A review of recent unexpected animal disease events in Japan and Korea and the follow-up action taken


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Summary
In Japan, the need to improve countermeasures against biological weapons was recognised after the Aum Shinrikyo cult attempted to use biological weapons in 1995. This paper describes how the two relevant ministries in Japan worked together to cope with recent disease outbreaks, including cases of classical swine fever (CSF) and avian influenza, which evidence suggests might have been the result of the deliberate misuse of unauthorised vaccines that had been illegally imported. By implementing successful control measures the two ministries were able to eradicate all the diseases within very short periods.

In the past few years, the Republic of Korea has also experienced outbreaks of foot and mouth disease, highly pathogenic avian influenza, and CSF, all of which had previously been absent (or had been eradicated) in Korea. A review of the historical background, major events of the outbreaks and the control measures which were implemented are presented here.

Keywords

Japan

Bioterrorism countermeasures in Japan
Prior to their famous 1995 sarin gas attack in Tokyo’s subways, the Aum Shinrikyo religious cult had disseminated Bacillus anthracis and had also attempted to release botulinum toxin on multiple occasions. It was these attacks that prompted Japan’s Defence Agency to examine their countermeasures against biological weapons. However, their basic knowledge of biological weapons was limited at that time, and specific requirements for the detection and protection of biological agents were not included in their discussions.

In 2000, a committee of experts on anti-bioterrorism was formed in order to study the countermeasures against biological weapons required by the Defence Agency and the armed forces in Japan – the ‘Japan Self-Defence Forces’. The committee members first studied the anti-terrorism policy of the United States of America (USA), then, in April 2001, they debated the essential countermeasures to bioterrorism that should exist in Japan and published concrete recommendations for the Defence Agency. These recommendations highlighted the need for a better understanding of biological weapons, the international challenges they present, and the current capacity for eliminating the risks they pose, and focused on fundamental approaches to bioterrorism and countermeasures to biological weapons by the Self-Defence Forces. Although these recommendations were designed for the Defence Agency, it was extremely important that they included advice for the Self-Defence Forces as they have been and will be on front-line duty during major national disasters.
Shortly after 9/11 in 2001, a meeting was held at the Cabinet Office to review countermeasures against biological weapons. In the meeting, Government Ministers discussed the coordination of policies among different ministries, and it was decided, at the Prime Minister’s initiative, to establish a crisis-management task force. At present, Japanese public health law already incorporates procedures for crisis management. The official bio-defence policy in Japan includes programmes for the enhancement of healthcare systems, co-operation among healthcare facilities, strict control over biological and biochemical agents, the provision of accurate and timely information, and the strengthening of skills to cope with terrorism. However, some people consider that it does not include concrete and substantial proposals that would enable Japan to defend itself if biological weapons were ever actually used. To strengthen existing laws the Government decided that the Ministry of Education, Culture, Science and Technology, the Ministry of Health, Labour and Welfare (MHLW) and the Ministry of Agriculture, Forestry and Fisheries (MAFF) should strictly control the storage and distribution of hazardous pathogens, such as B. anthracis, haemorrhagic fever virus, and foot and mouth disease (FMD) virus.

In recent years, several unexpected outbreaks of zoonoses and diseases of farm animals have occurred in Japan. The diseases that primarily involved public health were dealt with by the MHLW, and those primarily affecting agriculture by the MAFF. Zoonotic diseases such as anthrax, bovine spongiform encephalopathy (BSE) and rabies are managed by both MHLW and MAFF.

Ministry of Health, Labour and Welfare

The organisational structure of the departments and divisions within the MHLW has been described elsewhere (11). All infectious diseases of public health concern, including some zoonoses, are dealt with by the Tuberculosis and Infectious Diseases Control Division, which forms part of the Health Service Bureau of MHLW. The MHLW has held a series of committee meetings related to bioterrorism, and since October 2001 it has published a total of 27 guidelines and regulations on its home-page (http://www.mhlw.go.jp/kunkyuj-terr.html).

These guidelines cover anthrax (B. anthracis), botulism (Clostridium botulinum toxin), plague (Yersinia pestis), smallpox (variola major), tularaemia (Francisella tularensis) and viral haemorrhagic fevers (filoviruses [e.g. Ebola, Marburg] and arenaviruses [e.g. Lassa, Machupol]). Among them, anthrax and smallpox are thought to be the most dangerous and powerful candidates for biological weapons; all these diseases, except smallpox and plague, are zoonoses.

Smallpox and anthrax

In Japan, official bioterrorism countermeasures have focused on anthrax and smallpox. But information on other infectious diseases, including how to respond in emergency situations, has been published through the home-pages of the MHLW.

In accordance with government smallpox guidelines (7), a stockpile of smallpox vaccine has been prepared as an urgent matter because the younger age group has not been vaccinated. Simulation exercises for smallpox outbreaks that may occur as a result of a bio-terrorist attack have also been proposed. At present, the smallpox vaccine is fully stockpiled in Japan and priority would be given to medical doctors, fire-fighters, policemen, and other first responders.

The control of anthrax is easier than smallpox, because person-to-person anthrax infection rarely occurs. The most effective countermeasure for the prevention and treatment of anthrax is to have a sufficient stockpile of antibiotics. As B. anthracis is sensitive to various kinds of antibiotics Japan has a stockpile of antibiotics sufficient to deal with initial attacks. Just after 9/11, new quinolone antibiotics, such as ciprofloxacin, were approved as drugs which would be covered by the national health insurance scheme. In addition, a stockpile of disinfectant is essential for combating environmental contamination by bacterial biological weapons such as B. anthracis.

It was emphasised in the White Paper on defence published in 2000 that advanced knowledge of biological weapons should be urgently acquired, but the budgetary provisions for the development of new techniques to detect, inspect, diagnose, prevent and treat anthrax were not provided, as the ministries concerned generally give low priority to rare infectious diseases. Just after 9/11, the financial resources were made available to some extent, but it has not been sufficient.

Severe acute respiratory syndrome

In March 2003, shortly after the occurrence of severe acute respiratory syndrome (SARS) in Hanoi and Hong Kong, the MHLW issued the World Health Organization (WHO) case definitions for reporting SARS, and started surveillance in Japan. The SARS Surveillance Committee was established to verify all the cases reported to the MHLW and to announce the results.

For the Japanese administration the SARS outbreak was the first outbreak of an emerging infectious disease since the enactment of the revised Infectious Disease Control Law in April 1999. In early April 2003, the Infectious Disease Control Law was revised again and it was decided that SARS would be newly classified as a Category I infectious disease.
In June 2003, a physician from Taipei China visited Japan as a tourist, and became symptomatic. He was hospitalised shortly after his return home, and was diagnosed with SARS. Immediately, traceback investigations in Japan were conducted by the local governments and the MHLW, and they later confirmed that there was no secondary case among any of the people who had been in contact with the physician in Japan (1).

As a result of the SARS surveillance programme the medical infrastructures of Japan were reviewed and further improved, the guidelines for the management of SARS patients in hospital were also improved, and the quarantine systems for Category I diseases were reinforced. Also, the emergence of SARS raised some issues related to the control of bioterrorism, such as the medical infrastructure required when international air travel is involved, the quick establishment of diagnostic capacity for a new disease, and the management of disease information to avoid public panic. The importation of wildlife such as Himalayan palm civets and raccoon-dogs coming from the People's Republic of China was prohibited.

Systematic countermeasures are considered necessary in view of an ever increasing threat of bioterrorism. A series of meetings have been and will be held by the MHLW in order to strengthen the measures to cope with all infectious diseases that might be artificially introduced.

**Ministry of Agriculture, Forestry and Fisheries**

The organisational structures of the MAFF have been described in a previous report and will not be discussed here (11). In 2001, shortly after 9/11, MAFF formed the Head Office for anti-bioterrorism under the leadership of the Minister of Agriculture, Forestry and Fisheries. This office collaborated closely with Cabinet Headquarters in collecting and disseminating information about market prices and the movements of agricultural products, evaluating economic losses of agricultural industries, and ensuring the safety of the staff members engaged in counter-bioterrorism activities. The first countermeasure taken by the MAFF was to tighten the storage systems of pathogens of socio-economic importance.

In recent years, a series of unexpected disease emergencies have surfaced in Japan, and the Animal Health Division of MAFF has been engaged in the control of FMD, highly pathogenic avian influenza (HPAI) and classical swine fever (CSF).

**Foot and mouth disease**

Japan had been free from FMD since 1908, but in March 2000 an unusual disease in cattle in Miyazaki Prefecture, south western Japan, was reported by a veterinarian. Within a few days the disease was confirmed as FMD by the National Institute of Animal Health. A 50 km restricted zone was put in place, but the disease spread to two other farms within this zone, and all cattle in those three farms were destroyed and buried. The virus isolated was an unusually mild strain of type O FMD virus. A total of 47,177 serum samples were tested, but no seropositive cases were found other than on the three farms previously mentioned.

Sero-surveillance for type O virus was expanded to investigate the cattle on farms where imported straw or hay were used, and another positive case was detected in April 2000 in a farm in Hokkaido (northern Japan), 705 cattle on the farm were killed and buried. No other seropositive cases were found.

The type O virus isolated in Japan was very mild, and did not spread as easily as the type O viruses found in Taipei China or the Republic of Korea in 2000. It was experimentally proved that the strain isolated in Japan could grow and produce typical lesions in pigs, but could not produce any signs of infection in Holstein cattle. Those observations indicated that the strains of type O virus in Japan's neighbouring countries were not of the same origin; the strain in Japan was most similar to isolates from South Africa (2000) and the United Kingdom (UK) (2001) (3, 10, 12). The type O virus isolated in Japan was most probably introduced from a neighbouring country via imported straw. In view of the fact that the virus was exceptionally mild it was concluded that the FMD virus had been introduced into Japan unintentionally.

**Highly pathogenic avian influenza**

Highly pathogenic avian influenza had been absent from Japan since 1925, but in January 2004, an outbreak of HPAI on a poultry farm in Yamaguchi Prefecture (western Japan) was confirmed, and 35,000 layers were slaughtered and buried. On 16 February 2004, HPAI appeared in Ohita Prefecture, at a very small pet farm of 13 bantams and one duck, and all birds were killed and buried. On 28 February 2004, a third HPAI outbreak occurred at a layer farm in Kyoto Prefecture, and 198,000 chickens were slaughtered. Prohibited zones were established around the three farms and all eggs originating from the farms within these zones were destroyed. The owner of the farm in Kyoto prefecture was punished due to an intentional delay in reporting the disease. A fourth and last outbreak was reported on 3 March from a broiler farm near Kyoto, 5 km away from the third farm. Approximately 275,000 birds died or were slaughtered and over one million eggs were destroyed due to the above four outbreaks of HPAI in Japan. However, the farms in Kyoto were distant from the other farms where outbreaks occurred and there was no epidemiological evidence to prove that the infection was spread by the movement of humans or poultry products (6).
All virus isolates in Japan were H5N1 virus; they were closely related to the strain isolated in the Republic of Korea (similarity more than 99%), but different from those isolated in Vietnam and Thailand in 2004 (similarity 93%). The same H5N1 virus was also isolated from nine dead crows in the Kyoto area, indicating that wild birds could spread the disease in Japan. For these reasons, it is considered that the HPAI epizootics in Japan in 2004 were caused by the movement of wild birds and not by human movement (21).

More recent surveillance for avian influenza (AI) started in June 2005. Subsequently, the presence of a low pathogenic avian influenza (LPAI) virus, subtype H5N2, has been found in Ibaraki and Saitama Prefectures. The virus isolated showed 94% to 97% similarity with the virus strains isolated in Guatemala between 2000 and 2002. A MAFF expert committee indicated that the outbreaks of AI might be the result of using an unauthorised defective vaccine that had been illegally imported.

**Classical swine fever**

There were no outbreaks of CSF in Japan between 1993 and 2003. In 2000, vaccination was suspended in 32 prefectures when the Government decided to prohibit the use of the vaccine without the authorisation of local government. By October 2004, the number of farms authorised to vaccinate had been reduced to 4% of all farms in Japan. It was under these circumstances that the spread of CSF virus (CSFV) was confirmed on five farms between March and September 2004 in Kagoshima Prefecture (southwestern Japan). Four of the five farms were located within a 1 km radius; one was about 100 km away from the other four farms. The virus isolated from those five farms was confirmed as CSFV, but the virus was not the same as the vaccine strain (GPE) authorised for use in Japan. The strains isolated in those five farms were identical, but were different from the field virus previously isolated in Japan and were different from the vaccine strains widely used abroad (16).

Investigations of the origin of the virus on those farms revealed that the owner of the first farm injected a medicine into the pigs that had been sick for a few months even after antibiotic treatment. The manager of the farm bought the medicine from an unidentified person. The medicine, which did not have a proper label and which could have contained an unauthorised virus strain, was injected into the farm’s 1,144 pigs. The outbreaks on the neighbouring farms were due to the spread of virus from the first farm via the movement of vehicles, humans, pets and wildlife. The origin of the virus isolated from a farm 100 km away was not identified, but the characteristics of the virus were identical to those from the other four farms. In total, 3,669 pigs on five farms were slaughtered (World Organisation for Animal Health [OIE] weekly report dated 3 December, 2004).

It was concluded that the disease was caused by a virus which was contained in the medicine introduced by an unidentified person from a neighbouring country. After the outbreaks in Kagoshima Prefecture, the vaccination against CSF was increased temporarily, but it is the intention of the government to introduce a total ban on the use of CSF vaccine, while strengthening the surveillance programme for CSF.

**Recent changes in the structure of national Veterinary Services**

Following the occurrence of BSE in Japan in 2001, MAFF undertook a thorough review of the Veterinary Services, focusing particularly on food safety. As a result, an independent Food Safety Commission (FSC) was created within the Cabinet Office in July 2003, which has since undertaken risk analysis related to foods. Based on the results of these risk assessments, risk management procedures have been implemented either by the MAFF or by the MHLW or by both ministries. Moreover, in August 2003, the Division of Veterinary Services was moved from the Department of Livestock Industries of the MAFF to the Department of Food Safety of the same ministry. Although the activities of the Veterinary Services remained basically the same, cooperation between the MAFF and MHLW has been strengthened.

In view of the new outbreaks of diseases of an emergency nature, such as FMD, HPAI and CSF, the Food Safety and Consumer Affairs Bureau of the MAFF was reorganised on 1 October 2005, and the Animal Health Division was divided into the following two Divisions:

- **a** the Animal Health Division, which deals mainly with the prevention/control of animal diseases within the country and at quarantine stations (this Division is responsible for managing trade negotiations, risk analysis and matters relating to the OIE)
- **b** the Animal Products Safety Division, which deals with the safety of animal and fish products for human and animal consumption (this Division is responsible for the control of veterinary drugs, biologics, antibiotics, feeds, small animal practices, and the traceability of cattle).

Now both Divisions are better prepared for unusual events, including the intentional introduction of animal disease agents and harmful substances.

**The Republic of Korea**

**Unexpected events in recent years in the Republic of Korea**

**Highly pathogenic avian influenza**

Up until 2003 the Republic of Korea (Korea) had remained free from HPAI, although sporadic cases of LPAI had been
reported. Low pathogenic avian influenza (H9N2) was first reported in 1996, when five farms in three provinces were affected (6). All chickens in the infected farms were slaughtered and buried. After a two-year absence, LPAI was again reported in 1999 and 2000. In 2001, H5N1 HPAI virus was isolated from frozen duck meat that had been imported from the People's Republic of China, but no HPAI outbreaks were reported at that time (17).

The first case of HPAI in Korea was reported on 10 December 2003 in a broiler breeder flock that was exhibiting high mortality, decreased feed consumption, a drop in egg production and mild respiratory signs (4). The chicken farm was immediately placed under movement restrictions and on 15 December 2003 the National Veterinary Research and Quarantine Service (NVRQS) confirmed the presence of H5N1. This was the first official report for this outbreak of H5N1 in Asia (2), but epidemiological analysis suggested that the primary outbreak actually began in Southeast Asia around August 2003 (R. Morris, personal communication). When the last case was reported on 20 March 2004, a total of 19 farms, consisting of ten chicken farms and nine duck farms, had confirmed reports of HPAI. No clinical signs were observed in ducks except on one commercial farm where birds had respiratory symptoms with a moderate mortality.

In response to the outbreaks, an emergency headquarters and control centre was set up by the Ministry of Agriculture and Forestry (MAF) and the NVRQS to deal with the situation quickly. Control measures were implemented, including stamping-out of susceptible animals in infected and neighbouring farms within a 3 km radius, movement controls within a 10 km radius, and disinfection. Epidemiologically linked high-risk livestock were also depopulated as a precautionary measure. A total of 5,607,635 animals from 381 farms were destroyed, as were all animal by-products on these farms. The use of vaccination was not considered as it would have delayed the eradication of HPAI in Korea. Subsequent evaluation of the stamping-out measures using disease modelling concluded that these measures were critical in reducing virus production and subsequent spread (5).

Active surveillance was initially focused on ducks, as their lack of clinical signs may have resulted in undetected widespread spread of the disease. Over 10,000 ducks were tested and two HPAI positive breeder farms were detected as a result. Also, a total of 5,460 faecal samples from wintering wetlands of migratory wild birds were tested, resulting in the detection of 26 AI viruses, but none were found to be H5N1. In addition, a total of 371 wild birds of 14 species were tested and H5N1 was isolated from two magpies captured around the infected farms. However, it is likely that the magpies were secondarily infected from chickens as they are non-migratory birds commonly found in Korea and they eat carrion (4).

Due to major concerns regarding the possibility of transmission to humans, people living around the infected farms and personnel involved in disease control were extensively tested. Fortunately, no human cases were detected.

Genetic sequence analysis of the HA and NA genes showed that the Korean isolates were all of the same origin, being almost identical to each other with over 99% homology. This is in contrast to the heterogeneity shown in other countries and maybe due to the low prevalence of the HPAI virus before initial detection and the rapidity of the control measures (5). The H5N1 isolate was also sent to one of the OIE reference laboratories for HPAI (National Veterinary Service Laboratories, Ames, Iowa, USA) and to the WHO Collaborating Centre for Influenza (Center for Disease Control, Atlanta, Georgia, USA) for further characterisation and evaluation of the potential risk of human infection. These studies showed that there were genetic differences in the HA and NA genes when the Korean isolate was compared to those isolated in Vietnam and Thailand in 2004. Also, unlike the isolates from Vietnam and Thailand, which have caused human infections, the Korean isolate showed an absence of mutation in the M2 protein genes, which are related to the resistance to amantadine and rimantadine (2, 8). A comparison of the HA and NA genes showed that the Korean isolates were closely related to those isolated in China in 1997 and 2001. In addition, a full gene comparison of the Korean isolates and of the HPAI isolate from Japan showed greater than 99% homology, indicating that these viruses may have been from a common source (2). Epidemiological investigations concluded that the most likely source of the outbreak was migratory birds moving through the East Asian-Australasian flyway route from the end of October to early November. Introduction via foreign travellers or the illegal entry of meat was considered to be less likely, but it could not be ruled out. Most of the inter-farm transmission was determined to be through mechanical spread by people and vehicles (5).

Foot and mouth disease

The first recorded case of FMD in Korea was in 1911, which was followed by sporadic outbreaks concentrated in the Northern provinces sharing borders with the People's Republic of China and Russia. The number of affected animals peaked in 1918, when 36,397 animals were infected. Before the most recent outbreak in 2000 the last reported outbreak in the Korean peninsula had been in 1934 in Hamkyoung province, now a part of North Korea.

A suspect case of foot and mouth disease was reported on 24 March 2000 and laboratory diagnosis conducted by the NVRQS officially confirmed the case on 2 April 2000. This was the first case of FMD in Korea after an absence of 66 years. In accordance with OIE guidelines, the samples were
also sent to the OIE World Reference Laboratory (Pirbright, UK), which confirmed the diagnosis. A total of 15 FMD cases were reported between 24 March and 15 April 2000 in three provinces: Gyeonggi, Chungbuk and Chungnam. Only cattle farms were affected. Clinical symptoms included depression, excessive salivation, lameness, and vesicles and ulcers on the mouth, tongue, hooves and teats.

Control measures, including stamping-out, movement restrictions, and emergency vaccinations were implemented. A total of 2,216 animals from 182 farms were culled as a part of the stamping-out policy. Movement restrictions were applied to two types of zone, protection zones (areas within a 10 km radius of the infected farms) and surveillance zones (areas within a 10 km to 20 km radius of the infected farms). The decision to conduct emergency vaccinations was made because the circumstances at that time favoured wind-borne spread. Some 860,700 and 661,770 animals within the protection and surveillance zones were vaccinated during the first and second round of booster vaccinations, respectively. All vaccinations were completed by August 2000 and there have been no further vaccinations. One of the major features of the emergency vaccinations was the decision not to slaughter all vaccinated animals. At that time, the OIE Terrestrial Code did not specify a required waiting period for a previously FMD-free country not practicing vaccination to regain its previous status if all vaccinated animals were not slaughtered. The 2005 OIE Terrestrial Code now specifies a waiting period of six months (20). Although this resulted in having to wait over a year after the last reported case before the country could recover its FMD-free status, the use of vaccination was regarded as being successful in quickly bringing the outbreak under control (13). After the outbreak, a national FMD surveillance programme, which consisted of the passive surveillance already in place and the newly initiated active surveillance of testing statistically selected and targeted samples, was implemented to maintain an effective system of detecting FMD and to provide sufficient evidence that the country continues to be free from FMD. From 2000 to 2001, a total of 63,589 animals from 14,692 farms were tested as part of the sero-surveillance and 88,624,673 animals were clinically examined. The results of the surveillance activities showed no evidence of FMD in Korea.

The FMD virus isolate was the same Pan-Asia O type that was also responsible for the outbreaks in many East Asian countries such as Mongolia and Russia in 2000. Epidemiological investigations concluded that the most likely source was imported hay and/or international travellers, and genetic analysis of the field isolates showed that multiple introductions into the country could have been possible (3, 14). In May 2001, Cheju Island, situated to the south-west of the Korean peninsula, received recognition from the OIE as ‘FMD-free without vaccination’ and the whole country regained this same status on 19 September 2001. The 2000 FMD outbreak initiated changes in control policy, increased training, education and public awareness, and heightened quarantine measures at the border to prevent another outbreak.

Despite these efforts, a new outbreak was reported in 2002. Between 2 May and 23 June a total of 16 farms (15 pig farms and one cattle farm) located in the two provinces of Gyeonggi and Chungbuk were confirmed with FMD. In contrast to the situation in 2000, pig farms were most affected and symptoms included vesicles on the nose, tongue, hoof and teat, loss of hooves and high mortality in piglets.

An emergency headquarters and control centre was quickly put in place within MAF and the NVRQS to coordinate the control measures. A total of 160,155 animals from 162 farms were culled as a part of the stamping-out policy that included the pre-emptive culling of pigs within a 3 km radius. Movement restrictions were applied in two types of zones, protection zones (areas within a 3 km radius of the infected farms) and surveillance zones (area within a 3 km to 10 km radius of the infected farms). No emergency vaccinations were conducted based on the fact that infections were restricted to pigs and local spread was mostly by people and vehicles and not via airborne infection. An evaluation of the control measures in 2002 concluded that three factors were especially important in improving the effectiveness of the control measures: heightened awareness of the disease, thus reducing the delay in notification; improvement in field diagnosis, such as the use of pen-side antigen tests, thereby reducing the delay in diagnosis; and quicker culling operations, such as the support of military personnel, thus reducing the delay in culling (19). Disease modelling concluded that rapid notification by the farmers was the most significant variable that could have affected the course of the outbreak in 2002, and thus demonstrated the importance of the awareness and co-operation of farmers in disease control. In 2002, a total of 18,482 animals from 3,673 farms were tested as part of the sero-surveillance and over 96,086,463 animals were clinically examined. The surveillance activities indicate that there have been no further cases of FMD in Korea since the 2002 outbreak.

The virus isolated in 2002 (AY114146) was also a Pan-Asia O type, but it was found to be closer to the viruses responsible for the 2001 outbreaks in the People’s Republic of China and Mongolia than to the 2000 Korean isolates (9). This supported the view that the 2002 outbreak was likely to be a reintroduction from overseas. Epidemiological investigations concluded that the most likely sources were foreign workers or international...
travellers. The country regained its previous status as ‘FMD-free without vaccination’ on 29 November 2002.

Classical swine fever

The first reported case of CSF in Korea was in 1908, with subsequent outbreaks being restricted to the Jeonbuk and Hamnam provinces. However, by 1948, CSF had spread across the country and had become an endemic disease. With the introduction in 1967 of a tissue culture attenuated live vaccine, LOM-850 vaccine, the number of cases dropped dramatically, but sporadic cases were still being reported into the 1990s.

In 1996 a three-stage nationwide CSF eradication campaign was initiated. The first stage was to encourage the use of vaccines to reduce the number of outbreaks and the second stage was to introduce mandatory vaccination and vigorous compliance testing throughout mainland Korea, except in Jeju province. The third stage was the cessation of all CSF vaccination and confirmation of CSF-free status. Stage 1 began in 1997 followed by Stage 2 in 1999. As an apparent result of the campaign no outbreaks were reported in 2000 and 2001 and after conducting a risk assessment the decision was made to ban all vaccination against CSFV on 1 December 2001. It seemed the country had successfully eradicated CSF and was on its way to becoming recognised as a CSF-free country.

This changed, however, when in April 2002, two cases were confirmed in Gangwon Province, and later that year, between October and December, eleven more cases were reported in Gyeonggi Province. Emergency vaccination was implemented in the surrounding areas, as was a stamping-out policy for all infected and neighbouring farms. At that time, these outbreaks were assumed to be isolated cases and the country was still considered to be at Stage 3 of the CSF eradication programme. However, the situation changed in 2003 when between March and May a total of 65 pig farms were confirmed as infected across the country. As a result, the Government made the decision to resume nationwide vaccinations, resulting in a major setback for the CSF eradication campaign. An interesting feature of the 2003 outbreak was that most of the CSF infections could be traced to the purchasing of pigs from one breeding farm (18). In hindsight, it is clear that more attention should have been directed towards breeding farms, which generally follow strict biosecurity measures but have the potential to be the source of widespread transmission should they become infected.

The CSFV isolates belonged to genetic group 2, which differed from the previous Korean isolates that were all classified as group 3 (8, 15). The genetic analysis data (AY168611, AF521712) supported the view that this was a new introduction from outside the country, most likely from north-eastern Asia (18).

Follow-up actions

In 2001, the NVRQS, which is the MAF agency responsible for the prevention and control of animal diseases, quarantine inspection at the border, livestock product safety and veterinary research in Korea, was restructured and expanded into three departments: the Livestock Products Safety and Inspection Department, the Animal Disease Research Department, and the Animal Disease Control Department. This resulted in the addition of two new divisions, the Animal Disease Diagnosis Division and the Veterinary Epidemiology Division, and three additional district offices. In 2002, the Animal Health Division, a part of the Livestock Bureau under the MAF, was expanded into two divisions, the Animal Health Division, which would focus their attention on livestock diseases, and the Livestock Products Sanitation Division, which would manage issues related to livestock products. The number of government officers involved in animal health was increased, both in the central government and in the provincial governments.

Amendments were made to the Act for the Prevention of Livestock Epidemics, and to its ordinances. For example, requirements for imported straw and forage were included, which were based on the conclusions of a 2000 FMD epidemiological report. Also, control guidelines for FMD, HPAI and CSF were established and subsequently revised based on the experiences and lessons learned from dealing with the outbreaks.

To improve quarantine measures at the border, additional disinfection facilities were installed at ports to disinfect ship cargoes. Beagle detector dog units were introduced in 2001 to prevent the entry of illegal livestock products and they are considered to have been successful, not only in terms of the number of seizures but also by the way in which they have captured the public’s interest and educated them in the importance of quarantine work. The recently installed electronic billboards at major ports and airports, and public announcement services on planes are being used along with traditional posters and leaflets to bring public attention to the risks of bringing illegal livestock products into the country.

It should be noted that, with the increase in international trade and the movement of people, even the most strict quarantine measures at the border may not be enough to prevent new introductions. Farmers need to practice good biosecurity measures to prevent disease introduction into their farms. Disease awareness and reporting by farmers and field veterinarians are also crucial because most cases are first reported by farmers and early detection and reporting were found to be the most significant factor in reducing the size of the 2002 FMD outbreak in Korea (19). Continued education of farmers through meetings, leaflets and farm visits is being conducted to maintain heightened...
awareness. Also, a system of awards and higher compensation for early reporting and fines for delays has been implemented to encourage early reporting.

The NVRQS conducts epidemiological analysis and research into the development of diagnostic tests, vaccines, therapeutic agents, and surveillance methods. In 2002, pen-side tests for FMD were developed and used successfully to reduce the time required for diagnosis. Recently, pen-side tests for HPAI were also developed. In 2004, the construction of the Emerging Disease Research Facility was completed at the NVRQS, which contains BL3+ laboratories to facilitate research into emerging and re-emerging diseases such as BSE, HPAI, SARS. Epidemiological studies into the outbreaks that have occurred continue to provide a clearer understanding of their source, their method of transmission and the effectiveness of the control measures used, so as to be better prepared for future emergencies. One of the major issues that is currently being addressed is what can be done to prevent the introduction of exotic diseases by wild birds.

The HPAI outbreaks demonstrated that there was a need for increased co-operation between veterinary and human health organisations to better maintain the preparedness of these services in Korea. It was for this reason that the Zoonosis Committee was formed in 2004. The members of the committee – experts from the NVRQS, specialists from the Korea Centre for Disease Prevention (part of the Ministry of Health and Welfare) and university professors – meet regularly to discuss and make recommendations. There are five subcommittees dealing with various bacterial, viral and prion diseases, such as anthrax, brucellosis, rabies, HPAI, Japanese encephalitis and BSE.

Furthermore, outbreaks of livestock diseases such as HPAI and FMD are now considered to be national disasters of major importance and are handled by the Office for Government Policy Co-ordination, which is in charge of managing each administrative and affiliated department under the command of the Prime Minister. This allows for better communication and co-ordination between the various ministries that would take a role during such emergencies, i.e. the Ministry of Agriculture, the Ministry of Health and Welfare, the Ministry of National Defence, the Ministry of Planning and Budget, and other ministries that deal with matters such as disease control, public health, the possibility of bioterrorism and the allocation of emergency F.

The need for the Veterinary Services to improve communication with the media and the public was evident during the HPAI and FMD outbreaks. The coverage by the media was often sensationalised, resulting in a drastic drop in consumption and exasperating government and industry efforts to deal with the crisis. Since then, a campaign has been implemented by the government to provide information to the public that can be accessed more quickly and easily, such as through its website. It is hoped that by being more transparent the public will gain confidence in the Government and be able to make informed judgments based on facts.

Livestock identification and tracking systems are currently being tested and evaluated for future implementation. They are expected to have an impact not only on food safety but also in disease control, facilitating rapid investigations through improved traceback systems.

Conclusion

The outbreaks of HPAI, FMD and CSF were devastating blows to the livestock industry and stakeholders in Korea. They initiated changes that included the reorganisation and expansion of the government organisations responsible for livestock and livestock products; the revision of legislation and emergency control guidelines; and the implementation of various measures and programmes to improve disease prevention, quarantine at the border, surveillance activities, the education of farmers, and public awareness. However, as the threat of animal and human disease emergencies is growing in the region, it will continue to test the Veterinary and Public Health Services and their readiness.

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Examen d’épisodes récents et inattendus de maladies animales survenus au Japon et en Corée et mesures de suivi prises


Résumé
Au Japon, la nécessité d’améliorer la parade contre les armes biologiques a été reconnue à la suite de l’attentat à l’arme biologique perpétré en 1995 par la secte Aum Shinrikyo. Le présent article décrit comment le ministère de la Santé, du travail et de la protection sociale et le ministère de l’Agriculture, des forêts et de la pêche ont coopéré pour faire face aux récents foyers de maladies, notamment aux cas de peste porcine classique et d’influenza aviaire, qui, selon les indications disponibles, pourraient bien être consécutifs à l’utilisation impropre et délibérée de vaccins non autorisés qui avaient été importés illégalement. En mettant en œuvre des mesures de contrôle efficaces, les deux ministères ont pu éradiquer avec succès toutes les maladies en un laps de temps très court. Ces dernières années, la République de Corée a également enregistré des foyers de fièvre aphteuse, d’influenza aviaire hautement pathogène et de peste porcine classique, alors qu’auparavant le pays n’avait connu aucune de ces maladies (ou les avait éradiquées). L’article présente le contexte historique, les principaux événements survenus pendant les épidémies et les mesures de contrôle mises en place.

Mots-clés

Casos recientes de enfermedades animales inesperadas en Japón y Corea y medidas adoptadas al respecto


Resumen
En el Japón, la tentativa de atentado con armas biológicas que la secta Aum Shinrikyo llevó a cabo en 1995 sirvió para que se admitiera la necesidad de mejorar las medidas destinadas a contrarrestar ese tipo de armas. Los autores describen la labor conjunta de los ministerios de Salud, Trabajo y Bienestar y de Agricultura, Bosques y Pesca para afrontar recientes brotes infecciosos, en particular de influenza aviar y peste porcina clásica, que a tenor de las pruebas existentes podrían ser fruto del uso intencionado de vacunas no autorizadas, obtenidas por importación ilegal. Aplicando medidas de control, los dos ministerios lograron erradicar ambas enfermedades en poco tiempo.
En los últimos años, la República de Corea también ha sufrido brotes de fiebre aftosa, influenza aviar altamente patógena y peste porcina clásica, enfermedades hasta entonces ausentes (o ya erradicadas) del país. Los autores repasan los antecedentes históricos, los brotes más importantes y las medidas de control adoptadas.

**Palabras clave**


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### References


