pigments, and it is probable that a more detailed study of these effects would supply further diagnostic indications. However, in this review of a somewhat obscure branch of chemical pathology nothing has been further from my desire than to claim for my subject an exaggerated practical importance or to suggest that the investigation of the urinary pigments should form part of the routine of clinical examination. Such importance as the subject possesses is derived from the light which it throws upon processes which are at work in the body both in health and in disease, and especially upon those which are concerned with the disposal of effete blood pigment. Nevertheless, in certain cases the examination of the colouring matters of the urine may afford information of real diagnostic value and which is not readily obtained in other ways. It may therefore be fairly claimed that their study is one which is not simply and solely of academic interest.

A Clinical Lecture
ON
EMPYEMA FOLLOWING LOBAR PNEUMONIA
Delivered at Guy's Hospital on June 27th 1900,
By W. HALE WHITE, M.D., F.R.C.P. LOND.,
PHYSICIAN TO, AND LECTURER ON MEDICINE AT, THE HOSPITAL

GENTLEMEN,—Most patients suffering from lobar pneumonia either recover or die without any complications, but among those few in whom complications follow there are none for whom you can do more than for those who suffer from empyema. A few years ago Dr. Chaning Pearce helped me to abstract several cases from our medical reports; lately my clinical assistants, Mr. F. W. Goble and Mr. B. W. Moss, kindly abstracted some more, and I have abstracted some myself. Altogether there are 45. 15 of these were under my care and for permission to refer to the others I am indebted to my colleagues. The results are shown in the following table:—

—	1898	1897	1896	1895	1894	1893	1892	1891
Total number of cases of lobar pneumonia in Guy's Hospital ...	122	115	114	100	67	182	88	108
Number of cases of pneumonia complicated by empyema ...	3	7	3	6	2	9	2	6
Percentage complicated by empyema ...	2.46	6.08	2.63	6.0	3.0	4.94	2.27	5.5

—	1890	1889	1888	1887	1886	1885	1884	1883
Total number of cases of lobar pneumonia in Guy's Hospital ...	88	60	43	72	48	39	26	69
Number of cases of pneumonia complicated by empyema ...	1	1	1	2	—	—	1	1
Percentage complicated by empyema ...	1.13	1.6	2.3	2.9	—	—	3.8	1.4

If we divide this period of 16 years into two equal periods we find that in the eight years 1891–98 there were 896 cases of lobar pneumonia, of which 38, or 4.24 per cent., had empyema, while in the eight years 1883 to 1890 the total number of cases of pneumonia was 445 among which there were seven cases, or 1.57 per cent., of empyema. Thus we see that both relatively and actually the number of cases of empyema due to pneumonia has increased of late years, and the rarity of this complication a few years ago explains the fact that in many text-books published then it was not mentioned that empyema was a complication of pneumonia, and it also goes to confirm what I think experience tells us—namely, that pneumonia is a more severe disease than it was; indeed, pneumonia has since influenza appeared, become much more formidable than formerly, for not only do these figures prove that the number of admissions for pneumonia have been very great during the last eight years, but the frequency of empyema has increased. There is very little

doubt that these figures understate the number of cases of empyema following lobar pneumonia, for it is almost certain that some of the patients who are admitted for pus in the chest have had pneumonia shortly before they came into the hospital. Only recently a man was under my care for empyema which was opened. He died very shortly after the operation and pneumonia was found at the post-mortem examination. Had he recovered we should not have known that his empyema was consecutive to pneumonia. Another reason which makes it impossible to give precisely the proportion of cases of pneumonia which are followed by empyema is that the pneumococcus may be the means of setting up an empyema, even although it does not induce pneumonia, and in such a case the general symptoms and physical signs may be such that it is very difficult to deny certainly the presence of pneumonia. I have seen three or four cases illustrating this point; perhaps the best is that of a man who was under my care but whose case is recorded by Dr. J. W. Washbourn in the Transactions of the Royal Medical and Chirurgical Society, vol. lxxvii. The patient was aged 36 years; his illness was ushered in by a rigor, he had persistent high temperature, rapid breathing, cough, herpes, and delirium. His general aspect was so like that of a patient suffering from pneumonia that both the medical registrar and I pointed him out to the students as having the exact appearances of a patient suffering from pneumonia. The physical signs were until the day before death those of solid lung—viz., loud bronchial breathing, bronchophony, dullness, and consonating râles. Not until the day before death did signs of fluid appear at the base of the lung. At the necropsy the lung was normal both to the naked eye and the microscope, 54 ounces of pus were found in the chest, and this was proved by microscopical examination, by cultivations, and by inoculations to contain no micro-organisms but pneumococci. It is of great interest to notice that such cases as these remind us that although the pneumonia due to the pneumococcus does lead to a pulmonary abscess, yet the same micro-organism may do so when it invades other parts of the body.

We see, therefore, that it is impossible to state with accuracy the percentage of cases in which pneumonia is followed by empyema, but it is interesting to note that out of 325 consecutive cases of empyema in the medical wards of Guy's Hospital there were 41, or 12.6 per cent., in which it appeared that the empyema followed a lobar pneumonia. But although this is so, it is easy by systematic examination of the pus to find out the proportion of cases of empyema due to the pneumococcus. I have not searched through all our records to find the exact proportion, for several authors have published results from which it appears that the pneumococcus is a very common cause of empyema, probably the commonest, that it is especially common as a cause in children, some considering that 75 per cent. of all empyemata in children are due to it.

Perhaps the best way to consider the subject is to see what we can learn from the 45 cases of empyema following upon lobar pneumonia which occurred in Guy's Hospital from 1883 to 1898 and to check the knowledge thus gained by the patients now in the hospital and one who has recently died.

By far the most important aid to diagnosing that empyema has followed pneumonia is the temperature. The usual thing, if empyema follow, is for the temperature to fall when the crisis takes place, for it to remain down two or three days, for it then to rise again, so that it soon becomes from 2° to 4° or 5° above normal in the evening and about 1° or 2° in the morning; this continues until the pus is evacuated. Chart 1, taken from a patient under the care of Dr. Frederick Taylor, shows this admirably. Sometimes the apyrexial interval is only one day, sometimes it is four or five days, and sometimes there is not strictly an apyrexial interval, for the temperature does not fall at the crisis to normal, but only to nearly normal, and then soon begins to rise again, so that instead of an apyrexial interval we have an interval of lower temperature. There is a fall of temperature at the pneumonic crisis with a subsequent rise in about a third of all the cases in which empyema followed pneumonia. This fall of temperature is a very curious phenomenon, for we believe the pneumonia to be due to the pneumococcus and the empyema to be due to the same micro-organism, and that it is in some way responsible for the pyrexia; that being so it is difficult to understand why, although these micro-organisms are constantly present, there should be

any fall of temperature, for there may be a well-marked crisis with an apyrexial interval before the onset of the temperature indicating empyema even in cases in which the pus from the empyema contains no micro-organisms save pneumococci. Also it is difficult to understand why, when the

associated with empyema after pneumonia and if they are present early in the case they may prevent the fall. Chart 3 represents the temperature of a boy now in John Ward under my care and as in his case there is pericarditis as well as empyema it is probable that this explains why he did not have a more definite crisis and why

CHART 1.

Showing the most common course of the temperature in empyema after pneumonia.

temperature is indicative of the invasion of the lungs by pneumococci, the daily variations should not be extreme, but when the same micro-organism subsequently causes empyema the daily variations should be great.

In many cases there is no apyrexial interval and probably in some of these pus is present from quite early in the illness. Chart 2, from a patient under the care of

CHART 2.

Showing the temperature from a pneumonic empyema without any apyrexial interval.

Dr. Taylor, shows very well a case in which there was no interval during which the temperature fell. You must be particular to bear in mind that there is no sharp boundary line between the two groups, for the temperature may fall a little about the end of the first week, but the fall may be so slight that it is impossible to say whether it represents a crisis modified by the presence of pus.

There is a third group in which also there is no interval during which the temperature is lower, but in which there is some complication present that may well explain this. Pericarditis and malignant endocarditis may both of them be

even when the empyema was opened the temperature did not fall. It is noteworthy that although pericarditis is a common complication of pneumonia and five of our cases of empyema had pericarditis, yet pyopericardium is so rare. Only one of our 45 cases showed it, and in this case, which was not diagnosed during life, 23 ounces of pus were contained in the pericardium and 12 ounces in the right pleural cavity. Although the empyema in the little boy (Chart 3) now in John Ward lay against the pericardium and he had pericarditis there is no evidence that he has had pyopericardium. Pus in the pericardium from any cause is very rare. I think we have only had six instances at Guy's Hospital in 11 years.

Three of our 45 cases developed pneumococcal malignant endocarditis; in one of them, although there was no lesion of

CHART 3.

Showing that if pericarditis is present the opening of the empyema may hardly influence the temperature.

even when the empyema was opened the temperature did not fall. It is noteworthy that although pericarditis is a common complication of pneumonia and five of our cases of empyema had pericarditis, yet pyopericardium is so rare. Only one of our 45 cases showed it, and in this case, which was not diagnosed during life, 23 ounces of pus were contained in the pericardium and 12 ounces in the right pleural cavity. Although the empyema in the little boy (Chart 3) now in John Ward lay against the pericardium and he had pericarditis there is no evidence that he has had pyopericardium. Pus in the pericardium from any cause is very rare. I think we have only had six instances at Guy's Hospital in 11 years.

Three of our 45 cases developed pneumococcal malignant endocarditis; in one of them, although there was no lesion of

CHART 4.

Showing the temperature in a case in which two empyemata were opened by incision.

the valves, there was general infection as shown by the presence of infective aneurysms. In a fourth case there was a pneumococcal gluteal abscess and in a fifth there was pneumococcal inflammation about the ankle. It is obvious that any of

these will mask the temperature due to the empyema. There really appears to be no part of the body in which the pneumococcus may not flourish; you know it will cause meningitis, peritonitis, and arthritis. In very rare instances there are two empyemata, then although the first is operated upon the temperature does not fall permanently until the second is opened. Chart 4, from a patient under the care of Dr. E. C. Perry, shows this very well, and Chart 5, from a patient under the care of Dr. P. H. Pye-Smith, shows a case in which there was a post-pneumonic empyema at each base

made out that rapidity of respiration is much help in diagnosis, but there is some slight evidence that when the empyema is due to the pneumococcus the respiration may occasionally be more rapid than either the fluid or the temperature would lead us to expect.

Let us now pass on to the examination of the chest, and in the first place let me direct your attention to the great importance of local tenderness. Very often people with deep-seated small abscesses have one spot pressure upon which with the finger gives rise to a slight feeling of pain.

CHART 5.

Showing the course of the temperature in a case in which a double empyema and gluteal abscess existed.

and an abscess in the gluteal region, and it was not until all had been opened that the temperature fell.

Although the study of the temperature is most important in helping you to diagnose an empyema following pneumonia it is not an infallible guide, for in the first place the temperature may remain up for some time and yet no pus be present. Crisis occurs in only about half of all the cases of pneumonia and when there is no crisis the temperature sometimes falls irregularly and tediously; this is well exemplified by a boy now in No. 3 bed, John Ward. Usually such temperature receives no explanation from the condition of the patient, but it is to be noted that these irregular unexplained temperatures which may, especially in children, follow upon pneumonia do not often show the considerable daily range which is so suggestive of pus, but, on the other hand, as we shall see directly, pus may be present without any wide daily range. Sometimes the persistent temperature after pneumonia is due to some other complication—e.g., malignant endocarditis—and not to empyema, or it may be due to some associated disease such as typhoid fever. Again, particularly in children, it is very difficult always to tell lobar pneumonia from broncho-pneumonia, and in this the temperature may remain up irregularly for a long time, or pyrexia may be caused by quite a small empyema which is coughed up and never detected. In the second place, an empyema in quite exceptional cases follows pneumonia with little or no rise of temperature to reveal its presence. In one of our 45 cases the temperature slowly fell to normal, but the signs of a localised collection of fluid below the left clavicle remained and an exploring needle revealed a localised empyema. In a patient under my care pneumonia was complicated with pericarditis. The patient was taken ill on Sept. 23rd; by Oct. 15th she was much better, but from then till Nov. 6th her temperature was usually raised a degree in the evening. From Nov. 6th to the 12th it was about 101°F in the morning and 103° or 104° in the evening. A small empyema containing four ounces of pus was found. Perhaps in this case the empyema had been present all the time, although for three weeks the temperature was only raised a degree. In another patient, whom some of you saw not long ago, there were two or three pints of pus, but the temperature was usually only between 99° and 100°. I have carefully compared the respirations in several cases, but I have not

Such a spot, if present, should be chosen for insertion of the exploring needle and may enable you successfully to find pus that would otherwise probably have been missed. I have seen attention to this lead to the discovery of a small suppurating hydatid, small subdiaphragmatic abscesses, and small localised empyemata.

There is little to be said about the physical signs. Pus gives the well-known signs of fluid, but nothing taxes the skill and experience of a physician more than the detection of small empyemata, for they are often surrounded by a thick layer of lymph and they have much solid lung in their neighbourhood. The smallest post-pneumonic empyema I have detected during life only contained half an ounce of pus and it is common for them to hold only three or four ounces. Sometimes it is the absence of air entry, sometimes it is the percussion note, and sometimes it is the absence of bronchophony that particularly guides you. In some cases the difficulty is greatly increased by the fact that the empyema is localised and deep in the chest; thus I have seen it sub-diaphragmatic and I have seen it between the lobes of the lung. There is at the present moment a boy in John Ward (No. 14) whose widely oscillating temperature following upon an ordinary attack of pneumonia makes it almost certain that he has an empyema. When we examine the chest we find that signs suggestive of fluid can be obtained just against the vertebral border of the scapula when it is well dragged forward, but there are none in the axilla. We have repeatedly tried, and always failed, to reach this empyema with an exploring needle. Probably it is a small one well under the scapula and perhaps between the lobes of the lung. Twice I have known a small empyema successfully and easily found with an exploring needle, although when later the patient has been under the anæsthetic the surgeon has failed to find it till he has made nearly 20 punctures, and I have seen small empyemata in the post-mortem room which had during life been missed, although the exploring needle had been inserted many times. There is no royal road to finding them—the only thing is to take an infinitude of pains. One reason why they are so difficult to discover is that as often as not adhesions shut off the pus in irregularly-shaped cavities. The most striking instance I have ever seen of these adhesions is that of a man who was admitted into Philip Ward last March. (See Fig. 1) He gave a history of two years' illness and said

that he had been worse lately, but even when questioned would not admit that he had been suddenly taken ill or had had a rigor. His temperature varied between 99° and 100° F., he had much diarrhoea and albuminuria, and he was anæmic and hectic-looking. Both sides of his chest moved equally.

FIG. 1.

A diagram of an antero-posterior section through the left chest, showing the shape of the empyema which is indicated by horizontal lines. From A to B the lung was firmly adherent to the chest wall. From B to C it was compressed. Most of the rest was pneumonic.

The left side was dull in front with a poor air entry, behind it was also dull with a poor air entry and some bronchial breathing. Below the tenth rib base it was especially dull, so that I inserted a needle in the tenth space and withdrew pus; and in order to prove

empyema at the base of the left lung and finally decided to open it. About four pints of pus gushed out and the patient died very shortly afterwards. We found that he was suffering from a huge post-pneumonic empyema, for the left lung was still in a state of grey hepatization. The empyema had commenced apparently between the base of the left lung and the diaphragm and strong but recent pleuritic adhesions running vertically down in and behind the mid-axillary line had localised it so that it spread up the front of the chest right up to the clavicle but only up the back as far as the tenth rib. The diagram shows an antero-posterior section through the left chest. Had we known that there was so much pus it would have been wiser to slowly aspirate before opening the chest, for probably the sudden taking away of all that fluid from around the heart led to the sudden death. It is interesting to note that there was a small abscess in the lung. I have seen that in at least one other case of pneumococcal empyema, and it is also worthy of note that although there was all this pus there was no oedema of the chest-wall, for it is said that oedema of the chest-wall never occurs with pneumococcal empyema. The pus that is let out of these pneumonic empyemata is often light green and very thick; you can notice this very well in the little boy in John Ward; he coughs out thick pellets of almost solid greenish pus.

Much discussion has taken place about the treatment, for it has often been stated that when the pus contains a pure cultivation of pneumococci aspiration will suffice and incision is unnecessary. Simple aspiration has been tried in several of our 45 cases, but always in a few days the temperature, which at first fell after the aspiration, has begun again to rise and to assume a hectic type, and at the same time signs of fluid have reappeared. One or two very bad cases have died, but in most cases the chest has been ultimately laid open and the patient has done well. Chart 6 from a patient under the care of Dr. Taylor, shows these points admirably. Two patients who have been aspirated have refused to submit to any further operation and have consequently gone out of the hospital. One we have fortunately been able to trace and Mr. Moss kindly visited him at his home and reports that he is now quite well and that his chest seems healthy, although no incision has been made into it. His chart is No. 7. He was admitted under my care for pneumonia on Oct. 16th, 1897, and subsequently was under the care of Dr. Pye-Smith. Five ounces of pus were withdrawn on Nov. 20th. The temperature fell but soon began to rise again, so six ounces were withdrawn on the 28th. Again the temperature fell, but in a few days it rose again and showed wide daily fluctuations, and as he would not have anything more done he left on Dec. 12th, 1897—that is, two and a half years ago. Whether he has coughed up a small empyema it is impossible to say. In none of our cases did a

CHART 6.

Showing the temperature in a case of post-pneumonic empyema which was aspirated and subsequently incised.

that the whole of the dullness behind was not due to fluid I inserted the needle again in the ninth and eighth spaces without obtaining any pus. There was a loud pleuritic rub and some rhonchi on the right side. I concluded that the case was one of phthisis with a tuberculous

single aspiration suffice to stop the pyrexia and formation of pus, although in some cases—as, for instance, that from which Chart 6 is taken—it was proved that the pus contained no organisms except pneumococci. So we may conclude from our experience at Guy's

Hospital that it is very unlikely that simple aspiration will cure any case of pneumococcal empyema; still it must be remembered that a certain number of cases have been recorded in which it has appeared to be curative. It seems to me that if the empyema is small it is wiser to evacuate it by incision, for if aspirated probably it will a week or so later have to be incised, and as it is small and will soon heal up it may as well be incised at once. Also, if the empyema is a large one it is better incised (first of all slowly letting out the pus to prevent cardiac failure), for the patient is seriously and dangerously ill and therefore it is not right to prolong his illness by aspiration, as that will almost certainly have to be followed by incision in a week or so. Still, in certain cases in which the patient is not very ill and much objects to an anæsthetic or to an operation, you may at his wish try simple aspiration if the pus withdrawn by the exploring needle gives a pure cultivation of pneumococci. It is said that children recover more often with simple aspiration than adults.

Turning next to the prognosis I find that among our 45 cases 13 died, giving a mortality of almost 29 per cent.

CHART 7.

Showing the temperature in a case of post-pneumonic empyema which was aspirated twice.

This is considerably higher than that given by some authors, but then it must be remembered that children—in whom the prognosis is most favourable—often go to a children's hospital, so that a large general hospital does not get a fair proportion of patients under 10 years of age, and further, four of the 13 had signs of general infection as shown by malignant endocarditis or infective aneurysms, and two were instances of pneumonia occurring in those patients who were already the subjects of phthisis. If we deduct these six cases we get a mortality of seven among 39 cases, or about 18 per cent. The mortality among patients suffering from pneumonia varies widely in different years. Thus at St. Thomas's Hospital¹ in 1887 it was 35 per cent. in the latter half of 1888 and in the first nine months of 1889 it was 9 per cent., and in 1882 it was 7 per cent., but in January and February when influenza was rife it was 64 per cent. It is thus impossible with the figures at our disposal to say how far the danger to life is, in pneumonia, increased by empyema, but certainly the extra danger is not very great. In one of the cases of empyema with malignant endocarditis this was more marked on the right side of the heart than on the left, suggesting that the infection had taken place from the pleura by means of the azygos veins.

It has been stated that recovery usually follows when a pneumonic empyema bursts into the lung, and our series contains a very striking case which goes to support this view. A very feeble man, aged 72 years, was admitted under the care of Dr. J. F. Goodhart suffering from pneumonia. An empyema formed at the base of the right lung; five ounces of pus were let out by incision, but the patient was no better; a few days later he coughed up several ounces of pus by the mouth; he at once began to mend and made an

excellent recovery. I have also seen a patient whose case is not included in our series cough up a post-pneumonic empyema and get perfectly well, and I am afraid that we must leave the boy in John Ward, whose empyema is probably deep-seated somewhere under the scapula, to get well in the same way; indeed, if it is deep between the lobes of the lung probably he will get better more quickly if he coughs it up than if we find it and open it.

The amount of pus found in these empyemata is most variable; 170 ounces were present in one of the patients who had malignant endocarditis. The rate at which it is poured out must be great, for if in the cases in which 80 and 72 ounces were respectively found we believe that the formation of pus began with the onset of the pneumonia at least five ounces must have been formed daily, and if we consider that the pus did not begin to be formed until the secondary rise of temperature began the rate of collection must have been half a pint a day. In striking contrast to these is the case already mentioned in which only half an ounce was found, although 24 days had elapsed since the secondary rise began. Rapid as is the rate at which pus may collect in the chest there is no evidence that it can collect at the rate at which clear fluid may be poured out, for I have recorded a case in which over 100 ounces of this were secreted in one and a half days.²

An Address

ON

THE PHYSIOLOGY AND PATHOLOGY OF INHERITANCE, OR WHAT DO WE INHERIT FROM OUR PARENTS?

A Lecture Introductory to a Course of Clinical Medicine delivered in the Newcastle-upon-Tyne Royal Infirmary on Oct. 31st, 1900,

By THOMAS OLIVER, M.A. DURH., M.D. GLASG.
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GENTLEMEN,—From a biological point of view “we are the heirs of the ages.” Not only in the sense that we are participators of the accumulated experience of the race, but in the physical and mental endowments that belong to each of us, do these words find scope for their realisation. Studying together, as we shall this winter, clinical medicine, it has seemed to me that the present is not an inopportune time to draw your attention to some of the less frequently discussed problems that underlie human life in health and disease. If I can show you that disease is not a morbid entity, requiring to be diagnosed and treated, but something more, and that into our conception of disease there must enter, in addition to the symptoms complained of and the physical signs of ill-health, knowledge of the individual with his peculiarities of constitution, his susceptibilities, his age and his occupation—in a word, that it is not disease as disease, but the individual with his malady that requires treatment—the time at our disposal will not have been misspent.

Disease, from the words “dis” and “ease,” simply means want of ease. In health all our organs functionate without impressing themselves upon our consciousness, but in disease we are often too painfully aware of their existence. It was the opinion of the ancients that disease depended upon a chemical change in the humours of the body, and so for a period the humoral pathology prevailed, remnants of which are still seen in the nomenclature of disease. Later disease was thought to be due to a distinct and tangible cause, a *materies morbi*, while subsequently to this it was regarded as the last link in a chain of processes of deranged metabolism and abnormal function with diminished resistance to external surroundings. Within the last two decades, owing to the great strides made by bacteriology—a science

¹ St. Thomas's Hospital Reports, vol. xix.

² THE LANCET, March 25th, 1893, p. 649.