absence of precipitation on the addition of the reagent it is not necessary to boil at all, hence the test is a much shorter one than the ordinary acidulation and heat test, a matter of great importance when a large number of urines have to be examined, for example, in hospital practice.

There is no need for care as to the exact amount of the reagent used; no danger of over-acidulation, as with nitric or acetic acids—even large excess of salicyl-sulphonic acid does not redissolve the precipitated proteid. Further, the reagent is non-caustic and exceedingly stable, while it does not stain like picric acid, etc. As regards portability it can be used in the form of crystals, which are much safer than the poisonous and staining picric acid crystals, with their further disadvantage in precipitating certain other bodies besides proteids—for example, many alkaloids, etc. When using the crystals, one should proceed as follows: Half a drachm, or less, of urine is taken in a small test tube—for example, $\frac{1}{2}$ in. diameter, and 3 in. in length—a few crystals of salicyl-sulphonic acid are dropped in, and boiling, if necessary, can easily be done in the absence of a spirit lamp, etc.—over an ordinary lamp or candle.

No substance in the urine, apart from those of the proteid class, has been found to give the reaction⁵, which is an exceedingly delicate one. As a precipitant of proteoses it is greatly superior to nitric and acetic acids, as the latter redissolve the precipitate when too much acid is added.

NOTES AND REFERENCES.

¹ Attention was called to these facts many years ago in this Medical School by Dr. Angus Fraser. ² Some observers deny that acid-albumen is formed. ³ Pickering, *Journal of Physiology*, vol. xiv, p. 374. ⁴ MacWilliam, *BRITISH MEDICAL JOURNAL*, 1891, p. 837. ⁵ To obtain a saturated solution dissolve 25 grams of salicyl-sulphonic acid crystals in 10 c.cm. of water. Roch used a relatively weak solution, and the results got by his method are very inferior in delicacy; Roch did not distinguish between albumen and proteoses. ⁶ MacWilliam, loc. cit., p. 839.

AN INQUIRY INTO THE PRIMARY SEAT OF INFECTION IN 500 CASES OF DEATH FROM TUBERCULOSIS.

BY

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ONE of us having been requested to examine the reports of fatal cases of tuberculosis in the hospitals in Bristol, it was thought that a short account of the analysis might be of some interest.

A question which it is scarcely necessary to remark has much agitated the medical mind of late has been the method of entry of the tubercle bacillus into the system. The statistics of some observers appear to show that in the great majority of cases of tuberculosis invasion takes place by means of the respiratory passages, while others have maintained that their experience shows that entry by means of the alimentary tract is by no means uncommon.

Those whose experience leads them to believe that the abdominal viscera are first invaded naturally lay great stress upon the danger of infected milk, while those who hold that the thorax is almost invariably the primary seat of disease are for the most part inclined to consider that bovine tuberculosis is rarely communicated to man. The whole question is involved in difficulty, and it is needless to remark that it is in the age of childhood that milk is chiefly drunk, and it is at this period of life that primary abdominal tuberculosis is most common; yet it does not follow that this is a proof of infection with bovine tuberculosis.

There are numerous ways by which tubercle bacilli of human origin can enter the alimentary canal. Even in the early months of life such infection is possible. All day long some babies are sucking an india-rubber comforter, and it no sooner drops on to the dirty floor than it is hastily picked up and thrust again into the mouth of the infant. Older children also as they crawl take up every article they can lay hold of and put it into their mouths, to the danger of which their dirt-begrimed cheeks bear witness.

While these risks are real, we have, on the other hand, to remember that the discovery of disease in a certain part of the body does not necessarily imply that the cause of the disease found its way to that spot by the nearest route. There

is what we may call the inborn weakness of certain organs, and the infecting agent may pass through more resistant parts of the body in order to reach these weaker organs.

Recent experimental work seems to show, also, that tubercle bacilli entering by the mouth may reach and cause disease of the lungs, while other parts of the body remain unaffected. However, although we may say that in some cases of disease of the lungs invasion may have taken place by the alimentary canal, so far as we can judge from *post-mortem* evidence it seems to us that infection of the abdomen may, on the other hand, sometimes occur from a small focus in the thorax. Thus we have seen acute tuberculosis limited to the peritoneum when the only caseous focus in the body that could be discovered was a caseous bronchial gland. During an attack of rheumatism in a boy pericarditis had arisen, and the disturbance set up by this inflammation in the thorax appeared to have disseminated tubercle bacilli contained in the caseous bronchial gland, which bacilli had attacked the peritoneum only.

As we have said, the question of the method of invasion is involved in difficulty, but, even if the matter were sufficiently simple to be settled by the evidence afforded by the situation of the oldest foci of disease in the body, we still have the difficulty of deciding in many instances which are the oldest foci. Cases of tuberculosis in children in which the disease is entirely limited to one cavity of the body are considerably in the minority, and the liability to fallacy of personal judgement cannot but influence the conclusions as to which cavity of the body was first attacked. Then, again, there is the difficulty that the pathologist who wrote the *post-mortem* notes may not always have been sufficiently explicit to enable the reader to decide which was probably the primary source of infection. Since, however, one of us has been responsible for fully half of the necropsies, the notes of which have been examined, and has always paid attention to this point, fallacies due to this cause are not likely to be serious. In the following list many cases are classed as doubtfully abdominal or respiratory in origin.

Although there may be intestinal ulcers, and perhaps a few caseous mesenteric glands of apparently recent origin, should there be old pulmonary lesions such as a cavity and perhaps also large masses of caseous bronchial and mediastinal glands, we have generally considered it justifiable to classify the abdominal disease as produced by swallowed sputum infected with tubercle bacilli, and therefore secondary to the disease in the thorax. In other cases, however, when we have considered that there would be the least possibility of difference of opinion, we have placed the case under the heading of "doubtful." For example, when the notes say, "In front of the right bronchus was an abscess cavity with thick walls containing caseous material," and also state that only "two mesenteric glands were caseous and all the others normal," we have classified the case with those in which the disease might have originated either in the abdomen or the thorax, though we are inclined to believe that the thoracic focus was with little doubt the older.

Statistics of 102 Cases of Tuberculosis under the Age of 15 Years.

Apparently definitely abdominal in origin...	12		11.7 per cent.
Definitely thoracic ...	57		55.8 "
Doubtful whether abdominal or thoracic ...	24		23.5 "
Of the remaining cases the primary lesion was possibly in the			
Bones or joints ...	...	...	in 4
The skin ...	...	...	in 1
The tonsil ...	...	...	in 1
No focus found ...	...	...	in 3

It will be noticed that there were 12 abdominal cases to 57 thoracic—that is, the proportion was 1 to 4.7. Examination of the cases under the age of 2 years showed, however, a much higher proportion of abdominal cases. There were 5 apparently primary abdominal cases and 9 apparently primary thoracic in the first two years of life. But if we consider it to be universally true that cases of primary abdominal tuberculosis are most common under the age of 2 years, although it suggests infection by means of milk as a frequent cause of tuberculosis, it does not prove it. The abdominal lymphatic glands are at an early age irritated and weakened by the products of the almost universal dyspeptic disturbances which occur in the first years of life, and this weakness naturally exposes them to infection with tubercle bacilli, whether human or bovine.

To digress from this subject for a moment, it may be remarked that, although cavitation of the lung due to tuberculous disease is decidedly much less common in children than in adults, there were two cavities of considerable size

present in one case at the age of 5 months and in another at the age of 8 months. The second cavity was the size of a tangerine orange. In neither of these cases was there any trace of disease in the abdominal cavity—not even of solitary tubercle in the spleen or liver. As is usual with such cavities in children, the tuberculous disease of the lung was obviously due to direct spread from caseous bronchial glands. Here a word may be said about primary affection of the bronchial glands. It seems to us that, as with the mesenteric glands, there is no doubt that the bronchial glands can be infected with tubercle bacilli without the presence of any lesion of the lungs or bronchi that can be discovered with the naked eye. Few pathologists perhaps deny this, yet it has been considered improbable by some. Tubercle bacilli undoubtedly at first not uncommonly set up a bronchitis. We have seen the sputum of a patient (who had been quite well a fortnight before) swarming with tubercle bacilli when but for the fact that the bronchitis from which he was suffering was associated with a rather suspicious temperature nothing more than a passing ailment would have been thought of. Not until three months later was there any discoverable physical sign of disease in the lung, and death did not take place until three years later. An almost precisely similar case occurred in an athletic fellow-student of one of us, who tested his own sputum during a microscope class, when he was suffering from what he only considered to be a passing catarrh. To his dismay he found tubercle bacilli present in abundance, and his death from phthisis took place a few years later.

One can understand how the setting up of bronchitis by the tubercle bacillus further complicates the difficulty of ascertaining from *post-mortem* evidence the primary source of infection with tubercle. The sputum containing thousands of bacilli when swallowed may readily produce more extensive lesions of the mesenteric glands than in the bronchial glands which are close to the seat of origin of the infected sputum. To return to the question of the evidence afforded by our statistics of the relative frequency of primary abdominal and thoracic affection. Curiously enough the proportion of definitely abdominal to thoracic cases appeared to be as great in the second as in the first twelve years of life. Thus there were 8 cases apparently primarily abdominal and 31 primarily thoracic; that is to say, the proportion was just over 1 to 4 in the second 12 years and under 1 to 4 in the first 12 years. It must be mentioned, however, that in the analysis of statistics for the years we have only placed 3 amongst the doubtful cases. It must be remembered also that fatal cases of disease in hospitals cannot be taken as illustrating the comparative frequency of those diseases or varieties of disease. A serious abdominal affection is far more likely to be taken into a hospital than a case of chronic pulmonary disease, especially if the latter is considered to be tuberculosis. The same remark is applicable when we consider the value of statistics for the third period of 12 years, that is, between the ages of 25 to 36, but here the proportion of primary abdominal cases is less marked.

The ratio of cases of primary abdominal to thoracic tuberculosis in this series of 12 years and during the periods of the same length before the age of 25 and after the age of 36 is shown in the following table:

0-12 years	...	1 to 4.70
13-24 years	...	1 to 3.87
25-36 years	...	1 to 9.66
37-48 years	...	1 to 9.25
49-60 years	...	No definitely primary abdominal case
Above 60 years	...	1 abdominal case and 7 thoracic—ratio, 1 to 7

The above cases do not include all cases of disease either of the abdomen or lungs. In a few cases disease of internal organs was with little doubt a sequel to long-standing joint trouble; in 3 the kidney appeared to be first affected, and in 2 the epididymis. It may be interesting to note that in 2 of the fatal cases of Addison's disease tuberculosis occurred in no other organ of the body except the suprarenal capsules; and it may be added that these cases presented, what is sometimes seen in Addison's disease, marked hypertrophy of Peyer's patches and of the lymphoid follicles of the intestines.

Many other details which attract attention when reading through reports might be mentioned. A somewhat curious point is, perhaps, the rarity with which a case of general adhesion of the peritoneal cavity, due obviously to a previous attack of tuberculous peritonitis, is met with. One of us who has had experience of nearly 2,000 necropsies only remembers having seen one such case. Localized adhesions with some evidence of a tuberculous origin are, however, not so very

uncommon. In an apparently healthy boy, aged 16, who had been run over and killed, adhesions were present over the liver, and a calcareous mesenteric gland with several fibrous glands were present. Another case of similar character was met with in a girl aged 17, dying of heart disease. There were "firm adhesions" enclosing several calcareous nodules over the liver and some over the spleen. The mesenteric glands presented nothing abnormal. A caseous nodule was present at the apex of each lung, but no active tuberculous mischief existed.

Another point of interest that has frequently struck us in the *post-mortem* room is the presence of calcareous nodules in the lower lobe of a lung, and not very uncommonly limited to such a lobe. It appears that the tubercle bacillus can more commonly than is generally thought acquire a temporary foothold, so to speak, in some part or parts of a lower lobe, but that it almost invariably ceases to be able to materially advance, and consequently basal phthisis as we know it is extremely rare. Yet we have seen on three or four occasions cavities of considerable size in the lower lobe, while tuberculous disease of less advanced nature was in the upper lobe. In connexion with the reference to isolated calcareous nodules, it may be interesting to remark that in some cases there appeared to have been, earlier in life, recovery from widespread tuberculosis of both lungs. For example, in a middle-aged man "brought in dead," having died of sudden cardiac failure, both lungs were found to be studded from apex to base with calcareous nodules the size of peas. There were from forty to fifty in each lung, and they were as abundant in the lower as in the upper lobes. Precisely similar nodules were found scattered through both lungs of a man aged 25, who died of tuberculous meningitis, but recent tuberculous pulmonary lesions were absent.

To sum up, if we take local foci of disease as evidence of primary disease in the neighbourhood of the foci, our statistics tend to show that during the first twelve years of life tuberculous infection by the air passages is four times as common as by the alimentary canal. Our statistics also seem to show that the comparative frequency of infection through the alimentary canal during the second twelve years is equally common. Deaths in hospitals above the age of 12 years can hardly, however, be taken to represent the average causation of death from varieties of tuberculosis for the whole population above that age, because cases of tuberculosis of the lungs are more chronic than at an earlier period of life, and are not usually admitted to ordinary hospitals.

In spite of the exclusion of chronic pulmonary troubles from hospitals, the proportion of abdominal to thoracic tuberculosis in the institutions from which the reports were taken was very small after the age of 24.

TWO CASES OF PRIMARY MALIGNANT DISEASE OF THE PANCREAS.

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THE two following cases occurred in my practice last year within a period of four months, and as there is reason to believe that primary malignant disease of the pancreas is somewhat rare, it seems desirable to publish them, especially as one of the cases presented an unusual congenital condition.

CASE I.

Mrs. S., married, age 58, came to see me in December, 1902, suffering from intense jaundice and most pronounced muscular weakness. She had never had an illness before. Had been a cook for a couple of years in a restaurant and had indulged moderately in stimulants. She had been losing flesh gradually for six or eight months, although able to do her work.

State on Examination.—The jaundice affected skin and conjunctivae and urine, the latter being deeply coloured. There was no constipation, but instead several motions daily (as many as six), quite white in colour, formed, and considerable in quantity: not lumpy, nor dry, passed in pieces about two inches long, and extremely smooth on the surface. There was intense irritation and itching which prevented sleep. The liver was very large, the right lobe extending into right iliac fossa, the edge and notch in the margin being easily felt. The left lobe was likewise enlarged and could be distinctly felt. The gall bladder was very much enlarged and tense, so tense that it could be grasped in the hand without making any impression on it. In the epigastric region there was a large mass rising as it were from the smooth surface of the liver and continuous with it. This was painful on pressure and was the only tender spot detected on palpation.

Progress and Result.—The patient continued to lose flesh and strength,