the stool, the excretion of calcium was closely related to the calcium intake. On the average, the normal and the constipated stools, with high soap content, were found when the intake of calcium was high, and, therefore they showed the higher excretion of calcium. However, constipated stools which contained more soap than normal stools, had lower calcium content. Nonhomogeneous stools, with the lowest average soap content, showed the same content of calcium not held as soap as did the constipated stools, with the highest soap content. The calcium that could be lost as soap was never a large proportion of the calcium intake. Even in the stools containing the most soap it was found to be less than three-tenths the calcium intake. The calcium lost as phosphate was shown not to be increased in soapy stools. The calcium percentage of the total solids varied, as a rule, with the water content of the stools, diminishing as the water increased.

77. Holt, L. E., Courtney, A. M. and Fales, H. L.: Calcium Metabolism of Infants and Young Children, and the Relation of Calcium to Fat Excretion in the Stools, *Am. J. Dis. Child.* **19**:97 (Feb.) 1920.

78. Range from 0.013 to 0.133 gm.

An excessive calcium intake apparently did not increase the calcium absorption, the excess being excreted. The calcium absorption was much lower when diarrhea was present. The absorption of calcium was regularly increased by the administration of cod liver oil, unless diarrhea was present.

The calcium absorption by rachitic infants was much lower than the absorption by healthy infants, the average for the group being 0.042 gm. per kilogram, less than one half that for normal infants. The few observations in infants recovering from rickets showed a calcium absorption that was higher than the normal average. These infants had received cod liver oil for a considerable period.

A second paper on calcium metabolism and the relation of calcium to the fat excretion deals with the conditions obtaining in the case of children on a mixed diet.⁷⁹

In such children the intake of calcium oxid averaged 0.108 gm. per kilo, ranging from 0.043 to 0.178 gm., in about half the cases being not more than 0.10 per kilo. The intake thus was lower than in the case of infants; the absorption also was lower. With children on a mixed diet, the absorption of calcium per kilo averaged, when the intake was adequate, 0.055 gm. calcium oxid per kilo. The average daily excretion of calcium oxide was 0.87 gm., being dependent more on the amount of the calcium intake than on the type of stool.

The percentage of calcium intake absorbed when the intake exceeded 0.09 gm. per kilo averaged 40.4; when the intake was 0.09 gm. or less, the absorption averaged only 20.3 per cent. Therefore, it may be inferred that an intake of at least 0.09 gm. calcium oxid per kilo is necessary to insure a good absorption by children taking a mixed diet.

The best absorption occurred when the intake of fat exceeded 3.0 gm. per kilo, and when at the same time there was in the diet from 0.03 gm. to 0.05 gm. calcium oxid for every gram of fat.⁸⁰ When the intake was only 0.09 gm. per kilo, or less, the absorption rarely exceeded 0.03 gm. per kilo, and in several instances there was a negative balance; the average being only 0.015 gm.

When calcium in the form of chalk mixture (calcium carbonate) was added to the diet, there was a greatly increased absorption of calcium. The absorption was not increased when calcium acetate or calcium phosphate was added.

79. Holt, L. E., et al: Children Taking a Mixed Diet, *Am. J. Dis. Child.* 19:201 (March) 1920.

80. The statement is also made that the excretion of calcium "was not at all related to the fat intake."

The two factors chiefly affecting the percentage of calcium in the stools were the amount of calcium intake and the reaction of the stools. The percentage of the total solids was lower in acid than in normal or constipated stool. The calcium lost as soap was in most cases an insignificant part of the calcium intake.

The absorption of calcium by children with chronic intestinal indigestion was extremely low; as it was also in children with active rickets.

Cod liver oil increased the absorption of calcium, except in cases in which the intake of calcium or of fat was very low. The substitution of vegetable fats for milk fat did not affect the calcium metabolism of children taking a mixed diet.

According to Grimm⁸¹ in normal children at the end of the first and at the beginning of the second year, the amount of feces varies from 5.5 to 8.5 gm. for each 100 gm. food taken; from 6.0 to 9.6 gm. for each kilogram of body weight.

The behavior of calcium in the body and its distribution under various conditions of health and disease, and under special feeding continues to attract much attention. Sherman⁸² has attempted to determine the calcium requirement of adult men.

Just as the protein need has been shown to average 45 gm. a day for a person of 70 kg. weight, and the phosphorus need is estimated at 0.9 gm. a day, so the new data for calcium requirement give a mean result of 0.45 gm. Expressed differently, this would mean that in order to furnish those essential nutrients in relative proportions corresponding to the needs of the adult body, a diet should contain at least 1 gm. calcium for every 100 gm. protein.

A study of the food supplies of American families and larger groups has shown that this ratio does not obtain therein. However there was probably no deficiency of calcium in the usual diet, since the percentage of protein was unnecessarily large. When calculated to the usual basis of nutrients for one man per day, the average protein content in 224 presumably typical American dietary studies, was found to be 106 gm. and the average calcium content 0.74 gm.

A method is described by Kramer and Howland⁸³ by which the calcium in 2 c.c. of serum may be determined with a maximum error of 3 per cent. and often less than 1 per cent. By the use of this

81. Grimm, G.: Abnormally Large Amounts of Feces in Young Children, *Monatschr. f. Kinderh.* **18**:193, 1920.

82. Sherman, H. C.: Calcium Requirement of Maintenance in Man, *J. Biol. Chem.* **44**:21, 1920.

83. Kramer, B., and Howland, J.: Method for Determinations of Calcium in Small Quantities of Blood Serum, *J. Biol. Chem.* **43**:35, 1920.

method they are able to show that the concentration of calcium in the serum of normal adults is strikingly constant, and amounts to 9 or 10 mg. per hundred cubic centimeters.

Handovsky⁸⁴ reports that in twelve adults who manifested the Chvostek phenomon and in nine who were free from it, the calcium content of the blood lay within the same range in all; thus contradicting, in adults at least, Sherman's statement that the calcium content is low when this sign is positive.

In a rather popular article Peckham⁸⁵ states that calcium is an essential part of the human economy, constituting approximately 50 per cent. of the inorganic matter of bone, and being an important part of the structures in ligaments, muscles and the nervous system; and he adds that when calcium metabolism is interfered with there may result a deficiency, in which case, the bones, muscles, nerves and ligaments are deprived of their calcium. "Under these conditions, there may result scoliosis, knock knees, bowlegs, flat feet, etc." Little satisfactory evidence for these statements is given, and in the discussion of the paper many diverse opinions were expressed.

The frequent use of carrots as an addition to broths in the feeding particularly of rachitic infants, lends additional interest to the studies recently made by Rose⁸⁶ on healthy young adult women, to determine the utilization of the calcium of carrots by the human body. In three out of four cases, she found that there was a positive calcium balance in the carrot diet, when the calcium intake was close to the estimated minimum for equilibrium; in the fourth case the loss was small. When approximately 55 per cent. of the calcium was derived from carrots, one subject had practically the same retention as on a diet on which 70 per cent. of the calcium was derived from milk. It seems possible, therefore, to meet the requirements of the adult human organism largely, if not wholly, from carrots.

Rickets and Tetany.—Nathan,⁸⁷ inquiring whether or not rachitis is a deficiency disease, summarizes some recent research which seems to answer the question affirmatively.

The diagnostic significance of craniotabes and beading of the ribs as signs of rickets is considered in a paper by Schwarz.⁸⁸

84. Handovsky, I.: Calcium Content of Blood, *Jahrb. f. Kinderh.* **91**:432, 1920.

85. Peckham, F. E.: Many Orthopedic Deformities Due to Calcium Deficiency. A Direct Result of Sterilized and Pasteurized Food, *J. A. M. A.* **75**:1317 (Nov. 13) 1920.

86. Rose, M. S., et al: Experiments on Utilization of Calcium of Carrots by Man, *J. Biol. Chem.* **41**:349, 1920.

87. Nathan, M.: Is Rachitis a Deficiency Disease, *Press méd.* **28**:577, 1920.

88. Schwarz, H.: Craniotabes and Beading of the Ribs as Signs of Rachitis, *Am. J. Dis. Child.* **19**:384 (April) 1920.

Howland and Park⁸⁹ show that a definite correlation exists in rickets between the roentgen-ray findings and the actual pathologic conditions. As calcium deposits in cartilage cast well defined shadows, the effectiveness of cod liver oil as a therapeutic agent in rickets could be demonstrated. In animal experiments a beginning calcium deposit was demonstrated two days after beginning the administration of cod liver oil; in human beings the calcium deposit in the cartilage was definitely demonstrable at the end of three weeks.

In the discussion, Marriott stated that he had prepared a solution containing all the inorganic constituents of blood plasma, an "artificial blood," containing phosphates, lime, magnesium salts, sodium bicarbonate and carbon dioxid, the latter being at a tension of 40 millimeters. This solution was perfectly clear, but a precipitate occurred when a portion of the carbon dioxid was removed, or if more bicarbonate, calcium salts, or inorganic phosphate were added. Only by increasing the amount of phosphate in the solution was a precipitate obtained that had a composition the same as that of bone. A very small increase in the amount of phosphate in solution caused a very considerable precipitate of the substance having the approximate composition of bone. A very small increase in the amount of phosphate in solution caused a very considerable precipitate of the substance having the approximate composition of bone. Marriott added that it would seem likely, therefore, that the method by which bone is laid down is by an increase in the amount of phosphate present at some points. Howland added that after feeding cod liver oil the phosphorus content of the blood was found greatly increased.

Jacobowitz⁹⁰ found the calcium content of the blood in children with tetany decidedly lower than in twenty-one children free from signs of tetany. Even when the therapeutic results seemed excellent, no influence on the calcium level in the blood could be detected on administration of calcium by mouth, in the tetany cases and others.

Hoobler⁹¹ reports that, in general, the retention of calcium, magnesium and phosphorus was found to be considerably diminished in children subject to convulsive disorders when compared with normal controls. He thinks that in such children an attempt should be made to discover the mineral deficiency, and if such a deficiency is found to bring the condition up to normal.

89. Howland, J. and Park, E. A.: *Proc. Am. Ped. Soc.*, 1920.

90. Jacobowitz, S.: *Calcium Content of Blood in Tetany*, *Jahrb. f. Kinderh.* 92:256, 1920.

91. Hoobler, B. R.: *Proc. Am. Pediat. Soc.*, 1920.

Some years ago Howland and Marriott⁹² showed that in infants suffering from tetany, the amount of calcium in the blood serum might be decreased 50 per cent.

Clark⁹³ reports that feeding a calcium-rich diet to animals had no effect on the calcium content of their blood. Intravenous or subcutaneous injections of lime salts brought about a transitory increase. Considerable evidence might be cited to show that feeding of calcium rich or calcium poor diets does not make any appreciable change in the amount of this element found in the blood, bones or other tissues.

Brown, MacLachlan and Simpson⁹⁴ report that administration of cod liver oil and phosphorus produced an increase in blood calcium in case of tetany, with a corresponding reduction in the mechanical and electrical signs, within a period of from ten to seventeen days.

Constitutional reactions were produced in nine patients following intravenous injection of calcium lactate in 1.25 gm. doses. It varied from slight drowsiness to almost complete collapse, accompanied by dyspnea. These signs disappeared usually between one and seven hours, severe reaction being recovered from more slowly. A temporary absence of both the electrical and mechanical signs of tetany was noted, usually lasting from seven to ten hours.

Unless supplemented by the administration of cod liver oil and phosphorus, apparently no beneficial therapeutic effect was exerted. Combination of the two methods resulted in a little more rapid reduction of the tetanoid symptoms than did the use of cod liver oil and phosphorus alone.

Grosser⁹⁵ reports the details of a study on the effects of injecting different salts of calcium and phosphorus parenterally in ten children on comparable diets in an effort to see which might be most readily assimilated by a child with a tendency to rachitis. He was not able to draw any general conclusions.

Schiff and Peiper⁹⁶ report that injection of pilocarpin in four infants from 2 to 4½ months old induced profuse sweating and retention of a larger proportion of calcium (one excepting), and epinephrin

92. Howland, J., and Marriott, W. McK.: *Quart. J. M.* **11**:296, 1917.

93. Clark, G. W.: *Effect of Hypodermic and Oral Administration of Calcium Salts on the Calcium Content of Rabbit Blood*, *J. Biol. Chem.* **43**:89, 1920.

94. Brown, A., McLachlan, J. F. and Simpson, R.: *Effect of Intravenous Injections of Calcium in Tetany and Influence of Cod Liver Oil and Phosphorus on Retention of Calcium in Blood*, *Am. J. Dis. Child.* **19**:413 (June) 1920.

95. Grosser, P.: *The Metabolism in Rachitis*, *Ztschr. f. Kinderh.* **33**:141, 1920.

96. Schiff, E. and Peiper, A.: *Calcium Metabolism in Infants*, *Jahrb. f. Kinderh.* **93**:160, 1920.

reduced the retention of calcium (one exception). They think this demonstrates a new and close connection between the calcium metabolism and the nervous system.

Sharpe,⁹⁷ continuing the earlier studies of Noel Paton and Findlay⁹⁸ studied the guanidine content of the feces of normal children and those suffering from tetany and found quantities of this base averaging 0.007 per cent. of the moist feces in normal children and 0.075 per cent. in cases of tetany. The actual amount excreted daily in the latter cases averaged 0.018 gm. as dimethylguanidine.

Benedict⁹⁹ and also Talbot¹⁰⁰ discuss the caloric requirement by children from birth to puberty.

The Circulation.—Recent investigations indicate that the capillaries play a more active part in the volume distribution of the blood than has been supposed. The fact that they have not muscular coats like arterioles and veins, need not necessarily indicate that they play an entirely passive rôle and become dilated or collapsed according to the different masses of blood that reach them. It is possible that the cells forming their delicate walls are contractile, this attribute being common to living cells and but highly specialized in muscle cells.

Krogh¹⁰¹ has summarized considerable evidence tending to show that these capillaries contain contractile elements of some sort within themselves and that they function especially in the direction of active dilatation.

The behavior of capillaries toward certain drugs leads to the conclusion that dilator effects, for example, can be produced independently of any extrinsic nerve supply or alterations in the arterial circulation. In studies on the capillaries of the tongue of the frog, it appeared that only to a slight extent, if at all, can capillary tonus be of a nervous nature, since it is generally maintained after section and degeneration of the nerves that might be involved. The maintenance of this tonus is, however, dependent on the blood supply. When a vessel gets no blood, its tone diminishes, and finally it relaxes, thus admitting blood and allowing the tone to be restored. Krogh concludes that every capillary must alternately open and close, thus providing uniform irrigation for the whole tissue when a sufficient period of time is con-

97. Sharpe, J. S.: The Guanidine Content of Feces in Idiopathic Tetany, *Biochem. J.* **14**:46, 1920.

98. Quart J. Exper. Physiol. **10**:3 and 4, Pt. 4, 1917.

99. Benedict, F. G.: Energy Requirements of Children from Birth to Puberty, *Boston M. & S. J.* **181**:107, 1919.

100. Talbot, F. B.: The Caloric Requirements of Normal Infants and Children from Birth to Puberty, *Am. J. Dis. Child.* **18**:229, 1919.

101. Krogh, A.: Studies in Capillariomotor Mechanism, etc., *Am. J. Physiol.* **53**:399, 1920.

sidered. The substance responsible for the tonic action of the blood is not oxygen.

The possibility of a chemical regulation of the blood vessels and blood flow is thus emphasized. Metabolites, or drugs, which produce a vasomotor action not clearly attributable to an effect on well known vasomotor nerves may act on the less well known local nervous mechanism, or perhaps, even directly on the musculature, or on the cells of the walls themselves, in finer vessels.

Hooker¹⁰² would conceive of a primitive chemical mechanism of control, with superimposed on this a highly organized nervous mechanism adapted to quick and efficient response. On the surface of the body, where rapid responses to changes in environment may be more necessary, the latter mechanism of control may be more highly developed. In the glands and other deeper body tissues, generally, where reaction is conceivably of less significance, the primitive chemical control may be relatively more important.

This extension of our conception of vasomotor control to all parts of the vascular system greatly complicates our ideas of the part played by the vascular system in normal physiology and in disease. The introduction of chemical factors that act locally further complicates the matter. Nevertheless, it is a conception toward which various pathologic studies have tended.

Utheim¹⁰³ has studied the blood and its circulation in well and sick infants. He finds that the serum protein in normal infants is from 6 to 6.5 per cent. and remains at this level until the tenth or eleventh month, after which it begins to rise, and by the fifteenth month has reached the level found in adults, 8 per cent. Premature infants show a low protein percentage in the blood. Infants suffering from diarrhea and vomiting have a high percentage of protein, the result of blood concentration. Otherwise, infants suffering from various diseases show, with the exception of exudative diathesis and nephritis, no noteworthy change in the blood protein concentration.

Athreptic infants show a low protein percentage in the blood. This in some instances seems due to lack of power on the part of the organism to build up protein, in other instances to overfeeding with carbohydrates. Athreptic infants also show a very low rate of blood flow which is thought to be due, in some instances, partly to the diminished blood volume, in other instances to constriction of peripheral

102. Hooker, D. R.: The Functional Activity of the Capillaries and Venules, *Am. J. Physiol.* **54**:30, 1920.

103. Utheim, K.: Study of Blood and Its Circulation in Normal Infants, etc., *Am. J. Dis. Child.* **20**:366 (Nov.) 1920.

small vessels in order to accomplish the distribution of the blood to the internal organs. This low blood flow is not usually accompanied by a lowering of blood pressure.

It is suggested that the high water content of the organism in both premature and athreptic infants is an important factor in the low immunity they show, predisposing these infants to multiple infections.

Acidosis and Alkalosis.—The prevailing conception of asphyxial acidosis is, according to Haggard and Henderson,¹⁰⁴ in many respects diametrically opposed to the facts. Under low oxygen overbreathing occurs before the blood alkali is appreciably reduced. It is improbable that such a condition as "lactic acid acidosis" ever occurs in life. Intravenous injections of lactic acid do not induce an acidosis at all commensurable with the amount administered. An increase of lactates in the blood or urine is probably an indication, not of acidosis, but of low ratio of carbonic acid sodium bicarbonate, that is, alkalosis.

The conditions attending the production of tetany through forced respiration are reported by Grant and Goldman.¹⁰⁵ Forced respiration causes symptoms of tetany to appear in the human subject; carpopedal spasm, Chvostek's sign, Trousseau's sign, Erb's sign, and (in one instance as observed by them) tetanic convulsion. As a result of the fall of alveolar carbon dioxid tension produced by overventilation, there is a reduction of the carbon dioxid capacity of plasma, a change in the reaction of the urine to the alkaline side, a decreased excretion of ammonia, and a slight increase in the calcium content of the serum. These authors believe that the underlying factor in the production of tetany of forced respiration is the alkalosis.

Seham¹⁰⁶ writes on the acidotic state of normal new-born infants, with special reference to carbon dioxid tension, alkali tolerance and acetonuria.

A paper by Gamble and Goldschmidt¹⁰⁷ deals with the relation of creatinuria to acidosis.

104. Haggard, H. W. and Henderson, Y.: Hematorespiratory Functions. III. The Fallacy of Asphyxial Acidosis, *J. Biol. Chem.* **43**:3, 1920.

105. Grant, S. B. and Goldman, A.: Study of Forced Respiration; Experimental Production of Tetany, *Am. J. Physiol.* **52**:209, 1920.

106. Seham, M.: The Acidotic State of Normal Newborns with Special Reference to the Alveolar Carbon Dioxid Tension, Alkali Tolerance and Acetonuria, *Am. J. Dis. Child.* **18**:42 (July) 1919.

107. Gamble, J. L. and Goldschmidt, S.: Creatinuria in Infants. I. Relation of Creatinuria to Acidosis. Elimination of Ingested Creatin and Creatinin, *J. Biol. Chem.* **40**:199, 1919. Relation of Protein Intake to Urinary Creatin, **40**:215, 1919.

PATHOLOGY

The popular opinion that during and after a war a great many more boys are born than girls has recently been tested and found to be incorrect.

During the first decade of the twentieth century the excess of male over female births ranged in Germany and Austro-Hungary and other countries from 5 to 6 per cent. In England, the apparent excess was only 3.9 per cent. for the years 1906-1910, but this is shown to be due to official conditions of notification. To offset this excess of male births, there is a higher mortality of male new-born than that of female new-born. According to the German vital statistics for the same decade, 202 boys died, as compared with 170 girls, out of every thousand. This gave a male excess mortality of thirty-two to each 1,000 living new-born. According to the 1912 statistics, the greatest excess of mortality occurs during the first month, and, calculating the excess mortality of boys in percentage of girl mortality, according to the principal causes of death, the following figures for the male excess mortality are obtained; defective vitality, 23.8 per cent.; diseases of the digestive organs, 20.8 per cent.; diseases of the respiratory organs (exclusive of pneumonia) 18 per cent.; pneumonia, 17 per cent. and infectious diseases 0.0 per cent. Professor Silbergleit, of the Berlin office of statistics, concludes, therefore, that defective vitality and diseases of the digestive organs are the main causes of the excess male mortality, and that better care and nursing, appropriate feeding and careful supervision can help to combat the effects of the apparently weaker constitution of male infants. Behla, former director of the Prussian office of statistics, reports no extraordinary excess in birth of boys up to 1917, and the usual proportion maintained during 1915. Schanta, of Vienna, reported a proportion of 100-102 for 1915-16; Bumm, of Berlin, 100-116; Kronig of Freiburg found no increase of boys.¹⁰⁸

Schwarz¹⁰⁹ presents a paper on infant and child mortality, including miscarriages and still-births.

Aschenheim¹¹⁰ describes what is supposed to be the first authentic instance of roentgen-ray injury to a human fetus. The case is that of an imbecile boy with an unusually small head, sunken and nearly blind eyes, and occasional convulsions. The otherwise healthy mother, at 37, was given deep roentgen-ray treatment for myoma of the

108. J. A. M. A. **75**:888 (Sept. 25) 1920.

109. Schwarz, H.: Infant and Child Mortality, Including Miscarriages and Still Births, *Am. J. Dis. Child.* **19**:249 (March) 1920.

110. Aschenheim, E.: Roentgen-Ray Injury of Human Fetus. *Arch. f. Kindrh.* **68**:131, 1920.

uterus, and conception must have occurred about a month before the treatment was begun.

Baldwin¹¹¹ describes the anomalies produced by exposure of the protoplasm of frog's eggs to roentgen rays.

Cerebral Hemorrhage.—It has been known that cerebral hemorrhage in the new-born may be a cause of infantile death and spastic paraplegia in those who survive.¹¹² It has also been suspected that symptomless and probably lesser degrees of meningeal bleeding are quite common. Recently, however, Rodda¹¹³ reports from statistics of the New-Born Clinic of the University of Minnesota that post-mortem examinations reveal cerebral hemorrhage in more than 50 per cent. of all infants that die intrapartum or during the first few days of life. It was notable that these findings were often made following noninstrumental or even easy deliveries. They were especially frequent following breech presentations and in premature births. The factor of asphyxia neonatorum was not always present. It was further noted that at necropsy the blood was often found only slightly coagulated or even fluid.

Seitz's studies on frozen sections of the skull are cited in support of a view that the massive hemorrhages in the still-born or in infants that die in the first hours of life result from the rupture of large veins, sinuses or tears of the tentorium. There remain, however, the majority of cases of cerebral hemorrhage developing insidiously and not until several days after birth, causing symptoms of increasing intracranial pressure, convulsions and death. In these cases, necropsy revealed a large clot with a thick center, thin edges, usually unilateral, and covering the parietal area; and there was no demonstrable source of hemorrhage. Further examination revealed multiple hemorrhages throughout the body in locations where it was hard to conceive trauma from normal birth forces or obstetric procedures.

Rodda¹¹⁴ finds the explanation of these cases in a delayed coagulation time for the blood, hemorrhagic disease. With his method he finds that the average coagulation time in the normal new-born is seven minutes, with a normal range of from five to nine minutes; the aver-

111. Baldwin, W. M.: Artificial Production of Monsters Demonstrating Localized Defects as Result of Injury from Roentgen Rays, *Am. J. Physiol.* **52**:296, 1920.

112. McNutt, L. J.: Double Infantile Spastic Hemiplegia, with the Report of a Case, *Am. J. M. Sc.* **89**:58, 1886. Intracranial Hemorrhage in Children, *New York M. J.* **41**:104, 1885.

113. Rodda, F. C.: The Coagulation Time of Blood in the New-Born, with Especial Reference to Cerebral Hemorrhage, *J. A. M. A.* **25**:452 (Aug. 15) 1920.

114. Rodda, F. C.: Studies with a New Method for Determining the Coagulation time of the Blood in the New-Born, *Am. J. Dis. Child.* **19**:269 (March) 1920.

age bleeding time, with Duke's method, is from three to three and one-half minutes, with a normal range of from two to five minutes. There is a prolongation of coagulation and bleeding times from the first to the maximum on the fifth day of life, with a return to the average first day determination before the tenth day.

It is significant that this coincides with the age incidence of hemorrhagic disease and cerebral hemorrhage, and evidences of hemorrhage appeared when a prolonged bleeding time accompanied a delayed coagulation time. Therefore, Rodda concludes that a more frequent cause of cerebral hemorrhage is mild trauma plus hemorrhagic disease of the new-born, accompanied by findings of delayed coagulation time and prolonged bleeding time.

The latter evils can be controlled by the subcutaneous injection of whole blood. In severe cases surgery should be employed early. Routine blood examination of the new-born, or at least of those presenting unusual symptoms, is advocated. (This is advocated also by Foote.¹¹⁵)

Sinus Thrombosis.—Hamburger¹¹⁶ analyses twenty-six cases of sinus thrombosis in young children. All were under 4 months of age, the youngest being 11 days old. Sinus thrombosis usually developed so insidiously during the course of a general infection as to be a surprise at necropsy. Symptomatic convulsions and signs of encephalitis reveal the bacterial invasion of the brain. In a few cases, there was stasis in the peripheral veins, with edema in the face and head. Somnolency and cerebral vomiting were not characteristic.

Miscellaneous Lesions.—An instance of aneurysm of the ascending arch of the aorta in a boy, aged 13 years, reported by Heiman.¹¹⁷ The study is a clinical one, but is illustrated by photographs tracings and roentgen-ray findings.

Holt¹¹⁸ reports the occurrence of primary sarcoma of the thymus in a child aged 6 months. The case was regarded as one of severe secondary anemia, with symptoms dating back only four weeks, and consisting of palor and slight fever. The child presented none of the symptoms attributed to enlargement of the thymus. At necropsy, a sarcomatous thymus weighing 36 gm. was found, also lesions of a similar nature in a lymph node, in the spleen and in the lungs.

115. Foote, J. A.: Hemorrhagic Tendency as Frequent Cause of Cranial hemorrhage of New-Born, *Am. J. Dis. Child.* **20**:18 (July) 1920.

116. Hamburger, R.: Vascular Thrombosis in Young Children. *Jahrb. f. Kinderh.* **91**:439, 1920.

117. Heiman, H.: Aneurysm of the Ascending Arch of the Aorta in a Boy of Thirteen. *Arch. Pediat.* **36**:543, 1913.

118. Holt, L. E.: Primary Sarcoma of Thymus. *Proc. Am. Pediat. Soc.* 1920.

The general subject of abscess of the lungs in infants and children has been studied by Wersler and Schwarz,¹¹⁹ and the presence of foreign bodies in the lungs by Graham.¹²⁰

An instance of liver abscess in an infant 1½ years old is reported by Carvallo.¹²¹ The child had symptoms of chronic dysentery and an abscess in the liver and right lower lobe. This was evacuated after resection of two costal cartilages, and the child recovered under emetin treatment.

A case of hepatoma in an infant is reported by Wollstein and Mixall.¹²²

Tull and Alam¹²³ report the occurrence of a lipoma in the breast of a girl, aged 11 years. It weight 51 pounds.

An instance of carcinoma of the ovary in a girl 11 years old is reported by Ridout.¹²⁴

Septicemias.—Dwyer¹²⁵ reports a case of gonococcemia in a female child, aged 23 months, with malignant endocarditis and a metastatic abscess in the sacral region. The causative organisms were recovered from the blood, and also, apparently, from the vagina and the abscess. The cardiac lesions were confined to the mitral valve. On the free border of each cusp there were greenish-yellow cauliflower vegetations. The posterior cusp was perforated, the circular opening measuring 6 mm. in diameter. The edges of the perforation were bordered with the vegetation.

The case is reported because of the age of the patient, ulcerative endocarditis being uncommon under 5 years, and because of the superficial abscess in the lumbar region of gonococcic origin. Dwyer refers to the series of cases of endocarditis in children assembled by Gilbert (197 cases), Satterwaite (100 cases) and Dunn (304 cases), and states that streptococcus ulcerative endocarditis has been reported in an infant aged 6 months, that Huber has recovered *Streptococcus attenuans* in an infant 1 year old with endocarditis, and that *Streptococcus viridans* is the common offender in "rheumatic" endocarditis and in

119. Wersler, H. and Schwarz, H.: Abscess of the Lungs in Infants and Children, Am. J. Dis. Child. **19**:137 (Feb.) 1920.

120. Graham, E. E.: Foreign Bodies in the Air and Food Passages. Am. J. Dis. Child. **19**:119 (Feb.) 1920.

121. Carvallo, C. J.: Dysenteric Abscess in Infant, Crón. méd., Lima **37**:208, 1920.

122. Wollstein, M. and Mixall, H. R.: Report of Case of Hepatoma in an Infant, Arch. Pediat. **36**:268, 1919.

123. Tull, J. C. and Alam, M.: Large Lipoma in Child. Indian M. Gaz. **55**:299, 1920.

124. Ridout, E. A. S.: Primary Carcinoma of Ovary at Age of 11. Brit. M. J. **2**:380, 1919.

125. Dwyer, H. L.: Malignant Endocardites and Metastatic Abscess in Gonococcemia, etc., J. A. M. A. **75**:1643 (Dec. 11) 1920.

those cases termed slow endocarditis or endocarditis lenta. In the three series only one case was found to be due to the gonococcus.

An instance of *Staphylococcus aureus* septicemia and endocarditis in a boy 11 years old is reported from the Children's Department of the University of California Medical School.¹²⁶

Other than for an attack of moderately severe tonsillitis eight months earlier, his history was essentially negative, except that four weeks before admission he had fallen, and injured his right knee over the patella. An abscess had formed and two weeks later been incised and drained, apparently healing well. Coincidentally, however, there developed malaise and listlessness. Four days before admission, fever and precordial pain were first noted, and two days later dyspnea became pronounced. A rough systolic murmur was present, and a pericardial friction rub. The roentgen ray showed a pericardial effusion. Cultures from the nose, throat and blood yielded *Staphylococcus aureus*, as did the cultures from serofibrinous fluid withdrawn in pericardial puncture. Decompensation soon set in and death followed.

Necropsy showed a heart weighing 240 gm., and covered with a tough grayish-yellow membrane. On section, the myocardium was dark red in color but showed no macroscopic evidence of general myocarditis. The valves were normal. One centimeter beneath the right cusp of the tricuspid valve was a small slightly elevated yellowish area extending from the endocardium. This was found to be the apex of a funnel-shaped abscess extending in the direction of the aortic semilunar valve. The aorta presented a number of yellow atheromatous patches in the ascending and transverse portions of the arch. There were pyemic abscesses in the kidneys.

Brennemann¹²⁷ discusses the evidence and significance of rheumatic nodules in children.

Meuron¹²⁸ reports a case of erythema nodosum and acute endocarditis in a boy, aged 8 years.

Scurvy.—Infantile scurvy is the subject of two papers by Comby.¹²⁹

Scorbutic beading of the ribs is discussed by Hess and Unger.¹³⁰ An instance of cerebral hemorrhage in scurvy is reported by Sammis,¹³¹ and an instance of scorbutic hematuria by Eaton.¹³²

126. Case Histories from the Children's Department University of California Medical School and Hospitals. California State J. M. 1920.

127. Brennemann, J.: The Incidence and Significance of the Rheumatic Nodules in Children. Am. J. Dis. Child. **18**:179 (Sept.) 1919.

128. Meuron, D. Erythema Nodosum and Acute Endocarditis in a Boy of Eight. Arch. de méd. d. enf. **22**:428, 1919.

129. Comby, J.: Infantile Scurvy. Arch. de méd. d. enf. **22**:225, 281, 1919.

130. Hess, Alfred F. and Unger, Lester J.: Scorbutic Beading of the Ribs; Am. J. Dis. Child. **19**:331 (May) 1920.

131. Sammis, J. F.: A Case of Scurvy with Cerebral Hemorrhage, Arch. Pediat. **36**:274, 1919.

132. Eaton, P. J.: Arch. Pediat. **36**:358, 1919.

Megacolon.—A paper by A. E. Meyers¹³³ deals with dilatation of the colon in children, and Kerley¹³⁴ contributes a paper on roentgen-ray demonstration of abnormalities of the gastro-intestinal tract in children. Casati's¹³⁵ experience would indicate that megacolon may be more common than is generally realized, but escapes detection unless it becomes obstructed. He reports cases (one in a child) in which the weight of the feces had dragged the colon down farther and farther until the sigmoid loop had been kinked and total obstruction resulted. The obstruction was overcome at once by raising the foot of the bed quite high so that the pelvis sloped sharply down toward the shoulders, the weight then dragged down the other way, unkinking the loop. Almost immediately, the contents of the megacolon were expelled with great force, thus confirming the correctness of the explanation. The rectum earlier had been found empty, but through its wall could be palpated the mass of the distended colon.

Magliani¹³⁶ describes Francioni's method of treating congenital megacolon in children by introducing a long flexible tube into the rectum. This overcomes the kink, which is assumed to be due to the sigmoid loop being unusually long or for some reason getting kinked or otherwise occluded. By allowing for the escape of gases and feces, the immediate disturbance is corrected and opportunity given for the anomaly to be outgrown. Magliani leaves the tube in place for a number of hours (up to thirty-six hours) and reintroduces it at intervals of four or five days, or oftener, as the symptoms develop.

In two cases which are reported in detail—an infant of 19 days, and a child of nearly 3 years—the tube seemed to meet an obstacle past which it had to be worked. A few days treatment sufficed for the infant, but in the older child treatment had to be kept up intermittently for several months.

Porter, Morris and Meyer¹³⁷ discuss certain nutritional disorders of children which are found associated with a putrefactive intestinal flora.

Intestinal Parasites.—DeBuys and Dwyer¹³⁸ have studied the per-

133. Meyers, A. E.: Dilatation of the Colon in Children; *Am. J. Dis. Child.* **19**:167 (March) 1920.

134. Kerley, C. G.: Roentgen-Ray Demonstration of Abnormalities of the Gastro-Intestinal Tract in Children, *Am. J. Dis. Child.* **19**:277 (April) 1920.

135. Casati, E.: Item from Megacolon, *Policlinico* **27**:699, 1920.

136. Magliani, I.: Treatment of Congenital Megacolon, *Riv. d. clin. Pediat.* **18**:321, 1920.

137. Porter, L.; Morris, G. B. and Meyer, K. F.: Certain Nutritional Disorders of Children Associated with a putrefactive Flora, *Am. J. Dis. Child.* **18**:254 (Oct.) 1919.

138. DeBuys, L. R., and Dwyer, H. L.: Study of the Stools in Children's Institutions Showing the Incidence of Intestinal Parasitic Infection, *Am. J. Dis. Child.* **18**:269 (Oct.) 1919.

centages of intestinal parasitic infection in children of Southern institutions.

An instance of migration of a round worm into the ear is reported by Coussieu.¹³⁹

Ascaris as a cause of pulmonary disease was discussed by Ransom¹⁴⁰ last year.

Syphilis.—The subject of prenatal syphilis is considered by Kolmer.¹⁴¹ He cites Vedder's estimate that from 10 to 28 per cent. of men from the class of unskilled labor and the trades, varying in age from 18 to 40 years, are syphilitic, as well as 10 per cent. of men of better education. He also states that among presumably healthy young women the percentage of syphilitic infections fluctuates between 2 and 20 per cent., depending on age, marital condition, education and social status, the percentage of infection increasing as one descends in the social scale. The incidence in negroes is estimated to be at least double the figure for whites.

Probably one miscarriage out of every ten involves a syphilitic individual. According to Jeans,¹⁴² at least 75 per cent. of the offspring of syphilitic families are infected. Thirty per cent. of the pregnancies terminate in death at or before term. Moreover, among syphilitic children the death rate is given as about double the normal, i. e., 30 per cent. It is estimated that only about 17 per cent. of all pregnancies in syphilitic families result in living nonsyphilitic children that survive the period of infancy.

It is found that from 2 to 6 per cent. of hospital and dispensary children give a positive Wassermann reaction, with higher percentages among backward, mentally deficient and sick children. Kolmer says it would seem safe to assume 5 per cent. of syphilis in the infant population, so far as detectable.

Cerebral involvement in hereditary syphilis was considered by Jeans a year ago.

Tuberculosis.—Austin¹⁴³ discusses the occurrence of tubercle bacilli in the tonsils of clinically nontuberculous children.

139. Coussieu, H.: Migration of a Round Worm into the Ear. *Rev. de Laryngologie, d'Otologie et de Rhinologie* **39**:358, 1918. *Abst. in Archiv. Pediat.* **36**:289, 1919.

140. Ransom, B. H.: *Ascaris* as a Cause of Pulmonary Disease, *J. A. M. A.* **73**:1210 (Oct. 18) 1919.

141. Kolmer, J. A.: Prenatal Syphilis, with a plea for its Study and Prevention, *Am. J. Dis. Child.* **19**:344 (May) 1920.

142. Jeans, P. C.: Cerebral Involvement in Hereditary Syphilis, *Am. J. Dis. Child.* **18**:173 (Sept.) 1919.

143. Austin, R. S.: *Bacillus Tuberculosis* in the Tonsils of Children Clinically Nontuberculous, *Am. J. Dis. Child.* **18**:14 (July) 1919.

Opie and Anderson,¹⁴⁴ in an article on the mode of infection with tuberculosis, state that tuberculous meningitis has been followed by recovery, with calcification of those meningeal tubercles which have undergone caseation. The point is emphasized that, in general, the distinction between latent and clinical tuberculosis, which is not infrequently made, has no other basis than the limitations of diagnostic methods, and the tendency of tuberculosis is to proceed to recovery.

The occurrence of a tuberculoma the size of a hickory nut in the midbrain of a child aged 3 years, is reported by Knox.¹⁴⁵ The symptoms were present for three months before death. The child gradually developed bilateral ptosis, partial paralysis of the ocular muscles, and a coarse tremor followed by ataxia. The mass involved corpora quadrigemina and occluded the aqueduct of Sylvius.

An instance of congenital tumor of the brain (telangiectasis) is reported by Spiller.¹⁴⁶

Amyotomia, etc.—Swanberg and Haynes¹⁴⁷ report a case of mongolism in one of twins.

Starck¹⁴⁸ reports the interesting occurrence of apparent sex incidence in Tay-Sacks amaurotic family idiocy. In a nobleman's family in which the parents were apparently healthy, living in easy circumstances, and without history of Jewish ancestry, the first and fourth child—both girls—had died of the disease at 12 months. The second and third children, boys aged 12 and 10 years, respectively, developed normally and showed no signs of the disease. The fifth child, a girl, was 1 year old when seen by Starck, and seemed likely soon to die.

An unusual number of cases of amyotonia congenita (Oppenheim) are reported by Pearce,¹⁴⁹ the second and third and the fourth and fifth are believed to be the first authentic instances reported of twins suffering from the disease. In the only other instance of this found in the literature, one of the two infants died intrapartum. Krabbe¹⁵⁰ reports six cases in which the disease clinically closely resembled amyotonia congenita, and only later information showed it was a familial disease. He says that according to the original description, amyotonia congenita seems to be a rather benign and not an hereditary disease, and

144. Opie, E. L. and Anderson, H.: First Infection with Tuberculosis by Way of Lungs, *Am. Rev. Tuberc.* **4**:629, 1920.

145. Knox, J. H. M.: Lesions of the Midbrain, *Am. J. Dis. Child.* **20**:436 (Nov.) 1920.

146. Spiller, W. G.: Congenital Tumor of Brain (Telangiectasis) and Associated Cerebral Movements, *Arch. Neurol. & Psychiat.* **2**:50 (July) 1919.

147. Swanberg, H., and Haynes, H. A.: Case of Mongolism in One of Twins, *Arch. Neurol. & Psychiat.* **1**:717 (June) 1919.

148. Starck: Amaurotic Family Idiocy, *Monatschr. f. Kinderh.* **18**:139, 1920.

149. Pearce, N. O.: Amyotonia Congenita, *Am. J. Dis. Child.* **20**:393 (Nov.) 1920.

150. Krabbe, K. H.: Congenital Familial Spinal Muscular Atrophies and Their Relation to Amyotonia Congenita, *Brain* **43**:166, 1920.

does not seem to leave any defects in adults. In eight of eleven cases which have come to necropsy there have been severe atrophies of the anterior horn cells and muscles. In two of his cases of hereditary congenital muscular atrophy corresponding changes were seen—changes that resemble, on the whole, the changes in Werdnig-Hoffmann's progressive muscular atrophy.

The case described by Holmes¹⁵¹ conformed clinically in all essential details to the condition known as amyotonia congenita (Oppenheim). The disease, however, was present at birth; there was no lasting amelioration, and the child died of the usual pulmonary complications at the age of 18 weeks. The spinal cord was relatively large for the age of the child; the contour of the cord in cross section was not altered; the anterior roots were diminished in size as compared with the posterior roots. Myelination was normal, and the cells of Clarke's column were of normal size and well preserved. The large (motor) cells of the anterior horns were strikingly few in number and, in part, replaced by much smaller but apparently healthy looking cells. There was no microscopic evidence of any acute, or chronic, inflammatory process, nor of recent degeneration. There was no gliosis.

In the muscles, areas (bundles) of hypertrophied, but otherwise normal, muscle fibers were intermingled with areas of very small muscle fibers that appeared less fully developed and in appearance resembled most closely embryonic muscle cells of the third month. There was no increase of connective tissue, nor evidence of replacement of muscle by adipose tissue.

The histopathologic findings seemed best explained on the assumption of a delayed or retarded embryonic development affecting certain motor cells of the anterior horns and certain groups of developing muscle cells (fibers).

Pearce's first case is of interest because of the classical symptomatology and the results of the exhaustive metabolism study that was carried out. The following findings and deductions were made: (1) a lowered creatinin excretion, in addition to the excretion of creatin on a low protein diet; (2) a normal uric acid excretion; therefore no nucleoprotein broken down; (3) an increased rest nitrogen, accompanied by an increased neutral sulphur; (4) a normal phosphorus excretion; therefore no bone disintegration, and (5) a lowered chlorid excretion.

From a review of the literature and of their own case, Hueneckens and Bell¹⁵² believe the conclusion justified that amyotonia congenita

151. Holmes, J. B.: Amyotonia Congenita (Oppenheim) Report of a Case With Full Histopathologic Examination, *Am. J. Dis. Child.* **20**:405 (Dec.) 1920.

152. Hueneckens, E. J. and Bell, E. T.: Infantile Spinal Progressive Muscular Atrophy (Werdnig-Hoffmann); Report of a Case with Necropsy Findings, *Am. J. Dis. Child.* **20**:496 (Dec.) 1920.

(Oppenheim) and infantile spinal progressive muscular atrophy (Werdnig-Hoffmann) are extreme types of the same disease—a view presented some years ago by Spiller; also that they are probably both related to the group of myopathies represented by Erb's juvenile form of muscular dystrophy and the hereditary form of Leyden and Moebius.¹⁵³

Haushatter reports three more cases of amyotonia. In his second case the child, up to the age of 4, had remained flabby and inert, keeping any position in which he was placed. He then underwent a rapid transformation; he gradually learned to walk, to carry things to his mouth, to get up from the floor, and to dress himself. At 5 he rapidly learned to talk. At 11 he was in classes with boys of his age, and did not seem their inferior mentally. His body was well proportioned, but there was a diffuse, generalized muscular atrophy. In spite of this, he could walk and run.

The Skin in Measles.—Mallory and Medlar¹⁵⁴ describe in detail the findings in the skin lesions of measles as shown in small pieces of skin removed from thirty-five patients. They consider these lesions as being of infectious origin because of their focal character and lack of uniformity in distribution, and as being due to the causal agent of the disease. They find that the endothelial cells lining the capillaries in the earliest lesions often contain from one to four, rarely more, minute, intensely staining, spherical bodies which vary a little in size. In older lesions the bodies are fewer in number and usually more evident at the periphery of the lesion. Later they disappear entirely. It is suggested that these bodies may be the causal agent; possibly a coccus in various stages of digestion. They react positively to the Gram stain. Study of the nasal, pharyngeal, laryngeal and conjunctival secretions, and of the blood in several preparations by dark field illumination and by culture in various mediums, failed to show any micro-organisms which seemed to bear any etiologic relationship to the disease. Study of the endothelial cells lining the capillaries in other acute lesions examined for purposes of control did not reveal similar spherical bodies.

"The Cambridge," Charles Street at Thirty-Fourth.

153. Haushatter, P.: Amyotonia Congenita, Arch. de méd. d. enf. **23**:133, 1920.

154. Mallory, F. B. and Medlar, E. M.: Skin Lesion in Measles, J. M. Research **41**:327, 1920.