On clinical grounds some guidance can be gained from the previous family history. Walker and Murray (1956) have shown that in their series of infants with haemolytic disease of the newborn there was a general trend to more severe disease in succeeding pregnancies. They also showed that the stillbirth rate was about 10% when there had been no previously affected baby but that it was nearly 30% in subsequently affected babies. Moreover, in families where a previous infant was stillborn as a result of haemolytic disease there was an 80% chance that the next baby, if allowed to go on to spontaneous delivery, would also be stillborn. This in itself justifies the need for premature induction of labour in these patients, for this procedure will increase the likelihood of the infant being born alive and give it a chance of survival with treatment in spite of the hazards of prematurity. It is, however, essential to know in such a rhesus-incompatible pregnancy that the husband is homozygous rhesus-positive, as this will influence the choice of treatment.

The rhesus antibody titres in saline and albumin media of the maternal blood in this series have not necessarily corresponded with the severity of the disease in the infant. The need for a reliable method of assessment such as the antibody titration method described by Kelsall and Vos (1952) and the importance of weekly estimations of antibody levels are well illustrated by the following case record.

A patient aged 30 had the following history. Her first infant, born weighing 4 lb. (1.8 kg.), suffers from cerebral palsy; her second infant is alive and well; her third child died at 9 days of age with jaundice; her fourth pregnancy terminated at 36 weeks and the infant was stillborn. In her fifth pregnancy she was found at 10 weeks to be rhesus-negative with an antibody titre of 1/2. At 34 weeks the foetal heart was heard. Arrangements were made for her to be admitted at 38 weeks for possible induction of labour. Spontaneous onset of labour at 37 weeks resulted in delivery of a macerated stillborn foetus which showed at post-mortem examination all the features of haemolytic disease of the newborn.

Allowing for the clinical difficulties and possible statistical variables inherent in comparing different series of such cases, selective induction of labour based on the family history and clinical assessment of each rhesus-incompatible pregnancy would seem to have reduced the total mortality in haemolytic disease of the newborn.

Summary and Conclusions

The results of 143 pregnancies of rhesus incompatibility delivered spontaneously or by selective premature induction of labour are reviewed.

There is a notable lowering in the total mortality in haemolytic disease of the newborn in the induced group (16%) compared with that of the group delivered spontaneously (29%).

The severity of the disease was probably greater in the induced group, as twice as many exchange transfusions were performed and the average haemoglobin level was lower than in the group spontaneously delivered.

The beneficial results of selective premature induction of labour are also illustrated by the individual case histories.

The time of induction was based on the previous maternal history and by clinical assessment of the individual patient.

Selective premature induction of labour is thought to reduce the total mortality from haemolytic disease of the newborn.

I thank my colleagues at the Royal Maternity Hospital, Belfast, and in particular Professor C. H. G. Macafee, Professor F. M. B. Allen, and Dr. Maurice Russell, for their assistance in preparing this report.

ADDENDUM.—Since this article has been accepted for publication a further paper on the subject has been published by W. Walker, S. Murray, and G. K. Russell in the *Lancet* on February 16, 1957.

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BRUCELLOSIS IN CHILDREN

BY

HUGH R. E. WALLIS, M.D., M.R.C.P., D.C.H.

Consultant Paediatrician, Bath Clinical Area;
Medical Officer, Kingswood School, Bath

Brucellosis is a disease of mistakes. If we do not think of it we miss it; or we may think of it and test for it, yet find nothing. It eludes us. Nevertheless, as a cause of pyrexia of undetermined origin it is important; and obscure headaches, lassitude, abdominal pain, or arthritis may be due to its smouldering activity.

Case 1.—A girl of 6 was referred to me because of abdominal pain, lassitude, and irritability. I could find no abnormality, and investigations proved negative. Her family had moved house a few months earlier and she had been sent to a new school. I assumed that her symptoms were due to psychological upset and hoped that they would settle down in the course of time. Three months later I was asked to see her again because she was no better. She then had some enlarged glands in the neck, axillae, and groins, and her liver was palpable. A white cell count showed a leucopenia, with a diminished number of neutrophil polymorphs. Serum agglutinations against *Brucella abortus* were positive at 1 in 320 dilution. Chlortetracycline and streptomycin were given for seven days. Her temperature fell rapidly and she felt better within a week. Her recovery was complete and permanent.

I was able to learn by my mistake in this case. From that time I was more keenly aware of the possibility that brucellosis might be the cause of vague or unexplained symptoms. In the course of time I met with a number of children who were undoubtedly suffering from brucella infection. I scrutinized the notes of 2,000 children I had seen in hospital during the previous four years and made a retrospective diagnosis in several others. It is important to record my findings in order that others may learn from my mistakes as I have done. I hope thereby to reduce the number of cases in which pain, fever, and arthritis remain unexplained, and also to shield children from unjustified accusations of neurosis and malingering.

Dalrymple-Champneys (1950) has given an excellent review of the history, ecology, and symptomatology of this disease, which he calls "a neglected problem." Full reference to the previous work has been made by Huddleson (1939) and Harris (1941, 1950) in their exhaustive monographs, and it is evident that any system of the body may be affected.

Sander (1933) said that the disease in children did not differ at all from that in adults; but Huddleson wrote that in Malta, where it is commonest in children, it is relatively mild and often passes unnoticed. Williamson

and Gibson (1931) reported the first case in this country, that of a boy of 20 months. Paterson and Hardwick (1938) also reported cases, and gave their opinion that many such cases are never recognized. In infancy the symptoms are more obscure. Repeated gastro-intestinal upsets, failure to gain weight, and pyelitis may be noted. Hagebusch and Frei (1941) believe that the infection may be acquired *in utero*. Epidemics have been reported in this country by Elkington *et al.* (1940) and Cruickshank and Stevenson (1942).

Case Reports

General.—For greater brevity all negative or normal investigations have been omitted. It may be assumed that the tuberculin and Widal reactions were negative, and that urine examinations and x-ray examinations of the chest, abdomen, and sinuses gave normal results unless otherwise stated. All the children lived in the country except one, who had recently moved into the city. All of them had drunk milk which had not been pasteurized, though in some cases it was from tuberculin-tested herds.

Case 2.—Acute Attack and Relapse

A boy of 8 lived in a village where there was an epidemic of brucellosis. He had drunk milk from a herd which was later proved to be infected with *Br. abortus*. In December, 1954, he had an acute attack of diarrhoea and abdominal pain. His temperature rose to 101° F. (38.3° C.), and he had a cough. The family doctor made a diagnosis of brucellosis, and the patient was admitted to hospital after a week. He was found to have glands in the neck, axillae, and groins, and a systolic murmur in the heart.

Investigations.—Haemoglobin, 98%; E.S.R., 22 mm.; total white count, 3,400 (polymorphs 1,750). Agglutinations against *Br. abortus*, negative. Brucellin skin test, strongly positive.

He was treated with chlortetracycline and streptomycin for one week. His temperature settled rapidly, and he was discharged home. A month later he had gained 4 lb. (1.8 kg.) weight, but was rather tired and irritable. His total white count was 7,200, with 3,000 polymorphs. Agglutinations were positive at 1 in 640 dilution.

He continued to make a good recovery, and at follow-up a year later he was very well. Soon after this he was kicked on the head while playing football. A week after the injury he had an attack of lethargy, anorexia, and malaise. On examination there were some small glands in the neck and axillae. The systolic murmur remained. At the site of the skin test there was still an area of induration and scaling of 5 by 5 mm. His mother said that the place broke down and wept after he left hospital, and that it had never healed since. During the next month he had headaches, irritability, and fever up to 102° F. (38.9° C.). He was admitted to hospital for further treatment. His liver was then palpable, and the agglutinations were positive at 1 in 160. After a second course of treatment he has again progressed well, and the systolic murmur is no longer audible.

Comment.—This may have been a reinfection; but in view of the behaviour of the skin test it is more likely to have been a relapse. Barrett and Rickards (1953) refer to the flaring-up of malaria after surgical operations and other insults, and suggest that the same may happen in brucellosis. Dalrymple-Champneys records a case where a fracture of the femur precipitated a relapse 35 years after the original attack.

Case 3.—“Influenza”

At a school in the country several boys had what was thought to be influenza. Most of them recovered rapidly, but one aged 8 had a persistent fever of 99 to 100° F. (37.2 to 37.8° C.) in the evenings for three weeks. Sulphonamides and penicillin had no effect. Examination then showed a fit pale boy with one gland in the left axilla.

Investigations.—Haemoglobin, 95%; E.S.R., 4 mm.; total white count, 7,000 (polymorphs, 3,500). Agglutinations against *Br. abortus*, positive 1 in 80. X-ray examination of the chest showed mottled shadows in the right and left lower zones and hilar enlargement on the left.

The temperature continued to be high in the evenings for another 14 days and he was seen again. His blood picture was unchanged except for a rise in titre of agglutinations to 1 in 160. The x-ray picture was clearer. A diagnosis of brucellosis was made at this time, and it was decided to wait before treating him. Fourteen days later he seemed to be worse. His appetite was poor and he had become short-tempered and apt to burst into tears without reason. He had had pain in one knee, and evening pyrexia. He was treated with chlortetracycline and streptomycin for 10 days, and made a good recovery.

Milk Supply.—The dairyman who supplied milk to the school obtained it from three farms. These were inspected, and positive evidence of infection of the herds with *Br. abortus* was found in two of them.

Case 4.—E.N.T. Problem

The patient was a boy of 10. His father worked on a farm and brought home raw milk in a can. In December, 1955, he had an acute pain in the neck. Next day his right knee and ankle were painful. The family doctor found that he had tenderness over one mastoid process and some meningism. He was admitted to an E.N.T. ward. On admission he had deep cervical adenitis, without definite ear disease. Haemoglobin, 87%; E.S.R., 42 mm.; total white count, 3,100 (polymorphs, 1,550).

Three days later his liver was found to be enlarged and tender and he was transferred to the paediatric department. He had a systolic murmur; but further investigations were negative. Agglutinations for *Br. abortus*, positive at 1 in 20 only. Fever up to 99° F. (37.2° C.) persisted, and he had some diarrhoea. A week later he complained of headaches and pain in the chest and abdomen. His spleen became palpable and there were glands in both axillae and posterior triangles. By this time the total white-cell count was 2,000, with only 1,020 polymorphs. The house-physician (who had trained in London and could not believe the diagnosis of brucellosis) became worried, and prepared to take a specimen of sternal marrow. However, a repeated test of the agglutinations showed a rise to 1 in 160. About this time there were some dry scaling patches on both cheeks, and the boy became constipated. A skin test was negative. His temperature settled, the liver and spleen receded, and he felt better. A month later there was a relapse, with abdominal pain and fever. He was treated for 14 days with chlortetracycline and streptomycin. Three months later he was well and considered to be cured. The systolic murmur was no longer heard.

Case 5.—Psychological Disturbance

A girl of 5 was referred by her family doctor with this note: “She is listless and pale, and has become rather a frightened child. Mamma has to work to keep herself and the child. A neighbour looks after the girl during the day, when she is not at school. I feel that the problem is really a social one, but would be glad of your reassurance that it is not physical.”

Examination revealed some glands in the neck, axillae, and groins, and a basal systolic murmur. There was also a golden-brown pigmentation on the forehead and temples.

Investigations.—Haemoglobin, 81%; E.S.R., 8 mm.; total white count, 4,500 (polymorphs, 3,150). Agglutinations against *Br. abortus*, positive 1 in 320. Brucellin skin test, positive. The urine contained 100 mg. of protein per litre and many pus cells, but it was sterile on culture.

She was treated with chlortetracycline and streptomycin for 10 days and made a rapid and complete recovery. A month after the end of treatment her mother said: “I

think you must have been feeding her with energy pills." Three months later she was very well, the murmur had gone, and no glands were palpable in the neck or axillae.

Case 6.—Spontaneous Cure

A boy of 12 had had a dry cough, abdominal pain, and constipation for two months. On examination there were no abnormal physical signs.

Investigations.—Haemoglobin, 76%; E.S.R., 20 mm.; total white count, 3,200 (polymorphs 544). Agglutinations, negative. Brucellin skin test, negative. A month later the total white count was 7,000, with 4,760 polymorphs. The agglutinations were positive at 1 in 160. By then he had improved, and it was not thought justified to treat him. A year afterwards he was very well.

Comment.—A spontaneous cure. The very low polymorph count might have caused alarm if this disease had not been recognized.

Case 7.—Migraine

A boy of 9 had attacks of paroxysmal abdominal pain and headache associated with nausea and blurred vision. On admission to hospital no abnormalities were found except a few glands in the neck and groins and a systolic murmur. Haemoglobin, 90%; E.S.R., 2 mm.; total white count, 7,000 (polymorphs 2,590). Cerebral tumour and subdural haematoma were ruled out, and a diagnosis of migraine with a psychological background was made. A month later he was easily tired and could not concentrate at school. Brucellosis was considered, and he was admitted to hospital. Agglutination was positive at 1 in 40 only. A skin test was negative, and a week later the agglutination titre was unchanged. He was discharged with no firm diagnosis.

After another month he was still lacking in concentration, and had pains in the shoulders and knees. The headaches continued, and his evening temperature was raised to 99–100° F. (37.2–37.8° C.). A diagnosis of brucellosis was made on clinical grounds despite the absence of confirmatory pathological findings, and it was decided to treat him. He was given chlortetracycline and streptomycin for 10 days. After three days his temperature fell below 98° F. (36.7° C.) and remained low. He felt better and his cheeks became pink. Meanwhile the agglutinations had been repeated, and were reported as positive at 1 in 160. Since the end of treatment he has had no headaches or other symptoms. His mother states, "He is a different child."

Milk Supply.—The medical officer of health was informed, and as a result herds at two farms were found to be affected.

Comment.—Note the delayed response to the skin test. The final specimen of serum which returned a titre of 1 in 160 was taken 40 days after the skin test, and after a diagnosis had been made without positive pathological evidence. Dixon and Roaf (1946) and Nichols (1951) have reported cases with transient migraine.

Cases Diagnosed in Retrospect

Case 8.—X-ray Picture Mimicking Military Tuberculosis

This boy of 11 lived on a farm. In November, 1953, he had an attack of vomiting and abdominal pain. A week later he had frontal headaches, dyspnoea, and a dry cough. On examination his temperature was 99° F. (37.2° C.), pulse rate 100, and respiratory rate 40. His breathing was shallow, and there were fine crepitations in all parts of the lungs. An x-ray film showed that both lung roots were rather prominent and there was a fine mottling throughout both lungs resembling military tuberculosis. Haemoglobin, 97%; E.S.R., 6 mm.; total white count, 6,000 (polymorphs 2,100). Mantoux test, negative to 100 T.U. His temperature settled quickly, and after 14 days he was discharged with a provisional diagnosis of bronchopneumonia. Six weeks later he was irritable and had no appetite. Small

glands were found in his axillae and neck. Crepitations were still heard in his lungs, and the x-ray picture was unchanged. He was admitted again. The tuberculin tests were still negative. A diagnosis of sarcoidosis was considered, but the plasma proteins and the albumin/globulin ratio were found to be normal. No abnormality was found in the x-ray films of his bones. He improved once more and was discharged again with a diagnosis of possible sarcoidosis.

He went downhill and was admitted for the third time six months after the onset of the disease. His spleen was then palpable, and extrasystoles were noted. Kahn and Wassermann reactions were negative. Brucellosis was considered and discarded as the agglutinations were negative. A lymph node removed from the axilla showed no histological evidence of lymphadenoma or sarcoidosis. An electrocardiogram was normal.

He again improved and was discharged with no final diagnosis. He was seen from time to time in the outpatient department. The x-ray picture cleared, and he was finally discharged from attendance over a year after the onset, still undiagnosed. A year after that he was sent for again. He was a fine fit boy, and had gained 19 lb. (8.6 kg.) weight. He had no symptoms. There were no abnormal physical signs, and x-ray films of the chest were normal. Haemoglobin, 89%; total white count, 5,000 (polymorphs 2,200). Agglutinations against *Br. abortus*, 1 in 160. Brucellin skin test, negative.

Comment.—If this boy had by chance been tuberculin-positive a diagnosis of milary tuberculosis would have been almost irresistible. In the days before antibiotics were available there were a few legendary patients who recovered from milary tuberculosis. Probably some of them were in fact suffering from brucellosis. It seems possible also that some obscure cases of "sarcoidosis" may really be victims of brucella infection. The only other child seen in this area with an index diagnosis of "query sarcoidosis" also had a leucopenia and a high titre of agglutinins. Note also that the leucopenia remains despite apparent clinical cure.

Case 9.—Spinal Radiculitis

A boy of 15 had an acute febrile illness with cough, lassitude, and anorexia. He was found to be tuberculin-positive and to have healed calcified glands in the abdomen. A month later he had pain in the chest, constipation, and fever. At this time the white count was 4,400, with 1,980 polymorphs. Six months later he had pain in the back which was unexplained. A year later there was an obscure disease of the right elbow which was variously diagnosed as early osteoarthritis and a cervical disk lesion. After another six months he complained of a stiff ankle with limited movement. A prolapsed intervertebral disk was suspected, and he was admitted to an orthopaedic hospital. Here the total white count was 2,800, with 1,512 polymorphs. The sedimentation rate was 2 mm. Some sensory loss appeared in the legs, and a diagnosis of cauda equina tumour was made. In a neurosurgical unit lumbar puncture was performed. The C.S.F. was faintly yellow. Protein, 208 mg. per 100 ml.; W.B.C., 87 per c.mm. (75% lymphocytes); Lange, 0001110000.

An operation was performed, and on opening the dura all of the roots of the cauda equina were seen to be injected and swollen to two or three times the normal diameter. This unexpected finding was noted as "a rare condition, not fully understood." His progress after the operation was poor. He lost weight and became very depressed. The possibility of carcinomatous neuropathy was considered but not proved.

When the question of brucellosis was raised three years after the onset tests showed that agglutinations were negative and the skin test was strongly positive. Treatment with chlortetracycline brought much improvement.

Comment.—The leucopenia should have led to an earlier diagnosis, which would have saved this boy much suffering.

Huddleson (1939) and Nelson-Jones (1951) report cases of spinal radiculitis, and I have since seen one other. Neurologists should be on the alert for this disease.

Case 10.—“Tuberculous Rheumatism”

A girl of 12 had an acute attack of abdominal pain and constipation. In hospital her temperature and pulse rate were normal. Her appendix was removed and found to be normal also. Two months later she still had pain and some dysuria. A blood count showed: haemoglobin, 78%; E.S.R., 13 mm.; total white count, 4,200 (polymorphs 1,722). This was ignored.

Six months later she had a painful swollen knee. A systolic murmur was noted, and she was said to be nervous. A diagnosis of chondro-osteomalacia was made by an orthopaedic surgeon.

During the next six months she had low back pain and became easily tired. She was admitted to an orthopaedic hospital with the diagnosis of lumbo-sacral disk lesion. She was treated with a corset and some physiotherapy. Her response was not good. A tuberculin test was positive. Her urine contained a few pus cells on several occasions, but no tubercle bacilli could be found. An intravenous pyelogram was normal. Because of the constipation sigmoidoscopy was performed. Nothing abnormal was found. The house-surgeon wrote: “This child has probably been talked into her condition by over-solicitous parents. Away from them she seems to have improved a good deal. She should get up and persuade herself that she is not an ailing person.”

About this time I saw her and made another mistake. Because an x-ray film of the abdomen revealed that there were calcified mesenteric glands, I made a diagnosis of tuberculous rheumatism. I advised treatment with calceferol, but there was no improvement. Later, as a result of this survey, she was sent for again. It was found that she had been sweating at night, her liver was palpable, and the systolic murmur remained. Her blood picture was normal and agglutinations against *Br. abortus* were less than 1 in 20. A brucellin skin test was negative; but a week later the agglutination titre was 1 in 80.

Comment.—The fourfold rise in titre after the skin test proves the diagnosis. This poor girl has been subjected to appendectomy, intravenous pyelography, sigmoidoscopy, suspicion of psychoneurosis, and long months in hospital, all unnecessarily. If such cases of brucellosis could be recognized earlier not only would pain and suffering be relieved but the nation would be spared considerable expense.

Tuberculous rheumatism has been reported as an entity by Poncet and Leriche (1909) and Sheldon (1946). It consists of a short-lived and atypical arthritis occurring in the course of tuberculous disease. It seems possible that some of the cases so labelled are in fact suffering from two diseases, tuberculosis and brucellosis, both contracted from the same source—namely, infected milk. In Poncet and Leriche's book it is stated that one of their patients was “un vétérinaire de 50 ans.” We now know that brucellosis is an occupational disease of veterinary surgeons, and perhaps that gentleman could be included among those diagnosed in retrospect.

Diagnosis

The proof of infection with brucella may be extremely difficult. The following steps should be taken.

1. Consideration of the history and clinical findings.
2. Studies of the blood. Usually the haemoglobin level is slightly but not severely lowered. The sedimentation rate of the red cells is often very low. The number of white cells is decreased, and there is a marked diminution in the number of neutrophil polymorphs. The total count is usually below 5,000, with fewer than 2,500 polymorphs. But a normal count does not rule out the disease.
3. Serum agglutination tests against a suspension of killed brucella organisms. According to Wilson and Miles

(1955) a positive reaction in a titre of 1/80 or over in a febrile patient can be regarded as indicative of active infection. But a negative reaction by no means excludes such infection, and a rising titre is usually indicative of activity. The history of Case 7 suggests that a titre of 1 in 40 can sometimes be accepted as evidence of activity.

4. An intradermal sensitivity test with brucellin. This is similar to the Mantoux test for tuberculosis. If it is positive it shows that the patient has at some time met with brucella infection, though it does not prove that his illness is due to such infection. On the other hand, unlike the Mantoux test, a negative result cannot be taken to preclude the diagnosis. Evans *et al.* (1938) found that the skin test was negative in 39% of affected patients. Harris (1941, 1950) has described delayed reactions, and it would seem wise to read the test at 48 hours and thereafter daily for a week or more.

5. A second estimate of the agglutinins. Sometimes the skin test provokes a rise in titre, but not always. A fourfold rise is usually taken as significant. It has been customary to take the second specimen for testing at six to eight days. Criscuolo (quoted by Harris) found in some cases that the rise was delayed till the 30th day (see also Case 7). The rise in titre may occur even though the skin test is negative (Cases 6, 7, and 10).

6. Blood culture. The results of this procedure seem to be variable, and are unsatisfactory in the obscure chronic cases where they would be of most help.

All of the five last-named investigations may give normal or negative results even though the patient is suffering from active infection. Failure to realize this fact has often led physicians into error in the past. It must be emphasized that laboratory aids are sometimes misleading, and that in obscure cases the diagnosis may have to be made on clinical grounds alone (see Case 7).

Various Factors

Time of Onset.—An analysis of the months of onset of these cases showed that the disease starts most often in the autumn and winter months. Organisms are excreted in the milk in greater numbers during the early months of lactation. In Malta the kidding season occurs in March and April, and there is a seasonal increase in brucellosis in the summer (Eyre, 1907). In this country calving takes place more commonly in the late summer and autumn. The increased autumnal incidence may also be due to the fact that many children nowadays go to the country or seaside for their summer holidays and to the modern practice of spending holidays in caravans. Even city children who have safe milk at home may be caught in this way, and practitioners in large cities should remember this. One drink may be enough. One boy of 8 had always had pasteurized milk. He went for a picnic but left the milk at home. He begged a drink from a farm and was given milk fresh from the cow. Three weeks later he had an acute attack of brucellosis.

Heart Murmurs.—Systolic murmurs were heard in half of the cases. This is a higher proportion than is generally found in healthy children. They were not due to dilution of the blood, as in no case was there any severe anaemia. In three cases they disappeared after treatment. Such murmurs may come to be regarded as useful pointers in the diagnosis. Care should be taken to rule out bacterial endocarditis and acute rheumatism. Hart, Morgan, and Lacey (1951) record cases of brucella endocarditis.

Pigmentation.—The type of pigmentation on the forehead and temples noted in Case 5 was seen in another case not included here. It has not previously been reported so far as I can determine, though Hughes (1897) describes “a certain amount of bronzing.”

Urine.—In several cases protein or pus has been found in the urine. It seems likely that some chronic cases of low-grade pyelonephritis or abacterial pyuria may be due to brucellosis. Transient glycosuria was seen in one case.

Psychological Disturbances.—Several children were suspected by parents, family doctors, house staff, or consultants of being psychoneurotic. This is the fate at some time of most sufferers from chronic brucellosis, and we should guard against it.

Treatment, Prognosis, and Mortality

Good results have been reported from the use of various antibiotics, especially streptomycin and the tetracyclines. In America brucellin has been used alone. Léon *et al.* (1952) reported good results from a combination of these agents. Carpenter *et al.* (1955) found that in guinea-pigs the combination was more effective than either brucellin or oxytetracycline alone. This may be the method of choice in the future.

Most of the victims of brucellosis recover rapidly; but a few have a prolonged illness which entails investigations, repeated admissions to hospital, and even unnecessary operations, all of which have been noted in this small series. The number of deaths registered in England and Wales in 1953 as due to brucellosis was four (Registrar-General, 1954). It seems likely that death from this disease might easily be missed and classified as due to acute haemorrhagic pneumonia, nephritis, or possibly encephalitis.

Prophylaxis

The best method is to eradicate the disease from cattle. This can be done by inoculation of calves with a vaccine of attenuated *Brucella* known as strain 19. It is already in common use in this country, but it will be many years before all cows have been protected. In the meantime the only satisfactory way is to ensure that all milk is pasteurized. Tuberculin-tested milk is not safe. Unfortunately it has acquired amongst the general public a reputation for safety which is not justified.

It would be helpful if the disease were to be made compulsorily notifiable so that medical officers of health could apply their powers to stop the sale of infected milk.

In the modern world threat of legal process speaks louder than reasoned argument. Publicity might therefore be given to the following decisions. At Seattle, Washington, in 1937, a man who had contracted brucellosis from infected milk was awarded 1,946 dollars in a suit against the company which distributed the milk and the farmer who produced it (Harris, 1941, 1950). In London in 1939 a man was awarded £195 damages against a dairyman in a similar suit (*The Times*, 1939).

Conclusion

There is a tendency in the human race to look with suspicion on that which is new to it. The reaction of most doctors to the information that they have unwittingly been dealing with brucellosis is like that of M. Jourdain (*Le Bourgeois Gentilhomme*) when he found that he had been speaking prose for more than forty years: they can scarcely believe it.

Simpson (1941), introducing Harris's monograph in America, said that he hoped it would "help the great mass of people suffering from brucellosis by making their physicians brucellosis-minded." I trust that this paper may do the same in this country.

Summary

Ten cases of brucellosis in children are described. It is shown that the disease is common in country districts but is often missed. It may also be seen in cities, especially in the autumn after children have returned from holiday in the country, where they may have drunk raw milk. Of clinical importance are: fever; enlargement of the liver, lymph nodes, or spleen; arthritis; epistaxis; and chronic abdominal pain or headache. Constipation is common; and protein or pus cells may be found in the urine. A fallacious diagnosis of psychoneurosis

is often made. Systolic murmurs and skin pigmentation are two features of the disease described here for the first time.

Assistance in diagnosis may be had from pathological findings such as leucopenia with a low polymorph count, agglutinations of suspensions of *Brucella abortus* by the patient's serum, and by the reaction to the intradermal injection of brucellin. In some cases these tests may all be negative while the disease is still active, and the diagnosis must be made on clinical grounds alone.

Treatment with chlortetracycline and streptomycin appears to be successful, but relapses may occur. Prophylaxis is discussed, and universal pasteurization of milk is recommended.

I thank Dr. Paul Mann for his help and advice, and many general practitioners for their continued co-operation.

[ADDENDUM.—Extended experience shows that extrasystoles are fairly common in this disease, and that the abnormal bleeding tendency which causes epistaxis may also produce melaena, haematuria, and spontaneous bruising. Preliminary experiments with a multiple-puncture (Heaf) gun for the intradermal test have given good results. If a 1,000-fold concentrated solution of brucellin is used with it the results appear to be more reliable than those of the routine intradermal test. I am indebted to Messrs. Allen and Hanburys Ltd., who provided a Heaf gun for use in these experiments.]

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A reminder of the importance of providing fixtures to hold fireguards in position has been sent to local authorities by the Minister of Housing and Local Government. There are indications that so far few local authorities have installed the fixtures in their council houses, yet surveys have shown that at least 50% of burning accidents in the home are caused by unprotected fires. Many local authorities appear to have taken the view that the wide variety of fireguards makes it impracticable to provide fixtures. However, the British Standards Institution has recently produced a specification for fireguards, incorporating fixing hooks, for open fires, so that the difficulty can now be overcome. The cost of providing a suitable fixture in the wall or fire surround is small, and the Ministry understands that various models and sizes of fireguards which comply with the new specification are becoming available.—Statement from the Ministry of Housing and Local Government, dated February 26.