diseased or damaged skin where they act as a valuable defence against infection.

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Proteus Urinary Infections in Childhood

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Quantitative urine culture by the dip-inoculum technique of Mackey and Sandys (1965) has shown that the pattern of infection in male children is quite different from that of female children. Among boys under the age of 14 *Proteus mirabilis* is the causative organism in about 75% of cases of active urinary infection. By contrast only 15% of infection in girls is due to *Proteus*, the dominant pathogen being *Esch. coli*.

Proteus mirabilis was found in the preputial sacs of 20/51 boys under 10, without overt urinary infection. In nine instances preputial infestation was associated with the presence of *Proteus* in urine collected without retraction of the foreskin. Although the degree of bacteriuria arising in this way should not often reach levels typical of active infection, nevertheless infestation of the prepuce by *Proteus* may be the source of active infection in boys, thus providing a reason for the contrasting incidence of *Proteus* infection in the two sexes.

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Experimental Pertussis Infection in the Vaccinated and Unvaccinated Marmoset: Similarities to Natural Infection in the Child

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Isolates of *Bordetella pertussis* from children were type 1,2,3; 1,2; 1,3; or a mixture of these. Type 1 (apparently a degraded form) was rarely isolated and always grossly outnumbered by other serotypes. Fresh isolates of all four types were avirulent for mice, intracerebrally, but readily colonized the marmoset nasopharynx. Within three days of pernasal inoculation with type 1, the marmoset

colonization had changed to type 1,2 (? rough to smooth mutation).

No marmoset coughed or vomited, or 'whooped', though some became catarrhal. But, like children, they developed circulating antibodies consistent with the agglutinogens in the infecting strain or in a killed vaccine.

Three pairs of marmosets were challenged pernasally with type 1,3 (now prevalent in children). Those previously vaccinated with 1,2,3 eliminated the 1,3 challenge in 10 to 13 days, whilst those vaccinated with 1,2 harboured 1,3 organisms for 22 to 24 days. In unvaccinated animals (with no antibody 2) the 1,3 infection changed to 1,2,3 after two weeks, then to 1,2 after three to four weeks, and persisted until six weeks from challenge.

Three other pairs were challenged with type 1,2,3. Those previously vaccinated with 1,2,3 eliminated the infection in two to two and a half weeks; one, vaccinated with 1,2 took two and a half weeks, but the infection in the other changed to 1,3 and persisted for five weeks. In unvaccinated animals, the 1,2,3 infection changed to 1,3 after two weeks and persisted for five weeks (11 weeks in one animal).

Similar changes of serotype have been found in the child; and, as in these marmosets, type 1,2,3 vaccine appears more effective than 1,2 vaccine in protecting the child.

Brucellosis: the Situation in Britain

R. J. HENDERSON (*Public Health Laboratory, Worcester*)

About 600 cases of human brucellosis occur annually, according to the only reports available. They are virtually all contracted from drinking infected milk or contact with infected cattle. One third of the dairy herds of Britain are infected and the Ministry of Agriculture, Fisheries and Food has embarked upon a scheme to eradicate the disease from cattle. Sub-clinical infection with *Brucella abortus* affects dairy farmers and herdsmen and their families, slaughterhouse men, and veterinary surgeons at some time in their lives, and creates difficulties of diagnosis if it is made by serology alone. The disparity between the annual number of cases (328 for the years 1968-71) in Scotland, where there are only between 5000 and 6000 dairy herds, and in England and Wales (270 for the same period), where there are over 80 000 herds, may be perhaps due to the reporting of serological

findings without a clinical assessment of the patient being made, since reports show that infection in Scottish herds is no higher than that in herds in England and Wales. Legislation is strict; under the Agricultural Act of 1970 anyone selling a cow, otherwise than for slaughter, known to be a reactor, can be fined £400, and the MOH has wide powers under the Food and Drugs Act 1955 and the Milk and Dairies (General) Regulations of 1959 to order pasteurization of milk which he knows to be infected.

Brucellosis in South West Eire

BRIDGET V. FOLEY (*St Finbarr's Hospital, Cork*)

In 1964 Brucellosis eradication commenced in the 26 counties using a milk ring survey of churn samples. The incidence of brucellosis was found to resemble that of tuberculosis, being low in the west and north west and high in the dairy areas of Leinster and the south, areas of greater cattle concentration and habitual movement of dairy cattle. The use of S.19 vaccine was confined to 3-6-month-old calves to ensure protection for herds that would be mature before eradication was complete. In 1966 full-scale eradication commenced in Donegal and movement of cattle in and out of the country was controlled. Market value compensation was given for reactor animals.

In 1968 a complete ban was put on the use of S.19 vaccine, and the 45/50 vaccine was substituted. Later that year eradication extended to Sligo, Leitrim, Monaghan, Cavan, and in 1968 these five counties were brucellosis free. Wholesale clearance is going on along a line from Dublin to Mayo; other counties will not have eradication for some time and this includes our area of the south west.

The first investigation was undertaken in 1967 on three groups of people occupationally exposed to possible infection, ie, veterinarians, dairy farmers, and butchers, using Kerr's questionnaire and doing three sera tests (standard agglutination test, Coombs AHG and CF tests). Seventy-four or 92.5% of the 80 veterinarians, 45 or 44.1% of the 102 farmers, and nine or 18% of the butchers had positive titres. Thirteen veterinarians who were in administration work show that positive titres persist for many years.

The second investigation was carried out in connexion with an epidemic due to *Brucella abortus* in a girls' boarding

school, supplied with unpasteurized milk from its own herd. One hundred and twenty five girls attended the school, and 92 adults also drank the milk. Half the adults complained of symptoms which could be attributed to brucellosis and three gave a history of a 'recent influenza'. Forty-nine of them had positive titres. In contrast, 22 of the 57 children with positive titres complained of 'influenza', with sore throat and vomiting. Many had lymphadenopathy and splenomegaly which persisted for months.

The third investigation was concerned with the staff of one of the major agricultural research stations in Eire. One hundred and twenty-seven of 150 employees cooperated using Kerr's questionnaire and three sera tests. Eighty-seven, or 68.5%, were negative, and 40 or 31.5% were positive; none of the 40 with positive serology admitted to symptoms.

In 1971, 331 of 1,226 sera initially examined for *Br. abortus* gave positive readings one, two, or three tests (26.9%). Clinically, cases of acute brucellosis still present, usually in adult males and always with a history of raw milk consumption. We have also seen four examples of childhood brucellosis, all presenting with symptoms suggesting osteomyelitis.

There is still need for *Brucella* eradication and for adequate milk pasteurization.

Brucellosis in South-west Scotland

J. LAWSON (*Ruchill Hospital, Glasgow*)

The situation in Scotland with reference to brucellosis is reflected in serological evidence of the disease submitted by the Scottish laboratories to the Communicable Diseases Scotland Unit. The figures are an indication of the prevalence of *abortus* antibodies and are highest in Aberdeenshire and Dumfriesshire; it is not possible to identify clinical forms of the disease; it is suggested that many persons could have acquired antibodies from exposure but have never suffered an illness resembling brucellosis.

The clinical picture of the acute infection is based on 22 patients admitted to Ruchill Hospital over a 10-year period. Fever, headache, sweating, fatigue, and joint pains are predominant. Characteristic drenching sweats and low backache are clinically almost diagnostic. The blood picture is not diagnostic but a low white count with lymphocytosis and a polymorphonuclear leucopenia is a valuable sign. Cases illustrative of acute, subacute, and chronic infection are discussed.

The epidemiological situation in a small residential area which produced 11 of 16 acute cases caused by the consumption of raw milk is described. The results of serological surveys of this area and of other parts of the adjacent countryside are shown; they would appear to confirm that *Brucella abortus* is a low invasive type for man.

Three points are emphasized. (1) There are probably many cases of acute brucellosis not clinically recognizable. (2) All cases must be followed up clinically and serologically in order to establish their clinical category. (3) A diagnosis of chronic brucellosis should never be made without a critical evaluation of history, clinical signs, and serial serology.

Brucellosis in Eastern Turkey

R. OGUTMAN (*Ataturk University, Erzurum, Turkey*)

Brucellosis is still a problem in Turkey. In this limited survey we have tried to find out its incidence in the eastern part of the country. Erzurum is a city located in eastern Turkey: it has a medical school and other technical facilities, and is an active medical centre for a population of about eight million. The main occupation of the population of the region is raising cattle; as well, cattle from other parts of the region are brought to Erzurum to be slaughtered.

In this survey we have selected different groups of people and animals and applied the acridine precipitated serum test for brucellosis agglutination, using *Br. abortus* standard antigen. Agglutination titres of 1/80 or over have been accepted as positive for man, 1/40 and over for cattle, and 1/20 and over for sheep. Selected groups for survey are as follows:

I, Close animal contact with no evidence of clinical brucellosis (385 samples with 1.5% positives); II, no animal contact and no evidence of clinical brucellosis (616 samples with 1.3% positives); III, close contact with meat or meat products with no clinical evidence of brucellosis (283 samples with 18% positives); IV, no contact with animals or meat or meat products with brucellosis but high consumption of milk or milk products (505 samples with 7.4% positives). V, slaughtered cattle (337 samples with 11.7% positives); VI, slaughtered sheep (500 samples with 39.9% positives).

This limited survey shows that asymptomatic brucellosis is present in eastern

Turkey in man and animals. Handlers of meat and meat products have a higher seropositivity than other groups. The seropositive cases are particularly common in males aged 20-29 years. Consumers of milk and milk products also have a high seropositivity without clinical evidence of brucellosis. Cattle and sheep slaughtered in the main Erzurum slaughterhouse also have a high incidence of seropositivity for brucellosis without evidence of active disease.

Progress of the British Eradication Scheme for Brucellosis

W. J. BRINLEY MORGAN (*Central Veterinary Laboratory, Weybridge*)

The successful eradication of an infectious disease is dependent on knowledge of its epidemiology, accurate methods of diagnosis, effective means of vaccination, and/or its treatment.

Mass therapy of bovine brucellosis is neither effective nor economically feasible, and, since 1905 when a departmental committee was set up, the Ministry's main activities in the field of brucellosis have been concerned with advances in diagnostic methods and in vaccination as means of control. Limited trials in the eradication of brucellosis began in 1933 but these had to be abandoned at the outbreak of the Second World War.

In 1942, the use of strain 19 was introduced as a means of controlling the disease; its use in mature animals, however, led to difficulties when using the serum agglutination test in differentiating post-vaccinal titres from those due to infection; as a result, the permissible age when vaccination was allowed was restricted to 4 to 8 months.

The use of a reference serum for standardizing the agglutinating antigens and the development of the complement-fixation test in differentiating postvaccinal from infection titres as well as in detecting the chronic carrier were important landmarks in diagnosis.

The Brucellosis (Accredited Herds) Scheme was introduced in 1967, aimed at identifying and registering brucella-free herds; at this time the use of strain 19 vaccine was restricted to female calves between 91 and 180 days of age. In September 1970, this was replaced by the Brucellosis Incentives Scheme, incentives being used to replace the payment for reactors disclosed at the 'official' test. At this stage too, the Rose Bengal plate test was introduced as the first test to which all