of Hicken and McAllister (1952) suggests strongly that reflux into the main pancreatic duct is a frequent and normal finding in man, and of no pathological significance. They found also that this reflux may occur whether or not there is a common entry of the common bile and pancreatic ducts into the duodenum. Experience with cholangiography in this hospital agrees with this (Hughes and Kernutt, 1954b), and the relation of biliary reflux to pancreatitis in man is thought to be slight.

It is therefore postulated that these patients were in fact suffering from a type of chronic relapsing pancreatitis which is in some way related to pregnancy, and that this may represent an entity within the large group of diseases considered together as "pancreatitis."

The abnormality in pregnancy causing pancreatitis remains unknown. Liver-function tests and biopsies on pregnant women show no suggestive pattern in this regard (Ingerslev and Teilum, 1945; Day and Hellestrand, 1947; Dieckmann *et al.*, 1951). Boyd (1934) has shown that neutral fat, phospholipids, and cholesterol are all increased in the plasma during pregnancy, while Potter (1936) states that the gall-bladder is distended and that there is hypercholesterolaemia at term in most women.

The management of this disorder is poorly understood. Treatment has been conservative, surgery being indicated only in the presence of cholelithiasis, for the relief of obstructive jaundice, and for drainage of residual abscesses after an acute exacerbation. Internal biliary drainage by sphincterotomy does not seem to be indicated, because of the apparently normal state of the ducts and sphincters found in these patients, and the recent anatomical studies of Hughes and Kernutt (1954a) and of Sterling (1954).

Where symptoms of flatulence and pain have persisted the patient has been placed on a high-protein, low-fat diet and given atropine and ephedrine by mouth. It is not yet possible to speak of the efficacy of this regime or of the possible effects of further pregnancies in these patients. The recurrence of symptoms in Case 3 after cholecystectomy suggests that this syndrome may be one cause of the "post-cholecystectomy syndrome," although the normal biopsy finding in Case 4 two months after cessation of symptoms indicates that resolution may be complete.

Summary

Six cases are reported of young women who developed pancreatitis shortly after pregnancy. In all of them the clinical and laboratory findings were similar.

The aetiology of the pancreatitis is considered to be related to the preceding pregnancy, although the mechanism of this is unknown.

It is suggested that these patients, and others in the literature, form a distinct subgroup within the general group of patients with pancreatitis.

Until the aetiological factors are better understood, it is suggested that the term "post-partum pancreatitis" be applied to this subgroup.

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TUBERCULOUS MESENTERIC ADENITIS IN CHILDREN*

BY

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The purpose of this essay is to draw attention to a cause of minor illness in children which is usually overlooked in this country. It is intended to show that tuberculous mesenteric glands may sometimes cause symptoms and continue to do so even after they have become calcified.

The condition is well recognized on the Continent. Klein in 1927 reported cases from Poland and commented: "Beaucoup de médecins, en presence de cette maladie, ne croient pas à la possibilité de son existence." In Sweden, Strömbeck (1932) made a thorough review of the published work on the subject. Alexandre (1949), in France, gave another excellent account.

The symptoms described are colicky central abdominal pain, nausea, vomiting, sweating, meteorism, diarrhoea, constipation, pallor, lassitude, and loss of weight. The physical signs are palpable tumours in the abdomen, local tenderness, fever (especially in the evenings), and calcification visible in the x-ray film.

Most physicians, when confronted with calcified glands, assume that calcification signifies a healed lesion and that they must look elsewhere to account for the symptoms. If this assumption be true then we must assume also that the calcification appears suddenly and instantaneously, and that at that moment

*Condensed from the Nathaniel Bishop Harman Prize essay, 1954.

all symptoms cease. It would be better if we were to say, with the prisoner of Chillon (he was referring to his hair):

Nor grew it white
In a single night.

Strömbeck (1932) has shown the progress of calcification over a long period while symptoms continued, and in the cases here reported the same phenomenon has been demonstrated.

In this country the condition has received more attention from surgeons than from physicians (Carson, 1918; Struthers, 1921; Braithwaite, 1926). Rendle Short (1928) pointed out that an evening temperature rising to 100–101° F. (37.8–38.3° C.) may persist for months or even years.

More recently the condition appears to have been overlooked. This is probably because medical teaching centres are situated in large cities where the milk supplied to children is free from tubercle bacilli. Conway (1951) analysed the history and diagnoses of 250 children in London who complained of abdominal pain. Not one case of tuberculous mesenteric adenitis was discovered.

The following are some of the cases met with during a period of two years in consulting paediatric practice. They have been selected to show the different ways in which the disease may present itself. All the children were tuberculin-positive. All of them had had their chests x-rayed, and no tuberculous lesions were found. None of them had been in contact with infectious tuberculosis.

Case 1. Abdominal Pain

A boy who lived in the country and who had consumed raw milk from the age of 1½ years began to have attacks of pain in the left hypochondrium at the age of 8 years. This pain had no relation to meals, and occasionally woke him up. It was sharp and doubled him up, and was sometimes severe enough for him to be sent home from school. When it occurred he felt sick and turned pale. There were no abnormal physical signs. He was admitted to hospital with a tentative diagnosis of hiatus hernia or renal abnormality. His temperature, blood counts, urine, blood urea, x-ray films of the chest and sinuses, barium meal, and intravenous pyelogram were normal. An x-ray film of the abdomen showed calcified glands over the fourth and fifth lumbar vertebrae.

Progress.—He was treated with 20,000 units of calciferol daily for one month. A year later he had gained 4½ lb. (2 kg.) in weight. He still complained of pain occasionally, but it was not as severe as before. X-ray examination of his abdomen showed condensation of the calcium in the affected glands and a new area of calcification opposite the second lumbar vertebra.

Case 7. Incident Mimicking Acute Appendicitis

A Ukrainian girl who in early childhood had lived in Germany and had drunk raw milk there was admitted to hospital at the age of 11 as a case of acute appendicitis. She had then had intermittent pain in the right iliac fossa for six months. Her temperature was 100° F. (37.8° C.), pulse 92, and respirations 22. A blood count showed 8,200 white cells per c.mm. (72% polymorphs). Next day her temperature fell to normal and remained between 98 and 99° F. (36.7 and 37.2° C.) for five days. Her pulse rate remained below 100. Nevertheless on the seventh day her appendix was removed. The operation notes state that it was "inflammatory." She made an uninterrupted recovery.

Two and a half years later she was referred to the out-patient department complaining of abdominal pain in the left side. This was worse when she ran, but also occurred

at rest. On examination there was some tenderness on deep pressure at the umbilicus. She was admitted for investigation, but no abnormality was found in the chest, heart, urinary system, or gastro-intestinal tract. X-ray examination of the abdomen showed some calcified glands in front of the fourth and fifth lumbar and the second and third sacral vertebrae.

Progress.—She was treated by a course of ultra-violet light and 20,000 units of calciferol twice daily for six weeks. Six months later she was well, and said that she had more energy. She had occasional pain, but it occurred less often. The glands were palpable just below the umbilicus. X-ray examination showed an increase in the calcification of those in the pelvis, whilst the others were unchanged. Three months after this she had no pain at all.

Case 5. Abdominal Pain and Vomiting. Primary Infection Observed

A girl who lived in the country and had raw milk began to complain at the age of 4 of left-sided abdominal pain at intervals. She was usually constipated, and occasionally had frequency of micturition and pain on passing water. In one of these attacks she vomited once and was admitted to hospital in another part of the country. The summary of her notes states: "On examination, a rather pale unwell-looking child. E.N.T. normal. Chest clear. Abdomen slightly resistant to palpation, especially in the left renal angle. Physical examination otherwise showed no abnormalities. Progress and investigations: urine × 6 normal; Hb 89%; W.B.C. 10,000; Mantoux 1 in 1,000 positive; x-ray film of chest, no lesion seen; E.S.R. 10 mm. in one hour. She was allowed up before discharge, during which time she appeared well and made no complaints. Discharge note: the period of ill-health during the last 18 months was possibly due to a primary tuberculous complex. There is no evidence of activity now."

During the next two and a half years she had repeated attacks of abdominal pain lasting for periods varying up to a week. In one attack she began to vomit, and her general practitioner referred her to hospital with the following note of his findings and opinion.

"Pale and looks ill. Temperature 100.5° F. (38° C.), pulse 90. There is a tender knobby mass in the left iliac fossa. Per rectum, very tender anteriorly. I feel sure the diagnosis is tuberculous adenitis, but I cannot exclude a low-grade appendix or other pathology." The patient was admitted and the findings were confirmed. Investigations showed a normal blood count. E.S.R. 15 mm. in one hour (Westergren). Several examinations of urine for tubercle bacilli were negative. X-ray film of the abdomen showed several large calcified glands to the left of the fourth and fifth lumbar vertebrae and one small gland to the right of the third lumbar vertebra. An intravenous pyelogram showed no abnormality, and the calcified opacities were seen to be separate from the renal tract.

Progress.—The patient was treated with 20,000 units of calciferol twice daily for one month and a course of ultra-violet light. Her temperature subsided rapidly. Five weeks later she had gained 9 lb. 12 oz. (4.4 kg.) and had less pain. A year later she was very well, had gained 16 lb. (7.3 kg.) since admission, and had no pains or sickness.

Case 17. Pyrexia of Unknown Origin. Tuberculous Rheumatism

A boy who lived in the country and had drunk raw milk regularly complained of pain in the left knee and groin at the age of 7½ years. He was admitted to hospital with a diagnosis of synovitis of the left hip. This was considered to be a simple synovitis, not tuberculous, and he was transferred to an orthopaedic hospital. His temperature was normal. The E.S.R. was 2 mm. in one hour (Westergren). A blood count and his urine were normal. A chest x-ray film was normal. The condition was treated by simple traction, and six weeks later it had improved considerably. The boy's temperature, however, was raised to 99.4° F.

(37.4° C.), or even 100° F. (37.8° C.) in the evenings, and the orthopaedic surgeon in charge could not explain this. The E.S.R. had risen to 38 mm., and his weight was stationary. A second x-ray film of the chest was normal. The urine contained no pus cells or tubercle bacilli. X-ray examination of the abdomen showed calcified glands on the right side of the fourth lumbar vertebra. It was considered that the cause of the temperature was the mesenteric adenitis, and that the synovitis of the hip was a manifestation of tuberculous rheumatism.

Progress.—He was treated by rest in bed, ultra-violet light, and 20,000 units of calciferol daily for a month. At the end of this time his temperature had settled, his E.S.R. was 11 mm. and he was discharged home. Two months later he had gained 4 lb. (1.8 kg.) and was very well. His mother stated that he had an enormous appetite. A year later he was very well and had no symptoms. X-ray examination showed no change in the glands.

Case 19. Coeliac Syndrome

This boy, who lived in the country and drank raw milk, suffered from phlyctenular conjunctivitis at the age of 2 years. Two years later he complained of anorexia and vomiting, and upper abdominal pain. His abdomen appeared to be "blown out with wind." His stools were loose and offensive. He was admitted to hospital, where his weight was found to be 30 lb. (13.6 kg.). The stools were typical of the coeliac syndrome. A fat-balance test showed only 66% absorption of fat. Trypsin was present in several specimens of stool. One physician who saw him commented, "On clinical grounds I do not think that this can possibly be coeliac disease because he is so happy and cheerful, and there has never at any time been any wasting of his muscles." He suffered from a microcytic type of anaemia. X-ray examination of the abdomen showed calcified glands to the left of the second lumbar vertebra.

Progress.—He was given iron for the anaemia, but had no special treatment for the coeliac syndrome. He did very well, and when seen 13 months later had gained 6 lb. (2.7 kg.) and grown 2 in. (5 cm.). He had no pain or diarrhoea. X-ray examination showed the glands to be more firmly calcified.

Summary of Cases

Altogether 20 children were seen in whom tuberculous mesenteric glands were considered to be causing symptoms. Of these, 14 had pain as the main complaint, one had pain and pyrexia, four pyrexia alone, one showed the coeliac syndrome, and one was a case of primary infection. Details of these cases are given in the Table. There were 15 boys and five girls.

Details of Cases

Case No.	Sex	Age at Onset (Years)	Length of History	Nature of Case	Site of Glands (Quadrant of Abdomen)
1	M	8	4 weeks	Abdominal pain	Left upper, central
2	M	5	1 year	" "	Right lower
3	M	9	4 months	" "	Left upper, right lower
4	M	7	3 "	Abdominal pain, tuberculous rheumatism	Left lower
5	F	4	2½ years	Abdominal pain	" "
6	F	6	2½ "	" "	Right "
7	F	13	6 months	" "	Central, pelvic
8	M	9	1 month	" "	Right lower
9	F	8	2 years	" "	Pelvic
10	M	3	3½ "	" "	" "
11	M	6	1 year	" "	Right lower
12	M	3	9 months	" "	" "
13	M	2	7 years	" "	" "
14	M	5	7 months	" "	Left "
15	M	10	1 week	Abdominal pain, pyrexia	Right "
16	M	6	1 month	Pyrexia	Pelvic
17	M	7	Found in hospital	Pyrexia, tuberculous rheumatism	Right lower
18	F	9	" "	Pyrexia	Left "
19	M	4	8 months	Coeliac syndrome	" upper
20	M	2	Nil	Primary infection	" "

The age of onset was fairly evenly spaced throughout the third to eleventh years of life. The duration of symptoms before the first contact with a paediatrician varied from one week to seven years. Most cases were seen during the first year, and a small group at two to four years. The average length of history was one year four months.

All the patients except one lived in the country. The exception was a boy living in Bath who had previously lived in the country.

The glands demonstrated by x-ray examination were most often seen in the area of the ileo-caecal junction, but there were nearly as many along the line of attachment of the mesentery of the small intestine. In four cases the glands appeared to be in the pelvis. In two cases in which the infection took place at an early age the glands were demonstrated high up to the left (Cases 19 and 20). It may be that early or overwhelming infection occurs high up in the small intestine in an area which drains into glands on the left of the midline, whereas later and milder infections take place lower down the gut, where the mesentery is attached to the right side of the abdomen. In the infants at Lübeck the majority of the glands were found on the left.

In four of the cases it was possible, on looking back, to disclose illnesses which might have been due to primary infection (Cases 4, 5, 6, and 7). In one case the primary infection was observed in hospital and the glands were discovered by chance when the patient returned later with a different illness (Case 20).

Differential Diagnosis

The condition must be differentiated from non-tuberculous causes of pain, pyrexia, or vomiting, and these are legion. During the two-year investigation described below the following diagnoses were made in children who complained of abdominal pain; acute nephritis, dietary indiscretion, empyema, hernia of the linea alba, idiopathic epilepsy, idiopathic thrombocytopenic purpura, inadequate dentition, non-specific mesenteric adenitis, pneumonia, psychological disturbance, pyelitis, recurrent neutropenia, and salmonella food-poisoning. The causes of pyrexia are too numerous to mention.

If the tuberculin test is positive it is important to make sure that there is no active tuberculous lesion in any other organ. Pulmonary tuberculosis, especially when accompanied by pleurisy, may cause abdominal pain; and tuberculous peritonitis and inflammation of the spine must also be considered. Affection of the renal tract must be excluded by repeated examination of complete morning specimens of urine for pus cells and tubercle bacilli.

The radiological appearance of tuberculous glands is usually unmistakable. They are round or oval; the shadows are not homogeneous, but mottled, and appear like a mulberry or an archipelago as seen on a map. They may lie anywhere in the abdomen, but are usually seen along the line of attachment of the mesentery of the small intestine. In the lateral view they are often in front of the spine.

During the two-year survey other causes of shadows in the abdomen found were: stones in the gall-bladder, calcified phleboliths in a girl with multiple angiomas, calcification in an adrenal neuroblastoma, and various pills and tablets. No renal stones were seen.

The Lübeck Catastrophe

At Lübeck in 1930 virulent tubercle bacilli were administered inadvertently by mouth to 251 infants (Schürmann and Kleinschmidt (1935). Seventy-two died from tuberculosis within a year. Practically all the children who developed primary lung lesions died, while the majority who had primary alimentary lesions survived. In many cases the abdominal infection produced no symptoms or very vague ones. Calcification of the abdominal glands was seen at the earliest 18 months after the infection; and after

three years it had reached its final stage. Late results such as obstruction and the coeliac syndrome were not observed.

X-ray films were taken of 173 children at 4 years of age, and 126 of them had calcification in the abdominal glands. This was rather more common on the left side, suggesting that the site of infection was usually high up in the small intestine.

One most important point is the benign course of the disease in the abdomen compared with the serious outcome when the lungs were affected.

Treatment

In the majority of cases the disease proceeds to heal spontaneously, and it may be that there is no need to interfere with this natural process. Previous workers have usually approached the problem from the surgical angle. Arguments have been put forward for and against removal of the affected glands. It has been pointed out that sometimes when the diagnosis is in doubt it is imperative to operate rather than run the risk of neglecting to remove an acutely inflamed appendix. It has also been noted that after an exploratory laparotomy tuberculous mesenteric adenitis may improve in a spectacular manner, even though the glands are not removed, just as tuberculous peritonitis may.

Wallace (1946) and Gauvain (1948) have reported favourably on the calciferol treatment of tuberculous glands in the neck. Macrae (1947) has studied the effect in tuberculous peritonitis. Gauvain stated: "Calciferol causes an early flare-up of activity, followed generally by rapid healing, which is of such a sound degree that the glands can be immediately and, so far as we can tell at this early stage, safely excised with little risk of recurrence."

The dose of calciferol used by Gauvain was 100,000 units daily for several months. Macrae used even larger doses. He reported some alarming reactions. One of his patients died from haemoptysis from a very small cavity, the presence of which had been unsuspected. None of the patients consuming large doses of vitamin D felt fit, and all of them lost weight.

Results of Treatment.—It seemed that it might be dangerous to produce a flare-up in the abdominal glands, and that the ideal to aim at would be to produce a more gradual healing, imitating the natural process, but gently expediting it. It was therefore decided to give the children only 40,000 units of calciferol daily and to support this with a course of ultra-violet irradiation when this could be conveniently arranged. The treatment was continued for six weeks. Results are difficult to assess in a condition which usually proceeds to spontaneous cure. The numbers available are not sufficient for definite conclusions to be drawn, but on the whole the impression was that treatment gave considerable benefit. In most children the pains abated, the appetite improved, the weight increased, and after three to six months there were no more symptoms.

Flare-up.—Two of the treated children (Cases 8 and 16) demonstrated phenomena which might be considered to be due to mild exacerbations or flaring up of the disease. Neither was seriously inconvenienced and both were eventually regarded as cured.

Case 16.—A boy aged 6 years who lived in the country and consumed raw milk complained of pain in the legs and had fever of 99 to 100° F. (37.2 to 37.8° C.) for a month. He was admitted to hospital and found to have a positive tuberculin reaction. Calcified glands in the presacral region were seen on the x-ray film. Other investigations were negative. He was treated with calciferol and ultra-violet irradiation. Two months later he stated that he had had two attacks of abdominal pain lasting for two days. The pain was colicky and was felt at the umbilicus. He had lost 1½ lb. (0.7 kg.) in weight in the first month, but had regained it. Three months after this he had had no pain or pyrexia. He had gained over 5 lb. (2.3 kg.). X-ray examination showed firmer calcification.

Recommendations

When active tuberculous mesenteric adenitis has been diagnosed as the cause of symptoms it seems reasonable to recommend that the child should be given the benefit of treatment with calciferol. A convenient dose is 50,000 units daily, as tablets are made in this strength. This treatment is not expensive: the retail price of 50 tablets is 2s. 9d. and 500 cost 19s. 6d. Treatment should be continued for six weeks. In this dosage no fear need be entertained about toxic symptoms, but if headache, anorexia, or vomiting occurs the situation should be reviewed, especially with regard to raised blood pressure and protein in the urine.

In the acute case in which the possibility of appendicitis has to be considered a count of the white blood cells may be of value. If this is low or normal and an x-ray film of the abdomen shows calcified glands a policy of watching in hospital is probably justified. If there is any serious doubt it is better to proceed with a laparotomy.

There is no justification for treating this mild disease with streptomycin, para-aminosalicylic acid, or isoniazid.

Incidence in Consulting Practice

The Bath clinical area consists of a city of some 90,000 inhabitants and a large surrounding rural region with a total population of approximately 200,000. For medical purposes the area is covered by two consultant paediatricians. An analysis was made of all patients seen by one of these paediatricians during a period of two years (from October 1, 1951, to September 30, 1953, inclusive).

The total number of children seen for the first time either in the out-patient department or in the wards was 825. In 58 (7.03%) of these the main complaint was abdominal pain. Eight of the 58 had pyrexia also. Twenty-two other children were referred for pyrexia alone (2.73%).

Of the 58 children with pain 8 had tuberculous abdominal glands (13.79%). Of the 22 with pyrexia 1 (4.55%) had infected glands. Of the 80 who had either pain or pyrexia nine had infected glands (11.25%).

Relation to the Tuberculin Test.—Of the 58 cases with pain, 13 were tuberculin-positive. Eight of these had active tuberculous glands. Of the other five, one had a tuberculous infection of the lung, one a hernia of the linea alba, and in the remaining three cases a diagnosis could not be made. It may be that some of these children were undergoing a tuberculous process in the abdomen in which calcification had not yet appeared, or would never appear. Follow-up has so far revealed no such calcification.

Comparison With Tuberculosis of Other Systems.—During the two-year period, in addition to the nine cases of tuberculous mesenteric adenitis, one case of tuberculous peritonitis was encountered. There were 10 cases of tuberculosis of the lungs, two cases of tuberculous meningitis (both with primary lesions in the lung), one case of phlyctenular conjunctivitis, and one of tuberculous cervical adenitis. The total number of cases of active tuberculosis was 24. In 10 of them the abdomen was principally affected, and in 14 it was not. It may be inferred that in this clinical area abdominal tuberculosis is very nearly as important as the pulmonary variety.

In passing, three children were found to have healed calcified lesions in the lung, and two had healed inactive glands in the abdomen.

Incidence in a Group of Schoolboys

This is not a satisfactory control series. It is made up of boys only, of a social status not comparable to that of the population at risk. However, it consists of observations on healthy normal children who were not selected by reason of any medical symptom, and the results obtained were so startling as to be worthy of publication.

The boys were boarders aged 11 to 16 entering a public school in two successive years. They came from all parts of the country. A large number of them were the sons

of parsons; the rest were mainly sons of other professional men. Of the 128 boys seen and tested with tuberculin jelly, 25 reacted positively. These 25 boys were subjected to x-ray examination, and 18 (72%) of them were found to have calcified abdominal glands. One had calcified glands in the neck as well. Four (16%) had healed lesions in the lung, and the remaining three (12%) had no demonstrable tuberculous lesion.

The parents of the 18 boys with abdominal glands were asked for details of any unexplained pain, pyrexia, or obscure prolonged illness in the past. Seven reported unexplained pain and pyrexia, one pain and vomiting, one pain and anorexia, and one pyrexia alone. Only eight could recollect no symptoms at all. That the illnesses were not minor is shown by the following extracts (verbatim) from the replies.

Case 21.—"From the age of 4 years his health history has been one of recurring attacks of headache, raised temperatures, vague tummy-aches, intermittent diarrhoea, and marked lethargy. . . . He saw a number of doctors in each place where we lived, but none could find a reason for the symptoms, and I was assured 'He would probably grow out of it.' He was x-rayed in — about two years ago; three doctors failed to agree on the diagnosis. The tuberculosis specialist said there was nothing 'in his department'; but our doctor was not so happy about it, and, acting on his advice, I put the boy to bed for six months' complete rest. Since then he has seemed better."

Case 22.—"When he was 2 years old he first complained of a pain in his abdomen, but it did not trouble him very much. When he was 2½ he suddenly ran a temperature. We called in a doctor, who seemed unable to diagnose. When he was almost 5 he again ran a temperature, and very shortly afterwards our doctor suggested we called in a specialist. He examined him thoroughly, but could find nothing abnormal. After a further slight recurrence at about 7 years I arranged for Professor — to examine him, and he too could not find anything wrong. Since then he has had occasional spasms of pain which were relieved by resting for a short while."

Case 24.—"He certainly has had stomach pains, in which case we have always called our doctor in, but he has never been able to find anything wrong with him. Incidentally, he has for a period of a week run abnormally high temperatures, for no apparent reason, not once but many times. Secondly, he was always complaining of feeling very tired. I used to think he was lazy, when the doctor assured me at all times that he was a very healthy boy."

Case 26 (son of a medical man).—"He had repeated attacks of tonsillitis, and occasional attacks of abdominal pain when he was younger. I made the diagnosis at that time of tuberculous ileo-caecal glands, and x-ray examination of the abdomen at the age of 8 revealed what you have found—a calcified mass in the right iliac fossa."

Case 28 (from the family doctor).—"Six years ago he had symptoms of appendicitis, and a laparotomy was done. The appendix was mildly inflamed and there were definite tuberculous glands in the right iliac fossa."

Milk Supply

Abdominal tuberculosis is usually thought to be contracted by drinking infected milk. There are occasions when it may be traced to contact with open cases of pulmonary tuberculosis, but they are rare. Toddlers put most small objects in their mouths, and may thereby ingest some dried sputum from dust on the floor or road. Ashby (1923) reported cases of abdominal tuberculosis from Manchester in which no unboiled milk had been drunk. Strömbeck (1932) refers to cases occurring in Japan in 1904, when cow's milk was unknown as a food there.

Pasteurized and tuberculin-tested milks are usually considered to be safe. Pasteurized milk has been proved to be satisfactory and a stringent check is kept on its production. Tuberculin-tested milk, however, may occasionally contain

tubercle bacilli. The intervals between inspections are fairly long and tuberculous cows are occasionally found in the herds. The danger arising from this is made worse by the practice of bulking milk in 1,000-gallon (4,500-litre) containers for transport. Accredited and non-designated milks cannot be regarded as free from infection.

In the cases described above it was usual to obtain a history of drinking raw milk for prolonged periods, though the parents of some of the children would admit to no such exposure.

Wilson *et al.* (1952), writing on infection with bovine tubercle bacilli, state: "Many of the records suggested that the consumption of raw milk must have been only slight or occasional, pointing to the danger of drinking raw milk at any time or in any form."

It is possible that one draught of raw milk is enough to start a primary infection; and there must be few country children who have not at some time had a glass. However careful their parents may be, children are bound to go out for meals or snacks sometimes and to drink milk of unknown quality. Perhaps boys will do so more than girls, and this may be the explanation of the preponderance of boys in the series.

Of the milk supplied by retailers in Bath in 1953 85% was heat-treated, 14% tuberculin-tested, and only 1% raw. In Wiltshire, however, in the same year, 12.16% was heat-treated, 50.72% tuberculin-tested, and 37.12% raw. Some of the raw milk was transported out of the county and pasteurized elsewhere (mainly in London), but the situation is nevertheless alarming.

Figures for morbidity and mortality of non-pulmonary tuberculosis show the result of this. The morbidity rate for non-pulmonary tuberculosis in Wiltshire in 1952 was 0.1673 per thousand, compared with 0.1200 for Bath and 0.1410 for England and Wales. The death rates for 1952 were: Wiltshire, 0.0309, Bath, 0.0000, England and Wales 0.0280.

It would be fair to comment that a number of deaths occurred in the county from a disease which could and should be prevented. At some future date the county will become a "designated area" under the Milk (Special Designations) (Specified Areas) Order, 1952, and from then on the condition described in this essay will gradually become rarer until it goes the way of scurvy, rickets, and congenital syphilis.

Summary

Attention is drawn to the importance of tuberculous abdominal glands as a cause of pyrexia and abdominal pain in childhood. Twenty cases are described, including examples presenting with pain, pyrexia, attacks resembling acute appendicitis, tuberculous rheumatism, and the coeliac syndrome. Reference is made to the experience at Lübeck in 1930.

Treatment with 50,000 units of calciferol daily for six weeks is recommended as a means of expediting the natural process of healing. This is not expensive.

The incidence of abdominal tuberculosis has been investigated. It is concluded that in the area under review it is now nearly as common as pulmonary tuberculosis. It seems to be more common in boys than in girls.

A survey of unselected normal schoolboys led to the discovery of further cases which had in the past caused baffling symptoms. In this group abdominal tuberculosis was more common than pulmonary.

The relation between the incidence of the disease and the consumption of raw milk is discussed.

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ADDENDUM.—Since this essay was written cases of tuberculous mesenteric adenitis have been encountered with undiminished frequency, and another case of tuberculous rheumatism has been seen. The main problem encountered has been the diagnosis of cases in which the clinical picture is typical, the tuberculin test is positive, no other tuberculous lesion can be found, but no calcification is seen on x-ray examination. In these cases the diagnosis is vague, being arrived at by exclusion and therapeutic test. The use of radioactive calcium for tracing the process of calcification in the glands might be of value. Unfortunately no suitable isotope has yet been discovered.

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A COMPARISON OF VACCINATION WITH VOLE BACILLUS AND B.C.G. VACCINES

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B.C.G. vaccine was first used as a measure to prevent tuberculosis in human subjects in 1922. While, so far, there is no direct evidence that B.C.G. vaccination does in fact protect against tuberculosis, the experience gained in many countries, such as Denmark, goes far to support such a contention, and the vast majority of tuberculosis physicians throughout the world advocate the extension of anti-tuberculosis vaccination, believing that if it was adopted on a wide scale it would quickly reduce the number of new cases. A murine form of acid-fast bacillus found in voles was described in 1937 by Wells (1946), and from this organism he prepared a vaccine which he showed produced tuberculin conversions and acted in a manner very similar to B.C.G.

The course of vaccination with B.C.G. has been fully described; it is usually uneventful and produces little or no discomfort. However, there appear to be good reasons for carrying out investigations into new forms of vaccination. B.C.G. vaccine is not necessarily the ideal immunizing agent, as it is an artificial organism which might lose its potency. It would be wise to have available a proved substitute, and vole vaccine might well be suitable.

Any investigation of the action of vole vaccine must be controlled by a corresponding group treated with B.C.G., and all the conditions regarding surroundings and observations must be identical.

As vaccination with either B.C.G. or vole vaccine is a harmless procedure, neither giving rise to any systemic reactions, a comparison between the two vaccines can best be made by noting the ease of administration; the conversion rates; the early local reactions; the reversion rates; and the late reactions, or the late cosmetic effects. The final comparison must obviously include a note of any subjects who subsequently develop tuberculous disease. This is a matter of a long-term observation and cannot be completed until a period of at least fifteen to twenty years has elapsed.

The present investigation, which is being carried out at the Orphan Homes of Scotland, Bridge of Weir, began in the autumn of 1951. Of the 783 children between 1 and 15 years of age resident in the homes, the 575 included in the initial series and the 130 in subsequent series were negative reactors to 100 I.T.U., using old tuberculin. Details of the preliminary tuberculin survey have already been reported (Frew *et al.*, 1953). In all the cases x-ray examination by the M.M.R. unit failed to show any chest lesions. For the principal series, in 1951, two equal groups were selected by random methods, care being taken to ensure that both groups were as nearly as possible equal in regard to sex, age, school class, and cottage. B.C.G. was given to 288 children and vole vaccine to 280.

Administration

The B.C.G. vaccine was obtained from normal supplies prepared in the State Serum Institute in Copenhagen and given in the normal manner.

The vole vaccine used was in three forms: (a) Dry, reconstituted vaccine (2 mg. dry weight per ml.), used in 1951. (b) Liquid vaccine (2 mg. dry weight per ml.), used in 1952. (c) Liquid vaccine (half-strength) (1 mg. dry weight per ml.), used in 1953.

In 1951 the under-5-year group (numbering 55) were given the vole vaccine by intradermal injection, the dosage and method being identical to those used for B.C.G. In the case of the children of 5 years and over, vaccination was carried out by multiple puncture. The apparatus used consists of a spring-loaded gun which, on release of the trigger, projects 40 needles through a predetermined distance. For the present work the needles were adjusted to penetrate a depth of 2 mm. A sterile circle of rice paper of the same diameter as the end plate of the gun was dipped into the vaccine, applied smoothly to the skin, and the punctures were made through it. Little pain was felt, many of the children stating that they felt only a dull knock, and no dressings were required.

Conversion Rates

1951 Group.—Routine tuberculin-testing was begun at the end of the second week and was continued at weekly intervals until each case was recorded as positive. In children of 5 years and over, Mantoux-testing, using 100 units old tuberculin, was used, while in children under 5