nor does it seem to be a factor in the causation of a diseased condition of the lungs. Phthisis, either fibrous or tuberculous, as a disease among coal miners due to their occupation is very uncommon indeed; in fact, as a disease phthisis is probably more uncommon in coal miners than in any other class of workmen in the country.

I very much question whether the presence of coal dust and soot in the lungs of miners has any influence whatever in the production of phthisis, and I venture to express the opinion that anthracosis as a disease *per se* does not exist, but is really an epiphenomenon in diseases of the lungs in which this blackening is found.

In a tuberculous phthisis the diseased condition is due to the presence and work of the tubercle bacillus on a fertile ground; in a fibrous phthisis the fibrosis is due, not to the presence of coal dust and soot and their irritating peculiarities, but to the presence of and irritation produced by the dust particles from the post or sandstone strata and by the dust from the shale and seggar clay.

I wish particularly to draw the attention of pathological observers to this point, and to the fact that these other dust particles are probably not as a rule observed, on account of the only too evident presence of the coal dust and soot particles which obscure them macroscopically and microscopically. I would suggest to these observers the application of simple chemical tests, the use of the polariscope, and also a comparison with the lung tissues of dead ganister workers.

I am inclined to believe that the comparative rarity of phthisis among coal miners is probably largely due to the protective influence of coal dust and soot. I am aware that this is disputed, but I am not aware that it has been disputed in regard to the relative protecting and irritating influence of coal dust and soot, etc., and the post, shale, and seggar clay dusts.

I do not think that this point has been touched upon, far less argued out, by other observers. This protective influence of coal dust and soot appears to be due partly to a filtering action, partly to a mechanical action, in clinging to and covering the sharper angles of the post, shale, and seggar clay dusts, which latter are thus screened as a rule from observation, and to a lesser degree to an antiseptic and deodorant action.

That there must be some protective influence in the coal dust and other carbon particles inhaled by the coal miner seems evident, for many of the other factors which favour the development of phthisis are present and actively at work in his daily life, such as (in this district at least) living in damp houses under conditions of overcrowding and bad ventilation, working in an atmosphere often impure from the presence of noxious and irritating gases, and where the percentage of oxygen is often below the normal, and possibly also sometimes contaminated with dried tuberculous sputum, and spending the greater part of his time indoors and in the mine. In fact, one may say that the average coal miner often works in the mine under more healthy conditions than those in which he lives at home.

A point which corroborates this is the fact, which is well known to all men familiar with mine work, that the horses and ponies down the mine improve in condition there, and though they do not get very much nor very efficient grooming their coats are generally sleek and glossy. The average life of a horse or pony in a pit, notwithstanding the hard nature of its work, is quite up to the outside standard. I know of several ponies down the pit upwards of 20 years of age still working well. These have been in the mine all their working lives. The statements as to the prevalence of coal miners' phthisis in former years do not correspond with the actual facts observed now. Phthisis among colliers is the same as phthisis among other people, and arises from the same causes with the exception above mentioned. Facts worth noting, too, in this connexion are:

1. Coal dust may remain embedded under the skin for years without producing any irritation whatever.
2. The death returns from phthisis in a colliery district show a greater proportion of deaths among females than among males.
3. Colliery surgeons almost invariably state that phthisis is not so common in mining as in other districts where they have been in practice.
4. In the majority of phthisis cases which do occur there is a strong family history of phthisis on one or both sides.
5. Phthisis often seems to attack successive families in particular houses.

THE "PHYSIOLOGICAL" DIFFERENCE BETWEEN THE TWO SIDES OF THE CHEST

IN THE PHYSICAL SIGNS OBTAINED OVER THE UPPER PART
OF THE LUNG.

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It has long been recognized and taught that the physical signs obtained in examination of the chest by palpation, percussion, and auscultation are not identical on the two sides. That there are such differences may be generally recognized by teachers, though the fact is certainly not universally emphasized in their textbooks and writings. The extent of these differences is, however, certainly not always fully appreciated by practitioners, and an exaggerated idea of what may be considered as physiological differences in the signs elicited over the two lungs leads sometimes to failure in recognizing a very important pathological condition when such recognition is of vital consequence to the patient.

That tuberculosis of the lungs is curable if treatment is commenced whilst the disease is in its earlier stages is now abundantly proved; the small expectation of cure when the disease has become more advanced is unfortunately common experience.

In the detection of the disease physical examination of the chest is an important factor, and in the earlier stages the deviations from the normal are often but slight. There is practically no standard which we can apply to all cases; the physical signs which are normal in one individual would be abnormal in another person of different build or age. We are therefore obliged to supplement our sense of whether or not the signs elicited over a portion of a lung in any given case approximate to our views of the supposed normal, by comparison with the corresponding part of the opposite side of the chest. The exact amount of difference between the two sides which may be considered "physiological" as opposed to "pathological," becomes then a matter of supreme importance.

In the Medical Report for 1902 of the Mount Vernon Hospital for Consumption and Diseases of the Chest, out of 68 early cases of tuberculosis of the lung in which signs of disease were found in one upper lobe only, 46 had the right lung affected, or 67.35 per cent. In commenting upon this the report says that the preponderance of the right side over left-side cases affords evidence "that the greatest care should be taken before assigning any slight abnormality of the physical signs at the right apex to the generally-accepted physiological difference between the right and left apices." It is on these grounds, and in view of cases in which the physical signs of early tuberculosis of the lung have been passed over as representing the physiological difference between the two sides of the chest, that I have noted carefully when examining healthy chests what differences can be detected over the upper part of the chest between the two sides. The cases include healthy persons presenting themselves for life assurance, healthy young women joining the staff of the hospital as nurses, probationers, or servants, and a few patients suffering from slight complaints unconnected with the lungs.

THE PHYSICAL SIGNS OVER THE PULMONARY APICES ON EXAMINATION OF THE CHEST IN HEALTH.

It cannot be too much insisted upon that by physical examination we can only learn the physical condition of the parts, so that physical examination alone will not lead us to a diagnosis. But, on the other hand, the general condition of the patient and his various symptoms, though these may give reason to suspect tuberculosis, are by themselves insufficient foundation for an opinion on the nature of his complaint. Examination of the sputa cannot be relied upon for the very obvious reason that there may be no expectoration to examine. Many cases of pulmonary tuberculosis run their course to arrest or cure without any expectoration and even without any marked cough. Of those cases where cough with expectoration is present from the commencement, in comparatively few will tubercle bacilli be found in the sputa until the disease has advanced so far that the physical signs in the chest give clear indications of the presence of disease; examination of the sputa may then be useful to demonstrate its nature.

The right lung is primarily affected in pulmonary tuberculosis more frequently than the left, and it is in the

upper part of the right lung that the physical signs in health differ slightly from what may be considered the normal. Thus it may easily happen (and in my experience does sometimes occur) that a person with healthy lungs might be suspected to be phthisical. More frequently, and more disastrously, the physical signs indicating early tuberculosis may be passed over as being merely the physiological difference between the right and left sides of the chest.

The plaint from the various sanatoria for consumptives is that cases are not sent for treatment sufficiently early, the reason being in many cases that the disease was not recognized in time; and although this is often the patient's fault for not seeking advice, it is sometimes due to want of recognition, or faulty interpretation of the physical evidences of disease on examination of the chest. The first essential towards the recognition of a diseased condition of the lung is a clear appreciation of what signs to expect in examining a healthy lung, and it was to satisfy myself on this point that the investigation which forms the subject of this communication was undertaken.

The cases referred to in this communication are almost all young adults. I have been able to include a good proportion of females in the number, as I am responsible for the resident staff at the Mount Vernon Consumption Hospital, where every nurse and servant is carefully examined before being accepted for duty. Of the remainder of the cases, many are persons examined for life assurance, and passed as first-class lives. A few of the persons examined could not be included amongst the "healthy chests," although they expressed themselves as being in perfect health, and had every appearance of being so. In one of the nurses, for example, there were very obvious signs of consolidation in the apex of one lung, due probably to an old tuberculosis which had run its course to complete arrest without having been suspected, although inquiry showed a period of lowered health some years previously.

The cases dealt with in this report number 58—28 males and 30 females. The physical signs which are noted are as follows: The percussion note, the breath sounds, the vocal resonance, and the vocal fremitus.

In all cases the examination has been made with the person stripped to the waist, and the remarks refer to the upper part of the chest only, above the third rib in front, and to the spine of the scapula at the back.

Percussion.

No difference was detected between the right and left sides of the chest in 29 (11 males and 18 females). In 6 others the only difference noted was that on direct percussion on the right clavicle the note was slightly different from that on the other side and from the rest of the upper part of the chest on the right side, the sound being equal on the two sides except on the right clavicle. In 5 of these (2 males and 3 females) the note on the right clavicle was slightly less resonant, and in the other (male) slightly more resonant than that elicited elsewhere.

Another case (male) gave greater resistance on percussion over the right apex, though the note produced appeared to be the same as on the other side. In one case (male) the percussion note was more resonant on the right side above the clavicle than on the left. On the clavicle and below it the resonance was the same as on the left side. The man was a strong powerful man, 30 years of age; he was not left-handed and had no transposition of viscera.

In the remaining 21 cases (12 males and 9 females) the note was slightly less resonant over the right apex than over the corresponding area on the opposite side.

It may be noted that it is chiefly in the male subject (12 out of 28 males against 9 out of 30 females) that a difference in the percussion note is found. This might be taken to favour the view expressed by some writers that the note is altered by the thicker coverings to the chest on the right side, since men use their muscles more than women, and the right arm is always more used than the left. The percussion note would thus seem to be slightly higher pitched and less resonant in about half the cases. The difference in the note is, however, not very marked and might easily escape detection unless special attention was directed to the comparison.

I do not think there should be any danger of mistakes arising from this source, as a well-marked difference in the percussion note between the two sides cannot be considered "normal" in any case. It is, however, just this difference in the percussion note which often misleads the examiner.

Breath Sounds.

No difference in the character or intensity of the breath sounds on quiet breathing could be detected in 41 cases (22 males, 19 females).

In 7 cases (3 males, 4 females) the breath sounds were louder over the right apex, in only 3 (2 males and 1 female) were the sounds less distinct (softer) on the right than on the left side. In 3 cases (1 male, 2 females) the sounds were bronchophonic, that is, more directly conducted to the ear on the right side. The expiratory sound was distinctly more marked (louder) on the right side than on the left in 9 cases (3 males and 6 females). In only 5 cases (3 males and 2 females) was the character of the breath sounds different on the two sides. In 2 cases (males) the breathing was harsh at the right apex. In 3 others (1 male and 2 females) the breath sounds were higher pitched on the right than on the left; in one of these cases (a female) it was the expiratory portion of the sound which alone was modified, this being almost tubular in character.

It would appear, therefore, that though the breath sounds may be somewhat louder, and thus more clearly heard over the right apex, there is in health no difference in character between the breathing on the right and left sides. The expiratory sound may be more distinct on the right side, but there is no difference in the proportion between the length of the inspiratory and expiratory portions of the breath sound. If the expiratory sound is prolonged (as well as louder) the condition is abnormal, and cannot be taken to indicate a healthy lung, and any obvious alteration in the character of the breath sound must be taken to indicate a divergence from the healthy condition.

Added ("adventitious") sounds—for example, crepitations—are never heard under "normal" conditions of health.

Vocal Resonance.

In 21 cases (9 males and 12 females) no difference was detected between the two sides of the chest. In 30 cases (16 males and 14 females) vocal resonance was more marked over the right apex than on the corresponding region of the opposite side. In only one of these cases (a female) was the resonance noted as much louder on the right; in the remainder the difference was slight, and in 4 it is noted as very slight. Bronchophony was distinct on the right side in 7 cases (4 males and 3 females).

The voice resonance, like the breath sounds, is increased in intensity in a large proportion of the cases—rather more than half. It is to be noted that this increase in intensity is more often to be noted in the case of males, in whom the resonance is always more than in females.

It would appear that any marked difference in the vocal resonance on comparing the two sides of the chest, must raise suspicion of some abnormal condition in one lung.

Vocal Fremitus.

The vocal fremitus seemed to be equal on the two sides in 11 cases (5 males and 6 females). In 45 cases (22 males and 23 females) the fremitus was distinctly more marked on the right side; and in 2 cases only (1 male and 1 female) it was more marked on the left side.

The great majority of the cases showed an excess in the vocal resonance over the right apex as compared with that on the left side of the chest. This is, in fact, the most constant, as it is also the most marked difference in the physical signs over one apex as compared with the other.

We must infer that an increased vocal fremitus over the right apex as compared with the left is a normal condition, and is no indication of disease.

As to the explanation of the differences which may exist between the physical signs over the opposite sides of the chest at its upper part, I will, at present, merely say that the arrangement of the main bronchus in the right and left lung respectively seems to offer an explanation which will cover almost all the differences noted.

CONCLUSIONS.

1. In the majority of healthy persons, but not in all, the physical signs elicited over the upper part of the right lung differ somewhat from those on the corresponding part of the left side.

2. These differences consist in the following: (a) The percussion note is slightly less resonant and higher-pitched on the right side; (b) the breath sounds are louder on the right side, and the expiratory portion of the sound more marked; the character of the sound and the proportion between the

length of the inspiratory and expiratory sounds is not modified in health; (c) the vocal resonance, especially in men, is more marked on the right side; (d) vocal fremitus is more marked on the right side.

3. Of these differences the increase in the vocal fremitus is by far the most constant. Differences in the percussion note are only noted in half the cases examined.

4. The differences, except in percussion, are not so much alterations in the character of the signs as modifications in transmission of the sounds.

5. The modifications in the signs are apparently due to the direction and form of the main bronchus, which are not the same in the two lungs. The percussion note modification may possibly be influenced by the thicker covering of the right side of the chest, but is most probably also dependent upon the position and size of the bronchus.

CONSUMPTION IN THE NAVY.

By W. E. HOME, M.D., M.R.C.P.E.,
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MR. SICHEL'S important paper on Consumption in the Navy, read at the annual meeting of the Association at Manchester, published in the BRITISH MEDICAL JOURNAL of October 4th is full of interest, and his demonstration of the waste of money and loss of efficiency produced by the disease is most valuable.

Personally, I think that he has underestimated the damage, as he has only considered cases returned as tuberculous. The Blue Book for 1900 gives in addition, at page 9, materials from which we may calculate the total deaths ascribed to phthisis, and these must be added to the "tuberculous," that we may have complete statistics of deaths from tuberculous infection. Diseases of the respiratory system are reported on page 9, and at the end of the very valuable annual discussion of the prevalence of these diseases in the training service, it is said that in that service about half (really two-thirds) the invalids from respiratory diseases and about a quarter of the deaths are due to phthisis, probably tuberculous. If this proportion obtains in the service generally, we must add to the 49 deaths which occurred in 1900 from tuberculous disease one-fourth of the 106 deaths reported to have resulted from respiratory disease, that is, 26, and thus we get 75 as the total number of deaths in the service from tubercle in 1900, a rate of 0.79 per 1,000. This increased proportion gives even more weight to Mr. Sichel's contention that there is still room for improvement in the navy.

The loss of the training service from tuberculous diseases is nowhere shown in the Blue Book, but in the last ten years there has been on an average a yearly death-rate of 0.4 per 1,000 from phthisis and pleurisy, which may be pretty safely grouped together. The rate has been falling of recent years, such cases being increasingly returned as tuberculous. There is some reason for believing that in 1900 deaths from phthisis were proportionately more numerous in the training ships than in the general service, but there were only 3 in the training ships. In the three years 1896-7-8 the ratio per 1,000 of invalids and deaths for phthisis pure and simple was higher in the training service (5 per 1,000 invalids and 3 per 1,000 deaths) than in the general service (3 per 1,000 invalids and 1 per 1,000 deaths). This is a serious consideration when it is remembered how lately those boys were passed into the service as free from physical defect.

Owing to alterations made in the form of the health statistics of the navy it is no longer possible to compare the death-rate of this disease in the army and navy, but from their respective reports for 1896, 1897, 1898 the deaths in each service on the large home station (in each case involving about half the men of the service) may be extracted. To get a complete account of the deaths from tubercle I add to those specified as "tuberculous" those also ascribed to phthisis, hæmoptysis, hæmorrhage of the lung, pleurisy, empyema, and broncho-pneumonia. We then find an average:—Army, force at home, 97,666; deaths, 67; rate per 1,000, 0.68; 1896-8; navy, force at home, 34,481; deaths, 31; rate per 1,000, 0.9; and as our men are better clothed and fed, I suppose the excess must be due to their closer aggregation in small cubic space, as Mr. Sichel believes; in fact, to the greater chance our life offers for the spread of infection. To reduce this risk we must diminish overcrowding by improving ventilation, and as in the management of other infectious diseases we must strive for early recognition and isolation or removal of

the patient. Mr. Sichel has done a most useful work in bringing this matter before the Association, and has greatly lessened the difficulties of securing increased prophylaxis by his skilful investigation and telling announcement of the loss to the navy caused by tubercle, furnishing us with a financial argument for improved sanitation which cannot but arrest the attention of those who concern themselves with the defence of the empire.

OBSERVATIONS ON EMPYEMATA IN CHILDREN.

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In this paper I have put together the facts and impressions gathered from a personal experience of 81 cases of empyemata in children.

I think it is on the whole admitted that the disease during childhood is a less serious complaint than during adult life, but this statement does not hold good for all ages of childhood. It will not be denied, for instance, that the disease is a very serious complaint during infant life—that is, when it attacks a child under 2 years of age; under a year old, as the figures below will show, the recoveries are few and far between. Hence a record of a personal experience of the above number of cases may be deemed of value, and more especially the points relating to treatment.

I range myself with those who believe that an empyema is an empyema from the beginning—that it starts as such, and very seldom as a simple effusion, which later on becomes purulent. Only in one case did a secondary puncture (after an interval of a fortnight) of the chest reveal pus when the first exploration withdrew a syringe of clear pleural fluid. In this case, moreover, I am rather inclined to the belief that pyogenic organisms were introduced into the chest at the first operation. In every other case pus was found from the beginning.

Classification.

If I were to arrange all the 81 cases in some order of classification, I should, from a clinical standpoint, be disposed to divide them up into two main groups—those that I would associate with the name of "acute" or "primary," and the "late" or "secondary," which latter would include about 80 or 85 per cent. of all cases. To explain this classification, I would begin by saying that nearly all empyemata seen at a children's hospital are associated with an attack of pneumonia, either of the croupous or of the catarrhal form. An empyema due to initial disease of the pleura alone must be a very rare condition indeed, and then it would probably be associated with a similar condition of the other serous membranes or with some form of pyæmia. In the 81 cases to which reference is made, it was not found possible to attribute any one of them to an absolute primary morbid condition of the pleura. Further, many cases that were examined *post mortem* showed some trace of associated pneumonia. Of course, it is difficult to imagine how the lung tissue could escape implication when the contiguous pleura was diseased and vice versa, and hence it would be practically impossible to say which was the seat of the primary mischief. Now, the affection of the pleura is manifested either concomitantly with the attack of pneumonia or else subsequently to it, this period varying from ten days to three or four weeks, and even much longer; and hence those in the former group would be classed as acute or primary, and those in the latter as chronic or secondary.

In the acute cases the signs of fluid in the chest develop simultaneously with those of pneumonia, and the patient is very ill indeed from the first onset of the disease. The illness starts quite suddenly with vomiting and marked dyspnoea, the respirations are hurried and grunting, the *alae nasi* work vigorously, there is a good deal of recession of the lower part of the chest, the face is dusky and the lips markedly cyanotic; the temperature is found to be raised to 104° or 105°. On making a physical examination of the chest, there is marked dullness with increased resistance on one or both sides, and loud tubular breathing over a very extensive area. A puncture with an exploring needle withdraws a thin watery purulent fluid, very often blood-stained. Such cases practically always die when the patients are under 2 years old. They may live for a few days or as long as a fortnight after the onset, but they eventually die, not from the empyema, but mostly from extensive consolidation of the lungs, if they escape such complications as pericarditis, meningitis, and peritonitis.