

passes freely first through the cavity of the tympanum, then through the mastoid antrum, and the injection emerges through the external artificial orifice. A small perforation of the membrana tympani apparently makes no difference; the injection goes beyond the perforation and emerges, in the first place, through the external orifice of the antrum. This can be beautifully shown by impregnating the air with smoke; on careful observation through the perforated membrane the smoke can be seen passing through the tympanic cavity, onwards beyond the perforation to reach the antrum. It is not until the tympanic cavity and antrum are filled with the smoke-laden air that it emerges through the orifice of the perforated membrane.

This experiment we have done repeatedly, both by means of a membrana tympani perforated artificially and one perforated by inflammatory disease; in every case the smoke-laden air emerges, in the first place, through the external opening of the mastoid antrum and never, primarily, through the perforated membrana tympani. After repeated experiments on the same ear the smoke appears almost simultaneously through both the openings—viz., that of the perforated tympanic membrane and the external opening of the mastoid antrum. This is explained by the fact that the whole of the middle ear is filled with smoke after such repeated experiments. These experiments, we think, conclusively prove that when air or water is inflated it is first forced into the mastoid antrum irrespectively of whether the membrana tympani is perforated or not. We suggest that it would then be forced into the mastoid cells if formed and the fact that these cells are formed early means that there can be no distinction as regards treatment in the child and in the adult.

The conclusions to be derived from these experiments are open to the criticism that an external opening of the mastoid antrum is not present until operative measures have been undertaken. The presence of an external orifice will undoubtedly modify greatly the passage of injected air or fluid through the antral cavity but this modification is merely in the direction of increased quantity and increased facility of transit. The point which we seek to emphasise is that even when the external aperture is wanting there still exists a tendency for injected air or fluid to pass in the same direction. Beyond this one cannot go. Clinical experience teaches us that the disastrous results which follow the passage of septic material into the antrum are not invariable after politzerisation but we are convinced that from the anatomical arrangement of the parts they are by no means impossible.

Politzer states,⁶ on the authority of Michael,⁷ that "the view that in perforative inflammation of the middle ear purulent secretion is driven into the mastoid cells by the air douche has been disproved" and that Michael had "demonstrated experimentally that the secretion is always expelled into the external meatus," presumably through the perforated membrane. We think that our experiment proves that Michael's view cannot be substantiated. Our contention, therefore, is that in acute septic disease of the middle ear inflation should not be employed. If, however, for any special reason inflation be deemed advisable the Eustachian catheter should be passed and air driven into the cavum tympani with great care and gentleness. We believe that in every case of septic middle-ear disease the first and primary requirement from the anatomical, pathological, and surgical point of view is free and unimpeded drainage. To carry this principle into effect a free incision of the membrana tympani is essential and it is equally essential that the incision be kept open in its whole length by re-incision where necessary or by the actual removal of a triangular wedge of the membrana tympani itself. Furthermore, we believe that aspiration of the contents of the cavity of the middle ear by means of Siegle's speculum or Delstanche's raréfacteur is a therapeutic measure of the first importance, especially when combined with adequate drainage.

DESCRIPTION OF THE FIGURES.

We desire to express our indebtedness to Professor Symington, to Professor Robinson, and to Professor Peter Thompson (King's College, London) for their kindness in lending us many specimens and photographs.

All our figures were reproduced by photographs taken from actual specimens and of these Figs. 1, 4, and 5 were taken

from specimens lent to us by Professor Thompson from the collection in the anatomical department at the Middlesex Hospital. Fig. 6 is taken from a photograph of a special dissection made by Professor Robinson. The remaining figures are taken from preparations in our own collection.

FIG. 1.—Right temporal bone of a child, aged four years, showing the "middle-ear cleft" after removal of its roof, the tegmen tympani.

FIG. 2.—Right temporal bone of a child, aged four years. The tegmen tympani has been removed and the parts of the internal ear have been mapped out. The specimen shows the middle ear and its several cavities.

FIG. 3.—Horizontal section of head of a child at birth made by Professor Thompson. The section is cut transversely through the head at the level of the middle ear and shows the continuous cavities of the Eustachian tube, the tympanum, and the mastoid antrum—i.e., the cavities included in the middle ear.

FIG. 4.—Dissection showing the middle ear and its cavities and the relation of the middle ear to the external auditory meatus in a child at birth. The dissection was made by sagittal and coronal sections, removing a wedge-like portion of the face until the middle-ear cleft and the external auditory meatus were exposed. It shows from a different standpoint the points seen on Fig. 3, but owing to the oblique position of the specimen it does not show the whole of the mastoid antrum.

FIG. 5.—Right temporal bone at birth. The squamo-zygomatic element has been separated and the inner wall of the middle ear is exposed; the several cavities included in that cleft are well seen.

FIG. 6.—Right temporal bone of a six months' foetus. Similar preparation to that shown on Fig. 5 but at a much younger stage. It shows all the cavities of the middle ear but their continuity is more marked than at a later stage. Further, it shows indications of the commencing mastoid cells.

FIG. 7.—The middle ear and its cavities in the adult.

GENERAL STAPHYLOCOCCIC INFECTION TREATMENT BY ANTISTAPHYLO- COCCIC SERUM AND HETOL; DEATH.

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BUT for the fact that a post-mortem examination was made in this case it would have been classed as one of vegetative endocarditis. That this would have been an incorrect classification will appear from the post-mortem report. It has seemed to us that the case is an instructive one and worthy of publication, if only by reason of the negative results of the treatment followed, a treatment based on the supposition that it was a case of infective endocarditis and therefore probably of a mixed infection, as pointed out by Dr. Cyril Ogle. Though the clinical course of the case strongly supported such a diagnosis the onset was in no wise suggestive of this disease.

The patient was a man, aged 23 years, a painter, and beyond the fact that there was an account of rheumatic fever at the age of 13 years there was nothing worthy of note in his previous history. He was well until the morning of March 19th, 1904, when at 11 o'clock he had a sudden pain in the "stomach" followed by shivering. He shivered off and on until the evening when he became feverish. The next day he was feverish but had no pain and the following night he was "light-headed." On the 21st he came to the out-patient department with the above history. His temperature was then 101° F. and the spleen was easily felt below the costal margin. He was admitted. For the following notes we are indebted to Mr. J. B. Stevens, the house physician. The patient was flushed. His temperature was 102°. There were sores about both external nares and a semi-purulent discharge which had existed "for some time." The tongue was red and dry. The pharynx was normal. The abdomen was slightly distended but moved freely with respiration. The spleen was enlarged and easily felt. The liver was not enlarged and there was no local or general tenderness. The lungs were healthy and there were no adventitious sounds. The pulse was dicrotic (96). There was a soft apical systolic murmur conducted for a short distance towards the axilla; it was not suggestive of valvular disease of 13 years'

⁶ Loc. cit., p. 81.

⁷ Archiv für Otologie, vol. xi.

standing. There was no evidence or history of any genito-urinary disease. The urine was alkaline, of specific gravity 1018, and phosphatic; there was no albumin. The hands and tongue were tremulous. On March 22nd the temperature had been up to 104° in the morning and night and on the morning of the 23rd and it had not been lower than 100·4° since admission. Tepid sponging was employed when it was above 103°. The second heart sound on the 23rd was reduplicated in the aortic and pulmonary areas. The reduplication was louder and more distinct—in fact, quite sharp—to the left of the sternum. There was no diastolic murmur. The air entry at the right apex was poor. The spleen was smaller and was now only just palpable. The general condition remained unaltered. Dr. Bushnell took blood from the left basilic vein with the usual aseptic precautions as regards syringe, needle, and skin; he also took a culture of the nasal discharge. On the 24th the second sound at the base was rumbling in character. The abdomen was more distended, the spleen was not felt, and the highest temperature reached during the past 24 hours was 104° and the lowest was 102·6°. On the 25th there was a distinct diastolic murmur in the pulmonary area conducted down the left side of the sternum; it was not heard in the aortic area. There was no increase of cardiac dulness. Much pain was present in the left side of the chest in the morning and a to-and-fro pleural rub was heard in the lower part of the left axilla and just below the heart's apex beat. On ophthalmoscopic examination the discs were seen to be normal. The pathologist reported that as regards the nasal discharge "two colonies of staphylococcus albus have grown" and as regards the blood "ten c.c. of blood from left median basilic vein sown on agar and gelatin tubes gave a growth in 48 hours of staphylococcus (Gram staining, non-capsulated), probably pyogenes albus; the appearance of short chains in scanty numbers suggests possibility of mixed infection; if plating had been practicable streptococci might have been isolated; no pneumo- or gono-cocci isolated." On the receipt of this report, and considering the possibility of a mixed infection, ten cubic centimetres of polyvalent antistreptococcic serum were given at 4 P.M. A differential blood count showed 80 per cent. of polymorphonuclears. On the 26th the diastolic murmur was louder and there was also a systolic murmur at the base. There was a trace of albumin in the urine which was now acid. The temperature had been no higher than 103·6° and as low as 101·2° during the 24 hours. Another ten cubic centimetres of antistreptococcic serum were given. On the 27th the pleural rub was more extensive. The pathologist reported: "Leucocyte count, 9500—85·6 per cent. polymorphs." In the afternoon the patient had a rigor and the temperature rose to 104°; ten cubic centimetres of antistaphylococcic serum were given. On the 28th the abdomen was more distended and considerable subsultus was present. The temperature was higher in the evening. Ten cubic centimetres of antistaphylococcic serum were given and one-third of a grain of hetol intravenously with the object of establishing a more marked leucocytosis. On the night of the 28th the patient was wildly delirious and in the early morning of the 29th the temperature dropped to 97° and he slept. In the morning his mental condition was quite clear and he said that he felt better. The diastolic murmur was best heard at the aortic cartilage. Ten cubic centimetres of antistaphylococcic serum were given at 6 P.M., when the temperature was up to 103° again, this being followed by ten cubic centimetres of normal horse serum at 8.30 P.M. The temperature at 10 P.M. was 104·4°. The pathologist reported: "There are 14,700 leucocytes per c.mm. blood." On the 30th percussion resonance over both bases was impaired; there was no true bronchial breathing. The patient was coughing up a good deal of foul, bloody, frothy sputum. Ten cubic centimetres of normal horse serum were repeated and one grain of hetol was given intravenously at 3.30 P.M. The leucocyte count five hours later was 14,300. On the 31st the respiratory murmur was diminished and the voice sounds were distant over the left lower lobe; there was also impaired percussion resonance. The temperature was gradually declining; the general tremor was increasing, however. The tongue was dry and the blood-stained frothy expectoration was troublesome to the patient. Normal horse serum and hetol were again given. On April 1st the asthenic condition gradually increased and he died at 10 A.M. About an hour after death, the heart having been seared, a sterilised needle was

inserted into the right ventricle and four broth tubes were inoculated with the blood withdrawn; all these tubes developed pure staphylococcus. The pathologist reports: "Films and cultures of sputum show staphylococcus and organism, probably *B. coli communis*. Spleen (culture in broth made with usual aseptic precautions, post mortem) shows bacillus, probably *coli communis*, and staphylococcus. Urethra (culture in broth, post mortem) discharge shows bacillus, probably *coli communis*. Blood (ante mortem) culture on gelatin developed, and was pure staphylococcus, liquefying gelatin freely."

At the necropsy 48 hours after death numerous septic infarcts were found in both lungs with broncho-pneumonia; septic infarcts were also found in both kidneys. As regards the heart there was recent and extremely slight endocarditis of the pulmonary cusps. There were no definite vegetations, merely a roughening presenting a hirsute appearance; there was no endocardial injection. A firm fibrous nodule was found attached to one of the chordæ tendinæ of the tricuspid valve. Both mitral and aortic valves were healthy. The spleen was two or three times the normal size, soft and friable; it contained no infarcts. The sphenoidal and ethmoidal cells were opened and found to be healthy.

Remarks by Dr. MAYNARD.—The chief feature of note in the treatment of the case was the absolute failure of the various sera to bring about any improvement. The infection would appear to have been one of staphylococcus albus only and possibly the failure was due to the fact that there is no antiserum made for this organism; on the other hand, it may be that a sufficiency of antistaphylococcic serum was not given and that it was not given early enough in the disease. After perusing the very valuable lectures of Mr. L. S. Dudgeon and Mr. P. W. G. Sargent, recently published,¹ one would suppose that the white staphylococcus was almost a benign organism, at all events as regards the peritoneum, and possibly this is so, more particularly as compared with other peritoneal pyogenic organisms; that it may, however, exist in a very highly virulent form also is shown by this case in which it was cultivated both ante and post mortem from the blood and was apparently *per se* the cause of death. Normal horse serum was used solely on account of its reported efficacy in a case of septicæmia mentioned to us and in lieu of any better possible remedy. The point of entry of infection was probably the nose, as, though a most thorough search for other entries was made, none was found.

Remarks by Dr. BUSHNELL.—There have been several fatal cases of septicæmia at the Sussex County Hospital due to infection by staphylo-, strepto-, and pneumo-coccus in which the path of entry of the micro-organism could not be precisely demonstrated; in these the serous sacs were more especially affected, also the meninges, and in the case now reported the lungs contained numerous foci of suppuration. In this case the presence of the staphylococcus in the blood ante and post mortem, in the nasal discharge and in the sputum during life, and in the spleen, lungs, and kidneys after death, is evidence of the infection being staphylococcic; further, there were no pneumo- or gono-cocci in the blood cultures, nor streptococci in plate cultures. This with the absence of bacilli and the presence of staphylococci in numerous sections of the viscera prepared by Weigert, Gram, and Löffler's methylene blue methods show the infection to be staphylococcal. There is strong probability, too, that the respiratory tract was the path of entry. The lack of success in the treatment by antiserum may lie in the fact pointed out by Pröscher,² that variations in races of staphylococci occur; thus it is important that the strain from which the serum is prepared should be identical with that causing the suppuration. The use of a vaccine of sterilised staphylococcal cultures, even if it were administered at the periods recommended by Dr. A. E. Wright³ and after estimating the phagocytic power of the blood by Leishman's method,⁴ would not be likely to prove of any therapeutic service in such an acute case as this. The absence of leucocytosis, in the presence of such grave infection and after the exhibition of hetol. would be associated with diminished phagocytic and bactericidal protective fluids in the blood. Success in treatment of such conditions appears to be in the direction of stimulating or

¹ THE LANCET, Feb. 25th, 1905, p. 473.

² Deutsche Medicinische Wochenschrift, 1903, No. 2; Hewlett, Serum Therapy, p. 187.

³ THE LANCET, May 9th, 1903, p. 1299.

⁴ Brit. Med. Jour., 1902, vol. i., p. 73.

supplementing such bodies, whether "immune body" or "alexin," and phagocytosis, by direct or indirect measures. The necessity for the prevention of such illnesses by means of general hygienic measures and special precautions against infection is not apparently yet recognised by the public.

ELEMENTARY STATE SCHOOLS AND THE SPREAD OF CONTAGIOUS DISEASES OF THE SKIN.¹

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I DESIRE again to call attention to a matter which is manifestly one of great importance to the public as well as to the medical practitioner. In a joint paper by Dr. Alfred Eddowes and myself read in the Section of Preventive Medicine of the congress of this institute which was held at King's College, London, in 1894, it was pointed out that "now that school attendance is compulsory and that the clean and well-cared-for children of respectable families living in poor neighbourhoods often have to associate with those of the dirtiest, most careless, and most diseased classes of the community, it seems to us a moral duty that all reasonable precautions be insisted on (and carried out) by the authorities in order to minimise the risk of infection from the diseased to the healthy. Numerous instances have come to our knowledge in which not only has a skin disease been contracted in a board school but it has been carried home by the child and passed on to the previously healthy brothers and sisters."

A continued and very extensive experience of the treatment of diseases of the skin at two large London hospitals leads me thoroughly to endorse those remarks made 11 years ago; and I have no hesitation in now saying that we must regard the elementary State schools in London as largely responsible for the spread of such contagious diseases as ringworm, pediculosis, scabies, impetigo, &c., and of many perhaps more grave affections which may be their sequelæ, not only directly among the children of the poorer classes but indirectly among those of the well-to-do. The facts appear to be so obvious that it is astonishing that the authorities have not sufficiently realised their responsibilities in this connexion and have not adopted more efficient measures for preventing the contamination of healthy children. I do not deny that the late School Board and the present education department of the London County Council have given, or are now giving, some practical attention to the subject, but I maintain that the methods and precautions hitherto adopted by those authorities have been, to say the least, very defective and inadequate. It seems to me that one of their greatest mistakes is their attempt to shift the responsibility upon the wrong shoulders; they have not themselves had the children properly inspected, but they have put the onus of investigating such cases upon others, the result being that numbers of diseased children are still attending the schools and infecting other children.

Under the present system if a poor child acquires ringworm, for instance, he or she may attend a school for a considerable period without anyone being any the wiser and be all the time quietly disseminating the affection. When it is a typical case and something wrong is at last observed by the teacher the child is sent home and the parents are told that they must get an official form filled up by a medical man. An instance in illustration of this has just occurred at Blackfriars. A mother brought two children with well advanced ringworm and was asked how long they had been affected. She replied that "she observed their heads 'scurfy' about two months ago and then got some ointment for them from a chemist." Had they been attending school? "Yes, until this morning, when they were sent home by the teacher." She did not know until that day that they had ringworm. It will not be surprising if other cases crop up from the same school. If the parents are very poor they may not be able to afford the fees of a general practitioner and their usual course is to bring the child to a hospital—often with a cool message from the elementary school teacher or inspector

that the hospital medical officer must fill up the official school form. It has been my invariable practice to decline to do anything of the sort, and I venture to think that if all medical men in my position adopted the same course the school authorities would have been long before this brought to their senses and have ceased from attempting to "sponge" upon the honorary officers of a hospital and from trying to get the latter to do work which is really on behalf of the school and not for the individual benefit of the poor little patient. I do not wish to be misunderstood: if a child is brought to the hospital really ill or suffering from a complaint which would be made worse by going to school—i.e., if attendance at school would be detrimental to the child's health—I readily give a certificate (our own hospital one) to that effect. But as regards ringworm and some of the other cases to which I have alluded, it is for the sake of the school—in view of the risk of infecting other children—that the child should not attend. Children so affected may be, and usually are, perfectly well in every other respect; school is good for them; and the only reason why they should not attend is that they may, and probably will, communicate the disease to others.

I think it will be generally agreed that it should be the bounden duty of the education department to protect healthy and clean children from being infected at school with the above-mentioned loathsome diseases. I may even go so far as to say that should it be proved that a child has contracted such a disease at the school the necessary treatment for cure as well as the preliminary investigation ought to be at the expense of the department. I have often wondered indeed that some indignant and justly aggrieved parent has not brought an action at law and claimed damages for the injury done by the introduction of such a disease as ringworm into his house through being forced to send his child to a school in which there are cases of the kind.

What is the remedy? Obviously the most important and essential prophylactic measure would be the frequent systematic and periodical examination of all children attending the Government schools by competent medical officers especially engaged for that purpose by the department. This was recommended many years ago but was evidently not thought worth adopting by the late School Board probably on the ground of expense; the institution of continuation schools and the other developments—ornamental or otherwise—of Mr. Forster's original Act were no doubt considered of greater importance and more worthy of the ratepayer's money. I understand that the London County Council is actually going at last to increase the at present ridiculously inadequate medical staff of its education department and to employ a number of medical men to look more closely after medical matters in the London schools—it is to be hoped for the benefit of the children who have to attend the State schools. This, at any rate, is a satisfactory although tardy move in the right direction. That august body, however, still seems to think that it has the right to demand the gratuitous services of hospital medical officers, as is evidenced by a letter dated July 13th, 1905, now before me, addressed to the secretary of one of the hospitals to which I am attached.

It seems to me high time that medical men should make a stand against the system hitherto in vogue in the department and that the public should know the risks their children are being forced to incur through the lack of adequate medical supervision of the elementary schools.

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THE STAINING REACTIONS OF THE SPIROCHÆTÆ FOUND IN SYPHILITIC LESIONS.

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(Preliminary Note.)

Dr. Schaudinn and Dr. Hoffmann have pointed out the extreme difficulty which they have experienced in staining the spirochætes which they have recently shown to be present in various syphilitic lesions. These authorities have, therefore, recommended a special stain which they have

¹ A paper read at the London Congress of the Royal Institute of Public Health on July 20th, 1905.