

A REVIEW OF THE EPIDEMIOLOGY AND CONTROL OF BRUCELLOSIS IN MALAYSIA

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SUMMARY

The presence of brucellosis in large ruminants and pigs in Malaysia was confirmed by the isolation of *Brucella abortus* in 1950 and *Brucella suis* in 1963, respectively. Subsequently, brucellosis was detected in humans (1980), dogs (1982) and sheep (1991). The National Programme for 'The Area-wise Eradication of Bovine Brucellosis' which came into effect in 1979 had reduced the prevalence of bovine brucellosis in Malaysia from 3.3% in 1979 to 0.23% in 1988. It was then envisaged that by 1995 bovine brucellosis in Malaysia had been eradicated. However, the prevalence of brucellosis in cattle was reported to be high (<2%) again (Anon, 2005). In the state of Pahang, there was a surge in prevalence from 0.2% in 1996 to 13% in 1998 but was brought down to 1.8% in 2005 by stringent testing, culling and vaccination. The success of the eradication programme in the later phase proved to be difficult due to the remote geographical distribution of the animals, the extensive farming system being practised and the education and social status of the farmers. In the later phase of the programme, it was difficult to detect infected animals in the herds as the prevalence of infection was very low. It, therefore, became necessary to test every animal so as not to miss the few inapparent carrier animals. For this, the enzyme-linked immunosorbent assay was a useful test and was included, in addition to the Rose Bengal plate test (RBPT), to complement fixation test (CFT) and the Milk Ring Test (MRT) in the screening and diagnosis of brucellosis. Bacterial culture and isolation of suspected cases of bovine brucellosis (abortion, retained placenta) were additional measures undertaken to detect infected animals.

Keywords: Brucellosis, animals, epidemiology, control, Malaysia

INTRODUCTION

The assumption that brucellosis was not present in Malaysia prior to 1950 was based mainly on the lack of clinical evidence. It was probable that the disease was in existence for some years prior to 1950 but was not detected (Lancaster, 1952). The presence of the disease was confirmed by the Veterinary Research institute (VRI), Ipoh with the first isolation of *Brucella abortus* in 1950 from Institut Haiwan (IH), an intensive cattle farm in the state of Johore (Joseph, 1971).

There are two types of cattle farming being practised in Malaysia which can grossly affect the course of the disease and the success of the control programme. One is the intensive system. There were less than 20 such farms in the country and the majority of them were run by the Government. The other system of farming is the smallholdings owned by farmers who rear a few heads of animals to supplement their income. Usually the animals are let out to graze on any free or vacant land (orchards, abandoned padi fields, old disused tin mines, road reserves etc.). The majority of the domestic animals (cattle, buffaloes, sheep and goats) in Malaysia are managed under such a system and these smallholdings are widely distributed throughout the country. This extensive free-range system of farming poses a problem to the control and eradication of any disease programme undertaken in the country.

The Malaysian Government had embarked on a livestock programme and one component of this programme was to create a large sheep population in the country (Babjee, 1988). A quick and simple solution to expand the sheep population was to import large numbers of sheep, particularly from northern tropical Australia. This programme had added a new aspect to the presence of brucellosis in Malaysia. With the importation of sheep, outbreaks of ovine brucellosis were experienced in the state of Terengganu and the first isolation of *Brucella ovis* in Malaysia was seen in 1990 (Mahendran, 1991).

EPIDEMIOLOGY OF BRUCELLOSIS IN CATTLE IN MALAYSIA

The source of bovine brucellosis reported in Institut Haiwan (I.H), a large scale cattle farm in the state of Johore, was not established. Records from the IH indicated that the disease has been in existence for sometime. A serological survey of brucellosis in cattle herds in the country in 1951 revealed that the disease was widespread in the country (Lancaster, 1952; Wells, 1953). Serological reactors were detected in the states of Johore, Penang, Perak, Malacca and Selangor. Of the 2,621 cattle tested, 73 (2.8 %) were positive (Wells, 1953). There is hardly any published report of brucellosis in the 1990s except for the annual reports from the Department of Veterinary Services Malaysia. It was reported that the prevalence of

brucellosis in cattle in Pahang was as high as 13% (Anon, 1998).

In the 1950s, IH functioned as a teaching, research and holding farm, and animals from overseas were brought to this farm for breeding or as a transit point for distribution to other farms. Therefore, it played an important role in the epidemiology of brucellosis in Malaysia. The farm at the height of the outbreak had a reactor rate of 32 % with as much as 8.5 % loss in total calf births (Joseph and Ham, 1979).

With the disease at IH under control in 1953, interest in brucellosis diminished. In 1969, there was a resurgence of the disease in the Institute and by 1972, brucellosis was the leading problem in the Institute (Joseph *et al.*, 1976). The resurgence of the infection was suspected to be due to the following factors:

- i) Cessation of vaccination in 1959
- ii) Introduction of untested cattle from other parts of the country
- iii) Introduction of imported cattle of unknown brucellosis status from Australia, Pakistan and Singapore
- iv) Inadequate attention to sanitation and hygienic measures at calving
- v) Increased stocking rate

The first isolation of *B. abortus* outside IH was made by the VRI in 1964 from cattle found in the Ipoh areas in the state of Perak where abortions were reported to occur (Joseph, 1980; Palanisamy and Johara, 1988). A serological and bacteriological survey of brucellosis in Malaysia was carried out over a 10-year period (1969-1978) and it was seen that the state of Perak had the highest prevalence of brucellosis. One hundred and seventy eight (178) *B. abortus* isolates were obtained from several states in the country between 1969 and 1978 and of these, 165 were from IH. The biotyping of *B. abortus* isolates carried out at the Veterinary Research Institute (VRI) was based on procedures described by Brinley Morgan and Gower (1966) and Alton and Jones (1967). The distribution of the biotypes reflected the probable source of infection. The distribution of biotypes based on 130 smooth isolates obtained between 1971 and 1975 (Joseph and Ham, 1979) were as follows:

| | | | |
|-----------------------------|---|--------|-------|
| <i>B. abortus</i> biotype 2 | - | 86.9 % | (113) |
| <i>B. abortus</i> biotype 1 | - | 10.0 % | (13) |
| <i>B. abortus</i> biotype 9 | - | 2.3 % | (3) |
| <i>B. abortus</i> biotype 6 | - | 0.8 % | (1) |

Biotypes 1 and 2 were not found in other parts of the country except in government cattle farms. Both biotypes were known to occur in Australia and there is a possibility that they were brought in with the breeding stock from Australia. The foundation stock at the Air Hitam Farm, a farm very close to IH, was procured from IH and perhaps this explains why the Air Hitam Farm was infected with

the same biotypes. It was reported that the animals from IH were distributed only to government farms where the husbandry was well regimented and thereby the infection was confined to the affected farms only.

In 1987, Joseph reported that forty-seven *B. abortus* isolates were obtained from cattle between the period 1979 and 1986. Thirty-three of these isolates, the majority from the state of Perak, were biotyped at the VRI, Ipoh: The distribution of the 33 isolates were as follows:

| | | | |
|-----------------------------|---|--------|------|
| <i>B. abortus</i> biotype 9 | - | 65.6 % | (21) |
| <i>B. abortus</i> biotype 2 | - | 25.0 % | (8) |
| <i>B. abortus</i> biotype 1 | - | 9.4 % | (4) |

Biotype 9 was responsible for bovine brucellosis in the state of Perak and was widespread in the indigenous and the Local Indian Dairy (LID) cattle in this state (Joseph, 1987). Indiscriminate movement of animals out of the high prevalence areas like Kinta and Batang Padang districts had given rise to wider dissemination of brucellosis to other parts of the state as well as to other states which previously had been relatively free of brucellosis. The Hulu Behrang Farm received its foundation stock from farms in central Perak and it was therefore not surprising that biotype 9 was prevalent on this farm as well. In another survey (Joseph, 1987), an isolate was obtained from a case of brucellosis in the state of Selangor. The biotype of this lone isolate was biotype 6 which has not been seen elsewhere in the country (Palanisamy, 1987).

Pigs

Although the first case of porcine brucellosis was confirmed in 1963 in the state of Perak, its presence was suspected much earlier. In 1953, a number of abortions in pigs were reported but the sows were all serologically negative (Wells, 1953). In 1955-56, a number of pig sera tested had low titres to brucellosis based on the serum agglutination test (SAT). Serological testing of pigs for porcine brucellosis was carried out at the VRI and at the Regional Veterinary Diagnostic Laboratories on a farm basis in Penang, Perak, Selangor and Johore where pig rearing was undertaken on an intensive scale.

During the period 1969-78, 22 isolates of *Brucella suis* were obtained from pig farms in Penang, Perak, Selangor and Johore (Joseph, 1980). Five isolates belonging to *B. suis* biotype 3 were encountered and were probably brought along with the importation of breeding stocks from Europe. While brucellosis in pigs appears to be prevalent and probably exacerbated by the importation of various breeding stocks, yet, there was no programme to control brucellosis in pigs.

Sheep

Ovine brucellosis caused by *B. ovis* is an emerging disease in Malaysia. A serological survey conducted

using the complement fixation test (CFT) from 1981 to 1986 revealed no positive reactors. It was only between 1987 and 1991 that the presence of a few positive reactors to *B. ovis* was detected and this coincided with the importation of sheep from Australia. The isolation of *B. ovis* in 1991 from 3 rams in the state of Terengganu confirmed the presence of the disease in the country (Mahendran, 1991).

The first outbreak of brucellosis due to *Brucella melitensis* in Malaysia was reported in 1994 in a flock of sheep in Johor (Moktar *et al.*, 1995). The outbreak was confirmed by the isolation of the causal organism, *B. melitensis* biotype 2 and was reported to be due to importation of sheep into the country. Following that, a serological study of brucellosis in sheep in the state of Johor was carried out in 2002 (Janau, 2002). A total of 240 blood samples from sheep were collected from eight districts and the sera tested with Rose Bengal plate test (RBPT), the CFT and enzyme-linked immunosorbent assay (ELISA). All samples were negative to *B. melitensis* antibody when tested with RBPT and CFT, but, six (6/240) samples were positive when tested with ELISA. It was reported that all the sheep in the state of Johor were procured from IH.

Dogs

Investigation on the prevalence of canine brucellosis was initiated in 1981. The first isolation of *Brucella canis* was reported from a bitch in 1982 and this confirmed the presence of the disease in dogs in Malaysia (Joseph *et al.*, 1983). The source of the *B. canis* infection, however, was not established. Recently, a serological study of canine brucellosis was carried out in Klang Valley by Khairani-Bejo *et al.* (2006). One-hundred and twenty three (123) blood samples were obtained from dogs in the Klang Valley to investigate the presence of brucellosis. All sera were tested with the RBPT and 2-mercaptoethanol tube agglutination test (ME-TAT). All the sera were negative to *B. canis* when tested with the RBPT, but six (4.9%) were positive with high antibody titres to *B. canis* infection on ME-TAT.

Goats

There is no substantial evidence to indicate the presence of brucellosis in goats in Malaysia but then there were no studies being done on the diagnosis of brucellosis in these small ruminants in the past years. To date, there has been no report of strong serological reactors or the presence of *B. melitensis* in goats in Malaysia.

Humans

The true prevalence of brucellosis in man is not known. Selective serological screening of occupational

groups such as farmers, abattoir workers, veterinarians, and laboratory personnel has indicated low titre reactors amongst these groups (Heng and Joseph, 1986). The presence of the disease in humans was confirmed by isolation of *B. suis* biotype 3 in 1980 in Malaysia (Heng and Joseph, 1986).

CONTROL OF BRUCELLOSIS IN MALAYSIA

The initial outbreak of bovine brucellosis at Institut Haiwan was brought under control by a test and slaughter policy and by vaccinating all heifers with *B. abortus* strain 19 live vaccine. Vaccination was discontinued in 1959 as no reactors were detected (Joseph, 1980). The objectives of using vaccines, particularly in the control and early eradication programmes were to produce live calves, increase the resistance of cattle to field disease and prevent the spread of the disease. Proper identification of vaccinated animals and culling of reactors are important requirements in the control or eradication programme.

In 1969, the disease emerged in epidemic proportions probably due to the introduction of cattle of unknown brucellosis status from other parts of the country as well as animals imported from overseas. The cessation of the *B. abortus* strain 19 vaccination programme was also another factor. Later, it was realised that the test and slaughter policy could not be employed as a large number of animals of good genetic value were serologically positive. Adult cattle were vaccinated with the killed *B. abortus* 45/20 vaccine to minimise abortion. This, in effect, made it difficult to adopt the test and slaughter policy as the SAT was not able to differentiate vaccination titres from infective titres.

In 1974, the Bang's method of establishing clean herds was undertaken (Palanisamy and Johora, 1988). The method involved separating the calves three days after birth to a holding area where they were reared till they became yearlings. At three to six months of age, the animals were vaccinated with strain 19 vaccine provided they did not have high antibody titres prior to vaccination. When they became yearlings (12-18 months old), they were then transferred to a *Brucella*-free herd. New animals that were to be introduced to the *Brucella*-free herd were vaccinated and tested negative by CFT. With this approach, the brucellosis problem in IH was successfully controlled.

In 1977, realising the economic impact of the disease, a proposal for a National Programme for the Area-wise Eradication of Bovine Brucellosis was put forward by the Department of Veterinary Services, Malaysia (Joseph, 1977). This Programme was accepted in principle by the Government in 1978 and came into effect in 1979. However the Programme took off only after the implementation of the compensation scheme in 1982. The National Eradication Scheme provided compensation over and above the carcass value. The compensation

rate depends on the breed and age of the animals culled. Owners of crossbreeds were given the option of an equivalent replacement from the Government on condition that the reactor was slaughtered and the revenue credited to the Government. The compensation scheme was accepted by the farmers especially in dairy production where there was a big demand for crossbred cattle.

One achievement in the brucellosis eradication was the gazetting of the state of Perak as Brucellosis Control and Eradication Area in the 1980s. At that time, as the cattle population was small and the disease was mainly localised in the two districts of Kinta and Batang Padang, total eradication in the state was expected within 5 years. However, this could only be achieved with concerted efforts, particularly at the district level where brucellosis screening had to be accepted as an active part of the Herd Health Service. The herd health units operated under the supervision of either the veterinary officer from the State Veterinary Services Department or the research officer from the Regional Veterinary Laboratories and in turn were monitored and financed at the national level.

In 1979, the VRI started to implement the Brucellosis Eradication Programme in the state of Perak as part of the National Brucellosis Eradication Programme. It was only in 1983 that the Programme received good response from farmers following the introduction of a compensation scheme. From 1982-1987, a total of 12,502 heads of cattle from the state of Perak were tested for brucellosis by the CFT, out of which 430 (3.4%) were found positive for brucellosis. Of the 1088 herds tested, 152 (14%) were found infected with brucellosis. Fifty-nine percent (7,376 heads) of the total cattle tested were from Kinta district which had a prevalence of 3.8% (280) and a herd infection rate of 21% (229). Another 11% (1,375 heads) of the cattle tested were from Batang Padang district which had a prevalence of 5.9% and a herd infection rate of 18% (196). These two districts in the state of Perak had the highest brucellosis prevalence and herd infection rate recorded in Malaysia (Palanisamy, 1987). With the application of the test and slaughter policy and calfood vaccination, 11% of the infected herds were accredited free of brucellosis and another 25% were in the process of accreditation (Palanisamy and Johora, 1988).

Since 1951, serological surveys in cattle, swine, buffaloes, goats and sheep were carried out using the SAT. Serological reactors were first detected in cattle in 1951, swine in 1953 and buffaloes in 1980. The SAT was the official test for bovine brucellosis up to December 1977. The CFT which was introduced in 1973 was used only on SAT inconclusive or doubtful samples and to differentiate vaccinated from infected animals. But from 1978, the CFT became the official test in the National Eradication Programme and the SAT was only carried out on animals with a history of vaccination with strain 45/20 killed adjuvant vaccine. All serum samples for brucellosis are now subjected to the CFT.

In the National Brucellosis Eradication Programme, matured cattle in intensive farms were tested three times at intervals of four months. Positive reactors were slaughtered while doubtful cases were retested. In *Brucella*-free farms, tests were undertaken annually, with a provision for repeat testing of all newly introduced animals. In addition, the MRT was conducted once a month and positive herds were then individually blood tested.

The National Programme recommended the compulsory testing and culling of reactors and vaccination of female calves (3-6 months old) with strain 19 vaccine. The scheme is still being implemented up till 2007 as a voluntary programme in all states where farmers are persuaded to have their animals tested. The state of Perak operates the programme on a compulsory basis. Perak which accounts for 74% of the total brucellosis reactors at the smallholder level, was gazetted from 1987 as a Brucellosis Control and Eradication Area. The test and slaughter policy has been in force since the implementation of the National Programme. However, calfood strain 19 vaccination is only undertaken in the state of Perak and in government cattle farms. Brucellosis control and eradication work is being undertaken by herd health units in each state which carry out testing for brucellosis as well as Johne's disease and tuberculosis.

STRATEGIES TOWARDS THE CONTROL AND PREVENTION OF BRUCELLOSIS IN MALAYSIA

All intensive cattle farms in the country were brought under stringent routine brucellosis testing resulting in a marked reduction in the prevalence of the infection in these farms. There were numerous smallholdings in the country and with their extensive free range farming system, imposed problems in the implementation of the control programme. The constraints to testing the animals every four months were due to the numerous and widely scattered smallholdings, disorganised nature of farming system and limited manpower and facilities in the Veterinary Department.

Pig and poultry farming in Malaysia has become intensive and sophisticated and only a small proportion of these animals are reared in smallholdings. With intense competition, these smallholdings will eventually be phased out. It is an entirely different situation with the large ruminants. The large or intensive farms were not economically viable and only integrated farming and smallholdings with minimum budget appear to be viable. One problem in disease control is difficulty in getting to the animals in the smallholdings which are widely scattered. The animals are generally not easy to muster; as some of them, especially the buffaloes are reared in 'free-range' management. These are the animals that may impede the success of the brucellosis eradication programme.

Inadequate commitment by farmers and the public in certain areas aggravates the problem. Ignorance on the part of the farmers and people involved in the animal industry particularly importing agencies, regarding disease prevention and control need to be addressed. Education and extension work directed to these people will have to be given a priority.

In the control of the infection, there are three main considerations to be addressed (Alton, per. comm.):

- 1) How to avoid introducing the disease into free areas
- 2) How to eradicate when it is feasible
- 3) How to control it when eradication is not feasible.

There is an immediate need to assess the current status of brucellosis in the country. The last country-wide survey was done in 1988 and this warrants an update on information on the prevalence of the infection, results of vaccination programmes, and other epidemiological data. This would entail a cross-sectional survey of the cattle population based on RBPT and CFT or ELISA.

Farmers have to be advised to procure breeding stock from certified brucellosis-free farms in the country or from brucellosis-free countries or regions. Animals have to be tested and proven negative to brucellosis before they can be brought into any farm. Movement of animals from infected farms to free areas should be totally banned. Where attempts at eradication are not practicable, vaccination may be feasible, perhaps as a preliminary measure to reduce the prevalence of the disease to a level where eradication then becomes feasible. There is a need to vaccinate female calves between 4-8 months of age with *B. abortus* strain 19 vaccine in certain areas of the country where brucellosis is prevalent and at the same time, diligently eliminating positive reactors that have been identified.

In the eradication of bovine brucellosis, difficulties arise when routine serological procedures fail to detect all infected animals. The enzyme-linked immunosorbent assay (ELISA) has been reported to be much more sensitive than other serological assays. It has been introduced to the Veterinary Research Institute, Ipoh and Universiti Putra Malaysia, Serdang to screen animals for brucellosis. Hopefully, it will efficiently detect the animals with chronic infection, especially in the later part of the eradication campaign. The setback, however, is the difficulty in making both the CFT and the ELISA available in relatively small laboratories around the country.

Finally, efforts to control and eradicate brucellosis in Malaysia will only be realised if problems and barriers imposed by the natural topography of the country, shortage of trained manpower, uncontrolled movement of stock, infected indispensable animals due to their good genetic traits, livestock density, poor herd management and indifferent human cultural practices could be overcome.

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