Epidemiology and control of brucellosis in ruminants from 1986 to 1996 in Malta

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Summary
The epidemiology and control of Brucella melitensis in Malta was analysed using herd test data made available by the Veterinary Service of Malta. The eradication scheme commenced in 1987 with the introduction of a test and slaughter scheme using the Rose Bengal test. Herds registered with Malta Dairy Products Limited (MDP) showed a herd prevalence of 23% in 1987 which fell to less than 1.5% by 1993. Prevalence rose to 13% in 1995. Herds not delivering milk to the MDP showed an initial herd prevalence of 4% which fell below 1% in 1994, remaining under 2% in 1995. The epidemic in 1995 caused approximately 300 human brucellosis cases. Large herds and herds with small ruminants were most at risk to brucellosis infection. Seasonal fluctuation of prevalence was apparent. Increased enforcement of regulations and motivation of farmers would accelerate eradication of brucellosis in Malta.

Keywords

Introduction
Brucellosis, particularly Brucella melitensis infection, is an important zoonosis and may cause significant economic loss to livestock production (4). Only B. melitensis biovar 1 has been isolated on the Maltese Islands, Malta and Gozo, while the presence of B. abortus has been suspected but never proven.

Husbandry systems include intensive cattle-only herds with an average size of fifty cattle. Large-scale small ruminant-only herds have become rare. Mixed herding is common and usually allows unrestricted contact between cattle and small ruminants. Large numbers of small-scale small ruminant herds are also kept in traditional systems, within families. The average flock size lies between two and nine animals, predominantly sheep.

The Veterinary Services Division (VSD) estimated ruminant livestock populations on the islands of Malta, in 1995, at 18,800 cattle, 9,000 goats and 17,600 sheep.

Legislation demands that all herds should be registered and all animals identified by the VSD through ear tagging or freeze branding. However, reports exist of unregistered herds of considerable size which are difficult to locate and identify. Since the brucellosis outbreak in 1995, more farmers have come forward to register animals, stimulated by increased penalties if such herds are found.

Cow’s milk is delivered to the Malta Dairy Product Limited (MDP) milk plant while small ruminant milk is often kept for home consumption and manufacture of traditional cheese. Dairy products produced in household dairies and not registered with MDP are controlled only by the public health services. This cheese represents the major vehicle of infection
of humans. Small ruminant milk is sometimes added to cow milk, particularly when a quota is not met or traditional cheese sales are low.

A brucellosis eradication programme based upon test and slaughter was initiated in 1987 by the VSD. The programme initially included only those herds that delivered milk to the MDP for pasteurisation and processing, non-MDP herds were gradually included after 1989.

All known herds and their identified cattle, sheep and goats above six months of age, are blood-sampled by veterinary staff at least once a year. Following the epidemic in 1995, herds were tested more frequently. Herds with less than 10% of livestock infected are retested every three to eight weeks for a period of one year and any reactors are ear notched and slaughtered within fourteen days.

Farms in which more than 10% of the herd reacts positive to brucellosis testing are depopulated. Restocking of such farms may be undertaken after six months (13), during which time disinfection of the farm is necessary. Cattle for restocking are imported, while small ruminants are replaced from either government farm herds or imported stock.

An accreditation system is in place which allots a status to each farm. Herds become 'accredited herds' after two negative tests at a three-month interval. These herds are tested at least once a year and after the 1995 outbreak were tested twice yearly. 'Herd on the way to becoming accredited' consist of herds that have been depopulated or have slaughtered reactors. 'Problem herds' constitute brucellosis reactor herds. These are monitored closely to ensure that no animal movement takes place.

Brucellosis tests are carried out at the State Veterinary Laboratory. The Rose Bengal test (RBT) is the definitive brucellosis test in Malta, sometimes followed by the standard agglutination test (SAT). The complement fixation test (CFT) was introduced in January 1996. Milk delivered to the MDP is screened using the bulk ring test.

In addition, all ruminants slaughtered at the abattoir are screened using the RBT, which enables traceback and control of positive farms.

This paper attempts to describe the epidemiology of brucellosis in Malta and the progress of the eradication scheme from 1986 to 1996.

Materials and methods

Data and field work
Herd test data as recorded by the VSD from 1986 to mid-1996 was entered and analysed using Microsoft Access® 2.0. The island of Gozo was considered separately in the analysis since it was regarded as disease free.

To complement information acquired through data analysis, interviews were conducted with farmers, the MDP, the dairy co-operative Kooperativa tal-Halib (KPH), the Public Health Services and the Microbiology Laboratory at St Luke’s Hospital.

Characterisation of herds
The number of herds and type of animals in MDP and non-MDP groups were presented. MDP and non-MDP herds were characterised according to the type of livestock present. Herds were characterised as cattle-only, small ruminants-only and mixed herds. The annual herd prevalence from 1986 to 1996 was estimated for each category. A frequency distribution of herd sizes and type of livestock was graphed.

Prevalence calculations

The husbandry and production systems of MDP and non-MDP herds are distinct and this was considered the primary stratification. These two groups were then characterised with respect to herd size and composition. Herd and animal prevalence for MDP and non-MDP herds, per year and per quarter year, were then calculated as follows:

- herd prevalence equals the number of herd tests with at least one reactor animal per unit time divided by the number of total herd tests per unit time
- animal prevalence equals the number of reactor animals per unit time divided by the total number of animals tested per unit time.

Seasonality

The seasonality of estimated herd and animal prevalences for MDP and non-MDP strata was considered. Brucellosis herd prevalence was estimated per aggregated month from 1986 to 1996. This was, calculated by dividing the number of herd tests with at least one reactor animal per aggregated month from 1986 to 1996 by the total number of herds tested per aggregated month for the same period. The significance of differences in aggregated monthly prevalence was tested using the chi-square test (20).

Classical time-series

Classical time-series analysis was graphed to isolate three components of herd prevalence fluctuation according to the method used by Ernst and Fabrega (8).

The secular trend was obtained by regression analysis using Microsoft Excel® 5.0; time in months was considered as the independent variable and monthly prevalence as the dependant variable. This secular trend was then extracted from the data series and graphed. Seasonal fluctuation as determined above (seasonality), was next extracted from the time-series. Random variation was minimised by calculating a
six-month rolling mean to permit assessment of any cyclical patterns.

Human cases
The number of human cases reported each month to the Directorate of Public Health between 1986 and 1996 was listed and graphed. Variations in the number of identified human cases were compared with variations in estimated quarterly animal prevalence. Age groups of humans affected were also considered.

Results

Malta Dairy Products and non-Malta Dairy Products herds
Table I illustrates that, of the herds identified in 1994 and 1995, most were non-MDP herds. The figures show that in MDP herds, twice as many sheep were tested in 1995 as compared to 1994. On the island of Gozo, the number of registered non-MDP herds increased five fold, numbers of goats tripled and numbers of sheep doubled from 1994 to 1995.

Table I
Populations of cattle, goats and sheep identified in Malta and Gozo in 1994 and 1995

<table>
<thead>
<tr>
<th>Year</th>
<th>Herds</th>
<th>Cattle</th>
<th>Goats</th>
<th>Sheep</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>1994</td>
<td>MDP</td>
<td>132</td>
<td>1,473</td>
<td>215</td>
<td>1,877</td>
</tr>
<tr>
<td></td>
<td>Gozo</td>
<td>57</td>
<td>2,158</td>
<td>359</td>
<td>2,517</td>
</tr>
<tr>
<td>1995</td>
<td>MDP</td>
<td>127</td>
<td>2,138</td>
<td>1,047</td>
<td>3,232</td>
</tr>
<tr>
<td></td>
<td>Gozo</td>
<td>61</td>
<td>3,829</td>
<td>2,912</td>
<td>6,585</td>
</tr>
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<td>MDP</td>
<td>11,592</td>
<td>2,102</td>
<td>2,897</td>
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</tr>
<tr>
<td></td>
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<td>4,829</td>
<td>2,912</td>
<td>9,145</td>
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</tr>
<tr>
<td>1995</td>
<td>MDP</td>
<td>973</td>
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<td>2,967</td>
<td>9,417</td>
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<tr>
<td></td>
<td>Gozo</td>
<td>636</td>
<td>1,047</td>
<td>6,545</td>
<td>10,238</td>
</tr>
</tbody>
</table>

Table I illustrates the populations of cattle, goats and sheep identified in Malta and Gozo in 1994 and 1995.

Animal species found in MDP and non-MDP herds are shown in Figure 1. Whilst 65% of MDP herds contain cattle only (Fig. 1a), 86% of non-MDP herds consist only of small ruminants (Fig. 1b). MDP herds were found to be significantly larger (Fig. 2a) than non-MDP herds (Fig. 2b).

In summary, results suggest that MDP herds, which are larger than non-MDP herds, are at higher risk of brucellosis (Table II). The presence of small ruminants in a herd also leads to a higher risk of brucellosis (Fig. 3).

Herd and animal prevalence
Prevalence calculations were performed to include all herds and animals identified on the island of Malta; since the entire identified cattle, sheep and goat populations are included in the brucellosis serological testing, confidence intervals were not applied to the calculations (Table II).

Herd and animal prevalences from 1986 to 1996 are shown in Table II. Herd prevalence fell from 23% to 1% during this time. Animal prevalence was significantly higher in goats than in sheep and cattle. In 1995, for example, goats in MDP herds showed a prevalence of 9%, while cattle and sheep showed only 0.49% and 1.39% respectively. This trend is illustrated in the graph of quarterly MDP herd prevalence in Figure 4. Fluctuations in cattle prevalence appear to be dependent upon changes in goat prevalence.
Stratification into MDP and non-MDP herds (Table II) shows prevalences to be consistently higher in MDP than in non-MDP herds. This would suggest that MDP herds are at a higher risk of brucellosis infection than non-MDP herds.

Estimated herd prevalences in cattle-only herds, small ruminant-only herds and mixed herds from 1986 to 1996 in the MDP strata are shown in Figure 3. Small ruminant-only herds show the highest herd prevalence, followed by mixed
Estimated annual herd and animal brucellosis prevalence for all herds and stratified in MDP and non-MDP herds from 1986 to 1996

<table>
<thead>
<tr>
<th>Year</th>
<th>MDP and non-MDP*</th>
<th>MDP</th>
<th>Non-MDP*</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Herd prevalence (%)</td>
<td>Individual animal prevalence (%)</td>
<td>Herd prevalence (%)</td>
</tr>
<tr>
<td></td>
<td>Cattle</td>
<td>Goats</td>
<td>Sheep</td>
</tr>
<tr>
<td>1986</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>1987</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>1988</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>1989</td>
<td>5.6</td>
<td>0.3</td>
<td>2.9</td>
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<tr>
<td>1990</td>
<td>5.0</td>
<td>0.3</td>
<td>1.7</td>
</tr>
<tr>
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<td>0.0</td>
<td>1.0</td>
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<tr>
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<td>0.8</td>
<td>0.0</td>
<td>0.9</td>
</tr>
<tr>
<td>1993</td>
<td>1.5</td>
<td>0.1</td>
<td>0.7</td>
</tr>
<tr>
<td>1994</td>
<td>2.4</td>
<td>0.4</td>
<td>2.8</td>
</tr>
<tr>
<td>1995</td>
<td>1.0</td>
<td>0.3</td>
<td>0.7</td>
</tr>
<tr>
<td>1996**</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>

MDP: Malta Dairy Products Limited
* Non-MDP herd tests were included from 1989
** 1996 data only include data from 1 January to 31 July 1996

Estimated herd prevalences for MDP (Fig. 5) and non-MDP herds (data not shown) (1), per aggregated month over a period of ten years, exhibit one peak in May to July and another in September.

**Seasonality**
Seasonality was adjusted for area, herd type and herd size, which were considered the main potential confounding factors. Seasonality remained defined even after adjustment. Chi-square test results showed the difference in monthly values to be very highly significant.

**Time-series**
A time-series analysis for MDP herds is illustrated in Figures 6a-d. Figure 6a shows a decreasing secular trend in prevalence in MDP herds between 1986 and 1996. Figure 6b represents the herd prevalence data with secular trend removed, showing only seasonal variation, random variation...
and cyclic trends. Figure 6c shows random variation and cyclic trends only, after extraction of seasonal variation. Figure 6d, with random variation minimised, does not show any clear cycle in brucellosis prevalence.

The island of Gozo

Sporadic reactor herds have been identified by RBT on the island of Gozo. Only MDP herds seem to have been affected. The last outbreak, on one farm in 1991, was traced back to movement of livestock from Malta.

Human cases

The brucellosis eradication programme appeared to have controlled brucellosis until an epidemic in 1995 affected almost 300 people.

Fig. 4
Number of confirmed human brucellosis cases in relation to quarterly animal prevalence in Malta Dairy Products Limited herds from 1986 to 1996 (Arrows indicate peaks of infection in goats and possible effect on human incidence)
The number of confirmed human cases per month from 1986 to 1996 is shown in Figure 4. The peaks in human cases in 1988 and 1995 follow the peaks in livestock prevalence with an apparent delay of six months. The highest number of cases in humans lies in the age group 25-34 (data not shown) (1).

Discussion

The test and slaughter scheme

A programme of test and slaughter should result in a rapid reduction in brucellosis prevalence (17). Following implementation of the scheme in Malta, herd prevalence in MDP herds was reduced from over 23% in 1987 to below 15% in 1989 (Table I). The decreasing secular trend in prevalence determined from the time-series analysis (Fig. 6) also indicates the progress of the brucellosis eradication scheme. Time-series analysis of non-MDP herds is not illustrated here but showed similar trends (1).

Testing of non-MDP herds was introduced in 1989 and by 1992, overall prevalence in MDP and non-MDP herds had fallen to below 1%. However, herd prevalence was evidently much higher in MDP herds than in non-MDP herds (Table I) which tended to artificially reduce overall estimated herd prevalences. For example, in 1992, estimated MDP herd prevalence was over 11% as compared to only 2% in non-MDP herds.

 though the disease eradication scheme rapidly reduced prevalence in both MDP and non-MDP herds, eradication was not achieved. A significant outbreak occurred in 1995 when herd prevalence rose to 13% in MDP herds, but only to 2% in non-MDP herds; prevalence in goats rose to 9% in MDP as compared to only 1% in non-MDP herds. This increase in infected MDP herds was the cause of the human outbreak which led to 238 diagnosed cases and was traced back to the consumption of unpasteurised fresh cheese manufactured with milk from infected small ruminant herds kept illegally on MDP farms.

Blood sampling should have covered all animals in Malta, rendering estimated prevalence as close to the true population prevalence as possible. However, bias cannot be ruled out. Registration has not always been complete and males were not consistently tested. Furthermore, each test was considered independently during analysis, taking no account of repeat herd tests. Nevertheless, test data are likely to have provided a reliable maximal estimate of true prevalence.

Although male animals are not believed to be an important means of propagation of infection (3), consistent sero-testing of males may supply additional epidemiological data especially during the end phase of eradication.

Brucellosis is a notifiable disease in Malta but abortion is not notifiable. Abortions are apparently experienced infrequently in infected herds but under-reporting can be assumed. Infected animals usually tend to abort in the first pregnancy but give birth normally in subsequent pregnancies (4). For this reason, chronically infected herds may not show abortion as a clinical sign until naïve animals are introduced into the herd (4). Another explanation for low abortion rates in Malta may lie in the six-monthly testing of herds, where most
positives are identified and slaughtered before they are able to abort. Notification of abortion would facilitate detection of infected herds, especially as brucellosis prevalence is reduced to a low level (15). Laboratory facilities for investigation of abortions would be required.

Brucellosis prevalence appears to be either very low or zero in Gozo, but at the time of this study, the island was not yet declared free under the standards of the Office International des Epizooties.

Movement control

Although movement control is enforced, it is not entirely effective. Complete control remains difficult especially when single animals are moved, for example in the brucellosis case identified on the island of Gozo in 1991, which was traced back to purchase of cattle originally from the island of Malta.

Abattoir screening

Abattoir screening is used as another indicator of prevalence. Analysis requires careful interpretation because in Malta not all sheep and goats are slaughtered at an abattoir. Selection bias regarding breeds and age groups also exists. This method of monitoring becomes more valuable when prevalence is very low (17).

Tests used and identification of Brucella

Throughout the entire eradication scheme, the RBT was the principal test used. The early rapid drop in prevalence showed that the RBT was adequate at the beginning of the scheme (Table I).

In Malta, the RBT is used as a definitive test. The CFT was introduced to the Maltese islands in January 1996, hence during this study, CFT testing was in the preliminary stages, but was planned to be established as the confirmatory test for serial testing within the test and slaughter programme using RBT and CFT. However, some authors report that RBT has a lower sensitivity than CFT (6, 9, 11), although others argue that given appropriate antigen and antigen concentration, the RBT is more sensitive (7). Sensitivity may be compromised by large numbers of chronically infected animals (6). Furthermore, if sensitivity is not 100% then herd size has an effect on the probability of missing infected herds, since the smaller the herd, the smaller the chance of detecting at least one infected individual. Herd sizes in Malta vary greatly, but 25% of non-MDP herds have less than three animals, which
makes herd sensitivity lower than in larger herds. In the final stages of the eradication programme, a more sensitive and highly specific test is required to avoid a large number of false positives as the positive predictive values fall. The CFT test was introduced for this reason.

In addition to serology, milk ring tests play an important role in the monitoring of brucellosis. However, it is common in Malta for goat milk to be added to cow milk for MDP delivery. This reduces the sensitivity of the MRT (3, 12) because of the low content of antibodies and smaller fat globuli of small ruminant milk.

Isolation and identification of Brucella should be undertaken more regularly to eliminate the possibility of the presence of B. abortus. Brucella abortus has never been isolated from the islands although samples have also been sent to laboratories outside Malta.

The data in Figure 4b suggest that B. melitensis is the only Brucella species present in Malta. Fluctuations in cattle prevalence appear to be dependant upon, and follow, changes in goat prevalence (1). If B. abortus were present, one would expect independent fluctuations of species prevalence. Polydorou also made this observation in Cyprus (18). The risk that small ruminants pose to cattle justifies the stance of the Veterinary Service and KPH in discouraging mixed herds.

Brucella melitensis (biovar 1) is believed to be the most important Brucella species in Malta. Small ruminants, particularly goats, are the main hosts for B. melitensis and cattle become infected through contact with small ruminants as suggested in Figure 4b.

Identification of herds and individual animals
Identification of herds and individual animals is essential for the success of a test and slaughter programme (15, 17). Before 1995, not all herds were registered, although registration was demanded by legislation. Twice as many MDP sheep were tested in 1995 compared to 1994, indicating that registered MDP herds did not register all their animals.

Non-MDP herds are more difficult to monitor. For example, registration of herds on the island of Gozo in 1993 increased five-fold from 1994 to 1995. Although the number of herds registered on the island of Malta did not increase as dramatically as Gozo, numbers of goats registered tripled and numbers of sheep doubled from 1994 to 1995. The eradication scheme must therefore have been covering only a small proportion of non-MDP herds while missing many small ruminants in MDP herds.

The discrepancy between the number of herds identified and the actual animal population decreases the accuracy of prevalence estimates.

Milk and milk products
Goat milk presents the highest risk to public health because of the high prevalence of brucellosis in this species. Paying a premium price for goat’s milk would encourage farmers to register goat herds with MDP, and ensure pasteurisation of milk.

No specific quotas exist for small ruminant milk, which may be added to cow milk quotas. Quotas are expensive for small herds. If small ruminant milk were accepted by the MDP without being included in the quota system, farmers would be encouraged to deliver this milk to the MDP separately.

Pasteurisation of milk kills Brucella, however, failure in the pasteurisation plant would increase the risk of human infection through large-scale distribution of infected milk, especially since brucellosis prevalence is highest in MDP herds.

Product control, including monitoring of pasteurisation and cheese production and enforcement of labelling and packaging from home dairies, is now being co-ordinated by the VSD, the Directorate of Public Health, the Agricultural Department and the Department of Consumer Affairs.

Risk factors
Results suggest that MDP herds are at higher risk than non-MDP herds and that larger herds and herds including small ruminants are more prone to the occurrence of brucellosis. A multivariate analysis should be performed on data in the future to clarify the hypothesised risk factors more accurately.

The characteristics of MDP and non-MDP herds are different with respect to herd size (Fig. 2), species of livestock (Fig. 1) and objectives of milk production. Intensive husbandry, associated with larger herds, would increase intra-herd transmission (15). Turnover of stock is also greater in the larger, more commercial herds, increasing the risk of introducing an infected animal. Targeting larger herds more intensively may assist in the control of brucellosis.

Stratification of herds according to livestock types (Fig. 3) demonstrates that small ruminant herds have the highest prevalence and cattle-only herds have the lowest prevalence. Mixed herds fell between the two, suggesting that small ruminants posed a risk to cattle herds. The VSD and KPH discourage mixed herds.

Brucellosis prevalence in Malta is higher in goats than in sheep (Fig. 4); this contrasts with the observations of many authors in other countries (5, 11, 19). An explanation for the relatively low prevalence in sheep relative to goats may be that the Maltese sheep is more resistant to brucellosis than other sheep breeds (4). Introduction of exotic sheep breeds may have contributed to increased brucellosis prevalence.
Seasonality

Figure 5 indicates two distinct peaks of prevalence, one in May and June and another in September. The peaks are evident in both MDP and non-MDP herds, though more diffuse in non-MDP herds (1).

The season of goat parturition coincides with the first peak. Although it is difficult to be certain, the antibody rise associated with parturition may account for the peak in detection (16). The second peak may be associated with new infections; animals may become infected during the peak kidding season and subsequently show detectable antibodies after one to two months incubation (3). Sheep parturition also falls at the time of the second peak, this may increase detection of infected animals.

Goats in Malta have significantly higher brucellosis prevalence than sheep, although sheep milk is preferred in traditional cheese production. Fresh traditional cheese would be a seasonal commodity if production were reliant on the availability of sheep milk. In fact, when sheep lactation is low between April and August, the proportion of goat milk used for traditional cheese production is increased. This may relate to seasonal patterns in human brucellosis incidence (Fig. 4) and the correspondence with brucellosis prevalence in goats.

Patterns of seasonality may be used to focus testing at times of increased risk. Strict hygiene on farms, milk product control and public awareness could be intensified at this time.

Motivation of farmers

Motivation of farmers is crucial for the success of a disease eradication scheme. The VSD has played the principal role in raising farmer awareness regarding brucellosis in Malta. Incomplete registration of herds and animals, illegal movement of animals and poor co-operation during testing has contributed to inconsistent progress in the brucellosis eradication scheme. The KPH is collaborating with the VSD and the brucellosis eradication scheme by withholding membership of farmers who do not co-operate. The 1995 brucellosis outbreak also increased the awareness of farmers, since this caused a drop in cheese prices and farming families became infected with brucellosis.

MDP pays farmers the same price for milk from infected and non-infected herds. The fear of infected milk being diverted to uncontrolled market outlets has so far discouraged the MDP from reducing payment for infected milk. However, this also reduces the motivation of farmers to safeguard a brucellosis-free status.

Extension programmes through the VSD and KPH remain important in increasing awareness of brucellosis.

Human infection

Monitoring of livestock prevalence should enable early warning of increased human risk, permitting recognition and targeting of known higher-risk groups. Computerised information systems could facilitate interpretation of data and dissemination of information, which would be further enhanced by increased communication and collaboration of Veterinary Services, public health services, the dairy co-operative and farmers, in order to enable a rapid response to changes in animal prevalences. Figure 4 suggests the importance of monitoring animal brucellosis in preventing zoonosis.

Although public awareness of brucellosis in Malta is high, sixteen additional human cases were identified after the testing of family members of brucellosis patients. Under-reporting of human brucellosis cases has also been experienced in other countries (2, 10, 14).

The 25- to 34-year-old age group seems at increased risk of brucellosis in Malta, probably as a result of occupational infection. This overlaps with the age group most at risk in France (5). Public health services should focus on occupational groups at high risk such as abattoir workers and farmers. Further studies should be undertaken to assess the relationship between occupational exposure and brucellosis in humans.

Conclusion

This study presents the epidemiology of brucellosis on the islands of Malta over a ten-year period. Analysis of data demonstrated initial high prevalences before 1987, significant reduction in prevalences following the introduction of the brucellosis eradication scheme, and a recent outbreak. Investigation of herd test data has also revealed interesting epidemiological factors such as seasonality and associated risks of herd size and composition.

Eradication of brucellosis on the islands of Malta is a foreseeable goal. The 1995 outbreak has assisted the identification of weak links in the eradication scheme. Better enforcement of disease control regulations, motivation of farmers, inter-sectorial co-ordination and improved methods of testing would accelerate the eradication of brucellosis.

Acknowledgements

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Épidémiologie et prophylaxie de la brucellose chez les ruminants à Malte entre 1986 et 1996

B. Abela

Résumé
L'auteur étudie l'épidémiologie et la prophylaxie de Brucella melitensis à Malte à partir des résultats de tests pratiqués dans les élevages de ruminants et fournis par les Services vétérinaires maltais. Le programme d'éradication mis en œuvre, qui associait l'épreuve du rose Bengale aux mesures d'abattage sanitaire, a commencé en 1987.

La prévalence de la maladie dans les élevages bovins enregistrés auprès du Malta Dairy Products Limited (MDP) était de 23 % en 1987 ; ce taux est tombé à moins de 1,5 % en 1993 pour remonter à 13 % en 1995. Dans les élevages ne fournissant pas de lait au MDP, la prévalence était de 4 % en 1987 ; elle est passée en dessous de 1 % en 1994, pour se stabiliser à moins de 2 % en 1995. L'épidémie de 1995 a occasionné environ 300 cas de brucellose chez l'homme.

C'est dans les grands élevages de bovins ainsi que dans les élevages comportant des petits ruminants que le risque de brucellose était le plus élevé. Des variations saisonnières de la prévalence ont été observées. Une application plus stricte de la réglementation et une plus grande motivation de la part des éleveurs permettraient d'accélérer l'éradication de la brucellose à Malte.

Mots-clés

Epidemiología y control de la brucelosis en rumiantes en Malta de 1986 a 1996

B. Abela

Resumen
A partir de los resultados de análisis de rebaños de rumiantes, facilitados por los Servicios Veterinarios de Malta, se analizó la epidemiología y el control de Brucella melitensis en ese país. El plan de erradicación dio comienzo en 1987, con la introducción de una prueba de Rosa de Bengala y un programa de sacrificios sanitarios.

En 1987, los rebaños bovinos registrados con la empresa Malta Dairy Products Limited (MDP) exhibían una prevalencia de rebaño del 23%, cifra que había caído a menos del 1,5% en 1993. En 1995 la prevalencia ascendió hasta un 13%. Los rebaños que no servían leche a la MDP presentaban una prevalencia inicial del 4%, que bajó hasta menos del 1% en 1994, y en 1995 permanecía por debajo del 2%. La epidemia de 1995 causó aproximadamente 300 casos de brucelosis humana.
Los rebaños bovinos de gran tamaño y los que contenían pequeños rumiantes presentaban mayor riesgo de brucelosis. Había diferencias estacionales muy marcadas. Para acelerar la erradicación de la brucelosis en Malta será necesario sensibilizar a los productores y velar con más rigor por el cumplimiento de la normativa.

**Palabras clave**


**References**