are often diagnosed as manic-depressive psychosis, but our conclusion is that this is a rather uncommon condition, perhaps occurring in patients with a special constitution and previous personality.

Summary

Total body water and the distribution of electrolytes were studied on two occasions in 22 patients admitted to hospital suffering from mania. Their mood on the day of each test was assessed by doctors' rating and part of the Hildreth scale. On the basis of these assessments the patients were divided into three groups: mania, depression, and normal. The results have also been compared with our previous findings in depression.

Total body water and its partition between intracellular water and extracellular water did not change significantly with affective state, but extracellular water was consistently lower than normal in all groups, and this was also found for depressed patients (ill and recovered). Concentrations of sodium, potassium, and chloride in plasma were constant. Residual sodium (intracellular sodium with the addition of a small amount of sodium in bone) was greatly increased in mania. The smaller increment in residual sodium seen in the depressed phase of mania was similar to that found previously in severe depressive illness.

Body fat was greater than normal in mania, and was significantly greater than in the group of depressed subjects.

It was concluded that mania is accompanied by similar electrolyte abnormalities to those seen in depression but that the changes in mania are more extreme. The differences in body fat could be a consequence of the illness or they might indicate that there is a constitutional difference between patients suffering from a manic-depressive and a depressive illness.

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Deafness in Acute Otitis Media

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Acute otitis media in children is a common disease in general practice. Fry (1961) found that 10% of the children in his practice had one or more attacks in any one year, and the Medical Research Council Working Party (1957) reported a yearly incidence of 8%. Though it is known that deafness is found during an attack, there seems to have been very little evidence of the long-term effects on hearing of this common disease until the survey carried out in Liverpool by Lowe, Bamforth, and Pracy (1963). Cases followed up by general practitioners have all been tested by the ability to hear the whispered voice, and this has been shown to be a very inaccurate test (Huizinga, 1958). There have been several series followed up audiometrically, but these have consisted of patients who have been referred to hospital (Young and Simson Hall, 1948; Dixon, 1958; McNeill, 1962). The M.R.C. report states that only 1% of cases of acute otitis media are referred to hospital, so these series must be regarded as highly selected.

In this paper we report an audiometric follow-up of 121 children diagnosed as having had acute otitis media who have been treated at home by their general practitioner.

Method

The series consisted of all children under the age of 11 with acute otitis media seen in two general practices between March 1960 and April 1961. The practices, one of three doctors and

one of two, are in a market town in the Nottinghamshire coal-field. The total practice population at the time was 12,500, and the estimated population of children under 11 was 2,200. In general, housing conditions were good, and the children, coming from all social classes, well cared for.

When a child seen at home or in the surgery by one of the practitioners was found to have acute otitis media a special card was completed (Fig. 1). The definition of acute otitis media we used was that put forward by Fry (1958): "An acute condition with earache and a red drum or with a sudden onset of discharge from the ear, either following earache or arising *de novo* with no previous history of chronic ear disease."

The completed cards were left at the surgery for the otologist to collect, and as soon as practicable he visited the child at home.

All treatment was left to the general practitioner, and the otologist took no part in it unless the child was referred to hospital for his advice in the usual way. His function was to assess the condition, and in some cases to carry out an audiogram during the attack. His findings were recorded on the reverse side of the card.

For children over 5 years of age the follow-up examination was arranged six months or more after the attack, and those

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seen at a younger age were sent for after they reached the age of 5. The parents were asked to bring the children to the outpatient department, where they were examined by the otologist and an audiogram was done. Particular attention was paid to the appearance of the drumhead and its mobility. In some cases the parents would not bring the child, and the otologist then saw the child at home for the examination and audiogram. If the hearing was found to be defective, the child was seen again at approximately yearly intervals until the hearing became normal or the survey ended, in June 1964. During this follow-up period some of the children needed further treatment, and this was arranged after consultation with the general practitioner.

ACUTE OTITIS MEDIA.			
NAME:	Sex	M	F
	Date of Birth		
ADDRESS	Date first seen		
Any previous Ear Disease?	Yes	No	
If yes, what disease and when?			
Previous Consultant's Opinion on E.N.T.	Yes	No	
Present symptoms and signs:			
Fever > 100°	Yes	No	
Right Ear	Left Ear	Duration	
Earache	Yes	No	Yes
Discharge	Yes	No	Yes
Reddened Drum	Yes	No	Yes
Deafness	Yes	No	Yes
TREATMENT GIVEN:			

FIG. 1.—Card used by the general practitioner to record his findings.

All the audiograms were done on the same Peters portable audiometer in a quiet room, either at the hospital or in the home, and therefore are not strictly comparable with audiograms done in a properly sound-proofed room. Five children with no previous history of ear disease were used as controls, so as to be certain that these conditions had no great effect on the accuracy of the tests. The hearing loss over the speech frequencies averaged only 2 decibels (db.), which was considered an insignificant drop in threshold. We have drawn the line between "normal hearing" and "deafness" at the 20-db. level, though minor degrees of hearing loss (between 10 and 20 db.) are not without significance (see below).

Results

Of the 171 children seen in the initial stage of the survey, 49 (28%) were noted by the practitioner to have otorrhoea; 101 were having their first attack. Their ages ranged from 2 months to 11 years, the age distribution being shown in Fig. 2. A note was made at the first visit of any history of previous attacks, and Fig. 3 shows the age distribution of first attacks. Only 121 of these children could be followed up audiometrically. The main reason for this was that 43 were still too young in 1964 to be examined accurately; four of the families had left the district and three were so uncooperative that the attempt to test the child was abandoned.

FIG. 2.—Age at which children entered the survey.

Sixteen children were tested during an attack, and Fig. 4 shows the average audiogram obtained. A test of the ability to hear a whispered voice was carried out at the same time, and in many cases the child could hear this at about 12 feet (3.7 metres). If the hearing of a whisper was reduced to 3 feet (0.9 metre), the deafness was severe.

FIG. 3.—Age at which children had their first attack of otitis media (168 cases).

FIG. 4.—Average audiogram obtained during attacks of otitis media (25 ears).

At the first follow-up 25 (20%) of the children had a hearing loss of 20 db. or more in one or both ears over the speech frequencies, and 17 of these had this degree of deafness in both ears. This deafness persisted in some cases for months before finally clearing. The average time between the attack and final normal hearing was 23 months, but it was not possible to say exactly when the hearing returned to normal. A further 19 children (15%) had a hearing loss of between 10 and 20 db. in one or both ears when first tested, all improving ultimately. So 35% of the children suffered some impairment of their hearing over an appreciable period of time.

At the final test, however, only two (1.5%) were found with a deafness of 20 db. or more in both ears, and one of these had a variable deafness and had been tested on a bad day. Six others (5%) had this degree of deafness in one ear, in two of them the damage being sufficient to produce a 40-db. loss.

The main defect noted on final examination of the ears of those with persistent deafness was dullness and restriction of mobility. One had a grossly retracted and adherent postero-superior quadrant, but no perforations were found. Seventeen of these children had been referred to the consultant for advice regarding infections of the upper respiratory tract before entering the series, and 12 were referred during the survey. In 25 (20%) surgery was thought necessary. The operations performed and the final hearing results are shown in the Table.

The only factor that seemed to increase the chances of permanent deafness was repeated attacks of otitis media. Of the eight children with deafness greater than 20 db., six gave a history of recurrent otitis media, one of mild earache, and one

of deafness with colds. The history of otorrhoea did not appear to have any effect on the final result; of these eight cases only three had had discharge from the affected ear. The average age of onset for these eight children was the same as for the whole series.

Operations Performed on Children in the Survey

Operation	Final Hearing Result	
	Normal Hearing	Impaired Hearing
Adenoidectomy ..	10	4
" and myringotomy ..	2	
" and proof puncture ..	2	
Tonsillectomy and adenoidectomy ..	6	
Proof puncture ..	1	

Discussion

To provide a full picture of the effects of acute otitis media occurring in childhood the final assessment should be made when the child is over the age of 10, by which time most of the children will have ceased to have attacks; but this would entail a survey lasting at least 10 years. In this respect our survey must be regarded as incomplete.

Treatment

When planning the survey we had intended to divide the children into two groups, one to be treated with an antibiotic immediately, and the other to have a period of careful observation before the decision was made to use an antibiotic, as advocated by Fry (1961). We hoped, therefore, to be able to compare the effects on hearing of these two courses of action. However, it soon became apparent that the practitioners much preferred to give oral penicillin as a routine, and so the majority of patients were treated in that way and we abandoned the idea of making a comparison. Several varieties of penicillin were used, but penicillin V was the most popular.

The reasons for adopting the routine use of antibiotics were, briefly: (1) treatment with oral penicillin is simple for the practitioner and acceptable to the child; (2) it appears to be rapidly effective, and very few children had to be changed to a broad-spectrum antibiotic, or intramuscular penicillin; and (3) if the child is seen early it may be difficult to decide whether or not the attack is likely to be severe; to give oral penicillin at once may save the child much pain and the parents and the practitioner much worry.

Deafness

Our findings contrast strongly with those of Lowe *et al.* (1963), who found that 25% of their patients had a deafness of over 30 db. in one ear when examined six months after the attack. On this basis our figure at six months would be 6%. However, their figures were based on a single test, whereas our children were examined yearly until their hearing-loss had recovered or until the survey ended, and a longer follow-up of their children may reveal that many improve. Nevertheless, both these series show that, following an attack of acute otitis media treated with care and followed up assiduously, a consider-

able number of children spend an appreciable period of time with a deafness which can affect their progress at school. Ling (1956) found that 39 out of 40 children with slight deafness (under 25 db.) attending ordinary schools showed significant retardation in arithmetic or in English, or in both.

The ill-effects of this period of deafness can be minimized if it is recognized that the child's hearing has not returned to normal. Whispered-voice tests are of little value in this respect: we found that a child with a 25-db. deafness could hear a whispered voice at about 12 feet (3.7 metres) in an ordinary council house. A much more accurate idea of the state of the child's hearing can be obtained by careful assessment of the mobility of the drumhead by means of a pneumatic speculum. This type of attachment can be fitted to many auriscopes. If the degree of hearing loss is slight, such simple measures as a seat at the front of the class may be enough. When the changes are more pronounced and persistent, the child should be referred to an otologist for further treatment. Adenoidectomy, myringotomy and aspiration of the middle ear, politzerization, and treatment of sinusitis are the usual methods employed.

Provided these children are recognized and given help, they should come to no great harm in their education; and the ultimate picture, so far as this part of the country is concerned, is not so gloomy. The majority of these children seem to be emerging from the catarrhal phase of their lives with no significant deafness.

Summary

A survey was made of 171 cases of otitis media occurring in children in two general practices, and 121 of these were followed up with audiometry. Nearly all the children were treated with oral penicillin, and the reasons for taking this course of action are given.

Only two (1.5%) children suffered permanent damage to the hearing in both ears, and six (5%) had a permanent loss in one ear. At the first testing, 20% of the children had a hearing loss of over 20 db. in one or both ears, but in most cases they recovered, the average time between the attack and a normal hearing test being 23 months. A further 15% had a minor hearing-loss of between 10 and 20 db. Recurrence of the attacks of otitis media was the only factor that increased the chances of permanent damage to the middle ear.

The importance of recognizing these periods of impaired hearing is stressed.

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