that the evidence thus furnished is inadequate—that we are not justified in extending to all contagia what has been proved to be true of some only; but, until evidence of the same order and of equal weight has been brought forward on the other side—and I am not aware that this has yet been done—we are surely entitled, at any rate provisionally, to accept the conclusion in question.

Again, the statement that the infective principle is probably non-volatile, is not, as the reader of Dr. Notter's remarks might fairly suppose, a mere hypothesis or inference. It rests on experimental evidence obtained in the case of small-pox, ovine variola, and cattle-plague. (A brief account of the experiments is given on page 219 of my Report.) In short, the assertion that the contagia of certain communicable diseases are neither soluble, diffusible, nor volatile, is grounded on a substantial basis of observed facts; it is not what Magendie was so fond of stigmatising as a "*vue de l'esprit*".

All this, however, only goes to show that contagium is particulate; it does not show that it consists of living "germs". It is quite compatible with the belief that the virus of infective inflammation is "simply fibrinous exudation, which, after coagulation, has acquired poisonous properties". Whatever may have been my opinion on the subject of "germs", I was careful to keep it well apart from my investigation.

This brings me to the very point to which I wish to draw attention. So far from making the above-mentioned facts—which Dr. Notter terms my "questionable premisses"—the starting-point of my inquiry, I took great pains to show that the method of research which I ventured to advocate for the determination of the relative value of disinfectant agents differed from those previously followed, in yielding results wholly independent of any theory concerning the intimate nature of the contagia. In this complete independence I conceived its special value to consist. Conclusions arrived at in accordance with the principles laid down in my Report, would lose none of their force were the "chemical" theory, which Dr. Notter is inclined to favour, universally accepted as the true one.

The essential nature of the infective principle is a problem of vast importance and corresponding difficulty. Were it necessary to solve it before trying to ascertain the value of our disinfectant measures, our hands might remain tied for a long time. I did my best to show that the obstacle might be turned, as it could not be surmounted.

ON CASES OF PLEURITIC EFFUSION.*

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In the present paper, I propose to bring before you the results of two cases of empyema treated antiseptically, and also to give details of two cases of pleuritic effusion presenting special difficulties or sources of danger.

In considering the treatment of empyema, we have first to answer the question, Is it better to operate, or to let the pus find its own way out of the chest? I do not discuss the possible cure by absorption, as that is at best but a rare occurrence, and one on which we cannot calculate. In what directions may the pus be discharged spontaneously? Most often, either externally or through the lung by bronchial fistula; sometimes, in other most undesirable directions. Suppose the discharge to be by external fistula; the pus, before it escapes, burrows amongst the superficial tissues, often surrounding one or more of the ribs at the site of pointing; hence there often results necrosis of the rib, part of which lies bare in the midst of the pus. Thus there is added chronic bone-disease in a patient who is probably specially prone to the ill effects of such a condition. Again, a spontaneous opening is frequently in the wrong place; instead of being low down so that the cavity can drain, it is commonly high up, in the front of the chest, in the third or fourth space. Next, discharge through the lung is certainly undesirable, for the pus has then to be all pumped up (if I may use the expression) by cough, and must pass through a large tract of lung-tissue—a process at once injurious to the lung and most wearying to the patient. The rapid relief and recovery that may follow an artificial external opening in such a case are surprising.

If, then, we may conclude that a spontaneous opening is not a good thing, and that absorption of the pus is not to be expected, it follows that we must remove the fluid by operation. We may do this by means of: 1. Simple tapping or aspiration; 2. Establishing an external fistula.

In most cases, simple aspiration or tapping will not effect a cure, or, if it do, will not until it has been repeated again and again. It is true that, in exceptional cases—and especially in children—one or twoappings may cure the patient; but, generally, the history will be a long series ofappings and fillings of the chest, while the patient is losing ground and the lung is becoming more or less permanently disabled. Therefore, in the majority of cases of empyema, we do well to follow the principle adopted by Nature; that is, to let out the pus by a permanent opening. Why do we hesitate to do this? For the same reason that we used to hesitate to open a psoas abscess; knowing that while the abscess was closed, putrefaction would not occur, but that the opening of the cavity would be the signal for its contents to decompose, and for hectic to set in. An empyema is a large abscess, with an enormous extent of wall; and the fear of making a free opening was due to the dangers of admitting air into the pleural cavity and setting up putrefaction—a state of things only to be remedied by regularly washing out the cavity; this latter proceeding being both very troublesome and exhausting to the patient and also not devoid of immediate risk to life. I believe that we have no longer cause to fear a free opening, but that we may make one with perfect confidence, relying upon Lister's antiseptic method to prevent those ill results that were formerly dreaded.

In a paper read before this Branch of the Association, I have previously advocated the antiseptic treatment of empyema (BRITISH MEDICAL JOURNAL, 1876, vol. ii, p. 109), and have argued that thus we secure all the advantages of a free opening, without any of its disadvantages.

It has been objected that cases of empyema treated antiseptically are as yet too few to admit of generalisation from them; but to this I reply, that the generalisations have been made in the region of surgery in general, and that we merely apply to the case of an empyema the general principle that the antiseptic treatment will prevent putrefaction in an open wound. My early surgical experience made me a firm believer in Lister's system, and I only apply to the case of an empyema exactly those principles that would guide me in the treatment of a psoas abscess. What we want in either case is to empty the cavity so that the walls can come together, and at the same time to ward off decomposition. We attain our end by adopting Lister's method.

I will now give a brief outline of two cases of empyema treatment antiseptically.

The first patient was a deaf and dumb boy, aged 17, admitted into the Bristol General Hospital on October 10th, 1875, said to have been ill one week, although it was evident that the effusion was of much longer standing. There were the usual signs of left pleuritic effusion. Symptoms of hectic became marked, the evening temperature ranging from 101 deg. to 103 deg., or higher, and the morning temperature going down to normal, or below. Accordingly, on November 10th, the chest was aspirated and sixteen ounces of sweet pus were drawn off. After this, the hectic symptoms gradually disappeared, the temperature becoming normal by December 8th (about one month later), and then remaining subnormal. At the same time, however, the physical signs did not materially improve; and if I had depended upon them, I should have said that the chest still contained pus, but I relied upon the temperature—a temperature absolutely and permanently normal or subnormal—as a sure indication that no fresh pus had formed. As the event proved, I was wrong; but I believe it is a most unusual thing for the temperature to follow the course it did here. It is not very uncommon for aspiration to set up hectic when pus previously existed without; but when hectic has once accompanied empyema and the pus has been removed by aspiration, I am under the impression that it is an unprecedented thing for the temperature to remain normal when the pus collects again. The patient was in the hospital for two months longer, during which time his general health improved and the temperature continued subnormal. After being out for about a fortnight, he was readmitted on March 29th, 1876; there was then much expectoration of pus, and the temperature was normal.

On April 6th, ten ounces of offensive pus were drawn off by aspiration; but as the excessive expectoration, pointing to bronchial fistula, continued, ten days later a tube was inserted in the ninth interspace, in a line with the angle of the scapula, and antiseptic dressings were applied. The discharge rapidly diminished, and in a week the sputa had become scanty, thin, and watery, instead of purulent. At the same time, the general health improved rapidly. On one occasion, the tube slipped out and pus collected in the chest; this was at once shown by general discomfort, and by a return of the purulent sputa; but as soon as the channel was restored, these unfavourable symptoms disappeared. A little discharge continued for a long time, but the cavity ultimately closed in October. The boy had now become quite fat; on admission, he weighed sixty-nine pounds, and when sent out,

* Read before the Bath and Bristol Branch.

ninety-nine pounds. The right side of the chest was much retracted, but the patient has ever since enjoyed excellent health.

The chief features in this case are: 1. The failure of simple tapping; 2. The remarkable course of the temperature; 3. The fact that throughout the treatment, extending over about six months, it was not once necessary to wash out the pleura, as under the antiseptic method there was no putrefaction. Contrast this with a case recorded by Trousseau (*Clinical Medicine*, New Sydenham Society, vol. iii, p. 234), where the pleura was injected about four hundred times.

The next case is a striking example of the advantages of an antiseptic free opening. The patient was a farm-labourer, aged 25, who caught cold in January 1876, and when seen by my friend Mr. Forty was apparently dying, with his right pleura full of fluid; he was at once tapped, and between three and four pints of semipurulent matter were drawn off. Two months later, hectic set in, with purulent sputa, and six pints of pus were drawn off by tapping. The patient was admitted into the Bristol General Hospital in May; the right pleura was then full, cough was very frequent and wearying, and the sputa were copious, purulent, and fetid, amounting to about two pints of pus *per diem*. The evening temperature was 100 deg. As the disease had already existed for almost five months, and the chest had been twice tapped without permanent good, I decided to have a drainage-tube put in at once; and this was accordingly done on May 31st; the opening was made in the ninth interspace in a line with the angle of the scapula, and about two pints of exceedingly offensive pus and curdy matter escaped; a tube was then put in. The antiseptic treatment was followed throughout. The relief was immediately most marked; the cough, so troublesome before, ceased at once; there was not the least expectoration, although just before there had been about two pints *per diem*. In fact, the patient said he did not cough once after the tube was put in. The discharge, at first free and offensive, in a week was quite sweet and very scanty.

On June 19th, the tube was removed; in less than three weeks, after its insertion. During this time, the patient had improved wonderfully in general health, and he has ever since—now for nearly two years—enjoyed excellent health.

The chief features in this case are: 1. The failure of simple tapping; 2. The rapid recovery following the antiseptic free opening; the patient had been ill for five months, and yet he was cured in less than three weeks; 3. The strong evidence in favour of the principle that when bronchial fistula exists, a free external opening should be made.

Both the above patients have now been watched long enough to make it certain that recovery has been permanent; and this is the more interesting from the fact that, in both, the signs of the "tubercular diathesis" are marked.

With regard to the treatment of empyema, I would therefore say: 1. Aspirate once, or at most twice; 2. If the chest fill, again put in a drainage-tube at the base, and treat the case antiseptically; 3. If there is a bronchial fistula, establish a permanent opening antiseptically; 4. If an external fistula is about to form in a good position, anticipate it by an antiseptic free opening, and the ribs may thus be saved from necrosis; if in an unfavourable place, disregard it and put in a tube at the base; in such a case, I have seen the thin discoloured undermined skin—apparently inevitably doomed to give way—return to its normal state when the pus was drained off at the base.

The history of the two following cases illustrates a less cheering aspect of the treatment of pleuritic effusion.

The first case shows the difficulty that may arise when the effusion occurs in a patient whose tissues are old, whose chest is rigid and cannot therefore fall in upon a shrunken lung, so that a space is left between the chest-wall and the lung, which must be filled up by what may be called "complementary effusion".

The patient, a man aged 54, admitted into the Bristol General Hospital on May 23rd, 1877, had suffered from bronchitis for more than a year; and, three weeks before admission, was seized with pain in the left side and dyspnoea. He was old for his age; the chest was markedly barrel-shaped and rigid. There was left pleuritic effusion, dulness reaching up to the fourth cartilage in front; and the heart's apex was in the epigastrium. The right lung was emphysematous, and there were mucous *râles* at the base. As there was no distress, I did not tap the chest. Next day, I was told that the patient was dying, that he had been getting worse for some hours. When I saw him, he indeed looked as if *in articulo mortis*; the surface was cold, clammy, and blue; the respiration irregular and shallow; the pulse hardly to be felt, and there was mucous rattling in the throat; he could neither speak nor move; in fact, it seemed as if every breath must be his last. Although almost sure that it was too late, yet I thought it right to give him his only chance of life, by removing the fluid; and accordingly sixty-eight ounces of serous fluid were drawn off with the aspirator. The diffi-

culty was to keep the heart going while the chest was being emptied; all the available methods of stimulation, external and internal, were adopted; but so hopeless did the case appear, that I felt convinced the man would die with the trocar in his chest. He slowly rallied, and at the end of the tapping immediate danger was over. Next day, he was much better, and continued so for nearly a month; but on June 24th, dyspnoea rapidly came on, and the patient was again very near death; fifty ounces of clear fluid were drawn off, and he at once improved. The same sequence of events followed on four occasions afterwards: on June 28th, when ten ounces were removed; on July 5th, when the amount drawn off was forty-one ounces; on July 21st, when it was forty-two ounces; and on July 28th, when it was seventy ounces. The patient had been gradually becoming weaker, and died a few hours after the last tapping. The temperature, slightly elevated for a day or two at first, afterwards remained subnormal. *Post mortem*, the cartilages were found ossified, the ribs very rigid; the left pleura contained a large quantity of fluid; the lung was carnified, firmly bound down by a thick false membrane; the right lung was emphysematous, and showed evidence of bronchitis and œlema.

In this case, I take it that the chief obstacle to recovery was the rigid state of the chest-wall. The lung was bound down so that it could not expand—the chest-wall was too rigid to fall in—the other lung, already emphysematous, could not enlarge to take the place of the compressed lung; and the space necessarily left must be filled with fluid. As there was frequent occasion to point out by the bedside, this continued effusion could not be looked upon as due to a persistent inflammation; it was rather a mechanical act; Nature's means of avoiding her proverbial abhorrence—a vacuum. As this was recognised to be the case, the question may very fairly be asked, "Was it sound practice to draw off the fluid if it must reaccumulate?" In my opinion, it was; for, on each occasion, aspiration was resorted to solely to prolong life—to remove that dyspnoea which again and again rapidly coming on threatened the patient with immediate death. If, on any of the six occasions, he had been left alone, he would have died. But would not the removal of a smaller amount have been better? It seemed to me, however, that the indication was to give as much play as possible to the working lung-tissue by drawing off a considerable quantity of the fluid; and here also the quick improvement that repeatedly followed the operation seemed to justify the treatment. It was evident, in this case, that there was no prospect of cure; that the patient must ultimately die of exhaustion.

The last case that I will bring forward is one of pyo-pneumothorax, and presents two features of special interest: 1. The mode of production of the pyo-pneumothorax; 2. The rare and, as I believe, unique complication produced by aspiration.

The patient was a woman aged 21, admitted into the Bristol General Hospital last January, with a history of some months' cough and dyspnoea. There was marked dyspnoea, the respirations being 64 and the pulse 140; morning temperature, 100.8 deg.; evening, 104 deg. On the left side, there were the physical signs of pleuro-pneumothorax, the dulness at the base being as high as the angle of the scapula. As there was great dyspnoea, the aspirator-trocar was inserted in the ninth interspace in a line with the angle of the scapula, and about three pints and a quarter of very fetid pus were drawn off. When the point of the trocar was turned upwards, most offensive gas escaped in gushes. There was no apparent improvement. On the second day afterwards, the patient was much worse; dyspnoea greater, surface cold and clammy; she was very sensitive over the lower part of the trunk. There was subcutaneous emphysema around the site of puncture, extending over both sides as high as the angle of the scapula, and downwards to the iliac crest; in the left loin, the skin was red and brawny. On auscultation, very coarse bubbling *râles* were heard in the subcutaneous tissue. Knowing that the pleural contents were decomposed, I could anticipate only one result of their infiltration into the tissue: inflammation and sloughing all along their track, such as occurs on extravasation of urine. It was plain that there was only one thing to be done—to make a free opening into the pleural cavity so as to let the fetid pus and gas escape externally instead of into the planes of connective tissue. A tube was therefore put in at the site of the former puncture, and about three-quarters of a pint of pus and a quantity of gas escaped. However, the patient sank, and died about six hours afterwards. *Post mortem*, there was found extensive infiltration of fetid gas and pus into the subcutaneous tissue, the meshes of which were stretched so as to form a honeycombed tissue, the spaces in which were filled with most offensive pus and gas. The left lung was collapsed and bound down by a thick layer of lymph, evidently of old standing. No perforation of the lung could be found; its tissue was all more or less compressed and solid, and could be inflated but very little. There was no trace of phthisis or other lung-disease.

How did the gas get into the pleural cavity? The usual cause of pneumothorax is perforation from without, most commonly by the giving way of the pleura over a phthisical deposit in the lung; the symptoms then are generally sudden in their onset and sure. But, in this case, the absence of any such sudden attack indicates a gradual production of the condition. What did the *post mortem* evidence say? The lung had been compressed for a long time, and there was no evidence that there had been perforation from this organ; here there was what was apparently a healthy lung before it became compressed, with no pathological cause for perforation. If, then, we can find no cause external to the pleura, we are led to consider whether the gas may not have originated within the cavity itself, by decomposition in an old empyema. As to the possibility of such decomposition, authorities differ widely; for, while most English writers recognise it as a rare occurrence, Fraentzel, on the other hand, in Ziemssen's *Cyclopadia*, says: "No distinct proof has ever been adduced of the origin of pneumothorax in this way—indeed, it appears clear, from the researches of Ewald, that no development of gas can ever take place in such a manner." Notwithstanding this, I am disposed to regard this case as one in which the gas did result from decomposition without access of external air; there was no evidence whatever of any other source, while the history and the *post mortem* appearances alike pointed to a chronic course and a gradual accumulation of gas.

Lastly, with regard to the unfortunate sequel to aspiration—escape of the pleural contents into the subcutaneous tissue—this is an accident which, as far as I can ascertain, has not been met with before. Although there was only the puncture of the aspirator-trocar—usually so harmless—yet there was extensive passage of the very irritating secretions into the planes of connective tissue. As the result showed, it would have been better to have opened the pleural cavity freely at first; but the complication that occurred was one that has not hitherto entered into our calculations. In a similar case, if I decided on aspiration, I should be disposed to watch narrowly the site of puncture, and make a free opening into the pleural cavity if there was any evidence that its contents were passing into the subcutaneous tissue.

Of the foregoing cases, the first two, instances of empyema with bronchial fistula, tell strongly in favour of an antiseptic free opening. The third ended in death; but that could not be attributed to the aspiration, as it was simply the necessary result of the physical conditions present—the tapping itself having again and again prolonged life. And yet, in a table of statistics, the fatal result would be put down as occurring after tapping for simple pleurisy. The last case, so far as I have been able to discover, stands alone as an instance of a complication of aspiration not before met with; but even here, although death must be attributed immediately to the unfortunate accident, yet, if nothing had been done, the patient must inevitably have died, and that very speedily. These two cases illustrate how little is the value of bare statistics without those accompanying details that may entirely alter their apparent significance.

EXTRACT OF AN ADDRESS ON SOME CURRENT MEDICAL TOPICS.

Delivered at the Annual Meeting of the Birmingham and Midland Counties Branch.

By JOHN TIBBITS, M.D., Warwick,
President of the Branch.

RECENT legislation has given our profession a potent auxiliary in the appointment of special Medical Officers of Health. Through them a bond of communication is created between the Government, the public, and ourselves, enabling all three to work in unison in promoting and enforcing sanitary improvement in all its ramifications. Already, who can fail to observe some of the results apparent throughout the kingdom? The regret we occasionally feel on hearing of unfortunate collisions here and there between the Officer of Health and the private practitioner are, let us hope, only incidents arising out of a somewhat novel order of things. When our relationships are more thoroughly comprehended, such misunderstandings will no doubt cease. The admirable and exhaustive reports continually brought before us by sanitary officers aid us individually by pointing out the conditions of each of our particular localities, imparting to us a knowledge of facts, and acquainting us with the state of unobserved places, which escape the attention of those whose opportunities of vigilance are restricted within narrower limits; while the constant publicity of the more prevailing causes of death proves a most effective weapon in the armoury of preventive medicine.

In too many parts of the United Kingdom the alarmingly high rate of infant mortality calls for careful investigation and prevention. Some

of its causes are deeply rooted in social defects, perhaps almost beyond the reach or control of the sanitary officers. They can point to the figures revealed by the death-registers, but possibly in many instances can do little more; but it is in the power of all who are actively engaged in the practice of medicine to cast more responsibility upon the coroners than generally falls to their share in this momentous matter. Who amongst us is not painfully familiar with the half-fed, strumous, or syphilitic infant, brought for the first time before the physician's eye, when the heedless, incapable mother, or, still worse, the indifferent hired nurse seeks aid, not through affection or a conscientious sense of duty, but because of the fear of not obtaining the certificate of the cause of death, which is often too good-naturedly granted? Indirectly, we may thus be aiding and abetting the neglect we are so anxious to suppress. We are consulted in these cases, not on account of the good we can do for the sufferer, but for the satisfaction, as it is called, which we can give, and the veil our observation, however slight, may serve to draw over indolence, ignorance, or even crime. Besides all this, the actual infantile deaths only represent one part of the national evil. The incalculable number of those who do not die, in spite of unwholesome and insufficient food, bad nursing, cold, disease, and neglect of every possible description, goes on adding fearfully to the degenerated stock of our urban population. This especially concerns each one of us most deeply, as the custodians of their mental and physical development. Commonplace as these well known facts may appear to us, their incalculable importance induces me to call attention to them on this occasion.

Another important subject which suggests itself to us, as guardians of the public health, is the often imperfectly understood management of children of all ages in schools. The simple and self-evident proposition that during growth a proportionately much larger and more frequent supply of wholesome nutriment is requisite than in the fully developed adult, is too frequently ignored altogether or practically unknown. The disastrous results are manifest in the irretrievable damage so commonly inflicted on originally robust constitutions. The arrangements of many of our public schools and institutions for the young undoubtedly require improvement.

Probably very few instances would be found in which the earnest remonstrances of the responsible medical officers would fail to produce the necessary reforms. If only care be taken that such remonstrances are supported by physiological facts, with common sense arguments, no governing bodies can be so stubborn or so devoid of humanity as to disregard the well-considered suggestions and efforts of the medical philosopher. Too many of us are well acquainted with the lean, stunted, feeble, dyspeptic, strumous subjects, worn into premature adolescence by excessive brain-worry, insufficiently sustained by commensurate aliment to supply material for thorough development. The commonly prevalent system of commencing tasks in the early morning, occupying from one to two hours or more before breakfast, to be quickly followed by sustained mental effort until 12 or 1 P.M., with only an hour or two allowed for relaxation, and the most substantial daily meal; then again close application until 5 P.M., to be followed with the preparation of tasks for the next day, is far too much for young and rapidly growing children. Besides, in many cases, the only meal remaining is the one about 5 P.M., consisting generally of tea and bread and butter. Thus an interval of about fourteen hours elapses between the last repast in the evening and the first the following morning. We should reflect that the process of digestion in the healthy stomach is so rapid, that an ample meal consisting of animal and vegetable substances may be almost entirely converted into chyme in about the space of one hour, and the stomach left empty in two hours and a half. This was conclusively demonstrated some years since, in the case of the man St. Martin, in whose stomach an aperture remained after a gunshot wound, by means of which aperture experiments on the period of time occupied in the digestion of various aliments could be performed with unerring precision. Nutrition is in most active progress during repose, and man in his natural state, like most, if not all animals, would sleep when replete with food. Because the human economy early in life tolerates insufficient food, it does not follow that a more generous supply is not wanting for perfect development. For the errors to which I have alluded, the public mania for cheapness is in some degree responsible. How some scholastic institutions can possibly be remunerative at the present price of provisions, if children are properly fed, appears incomprehensible.

Many other problems suggest themselves to the medical mind, now that the State has decided that every child above the age of five years shall be educated. Neither the public nor our school-boards appear to grasp them yet. The primary principles of mental and physical health in children are imperfectly understood. How often are the sleepless conditions of the overwrought brain overlooked or misunderstood. Sensi-