

fed on mice which had died in 48 hours after being subcutaneously injected with virulent culture. None of these rats became ill or died. A number of rats were fed on guinea-pigs which had died after inoculation with virulent culture, and here the percentage of dead rats was certainly increased. Of six rats fed with the material from the guinea-pigs (subcutaneous fluid, peritoneal fluid, and spleen) four died from the disease in 11, 12, 11, and 18 days respectively; and of three rats fed with one whole guinea-pig two died from the disease in seven and 11 days respectively. So far the laboratory experiments.

2. *Experiments in the warehouse.*—The accompanying table gives the results of experiments of feeding on a large scale carried out in a dock warehouse in the Port of London, instituted by Dr. W. Collingridge, the late medical officer of health, and continued by the present medical officer of health. It ought to be stated in explanation of this table that the 60 tubes of Danysz rat virus used between April 26th and May 31st were culture tubes (on agar) which had been directly obtained from the Pasteur Institute of Paris, and that the guinea-pigs, mice, and rat used for the feeding experiments from June 14th to July 17th had all been inoculated subcutaneously in the laboratory with virulent culture of the Danysz bacillus and immediately after death from the typical disease were laid on the floors of the warehouse. We would also draw attention to the fact that one rat which had died after subcutaneous injection of the typical disease was offered to the rats in the warehouse but was not touched by them, whereas all the mice and the majority of the guinea-pigs were readily eaten by the rats of the warehouse.

The table shows that unlike the laboratory experiments those carried out in the warehouse were wholly negative, and therefore the expectation of the medical officers of health of a wholesale destruction of rats by Danysz rat bacillus as a preventive measure against plague cannot be considered from the results of the experiments to be of a promising nature.

It should be also stated that several rats that had not become ill after feeding with mice or with guinea-pigs or directly with culture were afterwards subjected to subcutaneous inoculation with small doses of virulent culture. They promptly became ill and died with the typical disease, thus showing that the susceptibility of the rat to the disease by subcutaneous injection is incomparably higher than by feeding.

It should be further stated that all laboratory experiments on rats kept in captivity must be conducted with care, since these animals, according to our experience (confirming that of Krausz), are liable to succumb spontaneously. In our experience 25 per cent. of the animals die in captivity within the first week or 10 days. On the other hand, those that remain alive and well after the first week or fortnight of captivity may be considered fit subjects for the experiment. It is possible that the great mortality of the laboratory rats observed by Kister and Köttgen may be due to this fact and not to their having been fed with the Danysz culture.

A CASE OF SO-CALLED "FŒTAL (OR CONGENITAL) RICKETS."¹

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THERE can be no doubt that many of the cases reported in past times as "congenital rickets" were, as a matter of fact, not rickets at all, but achondroplasia or, in other words, chondrodystrophia foetalis. In many of such cases at least the superficial likeness to rickets is great, the long bones are stunted and bent and the epiphyses enlarged. Stoeltzner has recently examined a foetus with a condition which he calls "foetal myxœdema"; it appears from his description that it resembled rickets, and though the myxœdema seems doubtful it certainly was not rickets. It seems certain, also, that there are various pathological processes which may take place during intra-uterine life which produce deformities and stunting of the bones quite apart from rickets.

In looking over the recent literature of the subject the

cases which most resembled foetal rickets that I can find are two reported by Osgood Mason² and Townsend.³ Both of the patients in these instances died when a few days old, and unfortunately no post-mortem examinations were obtained. In each case there were imperfectly calcified bones, both the cranial bones and long bones; the ribs were beaded and bent; the bones of the limbs were curved, the curvature being curiously like the curves produced in acquired rickets; and the epiphyses were enlarged and several fractures were present. It is certain in these cases that there was a condition of "osteogenesis imperfecta" with a proliferation of the cartilage at the epiphyses. In one of the cases the mother had suffered privation during pregnancy, in the other she had been well fed and cared for.

The following case clearly resembles the two just related and presumably was of the same nature. The mother was 46 years of age and the infant in question was her fourteenth child. The other children were strong and healthy with the exception of two who had died in infancy from some wasting disease. No history could be obtained of syphilis in the mother or in the other children. The mother had suffered from some form of jaundice both before and after the birth of the infant and there had been a good deal of vomiting during the pregnancy. The infant was well nourished when he was born, and he took food well. When a fortnight old he was brought to the Manchester Children's Hospital and admitted under Mr. Joseph Collier as he had sustained various fractures, though there was no history of anything like violence. The fractures involved the right humerus and radius, and the left humerus, ulna, and femur were also fractured. It was noted at this time that there was marked cranio-tabes, the occipital and parietal bones especially being in a backward condition as regards calcification. The ribs also were abnormally soft, as they bent inwards during inspiration on each side of the sternum, forming the broad shallow grooves on each side so commonly seen in rickets. There was slight beading of the ribs but no enlargement of the epiphyses of the long bones or any marked curvature. The infant was well nourished and had apparently been born at term. He was fed on cow's milk and water, the fractures were put up in splints, the fractured femur being treated by vertical suspension. The fractures mended up well but when he was six weeks old the right femur fractured. This also repaired well, and the infant apparently thrived and was sent out of hospital. It was noted that in consequence of the softness of the occipital bone it became very much flattened by the pressure of the head on the pillow when the infant was lying on his back. When seen at nine months of age the infant had cut two teeth and was bright and intelligent, without any signs of rickets or deformity of the bones. The occipital had a normal shape, the chest wall was well expanded, and there were no enlarged epiphyses.

What was the nature of these cases? They can hardly be classed as osteomalacia, as in this disease the patient goes from bad to worse, and it is doubtful if it occurs in infants, though in rare instances it seems to have occurred in children. Neither can they be said to be cases of fragilitas ossium—in this disease the bones are simply brittle and there is no tendency to bend. Syphilis produces an osteochondritis or epiphysitis, but not, as far as I am aware, a tendency to bend as well as to break. In the case I have just narrated I cannot help connecting the condition of the infant's bones with the fact that the mother was 46 years of age, had become more or less debilitated with child-bearing, and had suffered from illness during the greater part of the pregnancy. Yet notwithstanding this there was no sign in the infant of malnutrition except in the bones. In connexion with this it is interesting to note that Charrin and Gley⁴ claim to have produced congenital rickets in rabbits by inoculating the parents with the toxins of diphtheria and blue pus. Certainly the cases here recorded suggest rickets, but I think a certain amount of caution is required in asserting they were true rickets in the absence of a post-mortem examination and a careful examination of the bones by modern methods. Cranio-tabes may be present in rickets, but it is present also in premature and in badly nourished infants. Slight beading of the ribs and abnormal softness of the ribs may be seen under similar circumstances. On

² A Case of Congenital Rickets, Archives of Pediatrics, September, 1894.

³ Ibid., October, 1894.

⁴ Comptes Rendus de la Société de Biologie, 10 s. iii., 220, 1896 (quoted by Ballantyne).

¹ A paper read before the Society for the Study of the Diseases of Children.

the other hand, enlarged epiphyses and fractures with curvatures are much more characteristic of rickets or of some intra-uterine disease.

The experiments and observations of Stoeltzner⁵ still further impose caution in coming to a conclusion without having first had an opportunity of a histological examination of the bones. Thus Stoeltzner fed a puppy for eight weeks on a diet consisting of horse-flesh, bacon, and distilled water—a diet which was poor in lime salts. The animal gained in weight and also in length during the experiment, but on the tenth day it was noticed to have a waddling gait and there was swelling of the epiphyses of the bones of the foreleg, and later the ribs became beaded and bent. The bones also became tender (?scurvy). At the examination of the bones after death they were noted to be light in weight and very hyperæmic. Their naked-eye resemblance to rickets was very close. According to Stoeltzner, however, they were found on examination to be not true rickets, but simply spongy or in a condition of osteoporosis (*osteoporöse*). According to this author, an enlargement of the epiphyses, accompanied as it is with softening and swelling of the columnar zone of the cartilage, is not pathognomonic of rickets, as it is present in osteoporosis produced by a deficiency of lime salts in the food, and perhaps also in other conditions. In true rickets, though there is no deficiency of lime salts, the cartilage matrix does not undergo temporary calcification as it does normally; also the osteoid tissue built up by the osteoblasts remains uncalcified. In rickets much preparation is made for calcification, but the tissue formed for some reason or other is in a state unfit for the deposit of lime present in the blood. In osteoporosis comparatively little preparation is made for the deposition of the lime salts, but what osteoid tissue there is formed is completely and perfectly calcified. In rickets there is clearly a pathological state; in osteoporosis there is only a shortage of materials. Mr. F. C. Abbott's case, the post-mortem preparations of which by his courtesy I had the opportunity of seeing at the meeting of the British Medical Association this year, was one of undoubted rickets at the time of death at 14 months of age. There was a history of the deformities being present at birth, but the infant did not come under observation till some time later.

What is really wanted before the question of intra-uterine rickets can be finally settled is a careful pathological examination of an infant of the class in question made shortly after birth.

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A CASE OF TYPHOID FEVER WITH RELAPSE; PERFORATION AND OPERATION.

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THE following case may be of interest in view of the increasing number of cases where recovery has followed an operation for perforation of a typhoid ulcer. Although the patient here referred to died eventually, yet from a surgical point of view a success may fairly be claimed.

A woman, aged 27 years, was admitted into the Civil Hospital, Pretoria, on April 20th, 1901, this being about the twelfth day of an attack of typhoid fever. Rose-coloured spots, an enlarged, palpable spleen, and a more or less typical temperature range were to be observed. The fever pursued a normal course and ended about 14 days later by a rapid fall of the temperature. The temperature remained normal for another 15 days and then a definite relapse with a fresh crop of "spots" developed. Constipation, as is common in typhoid fever in this country, was present during both the first attack and the relapse.

The patient on admission was a feeble, emaciated, and anæmic woman, and during the course of the relapse the emaciation and general weakness became very pronounced. In addition, there were signs of bronchitis and hypostatic congestion of the bases of both lungs. Nevertheless, the patient was of the most optimistic disposition and always said she was "doing very well," so that good hopes were entertained of her recovery. Unfortunately, on the eighteenth day of the relapse perforation occurred. The symptoms pointing to this occurrence were pain of moderate severity, colicky in character and much aggravated by coughing, felt chiefly in the right lower quadrant of the abdomen; a rise of temperature of 3° and quickening of the pulse rate from 100 to 130; thoracic type of respiration; and total disappearance of the liver dulness even in the posterior axillary line, and this without any distension of the abdomen which remained hollow as it always had been. The patient was seen and examined within an hour of the occurrence of pain in the abdomen. A diagnosis of perforation was made and the aid of my surgical colleague was asked for.

With regard to the symptoms diagnostic of perforation I would venture to point out from the experience of several cases seen within a very few hours of the occurrence of this complication that it is frequently to be observed—(1) that the temperature first rises and does not fall with signs of collapse until some hours later; (2) that perforation may occur in cases where instead of tympanites the surface of the abdomen is quite hollow, and that the occurrence of distension in these cases only follows the onset of the consecutive peritonitis and paralytic distension of the gut; (3) that the absence of liver dulness in the mid-axillary line where there is no tympanites is an almost conclusive proof of the presence of free gas in the abdominal cavity, and that even if there be tympanites the liver dulness, although it may be absent in the mammary and anterior axillary line, is never absent in the mid and posterior axillary line without perforation having occurred; and (4) that in perforation there is usually a marked increase in the rate both of the pulse and the respiration. This and an obviously thoracic type of respiration should suggest perforation in a case of typhoid fever and lead to a careful examination of the abdomen. In the particular case here recorded a marked "crack pot" sound was observed on firm percussion in the eighth interspace in the mid-axillary line—a feature which I have never met with before or seen recorded.

My colleague, Mr. Godwin, deals with the surgical aspect of this case, but I may here draw further attention to the good effect which followed the use of calomel and saline purges freely given for the relief of paralytic distension of the gut which came on about from 30 to 36 hours after the operation. The results of the post-mortem examination showed that death was to be entirely attributed to the effects of the fever leading to marked fatty degeneration of the cardiac muscle and the occurrence of hypostatic pneumonia. From a surgical point of view the operation performed was successful, as the patient lived for eight days after it and the sutured gut was found air-tight and water-tight and there were no signs of peritonitis. Considering that the patient was exhausted by a long illness, being in the third week of a relapse, recovery was hardly to be expected; nevertheless the case presents many features of encouragement and fully warrants the belief that early diagnosis followed by suitable operative measures will lead to many recoveries from an otherwise fatal complication of this disease. Success will, above all, depend on early diagnosis, since operations, performed as they frequently are when the symptoms are not those of perforation only but of peritonitis following perforation, can only lead to failure and to condemnation of a thoroughly sound surgical procedure.

NOTES BY MR. GODWIN.

Taking into consideration the length of the patient's illness and her general weak condition I decided with Dr. Thornton that local anæsthesia would be preferable to giving ether or chloroform.

Operation.—The patient having been prepared in the usual manner the extremities were wrapped in cotton wool and two-thirds of a grain of eucaine were injected into the skin of the abdomen five minutes previously to her entering the theatre, and a hypodermic injection of 10 minims of solution of strychnia was administered. She was placed on a hot-water bed on the table and a nurse held a mask over her face so that nothing was visible to the

⁵ Das Fœtale Myxodem und Die Pseudorachitische Osteoporöse infolge von Kalkarme Fütterung. Beiträge zur Pathologie des Knochenwachstums.