We must also explain the differences in mortality rates from chronic bronchitis in the different countries of the world. Why should our mortality rate from this condition be almost 30 times greater than in the U.S.A.? And why should it be more than twice as much as that of Belgium? Obviously there is a great need for further research and inquiry into the causation of and variation in the disease.

This research should be carried out at a number of levels, one of which should be in general practice, for it is here that the true incidence and course can be observed. That this is possible has been proved, and perhaps it should be the first step in a national and possibly world-wide investigation and effort. It is considered by many to be a preventable disease (Lewis-Fanning, 1940; Pemberton, 1952; Joules, 1953a, 1953b). If this is borne out then vigorous steps at the highest levels should be taken to implement the findings.

Summary

The toll from chronic bronchitis includes 30,000 deaths and 16½ million lost days from work annually. In the G.P.O. 15% of all medical retirements are due to this cause. Around 10% of all attendances in general practice are for chronic bronchitis.

It is an indefinite clinical entity, which probably includes a number of separate and distinct clinical conditions.

In a study of a single S.E. London practice 127 chronic bronchitics were diagnosed (incidence of 28 per 1,000) during one year. Males numbered 71 and females 56. The incidence rises with age. No social predisposition was noted. It is indeed a chronic condition. In more than half the cases it had already been present for over 10 years. The commonest age of onset was between 30 and 60. In this particular series there was no difference between the smoking habits of those with chronic bronchitis and controls. A third of the patients were incapacitated from their usual occupation for more than a month during the year.

An attempt has been made to grade the disease into four groups of severity.

At present we have to rely almost entirely on palliative measures in the management of cases. Until its causes are defined and rational steps taken to prevent the condition, little progress can be made.

The most helpful lines of research may be closer studies of the natural course and distribution of the disease. The mortality rate from chronic bronchitis in England and Wales is far and away the highest in the world. It is some 30 times that in the U.S.A. These differences must be more closely examined.

There is a definite relationship between climate and atmospheric pollution and the disease. We have only to note that 4,500 deaths in December, 1952, were directly attributed to fog.

A nation-wide effort is necessary if we are to reduce the wasteful, and possibly unnecessary, effects of the disease.

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SALMONELLA DUBLIN OSTEOMYELITIS OF THE SPINE

REPORT OF A FATAL CASE

BY

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Bone and joint infections due to the food-poisoning salmonellae have been recorded much less often than have typhoid and paratyphoid infections. Ramon Guerra (1940), in his review of the literature on this subject, found 15 authentic cases of salmonella bone or joint infections during the period 1926–38. Thirteen of these were due to *Salm. suipestifer* and two to *Salm. breslau* (one of the two was a mixed infection with *Streptococcus haemolyticus*). Reports of *Salm. typhimurium* osteomyelitis were published by Stevenson (1938) and Krauss (1947). Vinke and Downing (1947), in their report of a case of *Salm. montevideo* infection of the knee-joint in an infant aged 6 months, state that in the 17 known outbreaks of *Salm. montevideo* infection in the U.S.A. this was the only reported instance of knee-joint involvement.

Salm. dublin, although well known as an intestinal pathogen, has seldom been isolated from bone or joint lesions. Lawrie (1952) described a chronic *Salm. dublin* osteomyelitis of the femur in a man aged 29 in which *Staphylococcus aureus* was found in association with *Salm. dublin*. Purnell (1952) reported a case of a woman aged 71 with a purulent prepatellar bursitis due to *Salm. dublin*.

The following case is reported because of the unusual localization of the *Salm. dublin* infection to the lumbar vertebrae. It was a post-mortem finding.

Clinical History

A man aged 77 who had enjoyed good health until the latter part of July, 1951, began to complain of lethargy. After a holiday in Scotland he had a shivering attack on August 11, and two days later was confined to bed with a temperature. He complained of increasing lethargy, headache, frequency of micturition, and pain in the left renal angle. Acute pyelitis was diagnosed. He was unsuccessfully treated with citrates and later with courses of penicillin and chloramphenicol. On August 28 he was admitted to the Lytham Hospital for investigation and was discharged in about a week. For the four and a half months until his death, treatment was continued in hospital and at his home. The earlier complaints persisted with increased severity and the patient suffered a long illness, characterized by rigors, high temperatures, and constant backache. Courses of chloramphenicol and aureomycin had surprisingly little effect, although the aureomycin controlled the temperature better than did the chloramphenicol. He died on January 13, 1952, the illness having lasted about five months.

Laboratory Investigations.—The bacteriological findings can be summarized as follows. *Salm. dublin* was isolated from two blood cultures, one early and one late in the illness, and from each of two specimens of urine and faeces, about midway in the disease. Many faecal specimens enriched by tetrathionate broth and selenite F medium failed to grow *Salm. dublin* except on two occasions, on October 8 and 20, 1951. It is noteworthy that before the initial isolation of *Salm. dublin* from the faeces five consecutive specimens of faeces were negative for salmonellae. The same negative results were obtained on examination of five consecutive specimens of faeces after the second isolation of *Salm. dublin*. This illustrates the difficulty which may be

experienced in isolating the organism in atypical cases of *Salm. dublin* infection. By the *in vitro* sensitivity tests the *Salm. dublin* strain was sensitive to chloramphenicol and aureomycin in the concentrations used in the disk method.

The results of agglutination tests with the patient's serum early and midway through the disease were as follows:

	September 13		October 31	
	H	O	H	O
<i>Salm. typhi</i> ..	Nil	Nil	1:25	1:25
<i>Salm. paratyphi B</i> ..	1:25	1:125	1:25	1:25
<i>Salm. enteritidis</i> ..	—	—	1:2,500	

Radiographic examination of the abdomen on August 31 showed considerable osteoarthritic changes in the lower dorsal and lumbar spines.

Necropsy

Examination 20 hours after death showed an extensive haemorrhagic rash on the neck and upper part of the trunk, together with purpuric patches on the outer aspect of the left thigh and on the left great and second toes. The left thigh was very swollen, tense, and fluctuant. The mucous membranes were blanched. Basal bronchopneumonia and oedema of both lungs were present. Both ventricles were moderately dilated, and the myocardium was flaccid and toneless. The whole of the small intestine was slightly dilated and the lower part of the ileum contained abundant mucus, while the mucosa itself was engorged. In the lower abdomen, the most striking feature was a large tumour mass in the retroperitoneal tissues which projected into the root of the mesentery of the small intestine and filled the left iliac fossa. It consisted partly of a sacular arteriosclerotic aneurysm of the posterior wall of the lower abdominal aorta, about 3 cm. above its bifurcation. It was a relatively large sac, the entrance measuring 4.5 by 3 cm., and the walls were lined with thick layers of organized blood clot. It had burrowed posteriorly and to the left, and by means of its increasing size had pushed forward the lower part of the aorta. Behind the sac was a large psoas abscess which extended from the upper lumbar bodies along the psoas muscle to the mid-thigh. The bodies of the second and third lumbar vertebrae were partly destroyed and the residual portions were soft, necrotic, and oozing with pus, suggesting an acute pyogenic osteomyelitis with psoas abscess formation, associated with an aneurysm of the lower abdominal aorta. The kidneys showed chronic interstitial nephritis and at the necropsy the blood urea was 130 mg. per 100 ml.

The anatomical diagnosis was osteomyelitis of the lumbar vertebrae, *Salm. dublin* septicaemia, uraemia, basal bronchopneumonia, and cardiac dilatation.

Post-mortem radiographic examination of the lower spine revealed marked destruction of the bodies, the intervertebral disks, and of both contiguous and articular surfaces of the second and third lumbar vertebrae.

Histological examination of the affected lumbar bodies showed marked bone necrosis with polymorphonuclear response around the lesions, the pathological picture of acute pyogenic osteomyelitis.

Pure cultures of *Salm. dublin* were isolated from post-mortem specimens of blood (approximately 45 organisms per ml.) and of pus from the psoas and the thigh abscesses, and mixed cultures, including *Salm. dublin*, from the small intestine and the lung.

Discussion

The overall clinical picture was that of a typical *Salm. dublin* septicaemia characterized by rigors with high temperature and continued fever. The osteomyelitis with psoas abscess, clinically obscured by the lack of localizing symptoms and by the marked constitutional disturbance, was the main factor responsible for the continued and progressive severity of the illness, the blood stream having presumably been repeatedly infected from this source.

Bacteriological examination of post-mortem material from the lumbar and psoas abscesses showed that the progressive osteomyelitis was caused by a single salmonella type and not by a mixed infection. The histological appearances of the affected lumbar bodies, closely resembling the well-known picture of acute pyogenic osteomyelitis, serve to demonstrate that salmonella osteomyelitis may be similar to or identical with bone infections produced by other pyogenic organisms and that the diagnosis must always be made by the isolation of the actual organism from the lesion.

The localization of the disease to the lumbar spine could be explained as a metastatic lesion or as a haematogenous osteomyelitis. According to the literature, the latter is a relatively rare or infrequent finding. Weaver and Sherwood (1935) state that haematogenous osteomyelitis due to *Salm. suipestifer* apparently occurs only in infants.

A more likely explanation lies in the association of the lesion with the aneurysm of the lower abdominal aorta. The repeated and continued erosion of the lumbar bodies by a large aneurysm would provide a locus minoris resistentiae with localization of the organism and the production of acute osteomyelitis. Most authors agree that in the production of typhoid and paratyphoid osteitis and osteomyelitis injury is an important localizing factor. This association has also been observed and recorded in the food-poisoning salmonellae infections, although much less often than in the typhoid lesions. Steuer (1937), in his case of *Salm. breslau* infection in a boy of 12 years, states that a bicycle accident eight days before the onset of the illness precipitated osteomyelitis of the sacro-iliac joint. The same article mentions the case of a young woman in whom obstetric manipulation was followed by fatal *Salm. suipestifer* infection. Purnell (1952), in his case of atypical *Salm. dublin* infection, states that a fortnight before the onset of the prepatellar bursitis the patient fell and injured her knee.

Although the psoas abscess could have caused the aneurysm of the lower abdominal aorta, the degree of aortic atheroma strongly favours the presence of an aneurysm long before the abscess developed.

The mode of infection could not be traced. Food-poisoning during the patient's visit to Scotland was the most likely explanation. Potential domestic sources of infection were explored. No history of infection was obtained from the only two surviving members of his family. Single faecal and urinary specimens from one of them failed to reveal salmonellae. Samples of the household milk, which came from four different sources, were examined for salmonellae, with negative results.

Summary

A fatal case of bacteriologically verified *Salm. dublin* osteomyelitis of the spine is recorded and the relevant literature is reviewed.

The localization of the osteomyelitic lesion was probably associated with a large arteriosclerotic aneurysm of the lower abdominal aorta.

There is no specific histological or radiological picture in salmonella osteomyelitis. The diagnosis rests upon the isolation of the organism from the lesion itself.

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