Introduction

Numbering of animals by ear marking or cold branding is practised in many countries of Asia, but the percentage of animals that are marked to indicate their origin is rather low in most of these countries.

The summary of responses to the questionnaire on traceback systems sent to Chief Veterinary Officers in November 2000 is shown in Table I. Routine traceback systems to inform animal owners of the results of examinations at slaughterhouses are applied in very few countries. However, in some specific surveillance programmes, traceback systems are applied in specified areas or zones using ear tags or other marking methods.

The requirement for economically feasible marking systems was discussed during the meeting held by the Office International des Epizooties (OIE) Regional Representation for Asia and the Pacific and the Food and Agriculture Organization/Regional Animal Production and Health Commission for Asia (FAO/APHCA) in New Delhi, India, in November 1997. However, as yet, none of the developing countries in Asia, where subregional campaigns against rinderpest or foot and mouth disease (FMD) were planned, have applied a nation-wide method to mark cattle or pigs to indicate the origin of these animals for traceback purposes.

The authors present examples of traceback efforts by countries in Asia in response to specific epidemics, such as Nipah virus infection in pigs in Malaysia, the FMD control...
programme in the Republic of Korea and the FMD eradication programme in Japan.

Nipah virus infection in pigs in Malaysia

History of Nipah virus
Between late September 1998 and May 1999, a new disease of pigs, with zoonotic implications, characterised by a pronounced respiratory and neurological syndrome and sometimes by the sudden death of sows and boars, was discovered in peninsular Malaysia. The disease of pigs was found to be associated with the epidemic of viral encephalitis which affected people with pig farming-related activities and resulted in 265 cases of human viral encephalitis and 105 deaths. A new virus, belonging to the family Paramyxoviridae, was discovered and named ‘Nipah’ after the village ‘Sungai Nipah’ in which the virus was first isolated from a human case. Molecular characterisation confirmed that the same agent was responsible for the disease in both humans and pigs (1). The Nipah virus is related to the Hendra virus that has killed two people and sixteen horses in Australia since 1994.

Epidemiological background
The Nipah virus epidemic is believed to have originated in the State of Perak and moved south, infecting other areas.

Transmission of the virus among pig farms within and between the states of peninsular Malaysia was due to the large-scale sales and subsequent movements of pigs. Active trading between pig farms was normal practice in peninsular Malaysia. Farms that did not receive animals suspected of infection remained free from infection during the national swine testing and surveillance programme (Phase II), although some such farms were located immediately adjacent to an infected farm. Although other routes of transmission between farms were considered, for example, lorries carrying affected pigs, sharing of boar semen and mechanical transmission by dogs and cats, no conclusive evidence has been found to suggest that these played a role in transmission (6, 7).

The disease was observed to spread rapidly among pigs on infected farms. Transmission between pigs on the same farm occurred possibly through direct contact with excretory and secretory body fluids such as nasal mucus, saliva, pharyngeal and bronchial secretions. The possible role of pig urine has yet to be clarified. Pigs were kept in close confinement and acted as a multiplying host. Mechanical transfer by dogs and cats, the use of equipment or needles which had not been properly sterilised for health intervention, artificial insemination or sharing of boar semen within the farm were considered possible means of transmission (6, 7).

The transmission studies in pigs at the Australian Animal Health Laboratory (AAHL) of the Commonwealth Scientific and Industrial Research Organisation (CSIRO), Australia,
established that pigs could be infected by either the oral route or parenteral inoculation, and demonstrated excretion of virus via oronasal routes. Infection was observed to spread quickly to in-contact pigs, and virus shedding from asymptomatic pigs was demonstrated (4).

**Surveillance and control measures**

Surveillance programmes were divided into the following three phases.

**Phase I: stamping-out (February-March 1999)**

The Department of Veterinary Services in Malaysia is empowered under the provisions of the Animals Ordinance, 1953, to control and prevent the spread of a disease by gazetting the new disease and identifying infected areas, disease control areas and/or disease eradication areas. On 20 March 1999, viral encephalitis was declared by the Minister of Agriculture to be a disease within the scope of the Ordinance and a policy was immediately developed to eradicate the disease by mass culling of diseased and in-contact pigs. In some farms where deaths of humans or deaths of pigs with clinical signs of Nipah virus infection were reported, farmers surrendered the pigs and these animals were culled. Farms that were abandoned by the owners were also taken over by the Department of Veterinary Services and all the pigs were culled. The army, police, volunteers from non-governmental organisations, the Department of Veterinary Services and other Government agencies were involved in the culling operation from February to March 1999. The operation consisted of shooting pigs, and burying the carcasses in deep pits. The culling of pigs in these areas successfully controlled the human epidemic in the States of Negeri Sembilan, Perak and Selangor. During the mass culling period, farmers and residents of the villages were evacuated from the infected areas. All inter-state movement of pigs was also banned during this period.

The evidence of infection in dogs in an outbreak area in Sepang led to the decision to shoot all stray dogs in infected areas at that time. The mass culling programme for pigs was discontinued when all the known infected farms in Perak, Negeri Sembilan and Selangor had been depopulated. An enzyme-linked immunosorbent assay (ELISA) was made available to identify infected farms outside the containment areas in April 1999 (5).

**Phase II: surveillance of farms and abattoirs (April-July 1999)**

A national swine testing and surveillance programme to test all the remaining pig farms was developed to detect any infected farms outside the containment areas. Each farm in peninsular Malaysia is registered using a unique farm code which is used as the basis for identification.

Serological sampling of a statistically significant number of sows from all the pig farms was performed twice, at least three weeks apart, because preliminary screening indicated that detection of antibody in sows gave the highest confidence of detecting active infection in farms. An ELISA developed by the AAHL, CSIRO, Australia, was employed to test the sera at the Veterinary Research Institute in Ipoh (11). The testing programme covered a three-month period, from 21 April to 20 July, and a provisional approval for slaughter was given to farms outside the containment areas. Serological sampling in the farms was conducted by teams, each of which consisted of a government veterinary officer, a private certified veterinarian and two or three veterinary assistants.

In addition to farm codes, global positioning system (GPS) readings were taken for every farm during serological sampling. No problems were encountered in the traceback of farms with positive serology, and hence further disease control action could be undertaken rapidly.

Simultaneously, a traceback system was established to screen pig sera from abattoirs to provide assurance that pigs entering the markets were uninfected. A random sampling programme for slaughter of pigs in all the six government abattoirs and two private abattoirs was implemented in April 2000 according to a programme approved by the Director General of the Department of Veterinary Services. The established farm codes which are unique to individual farms were also used for identification. Pigs entering abattoirs must have a farm code tattooed on the back, and animals without farm code tattoos are not allowed for slaughter. In the eventuality of animals giving positive results at the abattoir, the traceback system using farm codes to identify the affected farms was implemented and the affected farms subjected to immediate quarantine and classification as 'high-risk farms'. All high-risk farms were subjected to quarantine and given priority for testing.

A total of 896 farms (approximately 27,620 serum samples) were tested twice over a ninety-day period. Fifty of these farms were depopulated, based on the positive serological results. Traceback of the affected farms was not a problem using the farm code system.

A further 5,487 serum samples were collected from abattoirs, and traceback of positive samples enabled the identification of one high-risk farm. Further serological sampling and investigation at the farm level revealed that this particular farm was infected.

The principal difficulty encountered by the traceback system in abattoir surveillance was the identification of farms through farm codes tattooed on the back of animals. This was because the tattoos were stamped by butchers themselves and the possibility of irregularities could not be eliminated.

**Phase III: surveillance of abattoirs and farms (October 1999-October 2000)**

To overcome the irregularity of farm identification in abattoirs, an ear-notching system was made mandatory for farm
identification, commencing in October 1999. Ear notching was proposed, using the international ear-notching system for all pig farms in all states. All new-born piglets must be ear-notched before one week of age, using the proposed state and farm codes and these serve as a permanent identification of pigs from a particular farm in various states when they reach abattoirs for slaughter. From January 2000, all porkers must have permanent ear notches when sent for slaughter in an abattoir.

Although these measures solved the problem of farm identification, not all pig farms can be screened through abattoir surveillance because some do not send pigs to the government abattoirs for slaughter. To date (October 2000), the government abattoirs have managed to cover approximately 500 farms of the 796 included in the abattoir surveillance programme.

In March 2000, the Department of Veterinary Services decided to screen all pig farms by randomly collecting a minimum of thirty serum samples from breeding stock on all farms. Farms are classified as serologically positive when positive ELISA (immunoglobulin G) serology is confirmed by serum neutralisation tests (SNT) at the AAHL.

Two of 796 farms screened were found to have positive serology. Although further investigation failed to isolate any virus, depopulation of these two affected farms in Perak was performed, based on positive SNT results.

No new cases of Nipah virus infection have been diagnosed in humans or pigs since the end of May 1999 (9).

Traceback investigation of foot and mouth disease in the Republic of Korea

Epidemiological background

Between 25 March and 15 April 2000, fifteen outbreaks of FMD were reported in the Republic of Korea. Various control measures, including stamping-out of infected and neighbouring farms, movement controls and emergency vaccination were undertaken in all affected regions.

Stamping-out was applied to all infected and neighbouring farms within a 500-m radius, and a total of 2,216 susceptible animals from 182 farms were destroyed.

Movement restrictions were applied to two defined zones, a protection zone (area within a 10-km radius of the outbreak farm) and a surveillance zone (area within a 20-km radius of the outbreak farm). After extensive serological surveillance, all movement restrictions were lifted on 19 July 2000.

Vaccination of all susceptible livestock within the protection zones was completed in August 2000. During the first and the second rounds of booster vaccinations, 860,700 and 661,770 animals were vaccinated, respectively. Vaccinated animals, except for finishing pigs to be slaughtered immediately, were permanently marked by ear punching (pigs) and branding (cattle, goats and deer).

By 25 August 2000, eighty-seven suspected cases had been reported since the first outbreak. Except for the cases in the fifteen outbreaks, the remaining seventy-two suspected cases were later diagnosed as negative for FMD. A total of 5,400 animals from the surveillance zones and 3,568 animals from the disease-free regions were tested using liquid phase blocking (LPB) ELISA. In addition, a total of 8,863 vaccinated animals in the protection zones were tested using ELISA for non-structural protein (NSP). All samples from these zones gave negative results when screened for FMD antibodies.

Cattle were the only animals affected during the outbreaks in the Republic of Korea. However, the experiments performed at the World Reference Laboratory, Pirbright, United Kingdom, and at the Foreign Animal Disease Diagnostic Laboratory (FADDL), Plum Island, United States of America, demonstrated that pigs were susceptible to the Korean virus isolate (OSKR/2000). Sequence analysis of the VPI gene showed close similarity to the strains O/TAW/1/99 and O/Kimmen/TAW/99.

Traceback investigation

Although no conclusive evidence has been found to explain the mode of entry of the FMD virus into the Republic of Korea, the possible routes, as determined by epidemiological investigations, are imported hay, movement of people (by contaminated clothing, shoes, etc.) and wind-borne spread of contaminated particles (yellow sand). Based on these findings, farms using imported hay, imported hay samples from various sites and yellow sand samples collected from across the country were investigated. Other farms of epidemiological significance, such as those that had contact through milk collection trucks and feed delivery trucks, and those that had previously reported illnesses with symptoms similar to FMD, were also investigated. Clinical investigations and serological examinations of animals on these farms were undertaken by the provincial veterinary agencies and the National Veterinary Research and Quarantine Service (NVRQS) as part of the FMD Surveillance Programme. The results have been submitted to the OIE FMD and Other Epizootics Commission.

Results

Farms using imported hay

Although imported hay was not used on any of the farms involved in the outbreaks, it was used throughout the country. A list of 1,823 farms was compiled, based on the records of the companies that import hay. Of this list, 443 animals from 109 farms in the protection zones of Kyonggi Province (76 farms)
Table IV

<table>
<thead>
<tr>
<th>Area</th>
<th>Number of samples</th>
<th>Test results</th>
</tr>
</thead>
<tbody>
<tr>
<td>Kyonggi</td>
<td>44</td>
<td>Negative</td>
</tr>
<tr>
<td>Chungbuk</td>
<td>17</td>
<td>Negative</td>
</tr>
<tr>
<td>Chungnam</td>
<td>15</td>
<td>Negative</td>
</tr>
<tr>
<td>Chonnam</td>
<td>2</td>
<td>Negative</td>
</tr>
<tr>
<td>Kangwon</td>
<td>19</td>
<td>Negative</td>
</tr>
<tr>
<td>Kyongbuk</td>
<td>2</td>
<td>Negative</td>
</tr>
<tr>
<td>Kyongnam</td>
<td>1</td>
<td>Negative</td>
</tr>
<tr>
<td>Total</td>
<td>100</td>
<td></td>
</tr>
</tbody>
</table>

Milk collection trucks

Clinical and serological investigation of farms that had contact with milk collection trucks which visited farms in the outbreaks was performed. Of 67 farms clinically investigated, 143 animals from 15 farms were tested with NSP ELISA. All samples gave negative results when screened for FMD (Table V).

Table V

<table>
<thead>
<tr>
<th>Province</th>
<th>Farms</th>
<th>Number of Animals</th>
</tr>
</thead>
<tbody>
<tr>
<td>Kyonggi</td>
<td>31</td>
<td>207</td>
</tr>
<tr>
<td>Chungbuk</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Chungnam</td>
<td>36</td>
<td>36</td>
</tr>
<tr>
<td>Total</td>
<td>67</td>
<td>243</td>
</tr>
</tbody>
</table>

Feed delivery trucks

Farms that had contact with feed delivery trucks which made deliveries to the farms in the outbreak areas were investigated. Ninety-two farms were clinically investigated and of these farms, 114 animals from twenty-eight farms were tested with NSP ELISA. All samples gave negative results for FMD (Table VI).

Table VI

<table>
<thead>
<tr>
<th>Province</th>
<th>Farms</th>
<th>Number of Animals</th>
</tr>
</thead>
<tbody>
<tr>
<td>Kyonggi</td>
<td>57</td>
<td>230</td>
</tr>
<tr>
<td>Chungbuk</td>
<td>14</td>
<td>56</td>
</tr>
<tr>
<td>Chungnam</td>
<td>21</td>
<td>80</td>
</tr>
<tr>
<td>Total</td>
<td>92</td>
<td>366</td>
</tr>
</tbody>
</table>
Farms with animals presenting symptoms

Early cases of FMD were sometimes mild, showing symptoms such as salivation, lameness, fever and respiratory problems. Since these cases could have been overlooked, records maintained by field veterinarians were checked to identify such farms. Twenty-eight farms in the former protection zones had recorded such symptoms in animals, and these farms were clinically investigated. Of these farms, thirty-six animals from nine farms were tested using the NSP ELISA. All samples gave negative results for FMD (Table VII).

Table VII
Number of farms and animals presenting clinical signs of foot and disease, Republic of Korea (March-April 2000)

<table>
<thead>
<tr>
<th>Province</th>
<th>Farms</th>
<th>Number of Animals</th>
</tr>
</thead>
<tbody>
<tr>
<td>Kyonggi</td>
<td>11</td>
<td>44</td>
</tr>
<tr>
<td>Chungbuk</td>
<td>1</td>
<td>4</td>
</tr>
<tr>
<td>Chungnam</td>
<td>6</td>
<td>24</td>
</tr>
<tr>
<td>Total</td>
<td>28</td>
<td>72</td>
</tr>
</tbody>
</table>

Conclusions

Traceback investigation was performed on all farms of epidemiological significance. By 28 October 2000, 1,088 animals from 250 farms had been clinically investigated. Of these farms, 444 animals from 88 farms were tested by NSP ELISA. All samples gave negative results for FMD. In addition, forty hay samples and 100 yellow sand samples were tested by PCR to establish the possible source of introduction. Although all the samples were negative for FMD, additional studies are required before ruling out hay and sand as possible sources of infection. Delays occurred in identifying the farms, and a number of farms had already been destocked by the time traceback was completed and consequently could not be investigated.

These investigations did not identify any other source of infection or any evidence of spread of FMD. Further investigations will be performed, including the areas outside the outbreak zones.

Traceback investigation of foot and mouth disease in Japan

Eradication campaign

The details of the FMD outbreaks in Japan, organisation of the campaign, counter measures taken, surveillance systems employed and epidemiological investigations of the sources of infection are detailed by Sugura et al. (10).

Epidemiological investigations of the sources of infection

Epidemiological studies were undertaken to investigate all possible origins of infection (10). The potential sources considered were infected animals, humans carrying contaminated material (including tourists, veterinarians, artificial inseminators, cattle claw-trimmers, owners of animals and their families), contaminated vehicles (including feed or animal delivery trucks and garbage collection trucks), imported feed used in the infected areas, wind, potentially contaminated livestock products, insects, wild animals and pet animals.

All these potential sources of infection were ruled out by the epidemiological investigation, except imported forage. Two farms in which FMD was detected fed cattle with imported forage. These farms used wheat straw imported from the People’s Republic of China. The straw was imported during the winter season and some straw packs contained faeces-like substances.

Investigation of the quantity of wheat straw imported from the People’s Republic of China revealed that the largest volume of the imported straw from the People’s Republic of China was consumed in Miyazaki Prefecture where the first outbreak occurred in March 2000; the third largest amount was consumed in Hokkaido where another outbreak occurred in April 2000 (Table VIII). In Hokkaido, a small amount of rice straw was also imported from Taipei China.

Table VIII
Wheat straw imported from the People’s Republic of China to Japan (amount consumed in 1999 and stocks in June 2000)

<table>
<thead>
<tr>
<th>Prefecture</th>
<th>Consumed in 1999 (tons)</th>
<th>Stock in June 2000 (tons)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Miyazaki</td>
<td>7,043</td>
<td>324</td>
</tr>
<tr>
<td>Kagoshima</td>
<td>6,456</td>
<td>297</td>
</tr>
<tr>
<td>Hokkaido</td>
<td>3,391</td>
<td>156</td>
</tr>
<tr>
<td>Others</td>
<td>217</td>
<td>110</td>
</tr>
</tbody>
</table>

Comparative epidemiology

Straw and hay

Climatic conditions in Japan and the Republic of Korea before March 2000 were suitable for maintaining the infectivity of FMD viruses in the piles of hay and straw for prolonged periods. Although attempts to detect FMD antigens in imported hay from the People’s Republic of China gave negative results (Table II), these results do not imply that the
imported hay was safe for feeding cattle, as the probability of detecting FMD viruses or antigens in a pile of hay or straw is very low.

Even if an FMD virus or antigen were detected in the straw or hay, a traceback to the origin of the virus would be impossible under the present circumstances, unless the exact areas from which this straw or hay was harvested and the data on the FMD viruses prevalent in the harvested areas were made available, and comparative studies were performed on those viruses. Equally, the volume of imported straw and hay consumed in Japan and the Republic of Korea respectively (3) was so large that it would be impossible to ascertain that these forages were harvested in FMD-free areas and were safe for cattle consumption.

Further evidence that these forages were the most likely source of infection is that FMD affected only cattle, and not pigs, both in the Republic of Korea and Japan, despite the fact that, experimentally, the strains of virus that originate in the Republic of Korea and Japan are highly infectious to pigs (8).

Pathogenicity of foot and mouth disease viruses

An unusual character of the FMD virus that appeared in Taipei China (O/TAW/99) and Japan (O/JPN/2000) was that these strains did not produce clear signs of infection in yellow cattle in Taipei China and in Holstein cattle in Japan, respectively (8). These observations indicate that a variety of mild type O strains existed in the country of origin in regard to pathogenicity in cattle.

The strain from the Republic of Korea (O/SKR/2000) produced visible signs of infection in both native and Holstein cattle, but the molecular structure of the VP1 gene showed very close similarity to the strain from Taipei China (O/TAW/99) which gave much less clear signs of infection in yellow cattle.

Differences in pathogenicity clearly existed among the strains isolated in the Republic of Korea, Japan and Taipei China, although all these strains belonged to the pan-Asian topotype, indicating that the most likely country of common origin had a variety of type O viruses (8).

The origin of strains of low pathogenicity in East Asia

The occurrence of mild strains of type O virus in Taipei China and Japan caused serious concern for those engaged in the surveillance programmes, as these new FMD virus strains could spread subclinically from animal to animal without manifesting clear signs of infection.

The search for such FMD viruses in the literature focused attention on the live attenuated FMD vaccines used in the People’s Republic of China. According to the literature published in that country in May 1994, three types of attenuated vaccine strains were used, two of which were type O virus vaccines (2). Attenuated FMD type O-II vaccine for use in cattle was developed after 130 to 146 passages in mice and mass-produced in baby rabbits. This vaccine can be used for adult cattle (yellow cows and yaks), adult sheep and goats, but not for dairy cows, pigs or buffaloes. The use of the attenuated vaccines has been officially discontinued in the People’s Republic of China, but some people are thought to still use them occasionally. If a live virus vaccine is used in a country, the vaccine strain might persist in susceptible hosts by natural passages in the field without showing clear signs of infection.

Although the OIE Emergency Meeting held in Tokyo in June 2000 strongly recommended against the use of any attenuated vaccines for FMD (8), such a vaccine strain may remain in a country where the attenuated vaccines were employed. Therefore, it may be postulated that some of those FMD virus strains which appeared in the recent epidemics in East Asia originated from a vaccine strain(s) used in another country. Comparative studies of the molecular structures of attenuated vaccine strains and FMD viruses isolated in countries of the Far East would be highly desirable.

Conclusion

Most countries of Asia need to strengthen traceability mechanisms to determine the origins of pathogens causing new epidemics. The origin of outbreaks of FMD in the Republic of Korea could not be determined, despite efforts to detect the antigens in imported hay and yellow sand. Epidemiological studies performed in Japan to locate the origin of the FMD virus concluded that wheat straw imported from the People’s Republic of China was the most likely source of infection.
Systèmes de traçabilité ascendante utilisés lors des épizooties récentes en Asie

Y. Ozawa, B.L. Ong & S.H. An

Résumé
Comme le montrent les réponses à un questionnaire adressé aux directions des Services vétérinaires de treize pays asiatiques, les systèmes de traçabilité ascendante ne sont pas encore bien développés dans la plupart des pays de la région. Le marquage des animaux pour les besoins de la traçabilité n’est pratiqué que dans un nombre limité de pays, dans des zones particulières et à des fins bien précises.

La Malaisie satisfait aux exigences de la traçabilité ascendante chez les porcs en les tatouant du code de l’élevage d’origine. Cela permet d’identifier les élevages d’origine des porcs reconnus infectés par le virus de Nipah, lors de programmes de sérosurveillance.

Suite à l’apparition du virus de la fièvre aphteuse en République de Corée, en mars 2000, des enquêtes épidémiologiques ont été réalisées pour rechercher les sources possibles de contamination, par exemple le foin importé, les particules de boue, les camions de collecte du lait et les camions de transport d’aliments pour animaux. Aucune de ces recherches n’a permis d’identifier l’origine du virus de la fièvre aphteuse. L’apparition du virus de la fièvre aphteuse au Japon en mars 2000 a également donné lieu à des études épidémiologiques, mais, cette fois, la paille de blé importée a été incriminée comme la source la plus probable de l’infection.

Des études comparées sur le pouvoir pathogène des virus de la fièvre aphteuse (type O) isolés à Taipei China, en République de Corée et au Japon, suggèrent que ces virus ont peut-être pour origine des souches vaccinales utilisées dans un pays tiers.

Mots-clés

Sistemas de rastreo utilizados en Asia durante recientes epizootias

Y. Ozawa, B.L. Ong & S.H. An

Resumen
En la mayoría de los países asiáticos, los sistemas de rastreo son todavía rudimentarios, como pone de manifiesto un cuestionario al que respondieron los Servicios Veterinarios de trece países. El marquado de los animales con fines de rastreo se practica sólo en algunos países y sólo en determinadas áreas o zonas para cumplir con algún propósito específico.

En Malasia se han emprendido acciones de rastreo consistentes en tatuar el código de la granja en la piel de los cerdos, lo que sirve para localizar las granjas de origen de cerdos infectados por el virus Nipah cuando se aplican programas de serovigilancia.

Para investigar el origen del virus de la fiebre aftosa detectado en la República de Corea en marzo de 2000, se realizaron varios estudios epidemiológicos de presuntas fuentes de contaminación, como heno importado, partículas de lodo o
camiones de recogida de leche o de reparto de piensos. Ninguno de esos estudios arrojó resultados que pudieran revelar el origen del virus de la fiebre aftosa. También se recurrió a estudios epidemiológicos para investigar el origen del virus de la fiebre aftosa que fue notificado en Japón en marzo de 2000, y en aquel caso pudo determinarse que la fuente de infección más probable era una partida de trigo importada. De una serie de estudios comparativos de la patogenicidad de los virus de la fiebre aftosa (de tipo O) aislados en Taipei China, República de Corea y Japón se deduce que esos virus podrían proceder de cepas de vacuna utilizadas en algún otro país.

**Palabras clave**

## References


