

PROGRESS IN PEDIATRICS

RÉSUMÉ OF LITERATURE (1920) ON TUBERCULOSIS IN CHILDREN *

MAY MICHAEL, M.D.
CHICAGO

MODE OF INFECTION

J. W. ALLAN¹ is of the opinion that antenatal tuberculosis is more common than is generally believed and that many children are born with "seeds" of the disease lying latent which at a later period of life give rise to manifest tuberculosis. He thinks the placenta offers the most likely portal of entry for the tubercle bacillus, and quotes Bonny, who says that, despite the normal appearance of the fetal organ and of the placenta, tuberculosis has resulted from inoculation of animals with portions of these tissues and with blood from the placental circulation. Allan thinks that to account for the subsequent development of tuberculosis in the animals inoculated these apparently healthy tissues must have contained some "seed" or inverted form of the tubercle bacillus.

M. DUBOIS² adds the report of a case of intrauterine tuberculous infection to those already found in the literature. A woman suffering from miliary tuberculosis gave birth, prematurely, to a child. Forty-two days later she died and necropsy showed, besides the miliary tuberculosis, an old caseous tuberculosis of the left tube, of the endometrium, and a diffuse tuberculous peritonitis. The miliary tuberculosis originated either from a large tubercle in the right renal vein or from caseated tubercles found in the wall of the small uterine vessels.

The child, removed at once from the mother, developed poorly and died on the fifty-fourth day. The necropsy showed an old softened lesion in the right upper lobe with caseation of the right bronchial lymph glands, as well as a generalized miliary tuberculosis. The finding in the mother of a tuberculosis of the endometrium, which involved the site of the placenta and the age of the pulmonary and bronchial gland tubercles speak for an intrauterine infection either of hematogenous origin or due to aspiration of the amniotic fluid. The author

* Received for publication Dec. 10, 1921.

1. Allan, J. W.: Prenatal Tuberculosis, Glasgow M. J. 93:1 (Jan.) 1920.

2. Dubois, M.: Intrauterine Tuberculous Infection, Schweiz. med. Wchnschr. 50:772 (Aug. 26) 1920.

thinks the latter more probable because of the presence of the oldest lesions in the lung of the child and the findings in the uterus of the mother.

BACTERIOLOGY

A. STANLEY GRIFFITH³ has tried to ascertain the relative proportion of the human and the bovine types of tubercle bacilli in different kinds of human tuberculosis. Of twelve cases of tuberculous meningitis, ten were caused by the tubercle bacillus of the human type and two by that of the bovine type. In one instance the cow's milk supplied to the patient was found to contain virulent tubercle bacilli, indistinguishable in cultural characteristics with the strain from the meninges of the child.

Of seventeen cases of phthisis, sixteen were caused by the human bacillus and one by the form of bacillus recently found in various kinds of human tuberculosis and in one case of simian tuberculosis. Of twelve miscellaneous cases (three of bone and joint tuberculosis, eight of glandular tuberculosis, one of intermuscular abscess) nine were caused by the human type of bacillus, two by the bovine type, and one by a type which resembled the bovine but differed slightly in cultural characteristics and virulence.

From sixty cases of scrofuloderma, fifty-two cultures of the tubercle bacilli were obtained. Of these, sixteen showed the bovine type of bacillus, four a type less virulent than the ordinary bovine bacillus, and thirty-two the common human type.

The author reports that in England 1,068 cases of tuberculosis have been examined for the type of tubercle bacillus, 803 showed the human type, 194 the bovine, and five a mixed type.

N. NOVICK⁴ has studied the incidence of bovine infection in tuberculous meningitis. He quotes Park and Krumwiede, who found 15 per cent. of bovine infection in tuberculous meningitis among 1,000 cases of all forms of tuberculosis, and Rosenau, who analyzed 1,040 cases of tuberculous meningitis, which included those of Park and Krumwiede. Rosenau's figures were as follows: Among 685 patients 16 years of age or over, with tuberculous meningitis, nine, or 1.3 per cent., showed the bovine type of bacillus; among 132 patients between 5 and 16 years of age, thirty-three, or 25 per cent., showed the bovine type; among 120 patients under 5 years of age, fifty-nine, or 49 per cent., showed the bovine type. The striking feature of these figures is the alarming percentage of the bovine infection in children under 5 years. Undoubtedly this is due to the facts that milk, which is the probable

3. Griffith, A. S.: The Bacteriologic Characteristics of Tubercle Bacilli from Different Kinds of Human Tuberculosis, *J. Path. & Bacteriol.* **23**:129 (Feb.) 1920.

4. Novick, N.: Incidence of Bovine Infection in Tuberculous Meningitis, *J. M. Research* **41**:239 (Jan.) 1920.

means of transmitting the tubercle bacillus, is the chief element in the diet of children and that the bovine bacillus is much more virulent in children.

The author's series consisted of forty-eight cases of tuberculous meningitis; two were in adults and forty-six were in children of from 4 months to 16 years. Forty-eight strains of tubercle bacilli were isolated from the cerebrospinal fluid in these cases and only three proved to be of the bovine type. One of the bovine strains was isolated from a case of meningitis in a baby 22 months old, one in a 6 year old child and one in a 16 year old patient.

SYMPTOMATOLOGY

J. V. COOKE and T. C. HEMPLEMANN⁵ believe that many children are infected with the tubercle bacillus and for a variable length of time harbor somewhere in their bodies a pathologically active tuberculous focus, which may be unsuspected. To this form is applied the term masked juvenile tuberculosis. The authors think that masked juvenile tuberculosis presents a sufficiently distinct clinical type to deserve a prominent place in the category of tuberculous affections in childhood. The clinical picture may be sketched as follows: A history of frequent coughs and colds with or without known exposure to tuberculosis; attacks of unexplained fever, often with afternoon elevations; anorexia; loss of weight, and asthenia. On examination there is found malnutrition, occasionally anemia, and signs in the chest referable to enlarged tracheobronchial nodes. In some instances there may be phlyctenular disease or skin tuberculids. The Pirquet or intracutaneous tuberculin test is positive and three-fourths of the children over 4 years of age give a positive complement fixation test for tuberculosis. The chest findings may be verified by the roentgen ray, which not infrequently reveals also unsuspected lesions of varying size and age in the lung parenchyma. The diagnosis must rest on a review of all findings, but the authors emphasize the value of the complement fixation test in calling attention to this class of cases. As to the fate of children with marked tuberculosis, three possibilities suggest themselves. By far the commonest is regression of the lesion with recovery, and the authors are of the opinion that these relatively harmless lesions may stimulate the body to produce certain protective substances against future infections. A second outcome is the development of a more manifest tuberculosis through extension of the process. And the third is the persistence of the marked lesions to adult life with a possible later development of active tuberculosis.

5. Cooke, J. V., and Hemplemann, T. C.: Masked Juvenile Tuberculosis, *Am. Rev. Tuberc.* 4:660 (Nov.) 1920.

Cooke and Hemplemann believe that the recognition of this marked form of tuberculosis is a matter of the greatest importance, because the inauguration of an antituberculosis regime results usually in a reasonably good chance of recovery.

P. ARMAND DE LILLE⁶ describes the evolution of tuberculosis in older children. If the infection is not a massive one, the onset is very insidious and the disease becomes manifest only after an infectious disease or an indoor winter life, which lowers the resistance and suppresses the formation of antibodies. There then develop fatigue, stationary weight or loss of weight, listlessness, anorexia, and usually an evening rise in temperature. The child, however, does not appear to be ill. After several weeks these symptoms disappear, but the Pirquet test, previously negative, is found to be positive. At this stage physical and roentgen-ray examination reveal enlarged glands in the tracheo-bronchial region. If the child's resistance is sufficient, the disease then remains latent until adult life, when the glands gradually diminish in size and sclerose. If, however, the resistance is not great enough to overcome the infection, the second stage of generalization, namely, a miliary tuberculosis, results. The clinical symptoms then depend on the degree of generalization. If widespread, there is high temperature, rapid pulse, emaciation, lassitude, without signs of localization, which last from ten to twenty days, when signs of pulmonary or meningeal involvement appear. If the tubercles are very discrete there may be prolonged fever without localized signs, the "typho-bacillose" of Landouzy; there may be only a single localization, as a pleuritis, peritonitis or joint effusion. Sometimes only a few tubercles are scattered in various organs, where they become sclerosed or resorbed or develop into local tuberculous foci.

NOBECOURT and PARAF⁷ believe that chronic pulmonary tuberculosis in children may have an acute rapid onset or a slow progressive one. In cases with an acute onset there are general symptoms, as fever, emaciation, weakness, anorexia; functional signs, as slight dyspnea, a dry cough, or a paroxysmal cough, like whooping cough. The physical signs depend on whether the lesion is a tracheobronchial adenopathy or a dry pleurisy located at the apex, in the fissures, or at the hilus.

Cases with a slow progressive course occur usually at puberty. The symptoms are those of an active tuberculosis, emaciation, fatigue, pallor, anorexia, digestive disturbances, tachycardia and arterial hypo-

6. Armand-de Lille, P.: Tuberculosis in Older Children, *Bull. méd. Par.* **34**:999 (Nov. 13) 1920.

7. Nobecourt and Paraf: Chronic Pulmonary Tuberculosis in Older Children, *Rev. de la Tuberc.* **1**:329, 1920.

tension. The physical signs are difficult to detect and to interpret. A normal resonance at the apex may be accompanied by a feeble or rough low pitched respiration. Feeble respirations are not characteristic and may be due to imperfect nasal breathing, tracheobronchial adenopathy, an old pleurisy, cardiac disease or an asymmetrical thorax. The first valuable signs at the apex are impaired resonance, increased resistance, prolonged expiration and exaggerated voice sounds. A prolonged blowing expiration is corroborative evidence. Enlarged tracheobronchial glands, however, can cause an atelectasis and congestion of the apex and can simulate a tuberculous process. The roentgen ray is an important aid in differentiation.

H. ELIASBERG and W. NEULAND⁸ have studied a condition found occasionally in the lungs of tuberculous children, which they term "epituberculous infiltration." Clinically, children with this condition are pale and emaciated; they cough, have no appetite, and frequently have a slight temperature. These symptoms come on gradually. Physical examination reveals a massive dulness of an entire lobe, usually one of the upper lobes, with bronchial breathing but no râles—findings out of all proportion to the slight general disturbance. The sputum does not contain tubercle bacilli; but all these patients show a positive Pirquet reaction. Often there are other evidences of tuberculosis, as fistulae, tuberculous glands or tuberculids. There is usually a family history of tuberculosis. The disease runs a benign course; the symptoms disappear and the infiltration is gradually absorbed, until in the course of months it has disappeared entirely. No evidences of contraction of the lung, as drawing in of the thorax, displacement of the heart or mediastinum, or bronchiectasis, accompany resolution.

The authors believe the condition to be a chronic, nonspecific infiltration, with a simultaneous tuberculous infection and that it must be differentiated from the gelatinous infiltration of Laennec, the chronic bronchopneumonias, which follow whooping cough and influenza, especially when accompanied with a pleural exudate, foreign bodies, stasis, open ductus botalli, and, in young children, a persistent thymus.

As the infiltration ultimately subsides, no treatment is necessary beyond measures to promote resolution and absorption.

A. WOLFF-EISNER⁹ believes that in tuberculous individuals exudative manifestations appear frequently and that there is a hypersensi-

8. Eliasberg, H. and Neuland, W.: Epituberculous Infiltration of the Lung in Children, *Jahrb. f. Kinderh.* **93**:88, 1920.

9. Wolff-Eisner, A.: The Relation between Tuberculous Infection and Constitutional Diathesis, *München med. Wchnschr.* **67**:93 (Jan. 23) 1920.

tiveness not only to the specific proteid of the tubercle bacillus but also to other proteids (nuclein, albumoses, etc.). In tuberculous children variations in the normal electrical reactions also occur frequently. He thinks manifestations of exudative diathesis and spasmophilia are due not only to nutritional disturbances and absorption of toxins from the intestine but also to the absorption of foreign proteids from any source, hence they are evidences of hypersensitiveness or anaphylaxis.

A. WOLFF-EISNER¹⁰ has made a further study of the nervous excitability in tuberculous children. He thinks that if there is any relation between tuberculosis and the exudative and spasmophilic diathesis the electrical reactions in these conditions should be analogous. The electrical reactions of fifty-two children suffering from osseous tuberculosis were taken. As they were all between 6 and 14 years of age, there were no signs of spasmophilia. The results were interesting. The electrical reactions varied from the normal but were not characteristic of those of the exudative and spasmophilic diatheses, in that the A.C.C. was greater or equal to the C.C.C. Nevertheless, Wolff-Eisner believes these results shows a relation between tuberculosis and the diatheses of childhood.

C. MUNIGURRIA¹¹ reports a case of cardiotuberculous cirrhosis in a 6 year old boy. When seen by him, the child had been ill one year with pain in the extremities, fever, general weakness, insomnia, and loss of appetite. On examination there was dulness over the right apex, with bronchial breathing, pain over the sternum and arrhythmia. While under observation, the child developed a general edema, icterus, cyanosis of the extremities and dyspnea, with dulness and râles over the right base. The heart dulness was increased. The liver was enlarged and painful; the spleen was palpable. Death occurred six months after the first examination. Necropsy showed biliary ascites, tuberculosis of the mesentery glands, fatty degeneration of the liver, miliary tuberculosis of the lungs, tuberculous pericarditis with the pericardium adherent to the pleura and diaphragm. A large tubercle was found at the opening of the right ventricle.

R. SIMONINI¹² reports an instance of tubercle of the myocardium in an 18 month old infant. The tumor was the size of a nut, located on the outer side of the right auricle. It penetrated into the myocardium but not into the auricle.

10. Wolff-Eisner, A.: Changes in the Electrical Excitability in Tuberculosis of Childhood, *Beitr. z. Klin. d. Tuberk.* **45**:283 (Nov. 25) 1920.

11. Munigurria, C.: Cardio-Tuberculous Cirrhosis, *Abstr. Zentralbl. f. d. ges. Kinderh.* **9**:577 (Nov.) 1920.

12. Simonini, R.: A Report of a Large Tubercle of the Heart in an Eighteen Month Old Infant, *Abstr. Jahrb. f. Kinderh.* **94**:67, 1921.

T. H. and H. O. GUNWARDENE¹³ report a case of extensive primary tuberculosis of the heart in a 6 year old boy. The child died ten days after admission to the hospital. At necropsy both ventricles were hypertrophied and dilated. In the right ventricle, just above the attachment of the tricuspid valves, were two nodular masses about 1 c.mm. in diameter. Small isolated areas of firm, white tissue infiltrated the interauricular septum and the wall of the right auricle and the heart muscle at the root of the pulmonary vein. The visceral pericardium was completely adherent, but no tubercles could be seen. On section there was an indurated ulcer 1 cm. \times 1½ cm. in diameter. bacilli. Tuberculous lesions were not found by the naked eye in any of the other organs. The authors regard this as a case of primary tuberculosis of the myocardium. They found forty-one cases of tuberculosis of the myocardium reported in the literature but only one with a similar location and no other in which the disease was primary in the myocardium.

Under the name of hyperplastic tuberculosis of the small intestine J. RANSOHOFF¹⁴ describes a tuberculous process, which because of its chronicity permits of excessive effort at repair and assumes the guise of a neoplasm. In most cases the disease involves the cecum and terminal coils of the ileum, and is the primary localization of the tuberculosis.

The author's patient was a 9 year old girl, who had previously been operated on for tuberculous glands. For two or three years the patient had complained of colicky pains, which occurred four or five times a day, soon after taking food but which had no relation to bowel movements. The pain was localized in a small area, immediately to the left and slightly below the umbilicus. Examination of the abdomen showed a mass about the size of an apple in this location. At operation a growth was found at the lower end of the jejunum, which involved about seven inches of the intestine. The lymph glands of the mesentery were enlarged. About ten inches of the intestine was resected and recovery was uneventful.

The tumor mass was found to consist entirely of the intestinal wall. On section there was an indurated ulcer 1 cm. \times 1½ cm. in diameter. Microscopically, the tumor consisted of small round cells and polymorphonuclear cells; rarely a multinucleated giant cell occurred. In spite of the resemblance to a sarcoma, the author believes the growth to be tuberculous because of the history and the presence of the ulcer.

13. Gunewardene, T. H. and Gunewardene, H. A.: Extensive Primary Tuberculous Disease of the Heart, *Proc. Roy. Soc. Med. Lond. Sec. Dis. Child.* **13**:38 (March) 1920.

14. Ransohoff, J.: Hyperplastic Tuberculosis of the Small Intestine, *Ann. Surg.* **72**:196 (Aug.) 1920.

He considered, however, the possibility of a sarcomatous growth in primary tuberculous tissue.

J. H. M. KNOX¹⁵ reports a case of tuberculoma of the midbrain associated with tuberculous meningitis. The patient was a colored boy 3 years of age, who was taken to the hospital because of general weakness, trembling and drooping of the eyelids. The patient had appeared to be perfectly normal until six months before, when he stopped crying almost completely. Four months later it was noted that his hands shook when he fed himself. About the same time his eyes began to droop. On examination his general condition seemed excellent. The eyes showed the following: The pupils reacted to light, the left better than the right. There was a marked bilateral ptosis of the eyelids and a definite lateral deviation of the eyeballs to the right, also an occasional lateral nystagmus of the right eye. The child was sent home but returned for admission two weeks later, when a distinct paraplegia of both lower extremities was noted. The spinal fluid, obtained under a marked increase in pressure, gave a reaction for globulin, and contained an increased number of cells of the mononuclear type. The roentgen-ray examination of the head showed a moderate internal hydrocephalus and a probable tumor above the sella turcica. The Pirquet test was frankly positive. Ten days after admission a slight rigidity of the neck was noticed and from this time on the child grew constantly weaker. Drowsiness gradually deepened, general convulsions developed, and the boy died forty-two days after the first observation.

The acquired ptosis, the tremor of long standing, and the gradually developing external strabismus led Knox to venture the diagnosis of tumor of the midbrain interfering with the nuclei of the third and fourth cranial nerves. The positive Pirquet reaction and development of a meningitis toward the end suggested that the tumor was of tuberculous nature. This diagnosis was confirmed at necropsy when a solitary tubercle of midbrain and of the right parietal lobe, and a tuberculous meningitis were found.

H. KOCH¹⁶ is of the opinion that occasionally recovery takes place in cases of brain tubercle. He draws this conclusion from the study of three cases and from the review of the literature on the subject. His first case was a 5 year old girl who entered the hospital because of vomiting, ataxic gait and a positive Romberg's sign. While under observation there developed a marked tremor. The Pirquet reaction

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

16. Koch, H.: Contribution to the Etiology of Brain Tubercle, *Ztschr. f. Kinderh.* **24**:197 (Dec.) 1919.

was positive. The child remained in the hospital four months; on discharge all symptoms had disappeared, except the positive Romberg. The second case was that of a 9 year old child, who had for eight weeks attacks of dizziness and vomiting. Fourteen days before entering the hospital she became unconscious and developed a left sided paralysis. On entrance there was ataxic gait, a positive Romberg's sign, a paralysis of the left abducens nerve, and hyperesthesia of the left cornea. After seven months' observation the gait became normal and the child was discharged with no evidence of her illness, except the paralysis of the abducens nerve.

The third case was a 5 year old child, who was admitted to the hospital because of convulsions and muscular twitchings. The child was under observation for eleven months and the diagnosis of brain tubercle was based on the presence of irritative symptoms and a positive tuberculin test. At first the child showed no improvement and during an attack of measles had as many as twenty-three convulsions a day. Two weeks after the onset of the measles the convulsions subsided but recurred with greater severity about the fourth week. This period lasted fourteen days, when the convulsions ceased altogether. The author thinks that during the attack of measles there was a formation of miliary tubercles around the tuberculoma (he has seen this at necropsies) which caused the exacerbation of the convulsions. Their cessation was due to relief of pressure on nerves or blood vessels by absorption of inflammatory products or to the opening of the cerebro-spinal canal, which could have been obstructed by the inflammatory products.

Koch discusses the possibility of permanent cure and cites a few instances reported in the literature. Nevertheless, he believes the prognosis is usually unfavorable, chiefly because the tubercle is a metastatic tuberculous process and the prognosis depends upon the extent of the original disease and because, too, there is a tendency for patients with brain tubercles to develop tuberculous meningitis.

A. WAGNER¹⁷ reports a case of solitary tubercle of the spinal medulla in a 14 year old boy. For three weeks before entering the hospital he had complained of severe pain in the lumbar region and right leg, vomiting and headache. Examination on entrance showed marked pallor and emaciation, with tuberculous lesions on the lower extremities. There was tenderness over the spine and edema in the lumbar region. The Pirquet test was positive. The muscles of the right leg, especially those of the thigh and buttocks, were atrophic and paralyzed. There was a positive Babinski and Kernig's sign. Lumbar

17. Wagner, A.: Contribution to the Diagnosis of Solitary Tubercle of the Spinal Cord, *Ztschr. f. Kinderh.* **25**:322 (June) 1920.

puncture gave a slightly turbid fluid under pressure, with a positive Nonne and 240 cells to the cubic centimeter, only 8 per cent. of which were neutrophils, the remainder being polymorphnuclear cells. The clinical diagnosis was solitary tubercle of the brain; tuberculous meningitis; tuberculosis of the skin. The cause of the paralysis of the leg was undecided. The child died and necropsy showed old caseous tuberculosis of the bronchial glands, pulmonary tuberculosis, miliary tubercles of spleen, liver, and kidneys, multiple conglomerate tubercles in the brain, chronic internal hydrocephalus, and tuberculous ulcers in the colon. In the lumbar region of the cord was a cherry sized tubercle, which accounted for the paralysis of the right leg.

According to the writer, solitary tubercles of the spinal cord are rare. The disease usually begins with weakness, pain and paresthesias in the extremities; later there is a disturbance in temperature sense. Muscular atrophy and paralysis occur early. Compression myelitis and spinal syphilis are to be considered in differential diagnosis. Remissions and exacerbations of symptoms and the roentgen-ray finding of spinal caries speak for compression myelitis and a positive Wassermann reaction for syphilis.

SCHMINCKE¹⁸ reports a case of solitary tubercle in the cervical cord. The patient was an 8 month old child who for three months had lost weight and had cried continuously. The child did not attempt to sit up or to use the right arm. There was also less power in the right than in the left leg. While under observation, the child became apathetic and developed stiffness of the neck and general convulsions.

At necropsy there was found a disseminated caseous tuberculosis of the left upper lobe, caseous tuberculosis of the bifurcation and hilus glands, miliary tuberculosis of the liver, spleen and kidneys, tuberculous basilar meningitis. In the region of the cervical enlargement of the spinal cord the dura was adherent to the pia. The cervical enlargement was greater than normal, and on cross section there was found a caseous area, the size of a pea.

A. GENDRON¹⁹ reports three cases of erythema nodosum and one of a miliary eruption in children of a tuberculous family. The disease had a period of incubation of four days, in all of them, a period of invasion with the usual phenomena of infection, and a period of eruption of twelve days, followed by complete cure. Four months later one of the children developed a pleurisy. In one the roentgen ray showed an opaque zone near the fissure in the left lung and the other two children gave positive tuberculin reactions. These facts cause

18. Schmincke: A Case of Solitary Tubercle in the Cervical Cord, *Jahrb. f. Kinderh.* 92:407, 1920.

19. Gendron, A.: Erythema Nodosum and Tuberculosis, *Bull. et mém. Soc. méd. d. hôp. de Par.* 44:475 (March 26) 1920.

the writer to believe that the four children were already affected with tuberculosis, when they became ill with the erythema. He is of the opinion that tuberculosis creates a favorable ground for the development of erythema nodosum.

L. LAEDERICH and C. RICHTER²⁰ discuss the relation of erythema nodosum to tuberculosis. They believe clinical, biologic and bacteriologic studies point to a close connection between the two conditions. As regards clinical facts, erythema nodosum has often been observed in patients with open tuberculosis. It has appeared in persons apparently well but who soon after the attack develop signs of an acute tuberculosis; and it has appeared simultaneously with other manifestations of acute or subacute tuberculosis.

Biologic studies are very suggestive. Patients with erythema nodosum almost invariably give a positive tuberculin test. Injection of these patients with tuberculin causes the appearance of a nodule of erythema nodosum. Also often in tuberculous patients an intradermal injection of tuberculin will cause the appearance of the large red nodules of erythema nodosum.

In experimental animals the bacillus of Koch has been found in the blood during an attack of erythema nodosum and a number of observers have reported finding this organism in the lesions. Although the writers do not think that all cases of erythema nodosum are of tuberculous origin, they conclude from the facts they observed that tuberculosis is an important factor in the etiology.

E. WARD²¹ is of the opinion that erythema nodosum is a toxic manifestation of many different conditions, one of which is tuberculosis. That the occurrence of erythema nodosum and tuberculosis is not merely a coincidence is proved by the fact that erythema nodosum has been known to occur after an injection of tuberculin. The author has noticed the appearance of erythema in tuberculous patients, when a chronic condition becomes more acute and when the symptoms of tuberculosis first become noticeable in a patient under observation as a contact.

T. MCCRIRICK²² reports a case of tuberculosis verrucosa cutis of the foot in a 12 year old boy. The lesions were of four years standing and consisted of a warty growth, which involved the greater part of the thin skin of the sole and inner side of the foot. The height of the growth above the general skin level was three millimeters. The

20. Laederich, L. and Richet, C.: Erythema Nodosum and Tuberculosis, *Rev. de la Tuberc.* **1**:229, 1920.

21. Ward, E.: Erythema Nodosum and Tuberculosis, *Brit. M. J.* **2**:811 (Dec. 20) 1919.

22. McCririck, T.: Tuberculosis Verrucosa Cutis of the Foot, *Brit. J. Child. Dis.* **17**:26 (Jan.-March) 1920.

source of infection was evidently a sister, who had at the time of appearance of the lesions multiple tuberculous abscesses. The child ran about barefoot in warm weather and a cut or scratch evidently became inoculated from carelessly handled dressings.

C. WITH²³ observed an atypical tuberculous eruption, which appeared on the extremities of a 7 year old child, being treated for lupus. On the extensor surface of the upper and lower extremities was a bright red eruption, consisting of lentil sized papules, slightly infiltrated and with central scaling. There was a diffuse scaly infiltration of the skin surrounding the lesions.

D. GUTHRIE²⁴ found thirteen cases of tuberculous origin among seventy-nine cases of chronic otitis media, in which the cause had been noted. All cases, except one, occurred in infants 1 year of age. The disease was characterized by a painless, insidious onset. The discharge was frequently the first sign of the disease. Facial paralysis was noted in seven cases and enlarged parotid glands in all. The author believes that these cases are due to milk infection and that the infection is carried to the middle ear by way of the eustachian tube.

B. S. VEEDER and T. C. HEMPELMANN²⁵ subjected 196 children with phlyctenular disease to a careful study to determine the possible presence or absence of tuberculous infection. The study revealed an intimate association of the two diseases. Skin tuberculin tests were positive in more than 92 per cent. of the cases. The results of the complement fixation test for tuberculosis were strikingly similar to those obtained in cases of proved tuberculosis. Tuberculous lesions involving other organs than the eye were definitely demonstrable in more than half the cases. Cough, malnutrition and history of exposure to other cases of tuberculosis were frequent.

TUBERCULOSIS OF THE TRACHEOBRONCHIAL AND MESENTERIC LYMPH NODES

M. NOBECOURT²⁶ recounts the symptoms of tracheobronchial adenopathy. Respiratory disturbances are in proportion to the size of the glands. Dyspnea and shortness of breath are frequent. The dyspnea is more marked on exertion and in severe cases accompanied with expiratory difficulty in children under 3 years of age, and inspira-

23. With, C.: Atypical Tuberculid on the Arm of a Seven Year Old Child, *Abstr. Zentralbl. f. d. ges. Kinderh.* **10**:221 (Feb. 8) 1921.

24. Guthrie, D.: Thirteen Cases of Aural Tuberculosis in Infants, *J. Laryngol. Rhinol. & Otol.* **35**:99 (April) 1920.

25. Veeder, B. S. and Hempelmann, T. C.: Phlyctenular Ophthalmia and its Relation to Tuberculosis, *Arch. Pediat.* **37**:396 (July) 1920.

26. Nobecourt, M.: Tracheobronchial Adenopathy, *Progrès méd.* **35**:216 (May 15) 1920.

tory in children above 3 years. Two types of dyspnea are associated with enlarged bronchial glands, asthmatic attacks which come on suddenly, sometimes during the night, sometimes during the day, with difficulty in inspiration but quiet blowing expiration and spasm of the glottis which is accompanied by a rough noisy respiration. Aphonia and dysphonia due to paralysis of the recurrent laryngeal nerve may also occur—as may palpitation and difficulty in swallowing.

Enlarged tracheobronchial glands give rise to characteristic physical signs; dilated veins on the chest, but the glands must be very voluminous to cause this phenomenon; feeble expansion on one side of the chest; dulness and bronchial breathing in the intercostal and vertebral zones and D'Espine's sign. Evidences of passive congestion, such as diminished resonance and râles, are frequently found at the right base. In some children enlarged bronchial glands are accompanied by attacks of bronchitis, in others by a very obstinate bronchitis or bronchopneumonia. In these instances signs of pulmonary tuberculosis are found associated with those of tracheobronchial adenopathy. Radioscopy gives precise information of the pulmonary conditions.

Nobecourt calls attention to the fact that enlarged bronchial glands are not always due to tuberculosis. They may occur in the course of a bronchopneumonia, bronchitis or whooping cough. They are frequently associated with adenoid vegetations and are found in cases of hereditary syphilis and leukemia.

V. OHLEN,²⁷ discussing the early diagnosis of hilus gland tuberculosis, bases his conclusion on the study of seventy-seven children. He lays special stress on a failure to develop physically, the tuberculin reaction, and the roentgenogram. He thinks the most important of these is the failure to make satisfactory gain in development, associated with which is a condition of poor nutrition and a marked pallor of the skin and mucous membranes. Night sweats and general weakness and cough are concomitant symptoms. The cough is usually the symptom which causes the parent to consult a physician.

V. Ohlen frequently used the Ponndorf tuberculin test, instead of the Pirquet. Four or five vaccination scratches, from 5 to 6 cm. long, are made near one another on the upper arm. These are intersected by three or four cross lines, so as to make a lattice work. Two drops of pure tuberculin are well rubbed into the scarification. Observations are made after forty-eight hours. By this method a larger amount of antigen comes in contact with the scarified area than with the Pirquet test.

The author thinks that in only occasional cases can a positive diagnosis be made by the roentgen ray alone and this is when sharply

27. v. Ohlen: Early Diagnosis of Hilus Gland Tuberculosis, *Beitr. z. Klin. d. Tuberk.* 45:343 (Nov. 25) 1920.

defined hilus shadows are present. Repeated plates must be made at intervals, in order to draw correct conclusions. It is a valuable experience to see, on the one hand, how in the course of months hilus shadows become thicker, narrow streaks stretch out into the lungs, and new isolated shadows appear; or, on the other hand, to see how the hilus shadow becomes smaller, the cardiac outline clearer and the cardiophrenic angle becomes again visible. In all except one of the author's cases, in which the tuberculin test was positive, were there positive roentgenologic changes in the hilus region. Moreover, the intensity of the reaction was parallel with the severity of these changes.

K. KLARE²⁸ believes that D'Espine's sign is most valuable to establish the diagnosis of bronchial gland tuberculosis in children. Again and again he has proved its worth under control of the roentgen ray.

H. MERY²⁹ believes that the early diagnosis of tuberculous bronchial glands is the most important factor in the battle against tuberculosis in childhood.

A family history of tuberculosis and a previous history in the child of pleurisy, cervical adenitis, frequent attacks of bronchitis, a slow recovery from whooping cough or measles are important presumptive evidence of tuberculous bronchial glands. In examining the child attention is first called to emaciation, pallor, development of hairy growth, presence of cervical, axillary, and inguinal glands. Of the functional symptoms the paroxysmal cough, like whooping-cough, is the most important. Examination of the chest shows enlarged veins. Percussion of the anterior portion of the chest is more important than of the posterior. Here there is dullness and a resistance which extends two fingers' breadth to the right and left of the sternum. Dullness in the paravertebral area is important, as are modifications of respiratory and increased transmission of voice sounds. The author thinks a feeble respiratory murmur in this region is of important diagnostic significance. Rough breathing is frequently found over the bases, and crepitant râles due to transient pulmonary congestion. The roentgen ray should be used to complete the examination.

H. MERY and L. GIRARD³⁰ describe active forms of hilus tuberculosis in children. The active process may be confined to the glands or may involve the periglandular structure. If confined to the glands, there are more physical findings anteriorly than posteriorly. There is

28. Klare, K.: Spinal Auscultation in the Diagnosis of Enlarged Bronchial Glands, *Ztschr. f. Kinderh.* **27**:169 (Dec. 16) 1920.

29. Mery, H.: Early Diagnosis of Bronchial Gland Tuberculosis, *Presse méd.* **28**:873 (Dec. 4) 1920.

30. Mery, H., and Girard, L.: Active Forms of Hilus Gland Tuberculosis in Childhood, *Rev. d. la Tuberc.* **1**:289, 1920.

parasternal dulness in the two first intercostal spaces and a rough respiratory murmur. The dulness may be so marked that an apical or interlobar pleurisy or a hydatid cyst is suspected. The roentgen ray shows that the apices are clear, but there is present a paracardiac triangular shadow, with the base toward the heart.

If there is periglandular involvement besides the signs described, subcrepitant râles are heard posteriorly in the paravertebral spaces. General symptoms, such as fever, emaciation, loss of appetite, are also present. An interlobular pleuritis usually occurs and is manifested by severe pain. On the roentgenogram the interlobular pleuritis gives a transverse shadow which extends from the hilus to the axilla, with the base toward the heart and the apex toward the axilla.

W. PFEIFFER³¹ adds a contribution to the value of direct tracheobronchoscopy in stenosis of the respiratory system from tuberculous bronchial glands. He believes that this procedure is not only of value in confirming the diagnosis of enlarged bronchial glands but has also a therapeutic worth. Broken-down bronchial glands can rupture into the air passages and cause suffocative attacks or death from suffocation. Before rupture of the gland the bronchoscope shows in nearly every instance a bulging, redness and swelling of the mucous membrane, which has a smooth satin-like appearance. Widening and flattening of the carina of the trachea is usually a sign of enlargement of the inferior tracheobronchial glands. The right side of the trachea and the right bronchus are more often affected than the left. In case of rupture the point of perforation can usually be demonstrated and cheesy or purulent masses are found in the air passages. The cheesy masses look yellowish-white or chalky and frequently have a very foul odor. They can be removed by suction, with absorbent cotton pledgets or foreign body forceps. Sometimes they are coughed up through the bronchoscope during the operation. Sometimes the pressure of the tube in the neighborhood of the perforation causes cheesy masses to be evacuated into the air passages. Granulation tissue frequently forms on the edges of the perforation after the gland has ruptured. Rupture usually takes place slowly. Portions of the gland, passing through the small opening, cause cough and suffocative attacks, like those caused by small foreign bodies which do not entirely obstruct the air passages. The cough is paroxysmal and accompanied by a spasm of the larynx. This is followed by a latent stage in which there are no symptoms. Gradually, however, usually in consequence of a severe coughing attack, the perforation becomes larger and the broken-down gland is protruded into the air passages, producing all degrees of

31. Pfeiffer, W.: Value of Direct Tracheobronchoscopy in Stenosis of the Respiratory System from Tuberculous Bronchial Glands, *Beitr. z. Klin. d. Tuberk.* 41:197, 1919.

dyspnea—even to complete suffocation. Rupture of the gland into the air passages sometimes causes a subcutaneous emphysema, which spreads rapidly over the neck and thorax.

As to the treatment of tuberculous bronchial glands, if there are no symptoms of pressure, hygienic measures can be resorted to and many patients are cured permanently. If, however, there are symptoms of pressure, the patient should be taken to a hospital, where he can be under observation and examined with the bronchoscope. In children under 5, because of danger of subglottic swelling from pressure of the tube, a tracheotomy should first be performed. Tracheotomy alone is insufficient to prevent death from suffocation, in case the gland has already ruptured, though occasionally the obstructing gland is coughed up through the tracheotomy wound. By means of the bronchoscope the point of obstruction is located, the mucous membrane over the protruding gland opened, and the caseated masses removed. The operation must be preformed repeatedly because of the gradual breaking down of the gland.

As asserted by H. M. CHUTE,³² mesenteric lymph nodes react to infection in a manner similar to lymph nodes in other situations. In children and adults enlarged mesenteric glands are one of the causes of abdominal pain, which gives no hint as to its origin until exploratory laparotomy is performed. In children the early history of the condition is characterized by vagueness. The child is anaemic and listless and suffers from loss of weight and appetite. Digestive disturbances, like diarrhea or constipation, are common. As the inflammatory process progresses, there occur attacks of abdominal pain, which shift about, probably because of the ease with which the nodes move within the mesentery. Fever and vomiting and moderate rigidity over the muscles may occur. If, as is frequently the case, the ileocecal glands are involved, the picture may be one of acute appendicitis. As the disease advances to abscess formation, the symptoms are more definite and localized. A tender mass is found in the abdomen with moderate muscle spasm. If rupture takes place, there are symptoms of generalized peritonitis. Mesenteric glands of long standing may become calcified, when a roentgen-ray examination may lead to an incorrect diagnosis of renal or ureteral stone. Enlarged mesenteric glands may cause intestinal obstruction from adhesion of the gut or omentum to a gland.

Chute emphasizes that in children recurrent attacks of abdominal pain with fever, little or no vomiting, constipation and loss of weight, should remind one of the possibility of tuberculous mesenteric glands.

32. Chute, H. M.: Enlarged Mesenteric Glands, Boston M. & S. J. **183**:409 (Sept. 30) 1920.

The diagnosis can sometimes be confirmed by combined rectal and abdominal palpation.

Treatment is surgical, followed by hygienic measures, and the prognosis is good.

E. GEHRELS³³ classifies as mesenteric tuberculosis only those cases in which the mesenteric glands alone are affected and omits all in which there are also intestinal or peritoneal lesions. He believes the tubercle bacillus can pass through the intestinal wall without causing specific changes. The bovine is the more common type of organism found. The disease is not frequent and in the author's experience was found in only 1 per cent. of 15,000 autopsies. Two thirds of the cases occurred in children. The writer discusses two forms, the acute and chronic. The acute form may be easily mistaken for other acute abdominal disturbances. In the chronic form there are recurring attacks of abdominal pain, usually located in the ileo-caecal region and associated with loss of weight and fever. Functional disturbances, like spastic constipation or diarrhoea, may occur. Intestinal obstruction and peritonitis are the most important complications. The diagnosis is difficult. The palpation of enlarged glands, the temperature curve, and the roentgen ray are aids. The lack of abdominal distention and sensitiveness to pressure help to differentiate the disease from appendicitis, which it resembles in the earlier manifestations. Tuberculosis of the mesenteric glands is more amenable to treatment than any other form of tuberculosis. Forced feeding, change of climate, artificial heliotherapy, deep abdominal roentgenotherapy, and tuberculin injections are all valuable procedures. Surgical intervention is indicated only when long continued internal treatment has failed.

DIAGNOSIS

P. GROSSER³⁴ emphasizes the following points in the diagnosis of early tuberculosis in children. Very important is an exact history of possible exposure to the disease. The temperature curve needs careful study. Irregular, often intermittent temperatures which last over a long period of time are suspicious. It must not be forgotten, however, that similar temperature curves occur in children with infections of the upper respiratory tract and in nervous children. Night sweats are not frequent in early tuberculosis. The involvement of three groups of glands is suggestive, namely: those at the angle of the jaw, those just above the clavicle, and the thoracic glands. Early involvement of the tracheobronchial glands is difficult to detect and the glands must

33. Gehrels, E.: Tuberculosis of the Mesenteric Glands, *Deutsch. med. Wchnschr.* **45**:44 (Oct. 9) 1919.

34. Grosser, P.: Diagnosis of Tuberculosis in Children, *Deutsch. med. Wchnschr.* **46**:369 (April 8) 1920.

be of considerable size before they cause symptoms of stasis or pressure or before signs can be obtained by percussion. Enlarged veins on the chest frequently occur in normal children and are of no diagnostic value. Pressure on the sympathetic nerve gives rise to inequality of the pupils. Eustace Smith's sign is of little value. More important is an expiratory crow and the cough which resembles whooping cough. Direct percussion over the vertebra gives no information; but D'Espine's sign is very important. The roentgen ray is a great aid in diagnosis, but interpretation of the plates is difficult and a diagnosis of tuberculosis must be made only in conjunction with other findings. A negative Pirquet test, except in infants during the period of incubation, in cachectic conditions, and during the febrile stage of acute infections, means the absence of tuberculous infection. A positive Pirquet reaction indicates a tuberculous infection but not tuberculous disease.

G. MIOCHE³⁵ has studied the diagnostic value of the Pirquet reaction, the frequency of positive reactions, and the mortality rate of children who react to the test. She affirms that a positive tuberculin reaction always indicates a previous infection with the tubercle bacillus and that there seems little doubt that the bacilli active or latent are still present. Necropsies on individuals who gave a positive reaction always show tuberculous lesions. Except in acute infections, rapidly progressive tuberculous disease, and advanced cachexia, a cutaneous test, negative on repeated examinations, always eliminates a diagnosis of tuberculosis. This has been proved either by the absence of tuberculous lesions at autopsy or by the clinical course of the disease.

O. K. KLERCKER³⁶ attempted by means of intracutaneous tuberculin tests to differentiate active and inactive tuberculosis. He gave 257 children the intracutaneous test using 0.01, 0.10 and 1.00 mg. tuberculin. The children were divided into three groups: (1) Those with clinical tuberculosis, forty children; (2) those with a suspicious tuberculosis, forty-six children, and (3) those, who after long observations were found free from tuberculosis, 171 children. In the first group, 52.5 per cent. reacted to 0.01 mg. and 30 per cent. to 0.10 mg., a total of 82.5 per cent. Five per cent. of the children gave no reaction even to 1.00 mg. Of these last, one was a case of miliary tuberculosis; the other was a case of peritonitis. Klercker believes that an active tuberculosis, except the very severe forms, will give a reaction to 0.1 mg. and in most instances to .01 mg. of tuberculin. Further clinical study of the cases showed that when a pulmonary tuberculosis is

35. Mioche, G.: *The Skin Tuberculin Reaction in Children*, *Le Nourrisson* 8:42 (Jan.) 1920.

36. Klercker, O. K.: *The Local Tuberculin Test in the Diagnosis of Tuberculosis of Childhood*, *Abstr. Zentralbl. f. d. ges. Kinderh.* 19:523, 1920.

present, a sensitiveness to less than 0.01 mg. tuberculin indicates a weakening of the defense against the infection, and a sensitiveness to less than 0.1 mg. indicates a hopeless outlook.

In the children of the second group a positive reaction to 0.01 mg. tuberculin was regarded as evidence of active tuberculosis, to 1.00 mg. as evidence of latent tuberculosis, and a positive reaction to 0.1 mg., if the children were not in very poor general condition, a healed tuberculosis.

In Group 3, 26 per cent. reacted to the tuberculin, 10 per cent. of these reacting to the smallest dose; and the writer believes that, in spite of no clinical evidences, this also indicates a healed tuberculosis.

From observations on three infants and a careful study of the literature R. DEBRÉ and P. JACQUET³⁷ have come to the following conclusions regarding the length of time after infection that the tuberculin test becomes positive and the presence or absence of symptoms during this period. After infection with the tubercle bacillus the time when the tuberculin test may be positive varies. The minimum time is six days; the maximum, four months. Variations in this period are due to the age of the patient, the quantity of the infecting material, and whether the cutaneous or intradermal test is used. The period is shorter in new-born than in older children, when the infection is a massive one and when the intradermal test is used. Except in new-born infants, no symptoms occur during this period.

PEYRER³⁸ reports a case in which the exact time between exposure to tuberculosis and the appearance of a positive intracutaneous reaction was determined. Because of a tuberculosis in the mother and the presence of dullness and bronchial breathing over the left lung in a 7 year old child was thought to have tuberculosis and was placed in a room with another child who had active tuberculosis. He remained there only thirty-six hours. On admission to the hospital the intracutaneous test with 0.001 mg. tuberculin was negative. The test was repeated daily with increasing doses and on the eighth day the child gave a positive reaction with 10 mg.

Peyrer quotes Hamburger, who believes that after infection with 0.5 mg. of bacilli the primary lesion appears in six days; with 0.00001 mg., it appears in twenty-five days. According to Peyrer, a Pirquet test is positive in from six to nine weeks after infection and an intracutaneous test is positive in three weeks. Peyrer says that infection can take place at the distance of one meter and in a very short

37. Debré, R. and Jacquet, P.: The Onset of Tuberculous Infection, *Ann. de méd.* 7:122, 1920.

38. Peyrer: Contribution to Tuberculous Infection, *Wien. med. Wchnschr.* 33:488 (June 3) 1920.

association; hence, a child should never be in the room with a patient whose sputum contains tubercle bacilli.

W. UNVERRICHT³⁹ reports a case which shows the greater sensitiveness of the intradermal over the Pirquet test. Two boys, 5 and 6½ years of age, respectively, occupied for twenty-four hours a room with an individual who had open tuberculosis. One boy who sat on the patient's bed gave a positive intracutaneous test with 0.1 mg. old tuberculin forty-five days after exposure. Seventeen days later the Pirquet test became positive. In the other boy who avoided the tuberculosis patient both tests remained negative. Unverricht believes the greater sensitiveness of the intracutaneous test is due to the larger area in which the tuberculin and tissues react and the more rapid absorption of the tuberculin in consequence of the greater pressure with which it is forced into the lymphatics.

As the bovine tubercle bacillus is found more frequently in tuberculosis of children than in that of adults, BERNHEIM-KARRER⁴⁰ believes it advisable to use the bovine tuberculin as well as old tuberculin in making the cutaneous test. But it must not be forgotten that because of the close relation between the two forms of tubercle bacilli, patients known to be suffering with tuberculosis of the bovine bacillus type will react to human tuberculin, and that bovine tuberculin produces non-specific reactions difficult to diagnose from true reactions. In 143 cases of tuberculosis positive results were obtained with human and bovine tuberculin. In eighty-four of these there was no difference between the reactions obtained. In fifty-nine the papule with one tuberculin was decidedly larger than that obtained with the other; or a positive result was obtained with only one form of tuberculin. In eight cases the reaction to old tuberculin was so slight that without the marked reaction obtained with the bovine tuberculin a diagnosis could not have been made. In seven cases there was a reaction only to human and in three cases only to bovine tuberculin. Thus in eleven cases, or 7 per cent., the bovine tuberculin was of greater value than the human tuberculin.

I. SYNWOLDT⁴¹ tested eighty children from 3 to 10 years of age with bovine and human tuberculin. Thirty-nine children had a history of exposure to tuberculosis but no physical findings; thirty-four had a more or less widespread pulmonary involvement; seven had tuberculous peritonitis or scrofula. Seventy-six per cent. of the children in the first

39. Unverricht. W.: Tuberculous Infection, Berl. klin. Wchnschr. **57**:1019, 1920.

40. Bernheim-Karrer: The v. Pirquet Tuberculin Reaction with Bovine and Old Tuberculin, Schweiz. med. Wchnschr. **50**:10 (Jan. 1) 1920.

41. Synwoldt, I.: The Diagnostic and Prognostic Significance of the Cutaneous Reaction with Bovine Tuberculin, Deutsch. med. Wchnschr. **46**:455 (April 22) 1920.

group gave a negative reaction to both tuberculin; 5.2 per cent. gave a positive reaction to both tuberculin, and 17.95 per cent. reacted only to the bovine tuberculin. In the second group, 14.7 per cent. gave a positive reaction to both tuberculin; 29.2 per cent. gave a negative reaction to both tuberculin; 2.9 per cent. gave a positive reaction to the human and a negative reaction to the bovine tuberculin; and 52.94 per cent. gave a negative reaction to the human and a positive reaction to the bovine tuberculin. The third group is too small for any conclusion to be drawn from the results but the high percentage of positive (42.86) reactions with the bovine tuberculin is significant. The author does not believe it possible to differentiate the type of infection by vaccination with both tuberculin but the human organisms seem more sensitive to the bovine tuberculin, so the test is a practical aid in the diagnosis of a tuberculosis, before it can be detected by physical findings. Synwoltdt also regards a positive reaction to the bovine tuberculin as a favorable prognostic sign.

E. BJORN HANSEN ⁴² performed the Pirquet test on the inhabitants of an isolated parish in Norway, in which there had never been a death from tuberculosis. The total population was sixty and fifty-three were examined. The parish has its own school and very rarely do the people come in contact with the outer world. Twenty-one, or 40 per cent., showed a positive, and thirty-two, or 60 per cent., a negative reaction. No one below 16 years of age gave a positive reaction. A road connecting the parish with the outer world is being built and the author thinks it will not be long before the children will show a positive Pirquet reaction.

F. HAMBURGER ⁴³ has noticed that the sensitiveness to tuberculin varies at different seasons of the year. In his experience reactions were decidedly more marked in the Spring. In the Fall children suspicious of being tuberculous rarely gave a positive percutaneous or cutaneous test and the intracutaneous test was only positive with large doses of tuberculin. Children with healed lesions gave a late reaction with 1.0 mg. tuberculin.

Times of increased sensitiveness to tuberculin seem to run parallel to those of increased frequency of tuberculosis. The author offers no explanation of this variation in sensitiveness to tuberculin.

O. LADE ⁴⁴ has made a study of the microscopic changes in the skin after an intercutaneous tuberculin injection. His method of procedure

42. Hansen, E. Bjorn: v. Pirquet Investigation in a Parish without a Notified Death from Tuberculosis, *Tubercle* **1**:359 (May) 1920.

43. Hamburger, F.: Variations in Sensitiveness to Tuberculin at Different Times of the Year, *München. med. Wchnschr.* **67**:398 (April 2) 1920.

44. Lade, O.: The Capillary Microscopic Picture of the Intracutaneous Tuberculin Reaction, *Arch. f. Kinderh.* **68**:58 (Aug.) 1920.

was as follows: A dilution of 1:1000 or 1:100 of old tuberculin was injected through a very fine needle into the upper layer of the skin. Sufficient tuberculin was used to make a wheal 2 to 3 mm. in diameter. The skin was then made transparent by liquid petrolatum and magnified thirty-five times by means of a Zeiss microscope with a No. 3 objective and a No. 2 eyepiece. Direct sunlight was used for illumination. Directly after injection, when the white wheal is still present, there is seen microscopically a pale area in which the finer skin furrows disappear and the larger ones become narrowed to fine lines. The point of injection appears as a red canal at the end of which is a small amount of blood. A half hour after the injection, when the wheal has entirely disappeared, the skin furrows also have entirely disappeared, but the blood vessels are again plainly visible. After two and a half hours the furrows are again seen and after four hours the skin appears to be normal, except for a slight redness along the site of the injection. Six hours after the injection the redness again becomes intense and the furrows and the outlines of the blood vessels become less and less plain, as this redness increases. Twelve hours after injection well filled blood vessels are seen at the edge of the lesion, where the skin is paler. From eighteen to twenty-four hours after the injection, when a positive reaction can be determined microscopically, all the structures of the skin are blotted out by the diffuse inflammatory redness. The picture then remains stationary for from one to one and a half days, when the redness begins to fade and the blood vessels are again seen at the edges of the lesions. In the center, dark hemorrhagic points appear in the red background. These are the ends of the loops in the papillary bodies of the skin. The vessels of the subcapillary network become more marked than is normal and the skin furrows again become visible. On the third and fourth day the entire process has retrograded and there is a beginning scaling of the horny upper layers of the epithelium. The retrograde process lasts days or weeks, and if the reaction is observed at the end of the third week, besides the scaling there are found present in the horny layers of the epithelium homogeneous transparent masses, which can be lifted out with the point of a needle.

The changes which occur in the first half hour are not specific of tuberculin injections but are produced by injection of physiologic solution of sodium chlorid also; those which occur later, however, are specific, so that by means of this method it can be determined in a few hours whether a reaction is positive or negative.

G. BLECHMANN⁴⁵ found that the Pirquet tuberculin test in children aged from 1 to 15 years, when positive, is accompanied by a local glandular reaction in 56 per cent. of the cases; when negative, by a local

45. Blechmann, G.: The Adeno-Cutaneous Reaction to Tuberculin, *Rev. de la Tuberc.* 1:45, 1920.

glandular reaction in 16 per cent. The glandular swelling occurs the day after the appearance of the cutaneous reaction and usually persists for two days, though sometimes it lasts longer. When the cutaneous test is repeated, the glandular reaction is not so marked.

C. PESTALOZZA⁴⁶ tested seventy-two children for the regional cutaneous reaction. He substantiates the findings of Pisanis and other writers that reactions over the tuberculous lesions are stronger than controls made elsewhere. The explanation is that over the tuberculous lesions the lymphatics are more developed. This is, however, not a regular finding and has no significance.

H. ELIASBERG and E. SCHIFF⁴⁷ made a study, based on the researches of Wildbolz, who found in the urine of patients with active tuberculosis a specific antigen, which caused a tuberculin reaction at the site of vaccination. In preparing the urine, the authors followed the technic of Wildbolz. It was obtained in a sterile manner and evaporated to one-tenth its volume in a vacuum. The temperature of the water bath could be raised to only 70 because of the danger of destroying the tuberculin-like substance. After a cooling process the urine was filtered through a filter saturated with a 2 per cent. solution of phenol. Directly after the injection there appeared a large wheal with a large surrounding area of hyperemia. This traumatic reaction disappeared in from one to two hours. The character of the reaction was decided in forty-eight hours. A positive reaction consisted of redness and infiltration, which depended on the substance resembling tuberculin in the urine. A central superficial necrosis occurred in severe reactions.

Wildbolz emphasized that a reaction is to be expected only in cases of active tuberculosis and every patient tested with urine must have a control tuberculin test.

Eliasberg and Schiff's material consisted of forty cases of various forms of tuberculosis in children. They conclude from the study that the urine reaction is specific but gives no proof as to the activity of the lesion. The results in three patients with pleuritis serosa were especially interesting. In two there was no tuberculin-like substance in the urine and in one only a very slight amount—results which make it appears questionable whether every case of pleurisy in children is of tuberculous origin.

The authors do not put so much value on the procedure as did Wildbolz, but they believe the method worth further consideration.

46. Pestalozza, C.: The Reginal Cutaneous Reaction in Infants, *Pediatrics*. **28**:171 (Feb. 15) 1920.

47. Eliasberg, H. and Schiff, E.: The Wildbolz Auto-urine Reaction in Tuberculous Children, *Monatschr. f. Kinderh.* **19**:5 (Oct.) 1920.

R. OFFENBACHER⁴⁸ does not believe the Wildbolz test to be reliable, for he obtained only three positive reactions in twenty cases of active tuberculosis. In a number of instances the Mantoux test (1:10000) was positive and the Wildbolz negative, according to the writer, therefore its presence shows only a possibility of an active tuberculosis.

F. ARLOING, PIERY, LEDRU and CORDIER⁴⁹ were unable to verify Wildbolz's assertion that the uro-intradermal test allows of differentiation between active and inactive lesions. They believe the test to be of equal value with the intradermal tuberculin test.

O. IMHOF⁵⁰ reports his results with the autourine and autoserum tests for the activity of tuberculosis in eighty cases. The results of both tests, with few exceptions, coincided; but the reaction was somewhat weaker with the autourine test. Both reactions were positive in the presence of an active tuberculosis, provided the skin was sensitive to tuberculin. Both reactions were negative in nontuberculous patients. The autoserum reaction is of more value when a disturbed kidney function interferes with the excretion of antibodies.

BECKER⁵¹ uses the roentgen ray to follow the course of tuberculosis. He says repeated roentgenograms often give a surprising and characteristic picture. They sometimes show that diffuse pulmonary shadows are due not to the tuberculous process but to an inflammatory exudate in the neighborhood of one or more tuberculous areas. This is evident from the disappearance of these shadows after a number of years. Becker is of the opinion that roentgen-ray examination shows changes in the lung when clinical manifestations are entirely lacking; and that it proves also that active tuberculosis in children, if they receive proper care, can recede and leave only scar tissue.

From the study in 190 roentgenograms R. SPERLING⁵² draws the following conclusions as to the localization of the tuberculous lesions in children. The primary lesion is usually in the upper lobe and lymphatic involvement of the primary stage manifests itself by changes in the hilus glands. Apical lesions are rare. In the second stage acute generalization is frequent. In older children there is a tendency to chronic indurated forms, which more often affect the right lung.

48. Offenbacher, R.: A Study of the Wildbolz Method of Determining an Active Tuberculous Lesion, *Ztschr. f. Tuberk.* **32**:355 (Sept.) 1920.

49. Arloing, F., Piery, Ledru and Cordier: The Wildbolz Autourine Reaction, *Abstr. Rev. de la Tuberc.* **1**:183, 1920.

50. Imhof, O.: The Wildbolz Autourine Reaction as a Proof of Active Tuberculosis, *Schweiz. med. Wchnschr.* **50**:1033 (Nov. 11) 1920.

51. Becker: The Course of Tuberculosis in Childhood as Seen in Roentgen-Ray Plates, *Beitr. z. Klin. d. Tuberk.* **45**:391 (Nov. 25) 1920.

52. Sperling, R.: The Localization of the Lesion in Pulmonary Tuberculosis by Means of the Roentgen Ray, *Abstr. Zentralbl. f. d. ges. Kinderh.* **10**:64 (Dec. 14) 1920.

Isolated lesions in the left side and in both lungs increase with the age of the child. In older children the upper portions of the lungs, especially the infraclavicular regions, are often affected. The process spreads to the apex in one half of the cases. Also in older children bilateral lesions frequently occur at the base of the lung.

In the third stage cavities occur. These are usually single and unilateral and formed in the upper lobe.

D. GRINGOLD⁵³ describes a symptom which in the last seven years has been of considerable service to him in making a diagnosis of tuberculous basilar meningitis and which he calls a "reflex" strabismus. It is elicited by flexing the head on the chest, when there develops either a bilateral or a unilateral internal strabismus which lasts as long as the head is kept in a flexed position and disappears as soon as the head is relaxed. In some cases the strabismus is accompanied by a retraction of the upper eyelids and by a contraction of the pupils. The author believes a reasonable explanation of this early "reflex" strabismus is that when the head is flexed the already increased pressure at the base is suddenly augmented and causes pressure on the abducens nerve with a paresis of the external rectus, or on the oculomotor nerve, with a spasm of the internal rectus.

In twenty-three cases of tuberculous meningitis, G. GENOESE⁵⁴ examined the spinal fluid and urine for acetone. In twenty cases there was an increased amount of acetone in the urine and acetone was found in the spinal fluid. In three cases in which there was but little acetone in the urine none was found in the spinal fluid.

PROGNOSIS

J. W. LANGENDÖRFER⁵⁵ followed the fate of 269 children in fifty families of whom one parent or both were treated for tuberculosis at the Bonn Clinic. He found that 146, or 54.2 per cent., suffered from the disease of the parents. Of 119 children in nineteen families of which the father had tuberculosis, the mortality from tuberculosis was twenty-one, or 17.6 per cent. Of 150 children in thirty-one families of which the mother had tuberculosis, the mortality from tuberculosis was thirty-nine, or 26 per cent. So, when the mother was affected, the mortality was higher than when the father was affected. Langendörfer found also that the morbidity and mortality from tuberculosis were greater in large than in small families and the youngest children in

53. Gringold, D.: An Early Diagnostic Sign of Basilar Meningitis, *Arch. Pediat.* **37**:19 (Jan.) 1920.

54. Genoese, G.: Acetone in the Spinal Fluid in Tuberculous Meningitis, *Pediatrics*. **28**:449 (May 15) 1920.

55. Langendörfer, J. W.: The Fate During the War of Children of Tuberculous Parents, *Ztschr. f. Tuberk. u. Heilstättenw.* **33**:150 (June) 1920.

the family were the ones most frequently infected. The morbidity and mortality were greatest during the first five years of life and just before or after puberty.

M. M. RIBADEAU-DUMAS and H. BÈCLERÈ⁵⁶ report a case which shows that tuberculosis in infants does not always end fatally. The patient was a 13 month old baby who at 9 months had been cared for by a servant with open tuberculosis. The child developed slight temperature elevation and failed to gain in weight. There were absolute dulness and feeble respiration over the entire right lung. In the course of a month this became limited to the right scapulovertebral space, in which there also was bronchial breathing. Emaciation and whooping cough-like attacks and diarrhea developed. The Pirquet test was positive. Six years later the child again came under observation. He was well and strong and had no abnormal findings in the chest.

EICHELBERG⁵⁷ also reports two cases which show that the prognosis of pulmonary tuberculosis in young children is not so unfavorable as is usually supposed.

The first patient was taken to him when 13 months old and at that time was extremely ill. He was coughing day and night and was dyspneic and very hoarse. There was a tuberculous lesion on the right parietal bone. The cutaneous tuberculin test was positive and, in spite of practically negative physical findings, the roentgen ray showed a somewhat dense shadow over the entire right side. Under treatment the child gradually improved and a second roentgenogram, taken six months later, showed the shadow was less dense. At the time of writing the child was 21 months old and in very good condition. The voice was still hoarse and there was slightly impaired resonance over the right side. The lesion of the parietal bone was healing.

The second patient was seen at 2 years and 9 months of age. When 2 years old she was taken ill with cough, fever, loss of appetite and sweating. At first there were no definite pulmonary findings. Later the percussion note on the right side showed impaired resonance. The fluoroscope showed a definite shadow at the right apex and one extending downward from the upper part of the hilus into the right upper lobe. The Pirquet test was positive. The child was treated with heliotherapy and four months later appeared perfectly well. The roentgen-ray findings were unchanged.

56. Ribadeau-Dumas, M. M. and Bèclerè, H.: The Evolution of the Initial Lesion of Pulmonary Tuberculosis in an Infant, *Abstr. Arch. de méd. d. enf.* **23**:728 (Dec.) 1920.

57. Eichelberg: Prognosis of Tuberculosis in Childhood, *Monatschr. f. Kinderh.* **18**:123 (May) 1920.

The belief that tuberculosis in infants is always fatal has undergone a change. External tuberculous lesions in young children have been known to heal and at necropsies reparative processes have been observed in tuberculous lesions of the lungs in even very young infants. Furthermore, many times recovery from pulmonary tuberculosis in infants has been reported in the literature.

L. BENARD and R. DEBRÉ⁵⁸ have made a study of the infants of tuberculous mothers sent to the Laennec Tuberculosis Hospital with regard to the frequency of infection and the mortality of infected infants. Of fifty-eight infants, forty were found to be tuberculous. In the case of the eighteen who were free from tuberculosis, separation from the mothers took place after from eight hours to six months of contact. Of sixty-five infants of nontuberculous mothers sent to the hospital by mistake, only eight became infected, three in the hospital, two in another hospital, and three through the father.

Of the forty infants infected only twelve died. The length of contact with the mother in these cases was from two to three months; in one case thirteen days. In all of these cases death occurred in the month that followed separation.

The authors draw the following conclusions: After four months of contact with a tuberculous mother an infant is presumably infected. All infants infected by contact with their mothers do not die; if the infant is still alive one month after separation he will probably survive. This is contrary to the opinion that tuberculosis of the first year of life is incurable.

STATISTICS AND PROPHYLAXIS

J. BARTSCHMID⁵⁹ made an analysis of the histories of patients admitted to the University Children's Hospital of Munich from 1912 to 1919, in order to ascertain the effect of war conditions on the frequency of tuberculosis among the children of that city.

Six hundred and seventy-five patients were admitted in the prewar years 1912 to 1914, and 1,004 during the years 1915 to 1919. Thirty-six per cent. of the children admitted during the prewar years and 47.6 per cent. of those admitted during the years of the war gave positive tuberculin reactions. The increase did not affect infants or children between 7 and 8 years, but all others, and especially children between 3 and 4 years. The children of Munich, then, were infected earlier in war times than in prewar times. The statistics showed also

58. Benard, L. and Debré, R.: The Mode of Infection and of Prevention of Tuberculosis in Young Infants, *Bull. de l'Acad. de méd. Par.* **84**:86 (Oct. 5) 1920.

59. Bartschmid, J.: The Result of War Conditions on the Frequency of Tuberculosis in the Children of Munich, *München. med. Wchnschr.* **67**:957 (Aug. 13) 1920.

that the mortality from tuberculosis in children was increased only in 1916 and chiefly affected children from 1 to 5 years of age. This was due probably to the fact that during the first two years all able bodied men were in military service, the women at work, and the children left in care of sick and incompetent individuals.

A comparison of these statistics with those of other cities shows that during the war years there was less tuberculosis in the children of Munich than among the children of other German cities, but there was an earlier infection and an increase in the severe forms.

H. DAVIDSOHN⁶⁰ performed the Pirquet test on a large number of orphan children in an ambulatory clinic of Berlin to obtain an idea of the increase in frequency of tuberculosis during the war. During 1919, from 5.4 to 6.1 per cent. were found tuberculous, a marked increase over the figures of 1913. Moreover, infection took place at an earlier age; while in 1913, 30 per cent. gave a positive tuberculin test at 4½ years; in 1919, 30 per cent. of the children gave a positive reaction at 2½ years. There seemed to be a decrease in the number of positive reactions in the children of 5 and 6, but this was due simply to the absence of antibodies because of emaciation from improper food and not to the absence of tuberculous infection. Davidsohn found also that, when the intracutaneous test was used, a much greater number of positive reactions were obtained. His tests, then, showed, that among the 2 year old orphans every second child was infected and among the 6 year old children two of every three were infected.

E. ROMINGER⁶¹ found that in 1919 fewer children gave a positive Pirquet reaction than in previous years. Routine tests in 1917 gave 41 per cent. positive reactions; in 1918, 39 per cent., and in 1919, 31 per cent. And this occurred in spite of the material increase in tuberculosis among children since the war. Rominger believes an explanation is found in the fact that from general malnutrition there are changes in the skin which inhibit the reaction and he concludes that a negative Pirquet test is of little value and must always be followed by an intracutaneous test.

P. KESSLER⁶² has compared statistics of the number of positive Pirquet reactions in children compiled before the war with those which he has collected in the Rostock clinic since the war. He finds that among children from 1 to 2 years of age there were from three to four times as many positive reactions; among children from 2 to 7

60. Davidsohn, H.: The Increase of Tuberculosis in the Children of Berlin, *Ztschr. f. Kinderh.* **26**:178 (Aug.) 1920.

61. Rominger, E.: Experience with Tuberculin in the Diagnosis of Tuberculosis in Childhood, *Monatschr. f. Kinderh.* **18**:424 (Aug.) 1920.

62. Kessler, P.: Increase in Frequency of v. Pirquet Reactions During the War, *Beitr. z. Klin. d. Tuberk.* **44**:1 (April) 1920.

years there were twice as many, and between 7 and 10 years, one-third again as many as among children of the same age before the war.

F. GARLAND COLLINS⁶³ defines the pretuberculous child as follows: A child whose vitality remains materially lowered and in whom some or all of the following conditions persist: frequent rise of temperature, enlarged lymphatic glands, loss of weight or failure to gain in weight, chronic bronchial catarrh, loss of appetite, carious teeth with stomatitis, or a general strumous condition. Especially is this true if these symptoms are associated with a family history of tuberculosis or contact with a tuberculous person. Not all these children develop tuberculosis. A certain percentage have a high degree of resistance and respond readily to ordinary treatment, but the majority become definitely tuberculous.

Chief among the various forms of treatment are (a) open air schools, residential or daily; (b) convalescent homes; (c) boarding out in the country; (d) tuberculosis dispensaries. Of most value are the residential open air schools.

W. R. P. EMERSON⁶⁴ was able to bring 189 tuberculous children up to an average of nearly double the expected weight in a nutrition class, conducted in connection with the outpatient department of the Boston Consumptive Hospital. Emerson believes that the problem of tuberculosis is for the most part a problem of nutrition. He says that if children are made well in a sanatorium, they get health; but, if they can be made well in their own homes, they get health, health education, and character. Nutrition work, which covers a new and hitherto neglected field in medicine, must be carried on with proper authority. It cannot fit in as an adjunct to other programs; but other programs must be adjusted to fit the problem of nutrition, which is the fundamental problem of tuberculosis. With the proper cooperation of the four factors that safeguard the child's health, namely the home, medical care, the child's own interest, and the school, all children can safely be brought to normal health.

A. LEVINSON⁶⁵ discusses the questions what to do with children whose parents are tuberculous but who themselves have not contracted the disease and what to do with children who have already contracted the disease.

In regard to the first, children must not come in contact with open cases of tuberculosis. The tuberculous member of the family or the

63. Collins, F. Garland: *The Pretuberculous Child*, *Tubercle* 1:454 (July) 1920.

64. Emerson, W. R. P.: *Nutrition Classes and Tuberculosis*, Boston M. & S. J. 183:361 (Sept. 16) 1920.

65. Levinson, A.: *Sociological Phrases of Tuberculosis in Children*, *Mod. Med.* 2:539 (Aug.) 1920.

child must be removed. When the parent, or other member of the family, is a closed case, the fate of the child depends on whether the father or the mother is the offending party. If the father is tuberculous, he should be removed to a sanitarium, for no one can predict when he will become an open case; and the child should remain with the mother. If the mother is a closed case, the child should preferably be removed from the house. When possible, these children should be sent to a special home, where they can be under the supervision of a physician and nurses and where they can receive special attention.

In regard to the treatment of infected children, Levinson discusses only that of latent tuberculosis; and this depends entirely on home conditions. If home conditions are good, i. e., if the child can get plenty of sunshine, good nourishing food and enough sleeping space, and if there is no open case in the family, the child can be treated at home. A child with latent tuberculosis may be sent to school; if possible, to an open air school. Rest is one of the principle requirements of a tuberculous child.

If home conditions are not good, the child should be sent to a sanitarium. The author thinks that the founding of special sanitariums should arouse a great deal of interest among physicians and social workers.

M. KLOTZ⁶⁶ regards pulmonary tuberculosis of infants as being infectious, even when no tubercle bacilli are found in the sputum, and emphasizes that these children should not be allowed to remain in a ward with others. He reports the case of a child in a hospital ward who had coughed for two months, gave a positive Pirquet reaction, and had finally died of tuberculous meningitis. In the course of the following few months three caretakers and five children of the ward developed tuberculosis.

W. J. DOBBIE⁶⁷ agrees with all writers as to the great danger to the infant of contact infection. In children over three years of age, he emphasizes the importance of avoiding massive but not a casual infection. As immunity is essential for the welfare of the child, Dobbie believes the period between infancy and adolescence the most opportune time to invite infection for the purpose of immunization.

A. and T. STRÜBELL⁶⁸ have made an exhaustive review of the literature on the passage of immune bodies from the milk and of intestinal absorption of immune bodies; and they report their own

66. Klotz, M.: The Danger of Infection from Tuberculosis in Infants, München. med. Wchnsch. **67**:964 (Aug. 13) 1920.

67. Dobbie, W. J.: The Prevention of Tuberculosis, Am. Rev. Tuberc. **4**:23 (March) 1920.

68. Strübell, A., and Strübell, T.: Immune Milk and Prophylaxis of Tuberculosis, Beitr. z. Klin. d. Tuberk. **45**:38 (Nov. 25) 1920.

observations on the passage of antibodies and antigens from placental circulation and from the milk into the fetus.

They believe it certain that in women antibodies, antigens, and partial antigens pass into the fetus through the fetal circulation; and in all probability in cows. Moreover, it has been proven that antibodies and antigens, in large amounts, both in women and cows, pass into the milk. The mammary glands play not merely a passive rôle in allowing this passage of the antibodies but produce and elaborate them. Absorption of these antigens from the milk into the blood serum of calves during the first months after birth has been proved. That this is not only a passive immutivity but an active immunity of long duration is evident through the presence of a positive intracutaneous reaction. The inability to produce a positive intracutaneous test in the infant seems to be due rather to the method of experimenting than to the inability of the child to react to the tuberculin. It remains to be shown just how long this immunity lasts and from how severe an infection it protects. When this is ascertained, the authors think, a way will be found to use the milk of immune women and cows for infants and calves and a great step forward will be made in the prophylaxis of tuberculosis.

TREATMENT

M. SOLIS-COHEN⁶⁹ discusses a method to determine the appropriate dose of tuberculin for the individual child. He first makes the following test for tuberculin hypersensitiveness. Simultaneously, he injects intracutaneously, in the forearm one ten millionth mg., one millionth mg. and one hundred-thousandth mg. If no reaction occurs in from twenty-four to forty-eight hours, one ten-thousandth, one thousandth and one hundredth of a mg. are injected similarly in the other arm. If still no reaction occurs, one tenth of a mg. and 1 mg. are then injected, and, if necessary, at a still later time 10 mg.

The smallest dose that produces a distinct local reaction the author administers therapeutically either by mouth or subcutaneously. If this dose causes increase of appetite, reduction of temperature, a general feeling of improvement, it is repeated every three or five days until it loses its effect, when it is gradually increased until a favorable reaction is again produced. If no general reaction is produced by the smallest dose which causes a local reaction it is repeated for several weeks and is then increased. Should any dose produce an unfavorable reaction, such as rise of temperature, anorexia, malaise, it is reduced. At intervals tests for hypersensitiveness are again made by injecting intracutaneously into the forearm the dose the patient is taking and doses one-tenth of and ten times this amount.

69. Solis-Cohen, M.: A Method for Determining the Appropriate Dose of Tuberculin for the Tuberculous Child, *Arch. Pediat.* **37**:641 (Nov.) 1920.

If no reaction occurs from any of these, one hundred times, one thousand times and ten thousand times the amount the patient is taking is injected intracutaneously. If the amount producing the intracutaneous reaction is greater than the amount which is being given therapeutically the latter dose is increased rapidly until it corresponds with the former.

The author uses tuberculin Rückstand (T.R.) for the injections. He reports the value of this method in nineteen cases in children whose initial doses varied from one hundred-millionth to one hundredth mg. and were increased from ten to 120,000 times over a period of from one to twenty-one months, practically without producing an unfavorable reaction in any case. A large proportion of the children showed improvement in general condition, reduction in temperature and gain in weight.

R. C. HOLT⁷⁰ believes that infants are infected in early postnatal life, usually from their mothers, and that this is the time to use tuberculin injections as a curative agent. He points out that the systematic use of tuberculin in infancy has two objects: first, as a test to show how many babies are infected; and second, to be the first installment of treatment in those already infected. Whenever a child gives a positive reaction, further graduated injections should follow, until a reaction fails; and the weight should be used as an index of the effects of the tuberculin. In this way, then, one could secure reasonable assurance that every child a year old is free from tuberculosis. Probably a second test would be necessary for those still exposed to infection. Holt suggests injecting one-fifth of one millionth of 1 c.c. for an infant aged 3 months. Most tuberculous babies show a rise in temperature of 2 degrees during the first six hours after the injection.

J. GRACIA DEL DIESTO and B. CORDEO⁷¹ advocate the intradermal tuberculin treatment of tuberculosis in children. They have used it for three years and find it free from dangers and difficulties of the subcutaneous method. Their technic is as follows: A needle from 1½ to 2 cm. long, with a short, sharp end, which easily stays in the skin, is used. Six solutions are made. The first contains one part of tuberculin and nine parts of a solution of ½ per cent. sodium chlorid and ½ per cent. phenol; the second contains one part of this solution and nine parts of the phenol-sodium chlorid solution; the third contains one part of solution No. 2 and nine parts of the phenol-

70. Holt, R. C.: A Plea for the Tuberculinization of Babies, *Tubercle* 2:54 (Nov.) 1920.

71. Gracia del Diesto, J. and Cordeo, B.: Intradermal Tuberculin Treatment of Pulmonary Tuberculosis in Children, *Arch. Espan. d. Pediat.* 4:20 (Jan.-Feb.) 1920.

sodium chlorid solution, etc. Only 1/10 cm. of the solution judged best for the case is used for the first injection. In cases of tracheo-bronchial adenopathy, as the sensitiveness to tuberculin is slighter than in pulmonary forms, the more concentrated solutions can be used in the beginning of the treatment. According to Jeanneret, the diameter of the macule which results from the injection should not be more than from 10 to 15 mm. If it is, a weaker solution must be used; but the authors generally obtained a macule of from 20 to 30 mm. Injections are given once a week. If symptoms of anaphylaxis, as increased in size of papule with each injection, temperature, and loss of weight, arise the treatment is stopped. Weight is a valuable criterion of the benefit or harm of the tuberculin treatment. The authors are well satisfied with the results obtained by this method.

H. MUCH⁷² has lately published a monograph (translated by M. Rothschild) on the diagnosis and the treatment of tuberculosis in children. In it he goes into detail with regard to the so-called partial antigen treatment of Deycke-Much, and he says there can be no cure without immunity, while progress in treatment depends on the maintenance of immunity. His partial antigens, by which immunity is maintained, are obtained by so treating cultures of tubercle bacillus that the acid-fastness of the bacilli disappears and there is obtained a substance which is referred to as M. Tb. By filtering M. Tb. a water soluble substance, containing the toxin of the tubercle bacillus, is obtained. This represents the pure tuberculin and is designated as L. The water-insoluble residuum is called M. Tb. R. and by treating this with alcohol and ether the three partial antigens are obtained. The portion soluble in alcohol contains the fat acid lipoids and is called by the author F.; the portion soluble in ether contains the neutral fats and is called N., the insoluble portion belongs to the group of nucleo-proteins and is designated as A. Only the M. Tb. R. and the special antigens A. F. N. are used in the treatment of tuberculosis.

Before treatment is started, intracutaneous injections are made with the partial antigens, in order to determine to which the patient is already immune and the degree of immunity. The degree of immunity is shown by the size of the papule and surrounding inflammatory area which results from the injection. If a positive reaction is obtained with N. partigen and a negative reaction with A. partigen, the patient is treated chiefly with A. partigen. Very small doses only are used for treatment. The author believes this method to be of special value in the treatment of bronchial gland tuberculosis.

72. Much, H.: *Tuberculosis in Children; Its Diagnosis and Treatment*, Translation by M. Rothschild, MacMillan Comp., 1921.

R. PIPEL⁷³ reports his experience with the partigen treatment of tuberculosis in children. His observations were made on thirty-two children from 3 to 12 years of age. Twenty-six had pulmonary tuberculosis, four had bronchial gland tuberculosis, one had osseous tuberculosis, and one had peritoneal tuberculosis. Five of the children with pulmonary tuberculosis were dismissed as cured and fourteen with the condition improved. In three the condition remained stationary, in two it became worse. Five children died.

In the four children with bronchial gland tuberculosis the general condition improved but the roentgen-ray findings remained unchanged. The child with osseous tuberculosis improved and the one with tuberculosis peritonitis died. Pipel's therapeutic results, on the whole, were favorable, but no more so than results observed in another group of patients under observation at the same time.

A. CZERNY and H. ELIASBERG⁷⁴ have treated the cachexia of tuberculous children with a foreign proteid (horse serum) in the hope of increasing their resistance. At first 10 c.c. was injected twice a week but as severe anaphylactic manifestations were obtained from 1 to 2 c.c. daily were given instead. Thirty very sick practically moribund children, suffering from pulmonary and abdominal tuberculosis, were treated in this way. In twelve good results were obtained. The children looked better, gained in weight, and no longer had fever. These results were obtained only after weeks of treatment. The treatment with horse serum influenced also the manner in which the children reacted to the tuberculin test. Children who gave a "cachectic" reaction before treatment later gave a normal tuberculin reaction. Focal reactions were never observed in the tuberculous lesions.

H. ELIASBERG⁷⁵ recommends establishing a pneumothorax in pulmonary tuberculosis in infants and children. At first he used the procedure in children with advanced lesions only but later also in those with early lesions; at first, too, only in those with unilateral, but later in those with bilateral lesions. In instances of bilateral lesions the lung more severely affected was treated first, then the other. The author obtained favorable results in cases of hilus tuberculosis and pulmonary tuberculosis with cavity formation. Until the attempt is made, it is impossible to tell whether a pneumothorax can be produced or whether the pleural cavity is obliterated by adhesions. At first nitrogen was used, later atmospheric air. To be of any value, the

73. Pipel, R.: Review of Experience since 1917 with Partigen Treatment of Tuberculosis in Children, *Wien. klin. Wchnschr.* **33**:402 (May 6) 1920.

74. Czerny, A. and Eliasberg, H.: The Treatment of Tuberculous Cachexia with Foreign Proteid, *Monatschr. f. Kinderh.* **19**:107 (Oct.) 1920.

75. Eliasberg, H.: The Treatment of Tuberculosis in Children with Pneumothorax, *Monatschr. f. Kinderh.* **19**:105 (Oct.) 1920.

pneumothorax must be maintained, until the lungs are healed—for a period, that is, of at least two or three years.

W. BAENSCH⁷⁶ has used tebelon with nineteen patients, mostly children, suffering from bone, joint, gland and skin tuberculosis. Tebelon is a preparation consisting of the isobutyl esters of fatty acids of tubercle bacillus. Stoeltzner, who first isolated the substance, believed it stimulated the production of antibodies. Baensch injected 1 c.c. into the back every third day. No ill effects attended its use. From his experience the author thinks that tebelon is not a specific for tuberculosis but that it shortens the duration of surgical tuberculosis in children.

A. REUTER⁷⁷ reports his results with tebelon, which extended over a period of seven months. He used 1.1 c.c. twice a week. The greatest number of injections was thirty-eight. From this experience Reuter believes tebelon is an indifferent agent and has no effect on the human organism.

The experience of F. LEHNERDT and M. WEINBERG⁷⁸ with tebelon extended over a period of three years. In all there were treated ninety patients of whom ten were adults with acute phthisis; eight had lupus; thirty-three were children with severe clinical tuberculosis; thirty-seven were children with scrofula. The conclusions drawn from the study were that tebelon has no influence on tuberculosis in adults; it has a favorable effect on lupus but this is not permanent. It has no effect on pulmonary tuberculosis of childhood, when at an advanced stage. Its use is only advised when the process is well localized and the children are in good physical condition. In scrofula, however, it seems to be a very useful remedy, a favorable influence was observed in all the cases. At first there was a softening of the infiltrations of the skin or glands—then the secretion gradually stopped—all inflammatory areas showed a tendency to granulate and healing took place more quickly than was expected. Scrofulous eczemas and phlyctenular conjunctivitis were soon cured. Swelling of the glands disappeared and the general condition of the patient improved.

A. DU FOURT⁷⁹ advises heliotherapy in the treatment of mediastinal adenopathy in children. The treatment is begun by exposure of the lower extremities. After the eighth day the chest is exposed for five minutes daily and, if the treatment is tolerated, the exposure is increased

76. Baensch, W.: Tebelon in the Treatment of Surgical Tuberculosis, München. med. Wchnschr. **67**:1009 (Aug. 27) 1920.

77. Reuter, A.: Treatment of Tuberculosis in Children with Tebelon, Monatschr. f. Kinderh. **19**:34 (Oct.) 1920.

78. Lehnerdt, F. and Weinberg, M.: Tebelon in the Treatment of Human Tuberculosis, Ztschr. f. Kinderh. **26**:215 (Sept. 13) 1920.

79. Du Fourt, A.: The Treatment of Mediastinal Adenopathy with Heliotherapy, Arch. de méd. d. enf. **23**:436 (July) 1920.

to two hours daily. Pulse and temperature must be watched closely. If there is pulmonary as well as gland involvement, the child should be put to bed for a week before the treatments are begun; and thoracic exposure should never exceed ten minutes.

In mediastinal gland tuberculosis physical signs and roentgen-ray shadows usually disappear in four or five months, but, if there is pulmonary disease, the duration is much longer. In some patients heliotherapy seems to aggravate the glandular condition and is contra-indicated. Young infants do not stand the treatment well. Erythema and a rise of temperature to 39 or 40 C. are warnings against too long exposures.

I. S. TROSTLER⁸⁰ recommends the roentgen-ray treatment in tuberculous adenitis. When no breaking down or liquefaction has taken place, brilliant results are the rule in 80 per cent. of the cases. Even when the glands have broken down and are draining, the roentgen ray will often produce reduction in size and softening of the scar tissue. If the glands have broken down and are not draining, it is better to aspirate the contents, before treatment is commenced. Aspiration can be repeated as often as fluid appears. A very useful and efficient adjunct to roentgen-ray treatment in cases in which suppuration has continued for a long time is the swabbing out of the sinus with a mixture of equal parts of phenol and tincture of iodine.

C. E. FIELD⁸¹ does not advocate radium to take the place of surgery in the treatment of tuberculous adenitis but believes it to be of great value in the treatment of this condition. In thirty-two patients treated during four years the process was arrested and apparently cured in twenty-seven; three patients were lost sight of, and one died from pulmonary tuberculosis two years after treatment.

H. GAUVAIN⁸² describes the Teloar Crippled Hospital for tuberculous children. The place was chosen because of abundant sunshine, extensive shore line with considerable tidal excursion, sandy soil, slight or moderate rainfall, lack of trees, clear atmosphere free from dust, hills protecting from the cold and winds, bracing climate, beach adequate for unrestricted use of the patients. The hospital itself has an extensive veranda so constructed that the patients need not leave it, even during rain, and especially designed awnings pull down over the beds; the mattresses are heated by electricity, which is the best and most labor-saving method of keeping the patient comfortably warm.

80. Trostler, I. S.: The Treatment of Tuberculous Adenitis with Roentgen Ray, *Am. J. Clin. Med.* **27**:804 (Dec.) 1920.

81. Field, C. E.: The Treatment of Tuberculous Adenitis with Radium, *Long Island M. J.* **14**:424, 1920.

82. Gauvain, H.: The Care of Tuberculous Children, *Brit. J. Tuberc.* **14**:49 (April) 1920.

A valuable feature of the institution is the postgraduate course in surgical tuberculosis.

T. H. MARTIN⁸³ describes the hospital school for the treatment of surgical tuberculosis in children at Seasowe-Cheshire. It is built within 300 yards of the sea, fully exposed to winds which sweep from the Irish Sea. It is constructed on the block parallel system. Each block consists of two stories with twenty-four to thirty beds on each floor. The wards face due north and are light and airy. On the southern aspect are large sun balconies on which beds are always kept, except in the severest weather. Abundance of fresh air, sunshine and good food are the principal factors in treatment. Great importance is placed on heliotherapy. Carefully planned school-work with hospital treatment has proved a great success.

A. W. HOLLIS and I. H. PARDEE⁸⁴ have collected from the literature reports of thirty-eight cases of tuberculous meningitis with recovery of the patient and report two cases of their own. They report two other cases in which a probable diagnosis of tuberculous meningitis was made. Their method of treatment was to use intraspinal injections of antimeningococcic serum with frequent spinal drainage. They consider that intraspinal injections of antimeningococcic serum have two distinct actions. First it adds to the spinal fluid certain antibodies, which it is unable to develop itself and second it introduces within the dura a foreign proteid in the form of horse serum.

83. Martin, T. H.: The Hospital School for Treatment of Surgical Tuberculosis in Children, *Brit. J. Tuberc.* **14**:145 (Oct.) 1920.

84. Hollis, A. W. and Pardee, I. H.: Recovery from Tuberculous Meningitis after Treatment with Intraspinal Injections of Antimeningococcic Serum, *Arch. Int. Med.* **26**:49 (July) 1920.