on the blood culture, whilst the control cultivation from the skin remained sterile. Next day a few small papules which ran on to pustules appeared on the leg. He had a rigor at 5 P.M. (temperature 104.8° F.). The heart sounds were weaker and the murmurs the same. On August 7th hæmaturia appeared and continued on August 8th, when he was weaker. The sputum contained a large number of staphylococci, and a small group of cocci was found in the urinary sediment. Next day some livid patches appeared on the feet, and on August 10th great fulness was noticed in the splenic region without redness or fluctuation. On August 12th he was in a semi-comatose condition, and had diarrhoea and incontinence of urine and fæces. An intermuscular injection of corrosive sublimate was given. Next day he was in a typhoid condition, and on August 14th livid patches appeared over the abdomen. Right hemiplegia came on at 9 P.M., and involved the face, arm, and leg. The superficial reflexes were absent, the deep present. There was partial anaesthesia on the right side. He continued in a comatose condition, and died at 7 P.M. on August 16th.

Post-mortem Notes.—The heart was enlarged and dilated and flabby. There was a large mass of vegetations (the size of a hazel nut) on one aortic cusp. Another cusp was a little involved, but the third was healthy. There was no sign of old endocarditis. The mitral orifice was dilated, but otherwise healthy. The base of the left lung was collapsed, and the remainder of the lung was congested and collapsed along its posterior borders, but there was no pneumonia. The spleen was large, both poles being composed of huge infarcts, each measuring about 4 by 5 inches. There were several other small infarcts in the organ. The kidneys both showed several infarcts, each about the size of a hazel nut, surrounded by a very well marked zone of reaction. In the brain there was a large area, the size of a five-shilling piece, composed of breaking-down brain tissue, situated in the internal capsule, and extending into the optic thalamus and lenticular nucleus, and outwards as far as the island of Reil.

Bacteriology.—Two cultures were taken from (1) the blood from the right auricle, and (2) the splenic substance, at the necropsy both showed after twenty-four hours' incubation numerous colonies of staphylococcus pyogenes albus.

CASE III.—This was a very acute case, showing many symptoms of acute endocarditis. The patient died twenty-four hours after admission, and only eight days after the onset. Culture taken from the blood during life subsequently showed large numbers of colonies of staphylococcus pyogenes aureus, and the same coccus was isolated in pure culture from the heart's blood and spleen after death. A single dose of 20 c.c.m. of serum was injected shortly after admission without altering the temperature or the course of the disease.

CASE IV.—A bargee debilitated by chronic alcoholism was admitted for a subacute wandering pneumonia with mental symptoms. Delirium set in, and the patient sank gradually. A systolic murmur developed a few days before death, and an effusion into the shoulder-joint, which turned out to be purulent, was noticed the day before death. In the face of these symptoms malignant endocarditis was diagnosed, and 20 c.c.m. of anti-streptococcus serum injected, but the patient died. The necropsy verified the diagnosis, and a short streptococcus, associated with some staphylococci, was isolated from the heart's blood and spleen after death.

As will be observed, in none of the cases did the injection of serum appear to have the least effect, beneficial or otherwise, nor was the course of the disease altered or checked in any way whatsoever so far as could be observed. There seems to be some uncertainty as to what kind of case is likely to be benefited by this special treatment, and it does not seem to be generally understood whether the value of the serum holds good for cases of staphylococcus infection, or whether the treatment must be reserved for cases of pure streptococcus infection only.

It may be noted that in the first case there was a mixed infection, both varieties of coccus being present and both in a small variety, such being generally held to be more virulent than the larger or longer varieties. There is some little doubt as to whether or no there was a genuine blood infection in this case. The first blood culture was disregarded owing to the fact that the control test was contaminated with organisms. The second taken from the blood remained sterile. The culture, however, taken from the auricle after death grew abundant colonies, but whether it was that these were not sufficient in the circulating blood to ensure success, or whether it was that larger numbers gained entrance to the blood stream during the last hours of life it is impossible to say. At any rate, the inhibitory power of the serum over the organisms should have been the same whether they were in the circulating blood or in the tissues.

The second was a case of pure staphylococcus infection, as was also the third. The last-mentioned was a mixed infection like the first. It is a matter of great importance to be able to rely on the result of blood cultivation, more especially in those cases which recover or appear to be benefited by the treatment. It is obviously not of the same importance when the diagnosis is verified or otherwise by necropsy.

To ensure accuracy of result in this direction some such modification of the usual method as the following may be adopted, especially by those not conversant with the methods of bacteriology: The finger and that on either side of it should be sterilised in the usual way, as if prepared for operation, with the exception that when the pad of carbolio is removed prior to beginning the process the finger should

be rinsed in boiled water to ensure asepsis rather than antiseptis. With a sharp-edged sterile surgical needle the skin over the selected site should be scraped till all the superficial layers are removed, and the whole *débris* thus obtained should be inoculated on an agar-agar tube and be labelled "control." The needle, after re-sterilisation, should be plunged into the finger through the area thus bared of skin, and a second tube inoculated from the blood obtained. If the latter tube grows organisms whilst the control remains sterile, it is almost conclusive evidence that the organisms came from the circulating blood and not from the skin of the finger, whence they doubtless came in a considerable number of cases in which no such precaution is taken.

My thanks are due to Dr. D. S. Davies, Medical Officer of Health of Bristol, who very kindly placed his bacteriological laboratory at my disposal.

EFFECT OF FOREIGN BODIES IN THE BRONCHI.

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INTRODUCTION.

CASES have from time to time come under my observation in which it was known that a foreign body was or had been lodged in a bronchus. The great diversity in the clinical features of these cases led me to consult the ordinary textbooks on the subject, but finding very little there I thought it would be interesting to look into the subject more closely and learn what were the effects produced when a foreign body was impacted in a bronchus.

In the first place I propose to mention briefly some general considerations of foreign bodies; then in more detail to consider the effects produced, which I have divided for purposes of description into an early and late stage, not that this is altogether satisfactory, for the one merges gradually into the other.

I do not propose to enumerate the solid substances which are recorded as having found their way into the bronchi; the list is only of interest as showing how great is the variety.

The effects of a foreign body lodged in a bronchus will differ on the two sides of the chest according as the body is impacted above or below the eparterial branch of the right bronchus, and, as Poulet² states, more than two-thirds find their way into the right bronchus, it is a point to be borne in mind. Moreover, the effects will vary according to the extent to which the lumen of the tube is occluded, and this will depend on the shape of the body. A body, on account of its regular outline or from ulceration around it, is apt to change its location during a violent paroxysm of coughing; it may then be caught in the glottis, or if the cords be separated it may be projected into the mouth and expectorated, or it may impinge against the glottis, falling back into the same bronchus or even the one on the opposite side.

The effects may be divided into an early and late stage, the former being due to the obstruction and the irritative presence of the foreign body, the latter produced by the inflammatory changes consequent upon the prolonged irritation.

EARLY EFFECTS.

The physical signs in the earliest stage are those of obstruction to the entry of air into the lung, and will vary according to the amount present; it is important to note that with a free entry there may be no physical signs present. Such was the case with Mr. Brunel,³ the engineer, who was amusing some children by catching a half-sovereign in his mouth, when it slipped down the air passages and lodged in the right bronchus; at an examination of the chest some days afterwards no difference was detected between the two sides.

After the complete plugging of a bronchus collapse of the lung below the obstruction very soon ensues, and is brought about by the absorption of air in the alveoli. This change takes place within a few hours, for Lichtheim⁴ carried out a series of experiments on rabbits, and demonstrated that, on opening the chest walls twenty-four hours after a bronchus had been plugged with a piece of laminaria, the lung below the obstruction was collapsed. In the museum of the Royal Col-

lege of Surgeons of England are the lungs and bronchi of a child who died from the effects of a foreign body in the right bronchus; collapse of the lung below the obstruction is well shown, and there is emphysema of the unobstructed portion of the lung. Lichtheim in his experiments also found emphysema of the unobstructed portion of the lungs. I think that in cases where plugging is incomplete, but the entry of air much diminished, some collapse takes place, for the alveoli at the periphery of the lung are not likely to be affected by inspiration or expiration; the elasticity of the lung then comes into play, and the air becomes gradually absorbed. The same is seen in other morbid states.

The sudden and complete plugging of the bronchus thereby rendering a considerable area of lung tissue functionless does not, I think, necessarily bring about a fatal result immediately. In animals it certainly does not, for Lichtheim allowed days to pass after plugging a bronchus before killing the animal. That extensive collapse may of itself lead to a fatal result I think is clear, for in the case last referred to death took place twenty-four hours after the plugging of the right bronchus. These cases, in which the onset is acute, and an enormous amount of work is suddenly thrown on the heart and the remainder of the lungs, are not comparable with those cases in which disorganisation of the lung gradually takes place, for in these the circulatory and respiratory systems have time to adapt themselves to the altered conditions.

Before passing on to the consideration of the late stage, I should like to say something about tolerance. Poulet gives a few examples; two were in lunatics, the foreign bodies being discovered at the necropsies. As nothing was known about these cases, I do not think they are of much value. It seems to me to be improbable that a foreign body can stay in a bronchus without producing some changes; a few cases are reported in which a foreign body has been impacted in a bronchus for some time, but the changes produced were always considerable. In an article in the *Lancet* of last year, the authors² stated that they were only able to find thirty-one cases of recovery in which a foreign body had been retained in the trachea or bronchus for over one year before its removal. Furthermore, they found that the cause of death was tuberculosis in the great majority of cases that did not survive.

LATE EFFECTS.

The presence of the foreign body leads in time to inflammation of the bronchial passages with subsequent consolidation of the lung. Sometimes, but not often, the onset of these changes is sudden and takes the form of an acute lobar pneumonia.

In reading about these cases and in the specimens I have seen in several museums, I have been struck by the similarity of the morbid changes. The mucous membrane of the bronchus is ulcerated where it is in contact with the foreign body, the smaller divisions beyond are dilated, their walls are thick and filled with purulent secretion, and in places ulcerated; the lung presents various stages of consolidation, in some cases passing on to gangrene. The pleura is thickened, and the visceral and the parietal layers adherent. In the museum of the Royal College of Surgeons of England there are specimens⁶ which show these conditions; one is the lung of a child who died eight weeks after inhaling a piece of nut. The right lung is adherent to the chest wall, the divisions of the bronchi are dilated and the cut section of lung shows that it is solid, but it does not present the ragged, breaking-down appearance seen in another specimen.

The condition of bronchiectasis which I believe to be a common sequela is not mentioned in many of the references I have looked up. Mr. Rickman Godlee speaks of it in his lectures⁷ on the surgical treatment of pulmonary cavities, and there is an illustration in Gross⁸ showing the dilated bronchial tubes. It is interesting in two ways: in the first place as regards its causation, and secondly with reference to its diagnosis.

Of the two forms of bronchiectasis, cylindrical and saccular, the former is the one usually met with in these cases; whether this condition be due to the pent-up secretion or to the increased pressure during cough acting on the bronchial walls already inflamed and softened by the secretion, is not easy to say. That the latter is an important factor in its causation is

certain, for cases of chronic bronchitis and emphysema often show the bronchial tubes to be somewhat dilated; another explanation that has been offered for bronchiectasis—namely, that it is due to the contraction of the chronically inflamed lung tissue, does not, I think, hold good in these cases, for the lung in many cases shows signs of disintegration.

This condition of bronchiectasis may not be easy to diagnose. If in puncturing the chest wall a muco-purulent secretion is withdrawn, it shows that it comes from a cavity in the lung connected with the bronchial mucous membrane. After excluding tuberculous processes, I should think of a foreign body as a possible cause, particularly in children where the history is often indefinite and the presence of a foreign body may not be suspected.

The consolidation of the lung is a gradual process, and is not usually the result of an acute pneumonia which has never resolved, for acute pneumonia is not common, and the physical signs point to a more gradual onset.

In a later stage complete disorganisation of the lung is found. A case is reported⁹ in which death followed thirteen weeks after the inhalation of a piece of grass. The lower third of the lung is described as a gangrenous mass, riddled with cavities, in one of which a piece of grass was found.

The changes in the pleura are clearly the result of inflammation spreading through the lung. In some cases the process is different. Round the foreign body pus forms,¹⁰ and gradually works its way to the surface and discharges, often carrying the foreign body with it. Even after removal of the foreign body it is by no means certain that the lung will recover, for it may be too disorganised, or the damaged portion may form the starting point of tuberculous processes, the frequency of which I have already drawn attention to.

CONCLUSION.

The effects of foreign bodies in the bronchi I have divided into two stages. In the first stage the most noticeable feature is the collapse of the lung; in the second stage the inflammatory changes predominate. Of these the most important are changes in the bronchial tubes, their dilatation with walls thickened and full of secretion, the consolidation of the lung and it may be its final disintegration, and the changes in the pleura, in some cases the formation of an abscess.

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ON THE HOT-AIR BATH, WITH ILLUSTRATIVE CASES.

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IN my Note on the Hot-Air Bath in the Treatment of Arthritis, published in the *BRITISH MEDICAL JOURNAL* of December 10th, 1898, p. 1745, I promised to follow with the history of a few cases showing its value as a therapeutic agent. Between August 28th and December 31st, 1898, 680 baths have been given at our Royal Baths. I have received many letters from medical men asking me about superheated air baths. For their information I give a few general remarks on the different methods adopted till present date.

1. *The Tallerman*.—The heat is got from gas; it is a gas oven, can only be used for legs and arms, is cumbersome, and the products of combustion are distinctly felt.

2. *The Dowsing*.—The heat here is produced by electric lights similar to those used for house illumination. The light and heat from these is thrown from above on reflectors of glass and polished metal, but these cannot surround the part completely, as in

3. *The Greville*.—Here we have the sides, top, bottom, and ends supplying a steady glow all round from a very large number of small wires fixed in metal frame like the strings of a harp, and enclosed in a perforated aluminium case, which