Control of zoonoses in Cyprus

P. Economides
National Co-ordinator for the Mediterranean Zoonoses Control Programme, World Health Organization; Director, Veterinary Services, Ministry of Agriculture, Natural Resources and Environment, 1417 Nicosia, Republic of Cyprus

Submitted for publication: 20 August 1999
Accepted for publication: 27 January 2000

Summary
The excellent results achieved in the control of animal diseases in Cyprus have allowed the Veterinary Services to take a leading role in the elimination, surveillance and investigation of important zoonoses. The programmes for the control of echinococcosis, brucellosis, bovine tuberculosis, anthrax and taeniasis, and the measures taken to prevent the importation of rabies are described. Public awareness of the risks posed by the presence of zoonoses and the efficient and effective intersectoral co-operation achieved between the veterinary, medical, public health and other Government services and non-governmental organisations are considered to be the key to the successful control of zoonoses in Cyprus.

Keywords

Introduction
Cyprus is the third largest island in the Mediterranean, with an area of approximately 9,251 km². The island is situated in the north-east of the Mediterranean basin, 73 km south of Turkey, 106 km west of Lebanon and 250 km north of Egypt. The climate is semi-arid with relatively low rainfall in winter and a long, dry summer.

As a result of the invasion by Turkey in 1974, only 60% of the island is currently under the control of the Government of the Republic of Cyprus. The population is approximately 650,000, with 67.5% living in urban areas and 32.5% in rural areas.

Cyprus is predominantly an agricultural country, with both crop and livestock production. The animal population consists of 650,000 sheep and goats, 100,000 cattle and 650,000 pigs. Sheep husbandry is semi-intensive, practised mainly in the lowlands, whereas goats are mostly kept in the hilly areas. Beef and pork production is intensive and these farms are situated near the towns.

The annual reports of the Ministry of Health have shown a constant improvement of health indicators over recent years, demonstrating that Cyprus is one of the healthiest places in the Middle East. The World Health Organization recognises over a hundred important zoonoses for which animals act as the reservoir for disease in humans. Formerly, a number of these zoonoses were major problems in Cyprus, but with the advances made in veterinary public health, most of these diseases have been eradicated or are under control.

Tuberculosis, anthrax, echinococcosis, brucellosis and the taeniasis, *Taenia saginata* and *T. solium*, were all important zoonoses in Cyprus until the 1970s.

The very favourable animal health situation allowed the Veterinary Services of Cyprus to propose and implement programmes for the eradication of zoonoses such as echinococcosis and brucellosis and the reduction of salmonellosis and other food-borne diseases. The success of these programmes was due to the careful organisation of the department and the high level of training of staff, together with the close and effective inter-sectoral co-operation which...
has been achieved with medical and public health services, other Government services, organisations and private services.

Zoonoses under control

**Echinococcosis/hydatidosis**

**Before the 1971 control programme**

Echinococcosis/hydatidosis (Echinococcus granulosus) was widespread in Cyprus before the 1970s. Almost every mature food animal was heavily infected, thus presenting a very serious public health problem. The factors contributing to the perpetuation of the disease in the island were the large number of stray dogs, the uncontrolled slaughter of animals and the indiscriminate disposal of infected offal in the vicinity of abattoirs or in fields, in addition to the lack of knowledge regarding the disease on the part of the general public.

Figures from 1950 show that the incidence in ewes in some districts was as high as 80%-100%. By 1970, data over a seven-month period demonstrated that the highest incidence island-wide was in cattle over five years of age (62.9%), followed by sheep over twelve months of age (49.2%) (19).

**The echinococcosis control programme (1971-1985)**

As a result of the seriousness of the disease, a campaign to control echinococcosis was implemented by the Department of Veterinary Services in 1971.

The campaign included the following measures:

- control of stray dogs (85,727 dogs were exterminated) (17)
- compulsory registration of dogs with the authorities of the village or town and with the teams of the echinococcosis control programme
- mass spaying of female dogs for the control of reproduction (13,536 dogs spayed) (17)
- imposition of high registration fees for the ownership of unspayed female dogs
- compulsory arecoline testing of all dogs for echinococcosis every three months (euthanasia of all positive dogs) (18, 19)
- slaughter control
- education of the public.

The above measures reduced the percentage of infection in farm dogs from 14.1% in 1972, to 0% in 1984 and 1985, with the same results achieved in pet dogs and hunting dogs by 1982 and 1983, respectively (17).

The campaign of 1971-1985 achieved excellent results in livestock and can be favourably compared with successful programmes in other countries.

Between 1971 and 1985, the percentage of infected livestock over two years old was reduced. In sheep, infection was reduced from 50%-60% to 0.11%, in goats from 14.5% to 0.01%, in pigs from 18.6% to 0.04% and in cattle from 38.9% to 0.87% (17).

**The period between 1985 and 1993**

**Echinococcosis/hydatidosis infection in dogs and livestock**

After 1985, echinococcosis/hydatidosis was reported to have been eradicated from dogs, livestock and humans (18). Sporadic cases of hydatid cysts, which were detected upon slaughter, were mostly considered to be due to the smuggling of animals from the occupied areas of the island. In 1993, indisputable evidence of infection was found in livestock which were not introduced from the occupied areas, but were born and reared in the free areas. As a result of these findings, a detailed investigation was undertaken, covering the period from 1989 to 1993, which showed that the infected animals originated from 48 villages. In total, 51 cattle, 105 sheep and 5 goats, aged between 5 and 10 years, were found to have hydatid cysts (5).

The cysts found during meat inspection were sent to the Laboratory of the Department of Veterinary Services for verification. This was followed by visits to the farms concerned by veterinary personnel to investigate the problem with the farmers and local authorities in order to ascertain whether the infected animals were born and reared in these villages. Fifty-one infected dairy cattle were detected which had been kept continuously on the farms from birth, thus providing strong evidence that the infection was not introduced from the occupied areas. These cattle were kept on twenty-four farms in fourteen villages. Furthermore, the smuggling of dairy cattle to the free areas of Cyprus has never been reported (5).

A testing programme followed in May 1993, covering all dogs in the forty-eight ‘infected’ villages. In total, 2,391 dogs were tested with arecoline and sixteen (0.7%) were found to be infected with E. granulosus. These infected dogs were found in six villages in Nicostia district and in two remote villages of Paphos district which are situated far from the occupied areas of the island.

These cases of infection prompt the questions of how the disease re-appeared in the Government-controlled areas and whether the disease was eradicated or not. Given that hydatid cysts develop gradually over one to five years in livestock, these findings suggest that after 1985, a low re-contamination of the environment with E. granulosus eggs occurred from infected dogs (the infected animals were between five and ten years old). In the case of the two villages in Paphos district and the one village in Limassol, where infected livestock and dogs were found, it can be concluded that the cycle of this disease was operating at low levels in these locations. Another important proof is the detection of infected animals from the
same herds repeatedly over a period of six years. The two villages in Paphos and the one in Limassol are isolated, situated far from the occupied areas. However, this situation may not be limited to the three isolated villages, but could well be the case for villages in the other districts. This situation is in line with the developments in the programmes in New Zealand and Tasmania, in which similar methods were used and where infections occurred in a large number of sheep flocks for many years after the attack phase, despite a drastic reduction in the percentage of infected sheep (10, 11, 14, 15).

The low levels of infection can be attributed to the limitations of the arecoline test. This test is particularly unreliable when the taenia burden is low, i.e. the lower the infection burden in the dog, the greater the number of false negative results of the test (9, 21).

The author concludes that the cycle of the disease was locally operating in some foci and in other foci was initiated by the smuggling of infected livestock or the movement of infected dogs from the occupied areas. The extent to which each of these three mechanisms played a role in the persistence of disease cannot be ascertained, but can be indicated roughly by the location of the foci and the results of the epidemiological investigation (6, 7).

The Department of Veterinary Services prepared an emergency plan for the prevention of spread and eventual eradication of echinococcosis from the areas where the disease was detected. This plan was submitted to the Council of Ministers and was subsequently approved. The programme was of five years duration, commencing in March 1994, and was implemented by the Department of Veterinary Services in co-operation with the police and the Ministries of Health, Interior and Justice (6, 7, 22).

Control measures
In all infected villages, veterinary officers and health inspectors informed the public of the methods of disease spread and prevention. In addition, a media campaign which included publications and television programmes was mounted for the general public. At the same time, in the infected areas and the United Nations protected areas, a systematic campaign for the control of stray dogs was organised, with the assistance of the police, the United Nations Peacekeeping Force in Cyprus (UNFICYP) and the Game Reserve Service. This is a very important measure, as these stray dogs constitute a danger in terms of the spread of echinococcosis. Registration and examination of all owned dogs has commenced.

The measures which are implemented for the control and eradication of the disease in the infected villages are as follows:
- measures to halt the smuggling of animals from the occupied areas
- control of stray dogs
- registration of owned dogs
- testing a representative number of dogs once a year with the arecoline test or coproantigen enzyme-linked immunosorbent assay (ELISA)
- treatment of all imported dogs and cats with praziquantel
- treatment with praziquantel of dogs from infected villages with hydatid or Cysticercus tenuicollis cysts two to three times every year
- control of movements of livestock and dogs from infected to uninfected villages
- marking and control of movements of animals from infected flocks or herds
- prosecution of those who slaughter illegally in slaughterhouses or in places which are not approved
- inspection of all animals slaughtered for hydatid cysts and Cysticercus tenuicollis
- the burial or safe destruction of carcasses or offal of livestock
- education of the public
- education of dog owners to encourage the correct feeding of dogs.

Transmission between dogs and livestock
Between 1993 and 1994, arecoline testing of 9,831 dogs in the infected villages revealed twenty-two infected dogs (0.2%).

Between 1996 and 1998, out of a total of 5,558 dogs tested using a coproantigen ELISA, *E. granulosus* was detected in only one animal (0.02%) (6, 7, 8).

Overall, between 1994 and 1998, inclusive, 169 infected animals were detected in sixty-six different villages. This involved seventy-eight animals in 1994, forty-five in 1995, sixteen in 1996, twelve in 1997 and eighteen in 1998 (Table 1).

Comparison of the percentage infection levels in 1994 and 1998 demonstrates a significant decline in incidence in all species (in cattle from 0.14% to 0.02%, in sheep from 0.03% to 0.006% and in goats from 0.01% to 0.003%). The average

---

**Table 1**

**Number of infected animals at slaughter, 1994-1998** (22)

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Cattle</td>
<td>20</td>
<td>6</td>
<td>3</td>
<td>3</td>
<td>4</td>
<td>36</td>
</tr>
<tr>
<td>Sheep</td>
<td>44</td>
<td>33</td>
<td>12</td>
<td>9</td>
<td>9</td>
<td>107</td>
</tr>
<tr>
<td>Goats</td>
<td>14</td>
<td>5</td>
<td></td>
<td></td>
<td></td>
<td>19</td>
</tr>
<tr>
<td>Number of infected animals</td>
<td>78</td>
<td>45</td>
<td>16</td>
<td>12</td>
<td>18</td>
<td>169</td>
</tr>
<tr>
<td>Number of villages</td>
<td>22</td>
<td>23</td>
<td>13</td>
<td>7</td>
<td>13</td>
<td></td>
</tr>
</tbody>
</table>
Infection levels during the period 1994-1998 were 0.041% for cattle, 0.014% for sheep and 0.0034% for goats.

Transmission between dogs and humans
The findings in animals prompted an investigation of the disease in humans. All surgical records regarding cystic operations in the Government hospitals from 1980 to 1998 were collected. Unfortunately, although the disease is notifiable, no statistics on such operations were kept by private clinics. Surprisingly, this study showed that 160 operations were performed during this period (S. Demetriou and A. Nouska, unpublished findings; Chr. Hadjia nastasiou, personal communication). The actual number of cases was greater than 160, since those from private clinics were not included. The study also showed that no case of cystic echinococcosis had occurred in those under the age of twenty in the areas controlled by the Government. Other reports revealed that three cases occurred in patients under twenty years old in the occupied areas (M.A. Gemmel, unpublished findings). This implies that the cases observed in the general survey were mainly latent infections and that transmission between dogs and humans had ceased in the Government-controlled area of the Republic shortly after the introduction of control.

In the occupied area of Cyprus, the disease is very common and has become a significant public health concern (2).

Brucellosis

Brucella abortus

Brucella abortus was accidentally introduced into Cyprus by a consignment of dairy cattle imported from the United Kingdom (UK) in 1921. The infection spread to an alarming extent among the herd at Athalassa Government farm and from there, to privately owned dairy herds. The disease proved difficult to control with the resources and facilities available at that time and a continued effort over eleven years was required to eradicate B. abortus by enforcing basic hygiene measures, isolation and separate rearing of calves born to cows which were positive reactors (20, 22).

Brucella melitensis

In 1930, in an attempt to upgrade the local breed of goats, a consignment of thirty pregnant goats was imported from Malta. The goats were serologically negative when examined in Malta and after arrival in Cyprus. Two months later, one of the goats aborted and two strong serological reactors were detected. Both were immediately slaughtered and the remainder of the animals were kept in indefinite quarantine. Another reactor was found in 1932, after which no more cases were reported. No evidence exists to suggest that infection spread to the local goat population.

For approximately thirty years, no brucellosis was diagnosed and the island was considered free of the disease. In February 1964, during an investigation of abortion, Brucella antibodies were detected in milk and blood samples. Nine dairy cows and two bulls which were seropositive were slaughtered and the owner was compensated.

In 1970, during an investigation of cases of abortion in sheep and goats, seventeen strains of B. melitensis were isolated and sent to the Central Veterinary Laboratory, Weybridge, UK, where they were typed as B. melitensis biotypes 1 and 2.

A subsequent investigation traced the infection in only three dairy herds. Bacteria isolated from the placenta of cows and from milk were identified and typed as B. melitensis biotype 1.

A serological survey in sheep, goats and cattle using the complement fixation test (CFT) indicated that the rate of infection was very low. In the infected areas, the rate of infection was 3.50% in goats, 1.15% in sheep and 3.54% in cattle. The potential threat to public and animal health from this disease necessitated an eradication campaign based on testing and slaughter of positive reactors.

For the examination of all sheep and goat flocks, the intranasal allergic skin test was used. All sheep and goats in flocks which showed one or more reactors to the allergic test were ear marked and bled for serological examinations using the standard agglutination test (SAT), the CFT and the rose bengal plate test (RBPT). All reactors to any of these tests were removed from the flock with a minimum of delay and were slaughtered at the slaughterhouse of the Veterinary Department at Athalassa. The owners of the slaughtered animals were compensated.

All cattle were serologically tested using SAT, CFT and RBPT, any positives reactors were slaughtered and the owners compensated.

The campaign lasted until 1985 and was supported by legal orders enabling restriction of the movement and sale of animals from infected flocks, together with general hygiene measures. Education of farmers and the public, and research into the epidemiology of the disease were also integral to the control. Data demonstrating the reduction of the infection levels is presented in Table II.

For the success of the campaign, the co-operation of the Ministry of Health, the Ministry of Interior and the police was very useful and important.

After 1986, an annual blood sampling of sheep, goats and cattle was established which was able to test, with 95% confidence, for the presence of brucellosis at a level higher than 1%. The negative results obtained in this testing confirm the eradication (22).

No cases of brucellosis were reported by the Ministry of Health from 1995 to 1999.
**Bovine tuberculosis**

Bovine tuberculosis was recorded for the first time in 1922. Infection was introduced by imported dairy cattle from the UK. In two years, the disease had spread and was established in the Government farm and many private dairy farms. Bovines of the local breed which were used as working animals were generally not affected.

For the control of tuberculosis, a programme of testing and slaughter was introduced and the disease was brought under control in 1928, when the annual tuberculosis testing detected no reactors.

Testing of all cattle over six months and slaughterhouse inspection reports since 1928 confirm that bovine tuberculosis has been eradicated. The last tuberculin testing was completed in 1994 and revealed no reactors (22).

No cases of avian tuberculosis have been diagnosed during the last twenty years (22).

Human tuberculosis is a minor public health problem, but neither cattle nor swine appear to be affected.

During the years 1995, 1996, 1997 and 1998, the number of cases of tuberculosis was thirty-seven, twenty-four, forty-seven and forty-five, respectively. From January to June 1999, twenty-six cases were reported by the Ministry of Health.

**Anthrax**

Anthrax was formerly one of the most serious diseases of sheep and goats in Cyprus, causing severe economic losses. Human infections were not uncommon in the early part of the twentieth century. Fortunately, the disease has declined steadily since 1950. The last case was diagnosed in 1968. No human cases have been reported during the last fifty years.

The decline of the incidence of anthrax can be attributed to the systematic, compulsory, annual vaccination of all sheep and goats on the island. The vaccine used was the stem vaccine which is a non-capsulated living spore produced locally by the Central Veterinary Laboratory in Nicosia.

After 1968, vaccination was ceased in sheep and goats in some areas and the number of unvaccinated animals was gradually increased until 1975, when no vaccinations were performed. No vaccination against anthrax has been performed since, and no cases have occurred in animals (22).

**Taeniasis**

*Taenia saginata*, the beef tapeworm, was formerly a problem in humans and cattle, but has since disappeared due to improvements in rural sanitation.

*Taenia solium*, the pork tapeworm, constituted a serious public health problem in the 1950s, but has now also disappeared due to the improvement of rural sanitation and the change in pig production from extensive to intensive farming systems (22).

No cases of taeniasis in humans are reported. The elimination of these two taeniases is a remarkable achievement which is due to the co-operation between veterinarians, doctors and public health inspectors in the implementation of rural health sanitation programmes.

**Zoonoses under border controls**

**Rabies**

Rabies is unknown in Cyprus; the disease has been reported only twice in quarantine (in the 1930s). All imported dogs and cats need an import permit and official veterinary certification that the animal is healthy and has been

---

**Table II**

Results of examination of sheep and goats for brucellosis (1973-1980) (22)

<table>
<thead>
<tr>
<th>Year</th>
<th>Total animal population *</th>
<th>Number of allergic skin tests performed</th>
<th>Number of blood samples examined</th>
<th>Number of positive samples</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Sheep</td>
<td>Goats</td>
<td>Sheep and goats</td>
<td>Sheep</td>
</tr>
<tr>
<td>1973</td>
<td>368,400</td>
<td>224,732</td>
<td>583,132</td>
<td>312,925</td>
</tr>
<tr>
<td>1974</td>
<td>164,858</td>
<td>116,906</td>
<td>281,764</td>
<td>ND</td>
</tr>
<tr>
<td>1975</td>
<td>199,864</td>
<td>154,972</td>
<td>354,836</td>
<td>ND</td>
</tr>
<tr>
<td>1976</td>
<td>251,198</td>
<td>240,064</td>
<td>491,262</td>
<td>212,726</td>
</tr>
<tr>
<td>1977</td>
<td>265,561</td>
<td>205,470</td>
<td>470,031</td>
<td>277,634</td>
</tr>
<tr>
<td>1978</td>
<td>266,875</td>
<td>208,836</td>
<td>475,711</td>
<td>433,808</td>
</tr>
<tr>
<td>1979</td>
<td>255,710</td>
<td>188,672</td>
<td>444,382</td>
<td>219,543</td>
</tr>
<tr>
<td>1980</td>
<td>260,533</td>
<td>197,271</td>
<td>457,804</td>
<td>194,006</td>
</tr>
</tbody>
</table>

* includes approximately 20% lambs or kids
ND: no data available
vaccinated against rabies. Upon arrival, a booster vaccination with an inactivated rabies vaccine is administered to all dogs and cats, which are kept under close veterinary supervision at a suitable facility provided by the owner for six months, before being allowed free movement. No cases of rabies have ever been reported in humans (22).

**Trichinellosis**
Between 1970 and 2000, more than 50,000 samples from pigs were tested for the presence of Trichinella spiralis and no sample was found to be positive. Special conditions are imposed on imports of live animals and animal products for the prevention of the introduction of trichinelliosis in Cyprus. Based on this surveillance, Cyprus is considered to be free from this disease (22). No cases in humans have ever been recorded.

**Zoonoses under investigation**

**Leishmaniasis**
Cases of leishmaniasis in humans are rare. However, the information available on the prevalence, distribution and public health significance of this infection in Cyprus is limited.

Very few reports have described cases of human visceral leishmaniasis and cutaneous leishmaniasis (4, 23). The potential vector of the disease is Phlebotomus tobbi. In addition, P. papatasi, P. sergenti, P. jerseifl, P. gallinaceus, P. alexandri, P. mascittii and P. economidesi have been detected during several surveys since 1944 (1, 12, 13, 16). Canine leishmaniasis, which seemed to be widespread between 1940 and 1960, in coastal areas, has virtually disappeared as a result of the drastic reduction of the dog population during the anti-echinococcosis campaign of 1970-1985 (20). Since 1986, the dog population has increased significantly. No proven cases of visceral leishmaniasis have been reported in dogs during the last twenty years.

In 1996, a serological survey, undertaken in collaboration with the Institute of Parasitology of Zurich University, revealed seropositive dogs (3). Out of 601 samples examined by ELISA, 1.7% were positive. In a second sampling of regions where seropositive dogs were found in the first survey, 10% of the 301 dogs examined showed specific anti-leishmania antibodies in ELISA. In some regions, the seroprevalence rates were over 20%. Lymph node aspirates from ten seropositive dogs were found in the first survey, 10% of which were seropositive by PCR. All isolates were promastigotes detected by Leishmania cultured and dogs with and without clinical signs of leishmaniasis were examined by ELISA. In some regions, the seroprevalence rates revealed seropositive dogs (3). Out of 601 samples examined by ELISA, 1.7% were positive. In a second sampling of regions in which the sheep and goats were kept (22).

**Leptospirosis**
Leptospirosis is generally considered a serious disease and usually affects all species of animals. Following the detection of some positive cases in imported calves during 1983, 507 sera from sheep, 195 sera from goats and 261 sera from cattle were examined by the lysis microagglutination test (dark field illumination). These samples were collected from animals in areas in which the outbreak of the disease in imported calves was recorded. The antigens used for the lysis test were live cultures of Leptospira in liquid media. All samples were negative, but serological tests are continuing. A serological survey in pigs revealed positive titres to L. autumnalis and L. bratislava, a problem which requires further investigation (22).

**Rickettsiosis**
Cases of Q fever were first reported in Cyprus in 1951, when complement fixing antibodies to Coxella burnetii were detected in twenty-four of sixty sheep and eleven of thirty-one goats. In the subsequent years, other serious animal disease problems assumed greater importance than investigation of this disease, particularly as no clinical cases of Q fever were reported in humans. The problem re-emerged towards the end of the 1960s, when a survey of 547 people detected fixing antibodies to phase 2 Q fever antigen in 5.3% of serum samples. Serological tests for C. burnetii were conducted on as many aborting livestock as possible. During 1974 and 1975, a massive outbreak of abortions due to Coxiella was reported in sheep and goat flocks kept within the British Military Base at Dhekelia (22).

During the same period, an outbreak of Q fever also occurred in British troops stationed at Dhekelia, and epidemiological investigations revealed that the infection was almost certainly acquired by inhalation of dust-borne rickettsiae from the areas in which the sheep and goats were kept (22). In 1994, a contract between the European Economic Community, the University of Crete, the Veterinary Services of Cyprus and the University of Marseilles was signed for the study of spotted fever group rickettsiae. Results indicate that a problem exists with Rickettsia conorii, C. burnetii and R. typhi in humans and animals (Y. Tselentis, personal communication).

Two geographical areas were recognised as having a high prevalence of rickettsioses. In ticks collected from dogs, sheep and goats in these areas, R. conorii was detected by PCR. The
The proportion of ticks infected was 3.9% (74/1,888). *Rickettsia conorii* was also isolated from blood samples of febrile patients (Y. Tselentis, personal communication).

The study has revealed the following:
- 44.6% of the human population were seropositive to *R. conorii*
- 52.7% of the human population were seropositive to *C. burnetii*
- 46.8% of the human population were seropositive to *R. typhi*

During the study, strains of *R. typhi* and *C. burnetii* were isolated from humans with clinical symptoms of rickettsioses.

**Food-borne infections**

*Salmonella*, *Listeria*, *Campylobacter* and Staphylococcus are the principal bacteria with potential to harm people through consumption of contaminated food.

The Veterinary Services of Cyprus, as the competent authority for the hygiene control of meat, milk and other foods of animal origin, has recently intensified efforts to improve food hygiene and has succeeded in reducing the level of contamination in foods and subsequently the incidence of food-borne infections (22).

**Salmonellosis**

Outbreaks of salmonellosis in animals are rare, occurring mostly in young animals and poultry chicks. Over the years, more than 150 different serotypes of *Salmonella* have been isolated, including *S. Typhimurium* and *S. Enteritidis*. However, Cyprus is free from *S. Gallinarum* and *S. Pullorum*.

From 1985 to 1996, 110 cases of *Salmonella* were reported, however this figure does not include cases from the private sector, and is therefore a definite underestimate of the problem.

The continuous bacteriological examination of foods of animal origin at the Veterinary Laboratory for the Control of Foods of Animal Origin, Athalassa, shows that the highest incidence of contamination with salmonellae occurs in poultry meat.

During the period from 1993 to 1999, the percentage of poultry meat contaminated with *Salmonella* varied from 25.4% to 79.5%.

The contamination of milk products with *Salmonella* is negligible. Out of 19,615 samples examined, a single sample was found to be positive, and investigations have shown that one of the food handlers at the dairy was a carrier.

Eggs are tested for the presence of *Salmonella* on the shell and in the contents. To date, no *Salmonella* has been isolated in the egg contents and only a very small number of shells were found to be contaminated.

*Salmonella Enteritidis* was the most predominant serotype during the years 1990, 1992, 1993, 1994 and 1997, while *S. Hadar* was the predominant serotype isolated in the years 1991, 1995 and 1996, and *S. Typhimurium* and *S. Infantis* in 1998.

Food handlers are required to undergo medical checks, which include bacteriological examinations of faecal samples for *Salmonella*, before being granted a licence to work in any food processing establishment.

The number of cases in humans reported by the Ministry of Health for the years 1996, 1997, 1998 and 1999 were 52, 75, 148 and 99, respectively. These numbers underestimate the problem, as cases from the private sector are not included.

Systematic inspections of farms, slaughterhouses, dairies and food-processing establishments, in addition to other hygiene measures, have contributed to the decline in *Salmonella* incidence in foods of animal origin (22).

**Campylobacter infection**

Contact with infected animals and consumption of contaminated water or foods of animal origin are the main causes of human infection with *Campylobacter*. Poultry meat has been incriminated as one of the main sources of human infection.

Special studies undertaken by the Veterinary Laboratory for the Control of Foods of Animal Origin, Athalassa, have revealed a high rate of contamination of poultry meat, especially quails with thermophilic *Campylobacter*. Contamination rates of up to 90% were found (in quails), but the average is approximately 60%. *Campylobacter jejuni* was found to represent 60% of the isolates, and *C. coli*, 40% of isolates (22).

**Listeriosis**

Serological evidence of listeriosis was first reported in Cyprus in 1979. *Listeria monocytogenes* was isolated for the first time in 1983, from carcasses of horses which died suddenly (22).

The Department of Veterinary Services performs examinations for *Listeria* in meat and dairy products. When positive samples are detected in processing plants, operations are suspended until the danger of *Listeria* contamination is eliminated. The presence of this pathogen in foods is very rare.

No information on cases of listeriosis in humans is available.
Conclusion

The prevention, control and eradication of zoonoses require close co-operation, primarily between the veterinary public health and the medical services and also from a number of other services and organisations.

Intersectoral co-operation between all interested services for control of zoonoses in most countries has much room for progress and development. Much effort is required to overcome obstacles such as conflicts of opinion, difficulties in communication and co-ordination, and to establish effective and efficient collaboration between professionals and representatives of different sectors.

Inter-professional training, joint planning, exchange of information, motivation of co-operation between professionals, control of individual interests by professionals and the establishment of a co-ordinating body are some of the tools which could help to achieve the much needed co-operation.

Public health education, community sanitation and motivation, both in rural and urban areas, are very important and powerful tools in the planning and implementation of control programmes for zoonoses.

The author believes that the success of control programmes for zoonoses in Cyprus was due to the following:

- the efficiency of the Veterinary Services in planning and implementing the control programmes
- the devotion to duty of veterinary personnel involved in the control programmes
- the political support which was developed by public awareness of the health risks involved
- successful and effective intersectoral co-operation.

The Veterinary Services co-operate with the following groups and Services for the control of zoonoses and food-borne diseases (22):

- Medical and Public Health Services of the Ministry of Health
- State General Laboratory, Ministry of Health
- municipal or community authorities
- the police, Ministry of Justice and Public Order
- Game and Fauna Service, Ministry of Interior
- Ministry of Education
- animal welfare organisations
- National Guard
- Animal Husbandry Section of the Department of Agriculture, Ministry of Agriculture, Natural Resources and Environment
- Department of Fisheries of the Ministry of Agriculture, Natural Resources and Environment
- Department of Customs and Excise of the Ministry of Finance
- the State and private radio and television stations
- the local press (newspapers and periodicals)
- the community (participation which was achieved by public education).

Acknowledgements

The assistance of Dr M. Papaprodromou, Senior Veterinary Officer, Dr Ch. Kakoyiannis, Veterinary Officer A, Dr Ch. Taliotis, Veterinary Officer A, Dr G. Christofi, Veterinary Officer A and Mr K. Thrasou, Veterinary Inspector, Veterinary Services, in the preparation of this report, is gratefully acknowledged.
Le contrôle des zoonoses à Chypre

P. Economides

Résumé
Les excellents résultats obtenus dans la lutte contre les maladies animales à Chypre ont permis aux Services vétérinaires de jouer un rôle de premier plan dans l'identification, la surveillance et l'éradication d'importantes zoonoses dans ce pays. L'auteur décrit les programmes de contrôle de l'échinococcose, de la brucellose, de la tuberculose bovine, de la fièvre charbonneuse et du téniasis, ainsi que les mesures prises pour éviter l'introduction de la rage. La sensibilisation du public aux risques posés par l'existence de zoonoses et la coopération mise en place entre les Services vétérinaires, médicaux, de santé publique et les autres services publics ou non gouvernementaux ont été les clés du succès du contrôle des zoonoses à Chypre.

Mots-clés
Chypre - Coopération - Programmes de contrôle - Services vétérinaires - Surveillance - Zoonoses.

Lucha contra las zoonosis en Chipre

P. Economides

Resumen
Sus excelentes resultados en la lucha contra las enfermedades animales han conferido a los Servicios Veterinarios de Chipre un papel destacado en la eliminación, vigilancia e investigación de importantes zoonosis. El autor describe los programas de lucha contra la equinococosis, la brucelosis, la tuberculosis bovina, el carbuco bacteridiano y la teniasis, así como las medidas adoptadas para impedir la penetración de la rabia en el país. En su opinión, el éxito de esos programas de control zoosanitario se debe esencialmente a dos factores; por un lado la conciencia pública de los riesgos asociados a las zoonosis; y por el otro la eficacia del trabajo cooperativo intersectorial que han realizado los servicios veterinarios, médicos, de salud pública y otros servicios públicos y estructuras de la sociedad civil.

Palabras clave

References


