bacilli found in human bone and joint tuberculosis, found that of 261 cases of all ages of this disease, 55 were infected with the bovine type of tubercle bacillus. The age-incidence is shown in the table.

Age-period in years.	Total No. of cases.	No. of bovine infections.	Percentage of bovine infections.	Max. variation possible.
0-5	47	14	29.79	18.87
5-10	108	31	28.71	12.31
10-16	62	7	11.29	11.37
16-25	15	3	20.0	29.2
Over 25 ..	29	—	0.0	0.0
—	261	55	—	—

This table also shows the percentage of bovine infections with maximum variations possible which I have worked out for each age-period. If the percentages of the bovine infections be plotted as a graph in the usual way, the graph shown in Fig. 1 will be obtained. This graph does not necessarily represent what other investigators, working on the same subject, might find, for it only represents the results obtained by Eastwood and Griffith; it does not show the variations from the results of Eastwood and Griffith which could be obtained by other investigators without their results being in disagreement with those of the two original workers.

To increase the value of the graph, therefore, I suggest that in cases of this type—that is, where only two possibilities are dealt with—Poisson's rule should be applied to each observation plotted, and that the limits of possible variation should be plotted above and below each observation. In this way three graphs will be obtained, as shown in Fig. 2. It will be seen from Fig. 2 that any succeeding investigator might obtain results whose graph could lie anywhere between graphs Mx and Mn while still being in accordance with the results obtained by Eastwood and Griffith. For instance, a graph such as that seen in Fig. 3 might be obtained. When this is compared with Fig. 2 it will be seen that the two graphs of the observations are quite different, that of Fig. 2 showing its maximum at the 0-5 years age-period, while that of Fig. 3 (A¹) has its maximum at the 16-25 years age-period. It is clear that if such a graph as that seen in Fig. 3 had been obtained by later investigators working upon the same subject as Eastwood and Griffith, the work of these two investigators would be doubted, as apparently it would not be confirmed by succeeding inquirers. Actually, however, the work would be confirmed, for the results obtained by later investigators would lie between the maximum possible limits resulting from the work of the first observers.

Comparative Value of Graph and "Bar."

As the smaller the maximum variation possible the smaller the "bar"—as I propose to term the values included between Mx and Mn—it follows that the narrower the bar the more nearly does a graph approximate to the graph which would be obtained if an infinite number of observations for each plotting could be taken. Consequently, the graph of a series of observations is not of so great a value as is the bar based upon the same observations, for the bar not only points out the value of the observations, but also the limits within which succeeding investigators might obtain results in accordance with the original findings. The ordinary line graph, on the other hand, is only a record of the observations made on a comparatively few particular cases.

I believe that it is largely on account of Poisson's rule not being applied and of plotting graphs of statistics in the usual way that discordant results have so often been recorded by different observers investigating the same conditions. This apparent lack of confirmation which is obtained by recording observations only, and not maximum variations possible also, is unfair not only to the original worker, but also to the later investigator, for the apparent lack of confirmation throws doubt upon the work of both,

whereas their results may actually be in complete accordance.

I would therefore urge that Poisson's rule be applied to all statistical work in which there are only two possibilities, and that in the case of graphs of statistics, the graphs which I have termed Mx and Mn should be plotted. I urge this both for the protection of the work of the original investigators and of later inquirers. At a later date I hope to draw up a table of maximum variations possible for different numbers of cases, so that one can find by referring to the table the maximum variation possible in any series of observations whose total number and proportionate parts are known.

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A CASE OF

INFANTILE ACUTE ENDOCARDITIS.

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THE occurrence of acute endocarditis in infancy is sufficiently rare to justify the record of a case.

An interesting, though perhaps theoretical, point is the question as to whether the condition was a simple or a malignant endocarditis. G. F. Still, in his "Common Disorders and Diseases of Childhood," states that "the possibility of acquired simple endocarditis in a child under 2 years of age can be almost entirely excluded" on account of the fact that simple endocarditis almost invariably follows articular rheumatism, which hardly ever occurs under 3 years of age and almost never under 2; out of over 1000 cases of acute rheumatism or chorea in children he has only seen eight cases under 3 and not a single case under 2 years of age. Certainly the improbability of this case being one of simple acute endocarditis, either of foetal or post-natal acquirement, is borne out by the total absence of anything like symptoms of rheumatism in mother or child. It seems more likely that the endocarditis was of the infective type, since the child had a large area of unhealthy skin in which organisms of all kinds might be present, and it is not unlikely that some pathogenic variety gained entrance to the tissues at some place where the epithelium was damaged or absent. Against this view is the apyrexial course, but as this was only observed for some 20 hours it may not necessarily exclude a type of fever with a rather prolonged apyrexial period, during which the child might have been under observation. It must, however, also be remembered that the baby looked quite well apart from its eczema.

The incidence of malignant endocarditis in infants seems greater than that of simple endocarditis, though actual figures are difficult to ascertain. Malignant endocarditis, says Still, "does occasionally occur in infancy but it is excessively rare, and when it does occur is associated with an obvious source of infection." He states that he has seen two cases, one in a child of 7 months and another at 2 years, both associated with empyema. In this case there was in the eczema a possible source of infection, though there was no clinical pustulation; but there was also the possibility of a previous infection from the circumcision wound. The appearance of the vegetations, though neither ulceration nor any extension on to the mural endocardium was present, was suggestive of the infective type of the disease, but it would, I think, be impossible from the scanty evidence available to pronounce definitely on the aetiology, and though the weight of evidence points to a probable malignant type, it is only safe to say that the condition was an acute endocarditis; the occurrence of this condition

in an infant of 4 months is my excuse for presenting such an incomplete case.

History.—On Jan. 24th, 1922, a young mother brought her first baby to see me on account of a severe attack of infantile eczema which had shown no improvement under various lines of treatment. The baby was 4 months old, and had been suffering from an eczematous eruption from the age of 7 weeks; apart from the rash he was a healthy-looking infant, well nourished, and not at all fractious. The eczema chiefly affected the scalp, face, and flexor surfaces of limbs, with a few scattered nummular lesions on the buttocks, the eruption being moist and crusted but not pustular. Birth had occurred at full term and was normal; the baby was suckled for a week, after which Allenburys No. 1 food was employed for two months, followed by modified cow's milk, the reason for the discontinuance of the breast feeding being the too common one of "all the milk leaving the breasts." The mother gave the following account of her baby's previous history: When three weeks old circumcision was performed, and five hours after the operation smart bleeding took place and the doctor in attendance found it necessary to suture the prepuce (I could not ascertain whether this had been done previously), after which healing occurred naturally, though the baby seemed "out of sorts" for several days; it was noticed that its hands and feet were always blue, but did not feel cold to the touch. At seven weeks eczema appeared on the cheeks and very quickly spread to the scalp and limbs.

Examination.—I examined the child on the afternoon of Jan. 24th and beyond the eczema could detect nothing unusual; the motions appeared normal, and the frequency of micturition was that of a healthy baby; there was no pyrexia, while the gums and buccal mucous membranes showed no sign of any infection. Apart from the skin eruption the child appeared remarkably well.

Admission to Hospital.—The baby was taken into hospital and put to bed about 5 P.M., receiving his first feed at 6 P.M. (modified cow's milk taken well with no regurgitation), after which he went to sleep, waking at 2 A.M. He was again fed, and went to sleep immediately, waking once more at 6 A.M., when he was given a third feed. Again he went to sleep, and at 8 A.M., when the day-nurse went to dress the eczema, she found the child sleeping and decided to leave him for half an hour, intending to carry out the dressing later; but on returning at 8.30 A.M. she was astonished to find the baby quite dead. He had made no cry, and had not even turned over; there was no cyanosis or frothing at the mouth, nothing to suggest a cause of death, and when informed I was at a loss to account for it.

Autopsy.—I notified the coroner, and was present at the autopsy carried out on the following day, when it was found that all the organs were healthy with the exception of the lungs and the heart. On opening the thorax it was clear that there was no gross or widespread disease, both lungs being of the beautiful pink colour seen only in infants and quite free from any adhesions or the presence of lymph, but on the surfaces of both lungs were several bluish marks about the size of a mustard seed which on closer examination proved to be minute subpleural hæmorrhages. There was no excess of fluid in the pleural cavity or in the pericardial sac when the latter was opened. The heart appeared normal in size and colour, but on section it was observed that the tricuspid valve was somewhat less smooth than normal, and perhaps a little pinker than might have been expected, though the right auricle and pulmonary artery appeared perfectly healthy. The mitral valve, however, was found to be gravely involved, the free edges and auricular surfaces of the flaps being extensively covered with a beautiful growth of soft vegetations, not large, and quite recent, being shiny and pink in colour and extremely friable. The heart of a baby four months old is so small that it was difficult to make any detailed dissection, but so far as could be ascertained at the time the openings of the coronary arteries were patent and there were no congenital defects of any kind present. The cause of death having been ascertained with sufficient accuracy for the coroner's court, it was decided to leave the further investigation of the heart to the pathological department of the University, but by a regrettable misunderstanding the mortuary attendant failed to preserve this extremely beautiful pathological specimen.

Remarks.

Though the discovery of this unexpected and surprising lesion determined the terminology of the death certificate, the essential cause of death was obscure. There had been no clinical signs of any pulmonary or cerebral disturbance, nor were there present any pathological features, such as pulmonary infarcts or thrombosis of cerebral blood-vessels to account for such a sudden death. The most likely explanation perhaps is the onset of ventricular fibrillation conse-

quent on the presence of an embolus in a coronary artery sufficiently small to have passed beyond the openings, so that no sign of its presence was ascertainable from the naked-eye appearances of these arterial channels. Acute endocarditis in infancy is of extreme rarity, apart from foetal endocarditis, and I think this case was one of acquired disease for the following reasons. First, a careful history of the mother's previous health and pregnancy failed to elicit any suggestion of rheumatism or any other illness conceivably transmitted through the placental blood; syphilis was excluded in both parents, and so far as could be discovered no ante-natal circumstances seemed possible as ætiological factors. Secondly, as occurs in acquired disease, the left side of the heart was much more seriously involved than the right, whereas in endocarditis of foetal origin the right side is usually more diseased. Thirdly, there were no congenital defects in the heart, a factor of some importance, as foetal endocarditis is much more likely if such defects are present.

Medical Societies.

ROYAL SOCIETY OF MEDICINE.

SECTION OF OTOTOLOGY.

A MEETING of this section of the Royal Society of Medicine was held on May 19th, Dr. LOGAN TURNER, the President, being in the chair.

The Resonating System in the Cochlea.

Mr. GEORGE WILKINSON read a paper on the part played by the cochlea in the perception and analysis of sound, demonstrating his views by the epidiascope and by means of an apparatus constructed on the basis of the human cochlea. Helmholtz had declared that the only mechanical means by which sound could be analysed into its component vibrations was by a series of resonators, and that still held good. Every alternative theory was based on the possibility of a central analysis of the sounds received—i.e., by the brain. A notable step in advance was Dr. Albert Gray's observation that the spiral ligament increased in bulk from the base to the apex of the cochlea, denoting that it acted as the organ of tension. This increased bulk was a definite factor whose significance had hitherto been too lightly regarded. Mr. Wilkinson contended that the basilar fibres were loaded by a mass of cochlear fluid, which moved as they moved. The displaced fluid would travel along the scala until the membrane closing the round window was bulged to a corresponding extent; and a similar quantity of fluid would be displaced in the opposite direction in the scala vestibuli. The result would be the same whether the movement originated from an impulse applied to the stapes, or from vibratory movements of the sector itself. The mass of fluid moved was invariable for each sector, did not depend on the amplitude of the movement, and could be defined as that of a double column of fluid, the base of which was equal in area to the surface of the sector, and the length to the sum of the distances of the sector from the round and oval windows. The mass of the sector itself was inconsiderable in comparison with that of the fluid constituting the load. The formula for vibrating strings was:—

$$n = \frac{1}{2} l \sqrt{\frac{t}{m}}. \text{ This became } n = \frac{1}{2} l \sqrt{\frac{t}{ab}}$$

when applied to the transverse sectors of the basilar membrane, d being the sum of the distances of the sector from the round and oval windows, and b the width of the sector. The helicotræma was the essential part of the analysing membrane, and the conception of the mechanism now advanced allowed for a capacity of 10 octaves.