means uncommon when inspecting milk coolers to find a small leak either in the cooler or the water connections from which small quantities of water insufficient to be discovered by analysis of the milk may find their way into the milk.

When the bacteriological examination shows pollution while the chemical analysis is good, and *vice versa*, the supply should, at all events, be very carefully inspected, if not at once condemned; in one case the bacteriological results were so suspicious after twenty-four hours (turbidity in Parietti broth, which I then used, and sporogenes-like curdling of milk) that, notwithstanding a good chemical analysis, I telegraphed to have the well opened, and a small recent leak was discovered. In another case the chemical results were very bad, but the water was nearly sterile; on inspection the position of the well it was found to be hopelessly bad, and a later bacteriological examination was less favourable; in this instance it appeared that a quite unreliable filtration through the soil was going on.

I am of opinion that pollution from the drainage of cowsheds should be regarded as dangerous; I have seen so many instances during my visits to farms in which persons employed on the farm have relieved the calls of nature in the cowsheds, that for this reason alone I should condemn such a water.

With regard to the other two points, I would only mention that I know of two instances where water is brought in pipes for over one mile, and that I can confirm the extreme difficulty often mentioned by farmers of preventing cows from drinking from any dirty pool rather than from a good water supply.

TWENTY-NINE YEARS' SERVICE AS MEDICAL OFFICER OF HEALTH.—On January 1st, Dr. Joseph Henry, J.P., relinquished his office as medical officer of health of Rochdale, an office he had held continuously since October 30th, 1879. At the last meeting of the health committee he attended, Dr. Henry submitted a report in which he reviewed the improvements in the health and sanitary condition of Rochdale during his twenty-nine years of office. In this period the birth-rate had fallen from 35.6 to 23.8, the death-rate from 25.3 to 17, the phthisis death-rate from 2.4 to 1.28, and the infantile mortality from 176 to 121. On his retirement, Dr. Henry was presented with a silver tea and coffee service by the members of the health committee, and with a silver loving cup by the staff of the Marland Hospital.

THE EAR, NOSE, AND THROAT IN SCHOOL MEDICAL INSPECTION.*

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IN your capacity as School Medical Inspectors you will have it in your power to do much toward the prevention of ear disease and, by the detection of incipient deafness, you will be able to arrest its further progress by ensuring appropriate treatment. The enormous importance of perfect hearing in the intellectual and moral development of children, and the serious handicap to them of moderate or even slight degrees of deafness, will become very patent to you after you have spent a short time at your duties, and you will quickly find that the prompt recognition of imperfect hearing is not the least of your responsibilities. Before we turn our attention to the inspection of ears, nose, and throat, it will be well, therefore, to consider what the possession of normal hearing means to the child's education.

The primary and most simple idea of an object is formed by the revival in the mind of the impression that the object has made upon the sensorium through the sense organs, and each percept or idea of an object is the complexus of images received through the different senses—sight, smell, hearing, taste, touch, and the muscular sense, some one of these being usually the "master sense." The blending of these sensory ideas is probably due to the presiding intelligence, which belongs to the cerebral cortex as a whole. As education proceeds, and language is developed, each object percept becomes related with its name, these names being the verbal symbols of the simplest ideas which we have of things.

In the language of a nation, certain articulate sounds become the symbolic representatives of certain definite ideas, learned by each child first as sounds, later as symbols. *The sounds are first registered in the cortical centre for hearing*, and it is under the guidance of this centre that the child trains the motor centre to articulate the sounds, thus getting second images imprinted upon the cortical motor centre for speech. The motor reproduction of sound becomes so interesting that the child reproduces many sounds by *echolalia*, without

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attempting to understand them. Before *echolalia* is exhibited, however, the child obtains a number of word-memories imprinted upon the auditory centre before he can articulate a single one of them, and these are even associated with their proper meanings. At this stage the education of the receptive apparatus is ahead of that of the reproductive motor apparatus.

This very short statement will serve to demonstrate how much depends not only upon the auditory receptive apparatus, but upon the integrity of the channels—the auditory conductive apparatus—which carry the sounds to it.

When there is any defect of hearing the development of speech suffers, and with it the mental development of the child. The sensations which give rise to hearing consist practically of two elements—*tone* and *noise*, both of which possess the qualities of pitch, intensity, and timbre. From the multitude of sounds which surround the child, the most important to him is *speech*. Speech ranges through some three octaves, from C (128) to C² (512). In order to appreciate how defective hearing affects the education of the child, we must recognise what escapes him. He is unable to perceive noises of slighter intensity, such as the softer sounds of the wind and the chirping of insects; and as it is these sounds of slighter intensity which go to form the “Voices of Nature,” he loses much of the education which the natural world would otherwise afford him. He cannot distinguish the sounds of wood and countryside, and he loses also to a large extent the finer shades of human vocal expression. The hard of hearing child not only hears less than his normal fellows, but he also hears differently to them. His intellectual development consequently suffers, for, since all perceptions originating from soft sounds are wanting, a great defect in conceptions follows. Such a child does not know why a noise is at one time called humming, the next time murmuring, or singing, buzzing, etc. Many conceptions are also rendered incomplete; for instance, in “watch” the part represented by “ticking” is absent; with the idea of “bees” buzzing may be wanting, and so on.

But besides this, the important development of speech suffers in direct proportion to the degree of deafness and the period of its onset, many of the speech-sounds not being heard,

or being heard in an altered tone. As a result, speech is slowly learned, or various errors of speech appear, the child slurring consonants, which are either not heard or heard in an altered form. A poor comprehension of speech and its delayed development has the further result that the chief stimulus of thought—conversation with those older than himself—is partially absent. Consequently such children are sufficiently handicapped to be poor at their lessons, thus gravitating to the bottom of the class; they are less developed mentally, and the gap between them and their classmates becomes accentuated as their school life goes on. Even those who suffer from deafness in a minor degree feel their defect, and their mental development is influenced for the worst. These children are sometimes noticed by their teachers as “inattentive”—they are usually the children with adenoids and naso-pharyngeal catarrh. Such cases are easily fatigued and vary with the state of the weather. Damp and rain increase their nasal obstruction and accentuate their defects of hearing. If such children are punished they are frequently unaware of the reason, and, being generally shy, without much self-reliance, and often awkward of speech, punishment merely frightens them and renders them less easy to manage. You should be on the alert for such cases, and teachers cannot be sufficiently warned that children who make little progress and are inattentive should be presented for medical examination before they are put down as refractory.

There are, therefore, several very cogent reasons for exercising a special care of the ears, nose, and throat in school medical inspection, and you will probably wish to know the best and speediest method to pursue. It is wiser to make a routine examination of these regions before you examine functionally the hearing, as then your time is not wasted in testing children whose ears are obstructed by wax or discharge. Accumulations of cerumen or discharge should be removed by proper syringing and the ears again inspected to ascertain the condition behind the accumulation. All cases of discharge should be noted, and directions given for the parents to be communicated with in order that the child should have prompt treatment. The dangers of ear discharge should be impressed upon the parents, if they

are present, or the teacher should be instructed to inform them. Children whose parents persistently neglect treatment should, I think, be excluded from school, after the parents have been warned, and steps taken to enforce proper treatment. You should take note of such cases and make sure that adequate treatment has been carried out. When there is an otologist attached to the school it is better that all cases of discharge or other ear conditions should be referred to him, as you are then relieved of much responsibility.

The nose and throat should also be examined, especially with a view to the detection of enlarged tonsils, adenoids, and nasal suppuration. Time will not permit of our considering in detail the nasal conditions that may be found, but some attention must be given to the question of adenoids. I do not think there is any necessity for you to feel for adenoids with the finger behind the soft palate. An inspection of the pharynx and fauces with the tongue properly depressed is, combined with careful note of the symptoms, sufficient for all practical purposes, and if you make it a practice of palpating every case, you will soon become an object of fear and suspicion to the children. The small wooden tongue depressors used in the London County Council schools are most useful, as they can be burned after use. Very often you can see an adenoid mass by merely depressing the tongue strongly; and it has been pointed out that adenoids are frequently accompanied by large granules (much larger than the granules of an ordinary granular pharyngitis) on the posterior pharyngeal wall. Of the symptoms which help you to diagnosis, the frequent catching of colds is the most important, the next in order being mouth breathing, adenoid face, adenoid speech, ear complications, and aprosexia. It is worth while pausing here for a minute or two to consider some of the effects of adenoids upon the mental condition of the child, apart from the difficulties to which concomitant deafness may give rise. The condition to which Guye, of Amsterdam, in 1887, applied the term aprosexia is given by various authors as occurring in from 35 to 70 per cent.—a wide margin. In a recent investigation, the particulars of which I hope soon to publish, I found aprosexia present in 73 of the 1,562 children examined, or 1 in 21.41, and all of these had adenoids. In an analysis of 307 consecutive cases of adenoids

made in 1901, the symptom was marked in 17, or 1 in 18.05. In all these the nasal obstruction was severe. Crowley found aprosexia present in 28 per cent. of his cases, and considers that in many instances the mental dulness is more apparent than real, the true cause being the deafness. The deficient mental condition consists chiefly in a want of concentration, and any effort in that direction appears to exhaust children with marked adenoids in a very short time. It is probably due to the combined effects of deficient blood oxygenation and a hindrance to the cerebral hæmic or lymphatic circulation. It will generally be found that, apart from aprosexia, the effects of adenoids upon the temper and general disposition of the child are very noticeable. Many adenoid children are fretful, sulky, or liable to outbursts of passionate temper, and difficult to manage. I have known children to change markedly in this respect after an operation. The blood changes are important in regard to aprosexia. Lichwitz and Sabrazes found that children with adenoids have a mild form of anæmia and leukæmia, with an increase in the large mononucleated cells, viz., the lymph cells and eosinophiles, taken by the percentage method and by absolute count per c.mm., and a relative and absolute decrease in the number of polynucleated cells. After the removal of adenoids they found that the blood tends to return to the normal.

Of the importance of removing adenoids and enlarged tonsils there can be no doubt. It must be remembered that the children in State schools are exposed to a much worse environment than are the children of the better class, and they must have every possible handicap removed. The relation of adenoids and enlarged tonsils to tubercle, their effect upon the nose and ears, the shape of the chest, and the unfavourable influence they exert should the child suffering from them contract diphtheria, measles, scarlet fever, or other exanthema, as well as their effects upon the mental condition and blood state, are all very strong reasons for their proper and efficient removal. Whilst upon this subject I may point out two facts that are not generally known, or, at any rate, generally appreciated. The first is that very large tonsils may sufficiently block up the pharynx to cause mouth breathing, without the presence of adenoids; this was particularly brought home

to me when I met with a child in an elementary school in which mouth breathing persisted after the removal of adenoids, and in whom I found a pair of enormous tonsils so enlarged that air could only reach the lower air passages *viâ* the mouth. Their removal restored the child at once to nasal breathing. I recently also operated upon an adult, in whom there was mouth breathing without any nasal obstruction; she had two greatly hypertrophied tonsils which caused very considerable pharyngeal obstruction, and she could, in consequence, only breathe with any degree of comfort through the mouth.

The second fact is the frequency of enlarged tonsils and especially of attacks of tonsilitis in connection with carious teeth. This is, of course, a phase of oral sepsis, but I do not think the influence of dental caries in the causation of tonsilitis has been sufficiently recognised.

I now pass on to the consideration more especially of hearing defects. Defects in hearing in school children will be found to vary from slight departure from the normal to severe deafness, causing partial or complete mutism. The methods at disposal for testing the hearing are the watch, the bell, the voice, the Galton whistle, and the tuning-fork. Of these the watch should be discarded as misleading and useless. The tick of a watch is a complex of musical sound and noise, and some deaf persons will hear the former whilst others hear the latter; moreover, every watch varies in its tick according to the condition of the winding, and some watches tick more loudly than others. The bell is required only for the very deaf, and it should have its clapper fixed by a spring to the outside of the bell, in order to give a single stroke. The usual form of Galton whistle sold is unreliable, and, for motives of accuracy, it is best to use the Edelmann-Galton pfeife. It is required for testing the acuity for high sounds. The most useful tuning-fork to use is that known as Lucae's, provided with a vulcanite foot, and clamps to prevent overtones. The "Gardiner-Browne" fork is misleading. A C fork, of 128 double vibrations per second, should be employed; a stop-watch should be at hand to register the difference between the child's bone-conduction and that of the examiner (presumed to be normal).

But the functional testing of the hearing takes time, and when the medical inspector

has to examine a large number of children he cannot do more than detect those who are deaf, and either retain them for further testing, or refer them to an otologist. I am of opinion that consulting otologists should be appointed for this purpose. Of all the tests for hearing, that of *speech* is the most important, and therefore, the one to be relied upon for the medical inspection of school children. The tests should be applied in the presence of the teacher, who may be able to give the doctor important information about the child. A normal child's ear can hear whispered speech easily at from 20 to 25 metres (22 to 27 yards). To obtain a uniform whisper, the examiner should empty the chest of air and whisper with the last breath, *i.e.*, with the residual air. It may be noted here that special attention should be paid to sibilants, the high-pitched soft *g*, *f*, the explosives, and the letter *r*. Hissing sounds (*s*, *sch*.) are usually heard worst in diseases of the conducting apparatus, *f* in labyrinthine disease, and *r* in defects of the tympanic membrane. In testing with speech the ear under examination should be towards the doctor and the other ear firmly closed by the teacher; the child's eyes should also be closed or covered.

In the ordinary medical inspection of school children it is unlikely that the medical officer will proceed further than the whisper test, by which he will be able to segregate the deaf cases and direct their further examination by an otologist. By following this routine, and referring all deaf cases to an official otologist, no matter what the degree of deafness may be, there is a better chance afforded of classification and of timely advice as to the seeking of treatment. By such means a considerable number of cases of early deafness will be detected and prevented from progressing to marked degrees. We could thus materially diminish the number of acquired deaf-mutes and of those deaf children who need special education.

The method of roughly classifying children by the whisper test into bad deafness (below 2 metres), medium deafness (2 to 4 metres), and slight deafness (over 4 metres) is a good one for all practical purposes of routine inspection. It must be remembered that, of the whole cases that will be detected by this method, some 50 per cent. can be cured, and of the remainder a large proportion are capable of considerable improvement, and it

will be a great triumph for medical inspection if by these means a number of children thus have their important sense of hearing preserved. It means an augmentation of the number of normal, self-supporting citizens, and a corresponding decrease of paupers and criminals—actual and potential.

To sum up, all pupils should be examined as regards their hearing in the first year of school life. This examination should consist of a preliminary inspection of all children, with testing of hearing acuity, by the school doctor, and a special examination by an otologist of those found wanting. Both examinations should be repeated for all children kept back in their classes, and in all who have, in the course of the year, suffered from any of the exanthemata or shown signs of ear disease. To make the results of practical value, the examinations should be made in the presence of the teacher, and every case followed up as regards the seeking of treatment.

When a child is brought up for examination as dumb, the medical inspector must decide whether it is mentally defective or deaf. He should, therefore, satisfy himself as to: (1) the condition of the hearing; (2) the child's play and general conduct; (3) its habits as regards cleanliness; (4) its affection and manageableness; (5) the condition of the ears, nose, and throat.

I must, in conclusion, say a few words upon the important question of the education of the deaf child. There has been a rising consciousness upon this subject of late years in England, and, although we are scarcely as yet in the front rank of deaf-teaching countries, we are certainly advancing yearly. There are two highly-important points opened up by this question of deaf education: (1) Where is the deaf child to be taught, and, since this cannot be done to the best advantage without classification, how is the deaf child to be classified?

The turning-point of the whole situation in the education of the deaf lies in the proper handling of language, and, indeed, any system of classification is only a means to an end—the mastery of language. No classification can be complete that does not include those children who are semi-deaf or even slightly deaf, for there is absolutely no sharp line of demarcation between them. The slightly deaf and the better cases of the semi-deaf can be perfectly well taught in special classes in ordinary elementary schools; the former may even do quite well in ordinary hearing classes, provided they are placed in the front desks and the teacher gives them special attention.

Bezold considers that school work is possible when the child can hear loud speech at two metres, as the teacher can generally manage to place himself at that distance from him; those deaf children, whose minimal distance is less than half a metre, can be taught if the teacher can pay them special attention. I am inclined to think, however, that the latter are better taught in special classes.

Having regard to the large classes, numbering from thirty to fifty, that are to be found in many elementary schools, I am of opinion that, in such classes, it is well-nigh impossible for a teacher to give much individual attention to a semi-deaf child, even though he be placed in the front desks. It would therefore be a wise arrangement if, in each school district, there could be one or two special classes for those children who are too deaf to obtain full advantage of the education offered to them in an ordinary class, and that these special classes should be placed in charge of an elementary teacher who is qualified also as a teacher of the deaf. Moreover, the semi-deaf child is better for the companionship of normal children, and should not, therefore, be placed in a deaf school. This would be obviated by the establishment of the special classes referred to, as the child would be with his normal schoolfellows in the playground, whilst receiving special instruction during his working hours. The placing of such classes in the charge of a teacher of the deaf would further ensure that any of the slighter defects of speech due to his diminished hearing acuity would be corrected.

I think, gentlemen, that I have now said enough to show how much work there is for you to do in the departments of ear, nose, and throat. I have purposely omitted any narration of the evil effects of confirmed mouth-breathing or enumeration of the serious complications of middle ear suppuration, or descriptions of rare conditions, like congenital occlusion of the nares, because to do so would merely weary you without adequate return. The first two are now such well-established facts that you are already sufficiently well aware of their importance, whilst as regards the third, your work is to detect the common nose and ear conditions rather than to search for curiosities. Those of you who are specially interested in otology and rhinology will find many opportunities for original research. There are plenty of points upon which we need information. I would strongly advise you to keep private notes of your work and to collect as many facts as possible, for it is large collections of facts that are wanted for the elucidation of many questions as yet unsettled.