Current control strategies targeting sources of echinococcosis in Japan

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Summary
The authors describe the current control strategies targeting definitive hosts of the most important zoonotic parasite in Japan, Echinococcus multilocularis. A dramatic increase in the prevalence of echinococcosis in foxes in Hokkaido (the second largest of Japan’s islands), the invasion of wild foxes into urban areas, infection among pet and stray dogs, and the possibility of spreading the disease to the main island of Japan (Honshu) – all these pose significant threats to public health. Previous research findings and current strategies such as control measures against infections in wild foxes, suggest that it will be possible to eliminate echinococcosis in the future. The enforcement of a national reporting system for veterinarians, international collaboration, and the establishment of a Forum on Environment and Animals (FEA) give further reason to believe that success is possible. This is the first report of a multifaceted control strategy against echinococcosis in definitive hosts that includes collaborative efforts with local residents. This model might provide new ideas for Veterinary Services worldwide in their efforts to control other related zoonotic diseases.

Keywords

Introduction
Echinococcosis is caused by the tapeworm parasite Echinococcus multilocularis. The disease produces primarily hepatic, and to a lesser extent pulmonary and cerebral, disorders in humans. This disease, usually termed alveolar echinococcosis, is considered to be one of the most serious zoonoses in the northern hemisphere. The parasite is maintained in a transmission cycle involving voles (rodent intermediate hosts) and red foxes (definitive hosts), domestic dogs that prey on wild rodents are also presently an emerging concern.

The echinococcosis endemic area in Japan is restricted to the northern island of Hokkaido (total area 83,451 km²), although sporadic human cases are reported on other islands (7) and infected pigs are documented on the main island of Honshu (14). Lately, the threat that echinococcosis might spread to Honshu has raised fears. Reports claim that 2 out of 69 dogs that were moved from
Hokkaido to Honshu were found positive by *E. multilocularis* coproantigen examination (15), and a dog transported to the main island was found to be excreting *E. multilocularis* eggs. In September 2005, a stray dog in Saitama prefecture (Honshu) tested positive for *E. multilocularis* infection. It has been estimated that nearly ten thousand pet dogs are transported each year to and from Honshu and Hokkaido by plane and ferry; this potentially includes up to 30 *E. multilocularis*-infected animals per year (8). There is no compulsory quarantine for dogs transported within Japan and animals are not examined for the presence of *E. multilocularis*. This problem, however, could be easily dealt with by requiring anyone wanting to move a dog between islands to obtain a certificate from a veterinarian stating that the animal has been treated with praziquantel three to four days before travelling.

Previous advances, such as the establishment of a laboratory host model for the complete life cycle of *E. multilocularis*, made it easier and safer to study clinical aspects, diagnosis, and treatment (13). This model led to the development of a monoclonal antibody-based (EmA9) sandwich enzyme-linked immunosorbent assay (ELISA) for coproantigen detection that significantly improved diagnostic capabilities (19). Current control programmes instituted by the World Organisation for Animal Health (OIE) Reference Laboratory for echinococcosis in Japan reveal that an effective countermeasure against the disease is to target the fox definitive host population by anthelmintic baiting. The government of Japan has also responded to the challenges and output of the OIE Reference Laboratory by designating echinococcosis as a Category 4 disease under the Infectious Disease Law, which means that there must be a mandatory national reporting system for the disease. International collaboration enhances the exchange of knowledge and techniques to further redefine control measures against echinococcosis. Cooperation from private veterinarians and local residents through the Forum on Environment and Animals (FEA [see later section]) has also provided a significant contribution to the current control strategies.

Future strategies recommended by the OIE Reference Laboratory for echinococcosis aim to significantly reduce, if not to eliminate, *E. multilocularis* infection in the definitive host. Several measures have been taken and more are in line for evaluation and further investigation. Anthelmintic baiting systems are being studied with the aim of designing strategic modifications which will result in an efficient and cost-effective control programme against infection in fox definitive hosts. The results of research presently being conducted in Honshu are expected to rally behind policies that might require compulsory echinococcosis examination or deworming prior to transportation of dogs and cats from Hokkaido to other locations in Japan.

**Echinococcosis in Japan**

The history of echinococcosis in Japan started when Rebun Island, a small northern island off Hokkaido, became an endemic region. Foxes were introduced from the Kurile Islands between 1924 and 1926 for fur production and to control the vole population, primarily *Clethrionomys rufocanus* (27). A high prevalence of *Echinococcus* infection was reported not only among the red fox population (*Vulpes vulpes*) but also among stray dogs. The parasite was completely eliminated by intensively hunting foxes and culling all dogs on the island. In 1966, however, echinococcosis was diagnosed for the first time in the eastern part of Hokkaido. Re-introduction of the parasite into Japan is believed to have been from infected foxes wandering on drift ice from Russian islands or from infected dogs transported with repatriates after World War II (17). Thereafter, distribution of the parasite gradually expanded and at present, *E. multilocularis* is reported throughout the island of Hokkaido (Fig. 1).

The early human cases of alveolar echinococcosis were reported from Sendai on northern Honshu in 1926 and on Rebun Island in 1937. Since then, around 400 human cases have been diagnosed in Hokkaido and 5 to 19 (mean = 11) new patients have been reported every year since 1982. Between 1937 and 1997, 373 people underwent surgery to remove multilocular echinococcosis cysts. One study calculated that the rate of occurrence during the endemic period (1988 to 1994) was 48 cases per 100,000 residents every year (20).

The prevalence of echinococcosis in foxes in Hokkaido has dramatically increased over the past two decades. In 1985, less than 10% of foxes were reportedly infected and this rose to 58.4% in 1998. By 2002 the prevalence had fallen to just over 30% (Fig. 2), but it has been steadily increasing again over the past few years. Necropsy surveys conducted by the Laboratory of Parasitology at the Graduate School of Veterinary Medicine of Hokkaido University (situated in the suburbs of Sapporo, the capital city of Hokkaido) showed a high prevalence of infection in foxes, which rose from 54% in 1997 to 56% in 1999 (18, 31).

The invasion of red foxes into urban areas increases the infection risks in densely populated areas. An emerging concern with echinococcosis in foxes is the possibility of an urban cycle of *E. multilocularis* (such a cycle has already been reported in several European cities [11]). Surveys in Sapporo, either by necropsy or coproantigen detection, registered the presence of *Echinococcus*-infected foxes in parks and woodlands within the city (22, 29). Another survey reported that large numbers of fox faeces contaminated with *E. multilocularis* coproantigen were found in urban areas adjacent to recreational parks (10). Furthermore, this same survey reported that suitable intermediate hosts had been trapped in these particular
areas. Although none of the wild rodents captured were infected, there is a strong indication that an active urban cycle in Sapporo could be in the making. Pet dogs taken for outdoor walks are more likely to prey on infected rodents in suspected areas. This potential infection increase for people in urban areas who frequently visit recreational parks on urban fringes calls for the immediate implementation of control campaigns.

There have been very few studies on the prevalence of echinococcosis in dogs in Hokkaido. A coproantigen survey of Echinococcus infection in pet dogs, undertaken from April 2003 to February 2004, found 3 out of 1,136 dogs to be positive. Between September 2003 and February 2004, 2 out of 69 dogs were found to be positive for Echinococcus coproantigens (M. Kamiya, unpublished findings). Dogs are taken from Hokkaido to other parts of Japan when dog-owners move house or go on holiday. In some endemic areas such as Gansu (the People’s Republic of China) and on St. Lawrence Island (Alaska, United States of America), dogs appear to play an important role both in the maintenance and transmission of echinococcosis to humans (5). In one study of low prevalence regions, it was estimated that more than 10% of dogs were infected at least once in their lifetime (6).

In Japan, there has only been one documented case of cats with adult E. multilocularis worms (1). Recently, only 2% of cat faeces examined were found positive by coproantigen detection (Y. Morishima, personal communication). In Europe, however, cats were reported to be one of the main sources of infective Echinococcus eggs in the environment (31). In Hokkaido, Raccoon dogs (Nyctereutes procyonoides)
were also reported to be infected with *E. multilocularis* (32). Increased numbers and infection rates of foxes involved in the transmission of *E. multilocularis*, and closer contact between humans and foxes, raise considerable concern that echinococcosis in humans may increase in the future (12). It is clear that updated, continuous, and intensive strategic control measures against echinococcosis are needed in Japan, particularly in Hokkaido.

**Current control strategies**

**Targeting the source of echinococcosis**

Both cystic and alveolar echinococcoses are important zoonotic parasitic diseases worldwide. In countries where pastoral farming is a major agricultural activity, *E. granulosus*, which is maintained by dogs and herbivore livestock, is more common. In those countries, control strategies include advising farmers not to feed ovine offal to dogs and encouraging them to have their dogs treated regularly with anthelmintic drugs. These steps are necessary because of the numerous cystic hydatid disease patients in these regions. The feasibility of controlling the disease by eradicating it in its intermediate and definitive hosts is relatively high. However, in this case, successful control programmes can only be achieved when implementation is nationwide and all dog-owners give their consent for their animals to be dewormed. In Uruguay, for example, there is a ‘dosificador’ system, whereby a group of trained personnel moves from farm to farm and deworms dogs with anthelmintic drugs. This system has brought a dramatic decrease in the infection rate of *E. granulosus* among livestock (21).

In Japan, on the other hand, as well as in the People’s Republic of China, Russia, Alaska, and Central Europe, a different parasite is involved. Both its definitive and intermediate hosts are wildlife species and control is considered to be very difficult and costly. Currently, there is no reliable and cost-effective method for sustainable control or eradication of *E. multilocularis* in the sylvatic cycle (10). Deworming of wild foxes had not been attempted in Japan until 1997, but it proved effective and has continued ever since; there are, however, no effective control measures for wild voles. It is not clear whether only deworming foxes would have any impact on the effectiveness of reducing the parasite. In Hokkaido, only partial culling of red foxes and stray dogs has been carried out. These partial measures have resulted in the spread of the disease from eastern Hokkaido (where it had been endemic since the 1960s) throughout the whole island.

**Anthelmintic baiting**

Germany was the first country to attempt deworming of wild red foxes using anthelmintic (praziquantel) drug-fortified bait distributed to foxes by hand and dropped from the air. After the implementation, a significant reduction in the prevalence of the parasite among wild red foxes was observed (28). This indicates the feasibility of controlling echinococcosis in wildlife. From 1997, the OIE Reference Laboratory started a similar project in Hokkaido to deworm red foxes using anthelmintic-fortified bait. However, conditions in Hokkaido in terms of vegetation, quantity of snowfall, the species of voles involved and their habitat were different from those in Germany. A difference in the life cycle of *E. multilocularis* in Europe and Japan is mainly due to the intermediate hosts involved, and indicates a difference in the foraging behaviour of red foxes. For this reason, bait distribution by aircraft to cover a large area, as done in Germany, is not suitable for Japan and strategic bait distribution plans have to be designed. It will be necessary to develop cheaper baits and modify bait distribution patterns.

In 1998, a pilot area was selected in Hokkaido (Koshimizu, 200 km²) (Fig. 3a) where a survey was first undertaken to locate fox dens (30). Thereafter, examination for the presence of taeniid eggs and *Echinococcus* coproantigen in fox faeces collected around the vicinity of fox holes was conducted. The following year, anthelmintic-fortified bait was distributed on a monthly basis around fox holes in about half of the total study area (Fig. 3b). Commercial fish sausages containing fish meat, lard, gelatin and some spices were used as bait (1.5 cm long) and were embedded with 25 mg of praziquantel (Droncit®, Bayer Co.). It was observed that there was a decrease in the taeniid egg infection rate in foxes and this suppressive effect was also seen in the following years despite a decrease in the number of times the bait was distributed (Fig. 4a). Results revealed that coproantigen-positive rates in fox faeces from the baited area were significantly lowered after a month of bait distribution, as compared to non-baited areas.

![Fig. 3](image-url)

**Trial areas for controlling *Echinococcus multilocularis* in foxes with anthelmintic bait**

a) map of Hokkaido
b) baited and non-baited areas in Koshimizu
The trial found that voles born after bait distribution had a significantly lower prevalence of infection than their older counterparts (30).

In a follow-up study from April 2001, praziquantel-fortified bait was distributed throughout the whole area of Koshimizu by car alongside roads, at intersections and in wind-shield forests. Faeces from fox families outside this area were used as controls. Taeniid egg infection rates in foxes were significantly decreased together with coproantigen infection rates (Fig. 4). The significant reduction of taeniid egg infection rates, however, was not observed until six months after the start of bait distribution, and a lowering of coproantigen positive rates came about almost a year later (Oku et al., unpublished findings). Nevertheless, distribution of bait by car alongside roads, at intersections between roads, and in wind-shield forests proved to be effective in suppressing the infection rate of E. multilocularis in wild red foxes. This method was fast, did not require large numbers of personnel, and is highly effective for controlling disease over large areas.

It was demonstrated in these trials that distribution of praziquantel-fortified bait to foxes could reduce egg contamination by E. multilocularis and the potential risk for human echinococcosis. Thus, it is an effective way to stamp out the transmission sources of echinococcosis. These findings showed that this method could possibly be applied to overall control of the transmission source of multilocular echinococcosis in Hokkaido.

Deplazes et al. (6) have suggested that new approaches for efficient deworming are needed, such as suitable, target-specific bait or slow-release praziquantel applications. The current implementation of the new baiting strategy is under study in the OIE Reference Laboratory for echinococcosis to see if it could be extended to cover a
larger area like Otaru City. Machine-made bait embedded with 50 mg of praziquantel is produced from fishery waste and laced with tetracycline to monitor fox consumption by examination of tetracycline line formation in canine teeth. Bait is distributed along roads in the city (20 baits/km) (Fig. 5) and the prevalence in foxes is evaluated by necropsy of animals captured by local hunters, and by ELISA coproantigen test. Preliminary results show an effective reduction in the prevalence of *E. multilocularis* in foxes. In addition, a majority of the foxes with a tetracycline line in their canine teeth were found negative for *Echinococcus* infection.

The results of the baiting strategies discussed above suggest that when used in combination with the coproantigen detection system they could be highly effective in reducing or even eliminating the source of infection in the fox population of Hokkaido. This would be possible if a larger-scale operation with a proper combination of machine-made bait, an efficient distribution method, and an accurate evaluation system could be implemented.

Improving baiting strategies is an important step in reducing the risks posed by zoonoses that are transmitted by wild and domestic canine populations. Germany’s strategy for controlling alveolar echinococcosis was largely modelled from previous rabies vaccination campaigns. In the case of Japan, strategies against echinococcosis are vital should other zoonotic diseases (e.g. rabies) emerge in the country. Presently, Japan is free from rabies, nevertheless, the illegal trafficking of dogs, and foxes wandering across drift ice from Russia, might become potential threats.

The recent upsurge of proteomic studies has helped explain biochemical host-parasite interactions that might contribute to disease control (2). The construction of a cDNA library for *E. multilocularis* is ongoing at the OIE Reference Laboratory, with collaboration from the University of Tokyo and the Parasitology Laboratory in Sapporo. The upcoming result is expected to propel research and trials to identify proteins for immunodetection of infection in definitive hosts.

Recombinant antigens may not only enhance diagnostic accuracy but may provide candidate proteins for vaccination, particularly for dogs and cats.

The OIE Reference Laboratory is presently processing information on the location of fox habitats using a geographical information system (GIS) so that bait can be distributed more accurately. Recently, GIS has emerged as an innovative and important component of many projects in public health and epidemiology (25). Analysis of spatial data in relation to epidemiology is an important tool in the control and eradication of echinococcosis. It is reported that there is a significant correlation between landscape data and *E. multilocularis* transmission and epidemiology (4). In Europe, spatial analysis has shown that *E. multilocularis* transmission rates increase in areas with dense populations of foxes and grassland rodents (23). Furthermore, GIS is a technology that provides Veterinary Services with the information necessary to properly handle control strategies against zoonotic diseases.

**Compulsory reporting system for echinococcosis-infected dogs**

The results of a research project in the OIE Reference Laboratory for echinococcosis entitled ‘Prevention on the spread of areas that are endemic for zoonotic parasitic diseases’ suggested that there was a strong possibility that dogs infected with *Echinococcus* through faecal contamination could transmit the infection to their owners. The overall results of this study led the Ministry of Health, Labour and Science to direct the Hokkaido Prefectural Government to take the necessary measures for the prevention of infection in pet dogs. As part of the campaign, the public was also made aware of the potential for infected dog faeces to be a source of infection to humans.

During amendment of the Infectious Disease Law in Japan, certain specific zoonotic diseases were included in the 4th category of diseases, i.e. diseases which must be reported. Echinococcus in dogs was incorporated into this category along with bacterial dysentery in primates and West Nile fever in birds. In its 20th session, the Infectious Disease Evaluation Committee of the Ministry of Health, Labour, and Science, passed a resolution that makes it mandatory for veterinarians who diagnose echinococcosis in dogs to report the case to the health authorities. Thus, a national reporting system for dogs infected with *E. multilocularis* has been implemented by veterinarians since October 2004 to monitor and control the occurrence of infection in dogs throughout the country.

The Ministry of Health, Labour, and Science, with the assistance of the OIE Reference Laboratory, published guidelines on standard procedures to follow and diagnostic

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**Fig. 5**

*Area covered by the current echinococcosis control programme in Koshimizu*
measures to be taken when reports are submitted by veterinarians. The guidelines have been distributed to local health offices as well as to practicing veterinarians throughout Japan. Thus, it is equally important to utilise research output for lobbying policy-makers into implementing laws that strengthen Veterinary Services.

**Forum on Environment and Animals**

The full implementation of measures to control or eliminate echinococcosis is dependent on cooperation from all sectors of society. In 1999, the OIE Reference Laboratory organised a scheme called FEA (Fig. 6). This scheme links important organisations including government and non-governmental organisations, academic institutions, international agencies (e.g. the OIE), government and private veterinarians and local residents. Although involvement of private sectors in Veterinary Services has been reported in some parts of Africa, Europe, and South America, the focus is on livestock animal health programmes (3, 9, 24). Present experience in Japan has unified various sectors with the aim of reducing the prevalence of *Echinococcus* infection in definitive hosts and keeping agriculture safe for public health protection.

The FEA is presently serving as a hub for private veterinarians involved in small animal practice around the country, specifically for the diagnosis of echinococcosis. In cooperation with the Hokkaido Small Animal Veterinary Association, veterinarians who suspect *Echinococcus* infection in dogs, cats, or other susceptible definitive hosts send faecal samples for laboratory examination. Small animal clinics in the Tohoku district of northern Honshu have recently agreed to submit samples for echinococcosis examination in the light of fears that the disease might spread to the mainland. Three criteria for diagnosis are stipulated in the national reporting system, and a positive result in any of these should be reported to health authorities. The three criteria are as follows:

a) locating the parasite body which can be morphologically identified

b) detecting parasite DNA from eggs or a part of the parasite body

c) detecting parasite coproantigen, which should give a negative result due to deworming.

This avenue provided by the FEA enhances accurate diagnosis and proper monitoring of echinococcosis in...
Japan. It is envisioned that an *Echinococcus* Risk Control Centre will be established for the purpose of facilitating research and development related to control programmes protecting nature, agriculture, and public health.

Symposia focusing on the danger and threat of echinococcosis have brought about positive responses from local residents. The growing number of volunteers from among local residents, who constitute the population at risk, is a significant step towards successfully controlling echinococcosis. They serve as a potential workforce for bait distribution, fox monitoring, and reporting. Thus, it is claimed that successful surveillance systems should rely on networks of different people whose activities would include collecting, transmitting, analysing, and disseminating disease information (24).

Moreover, successful bait distribution in Koshimizu challenged local resident volunteers to continue the campaign with support from the OIE Reference Laboratory and the FEA. Recently, local residents of Kutchan conducted a preliminary survey on the prevalence of echinococcosis in foxes with technical assistance from the FEA. A proposed deworming campaign is now being formulated by Kutchan local residents and the FEA. It is expected that after successful campaigns in these areas, more volunteers from *Echinococcus*-endemic localities will follow. The current practice of involving local residents is believed to be a driving force for large-scale control in the near future.

**International collaboration**

Lessons learned from other countries have been useful in defining strategic approaches to controlling *E. multilocularis* in Japan. Aside from local control strategies, foreign models have broadened perspectives on control strategies. Collaboration with a national control programme in Uruguay's fight against *E. granulosus* provided insights into the delivery of large-scale programmes. Collaborating projects and exchange of information on control strategies against echinococcosis/hydatidosis in countries like Kazakhstan, the People’s Republic of China, France, and Switzerland strengthen capabilities and increase the likelihood that echinococcosis will be completely eliminated from Japan within a few years.

A programme of technical cooperation between Japan and Kazakhstan has recently been undertaken to establish control measures against echinococcosis. A dramatic increase in the prevalence of human cystic echinococcosis in Kazakhstan is due to a sharp transformation in its social and economic conditions (26). After the break-up of the Soviet Union, privatisation of former state farms

concentrated animals around human settlements, causing a growing problem of zoonoses and public health.

International symposia related to echinococcosis and other zoonotic diseases are being continuously organised. The Japan Interchange Association, in conjunction with the OIE Reference Laboratory and Hokkaido University, organised the Japan–Taiwan Symposium on Infectious Diseases in Animals and Quarantine on 20 and 21 October 2004. The issues discussed were the following:

*a*) infectious diseases of animals that have caused economic loss, and diseases that threaten the health of companion animals  
*b*) infectious diseases that are transmitted from animals to humans  
*c*) emerging infectious diseases that have been reported recently in world news, such as bovine spongiform encephalopathy and avian influenza  
*d*) animal quarantine measures to prevent the spread of the aforementioned diseases (16).

These kinds of symposia have allowed researchers, government officials, and members of the public to meet together and facilitate bilateral regional exchanges of information. Extrapolations from the technological output of the symposia are applicable not only to neighbouring nations but to the whole world. Future symposia are being planned in neighbouring countries.

![Fig. 7](image-url)  
**Fig. 7**  
A two-fold target for the control of echinococcosis in definitive hosts in Japan  
a) the immediate prevention of disease spread towards Honshu  
b) the ‘cleansing’ of Hokkaido by means of improved strategic baiting campaigns
Conclusion

The contribution of the OIE Reference Laboratory to controlling echinococcosis in definitive hosts in Japan has been significant and plans for continuing the current activities provide great hope for the future. Over the past few decades, developments in animal modelling and diagnostic methods and other advances in animal research have contributed greatly to efficient baiting strategies. The collaborative schemes of the FEA and cooperation with the international community give cause to believe that echinococcosis can be eliminated from Japan. These schemes, however, necessitate the use of the latest available technologies to maximise efficiency and improve control strategies. Genomics and proteomics are important leaps in science that could assist current strategies. Geographic information system technology is one of the more recent developments that must be exploited to upgrade current approaches.

This paper has described multifaceted strategies for the control of echinococcosis and could serve as an indispensable source of new ideas for Veterinary Services looking for a comprehensive approach to combating zoonotic diseases globally. Moreover, the opportunity for Japan to cooperate more closely with the OIE through the Reference Laboratory for echinococcosis has provided a broader avenue for achieving the much coveted goal of making Japan ‘clean’ from Echinococcus infection in the near future (Fig. 7).

Stratégies actuelles de prophylaxie visant les sources de contamination de l’échinococcose au Japon

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Résumé

Les auteurs décrivent les stratégies actuelles de prophylaxie visant les hôtes définitifs du principal parasite zoonotique au Japon, Echinococcus multilocularis. Plusieurs facteurs contribuent à rendre ce parasite particulièrement menaçant pour la santé publique : l’augmentation considérable de la prévalence de l’échinococcose chez les renards à Hokkaido (la deuxième en taille des îles formant l’archipel japonais), la pénétration des populations de renards sauvages dans les zones urbaines, l’infection des chiens errants et domestiques, et enfin le risque d’une propagation de la maladie dans l’île principale du Japon, Honshu. Les résultats des recherches précédentes ainsi que les stratégies appliquées actuellement, notamment les mesures de prophylaxie visant les renards sauvages laissent présager la possibilité d’éliminer l’échinococcose à l’avenir. La mise en œuvre d’un système national de déclaration pour les vétérinaires, le soutien de la coopération internationale et l’ouverture d’un Forum sur l’environnement et les animaux (FEA) offrent des raisons supplémentaires de miser sur cette réussite. Il s’agit de la première description d’une stratégie de prophylaxie multidimensionnelle visant à contrôler l’échinococcose chez les hôtes définitifs du parasite faisant appel à la participation active des habitants locaux. Ce modèle pourrait inspirer les Services vétérinaires du monde entier dans leurs efforts pour venir à bout de zoonoses similaires.

Mots-clés

Estrategias actuales de lucha específica contra los focos de equinococosis en Japón

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Resumen
Los autores describen las actuales estrategias de control para luchar contra los huéspedes definitivos del parásito zoonótico más importante que está presente en Japón: Echinococcus multilocularis. Un espectacular aumento de los niveles de prevalencia de equinococosis en zorros en Hokkaido (la segunda isla, por tamaño, del archipiélago japonés); la penetración de zorros salvajes en zonas urbanas; la infección de animales domésticos y perros callejeros; y la posibilidad de que la enfermedad se propague a Honshu, la isla principal del archipiélago; son otras tantas amenazas de importancia que planean sobre la salud pública. Los resultados de las investigaciones realizadas hasta ahora y las estrategias que se aplican actualmente, con medidas como la lucha contra la infección en zorros salvajes, llevan a pensar que en el futuro será posible eliminar la equinococosis. Además, la aplicación de un sistema nacional de notificación para veterinarios, la colaboración internacional y la creación de un Foro sobre Medio Ambiente y Animales (FEA) ofrecen otros tantos motivos de optimismo. Este es el primer informe fruto de una estrategia que aborda la lucha contra la equinococosis en huéspedes definitivos desde varios ángulos a la vez e integra también la colaboración con la población local. Se trata de un modelo que puede brindar ideas novedosas a Servicios Veterinarios de todo el mundo en su lucha contra otras enfermedades zoonóticas conexas.

Palabras clave

References


