Menangle Virus, Australia, November 1998
Emerging Disease Notice

Summary

- An outbreak in New South Wales, Australia of a new paramyxovirus (proposed name is Menangle virus) associated with reproductive failure in swine has been reported.
- Fruit bats have been identified as a probable reservoir of infection.
- Serologic evidence and possible clinical signs of infection have been reported in two humans with intense occupational exposure to infected pigs.
- Australia is a minor player in the international market for swine and swine products and the proportion of all U.S. imports of swine products originating from Australia is less than 0.05%.
- To date, there is no evidence that the outbreak has spread beyond the three associated premises where it was originally identified, and therefore, has had little effect on overall swine production in Australia.
- At present, the risk to U.S. swine from this new paramyxovirus appears low. This risk could change however, if for example, other reservoirs are identified, new cases are reported in Australia or elsewhere, U.S. imports of live swine, swine products or the reservoir species from Australia increase, or research into this new virus reveals information that would impact transmission risk.

Background

A farrow to weaning swine operation in New South Wales, Australia experienced a decrease in the pregnancy rate and average litter size and an increase in the proportion of mummified fetuses and stillborn piglets from mid-April to early September 1997. An apparently new virus in the family *Paramyxoviridae* was isolated from brain, lung and heart of stillborn piglets. The virus isolation was conducted at the Elizabeth Macarthur Agricultural Institute in Menangle, New South Wales, Australia and the proposed name for the new virus is Menangle virus. An assay for neutralizing antibodies to the virus was also developed at the Elizabeth Macarthur Agricultural Institute. The infection occurred in all four breeding units at a commercial operation with 2,600 sows, and in two associated grow to finish operations located several hundred kilometers away from the breeding facility. These associated grow to finish operations received batches of pigs at varying intervals from the farrow to weaning operation. Porcine sera (n=1,114) from other swine operations throughout Australia were tested for antibodies and the results indicate that infection appears to be confined to the affected farrow to weaning operation and the two associated grow to finish operations. There are currently no reports of this new virus anywhere else in the world. (Philbey AW, 1998)

As of October 1998, the infection was still circulating in the farrow to weaning operation and in one

grow to finish operation. Most pigs become infected at 12 to 16 weeks of age, after colostral immunity wanes. Among replacement gilts raised on the affected premises, approximately two-thirds are seropositive at entry into the breeding herd (Love RJ, 1998). Infection is no longer present in the other grow to finish operation. Eradication of infection in this operation is thought to be due to herd immunity achieved when no shipments of 8 week old pigs were received at the operation for a period of 10 weeks. Eradication plans for the other two premises are being developed. Quarantine measures are in effect. Pigs are only allowed to move off the affected premises directly to slaughter. All of the affected premises are quite geographically isolated from other commercial swine operations. (personal communication, Evan Sergeant, New South Wales Agriculture)

The pathologic lesions of affected stillborn piglets included the following: severe degeneration of the brain and spinal cord, arthrogryposis (rigid fixation of limbs, usually in flexion), brachygnathia (short lower jaw), occasional fibrinous body cavity effusions, pulmonary hypoplasia, and some had nonsuppurative myocarditis. No postnatal animals of any age manifested clinical disease, however greater than 90% of serum samples collected from pigs of all age categories at the affected operations (n=88) contained high titers (¥256) of neutralizing antibodies against the virus. The farrowing rate decreased to approximately 40% and litter size was also decreased. (Philbey AW, 1998, Ross AD, 1998)

Workers at the affected swine operations, slaughter workers, and others who had contact with potentially infected pigs were tested for antibodies to this new virus. Of 33 workers at the farrow to weaning operation, one was seropositive. Five workers were tested from the weaning to finish operations and one was seropositive. Another 218 people who had potential exposure to infected pigs (slaughter workers, researchers, animal handlers, veterinarians, pathology laboratory workers, others) were tested and all were seronegative. The two seropositive swine operation workers had onset of an illness in early June lasting 10-14 days, characterized by fever, chills, rigors, drenching sweats, malaise, headache and spotty red rash. It is suspected that the illness in these two workers was caused by the new virus. One of the seropositive workers had frequent prolonged contact with birthing pigs and the other seropositive worker performed autopsies on pigs without wearing gloves or protective eye wear. Seroprevalence was 5.26% (2/38) for individuals with high occupational exposure (workers at the swine operations), and if all individuals at risk are included, the seroprevalence was 0.78% (2/256). (Chant K, 1998) This low prevalence of seroconversion seems to indicate that the virus is not highly infectious to humans.

Investigators hypothesize that a large colony of fruit bats near the infected farrow to weaning operation were the source of the infection. Serum samples from fruit bats of several species collected both before and after the outbreak, were virus neutralization test positive. However, virus has not been isolated from bats. Samples from rodents, birds, cattle, sheep, cats and a dog were all seronegative. (Philbey AW, 1998)

Characteristics of Paramyxovirus Diseases

The family Paramyxoviridae includes three genera which contain many important viruses of both animals and humans. In the genus *Morbillivirus* are canine distemper virus, rinderpest virus, peste des petits ruminants virus, equine morbillivirus and the human measles virus. The genus *Paramyxovirus* includes Newcastle disease virus, four serotypes of parainfluenza viruses (including Sendai virus which affects swine), several serotypes of avian paramyxoviruses, and human mumps virus. The third genus, *Pneumovirus*, includes the respiratory syncytial viruses (RSV) of humans and cattle and the pneumonia virus of mice. (Fenner F, 1993)

Many paramyxoviruses produce a serious systemic disease (rinderpest, Newcastle disease, canine distemper) while others are primarily respiratory (parainfluenza, RSV). Many diseases caused by paramyxoviruses have a neurological component (canine distemper, Newcastle disease). Intestinal signs are also common. The incubation periods range from 24 hours (parainfluenza 3 in cattle) to 11 days (equine morbillivirus). Transmission is generally by direct contact as virus is usually shed in all secretions. For some paramyxoviruses transmission can also occur by airborne aerosols and dust particles (Newcastle, canine distemper, RSV) and by contaminated feed and water (Newcastle, rinderpest). (Fenner F, 1993; Timoney JF, 1988)

Virus stability varies from stable (Newcastle) to very labile (rinderpest, canine distemper, RSV). Morbidity and mortality vary also; parainfluenza viruses are associated with both low morbidity and low mortality whereas rinderpest, canine distemper and equine morbillivirus are associated with high mortality. A carrier state is present in Newcastle disease with virus shedding for at least four weeks post infection. (Fenner F, 1993; Timoney JF, 1988)

The gross pathologic lesions and histopathology described in reports of the Australian outbreak of this new virus, are consistent with a neurotropic paramyxovirus. Morbidity in adult sows is extremely low, with reproductive failure the primary clinical effect. La Piedad Michoacan Virus (LPMV) or "blue eye disease", first isolated in Mexico in 1980, is the only other known paramyxovirus which is associated with reproductive failure in pigs. (Ross AD, 1998) Newcastle disease virus and equine morbillivirus are other paramyxoviruses reported to cause zoonotic illness.

Probable mode of transmission

Respiratory transmission was suspected as the mode of spread in pigs because of the almost 100% prevalence of virus neutralizing titers in the pig population (Chant, et al., 1998). Additional studies, however, using sentinel pigs in the affected operations, indicate fecal-oral transmission may be more likely (Love RJ, 1998). Transmission from fruit bats to pigs is also hypothesized to have occurred by the fecal-oral route. Fruit bats fly over the farrow to weaning operation buildings when departing their roost at dusk and when returning to the roost at dawn. Paths around the buildings which house the pigs are contaminated with fruit bat feces and pigs are moved on these paths. (Love RJ, 1998)

Lesions in the affected swine fetuses as mentioned above, indicate viremia probably occurs with the virus crossing the placenta. Virus may be present therefore, in meat, secretions, and excretions of

affected animals. Research is needed to determine however, if transmission via meat to animals or humans is possible.

Suspected reservoir and its distribution in the U.S.

The suspected reservoir for this apparently new virus is fruit bats. Serum samples from several species of fruit bat in the family Pteropodidiae were found to be positive for the new virus in the virus neutralization test. These species were *Pteropus poliocephalus* (grey-headed flying fox), *P. alecto* (black fruit bats), and *P. conspicillatus* (spectacled fruit bats). Pteropodids can be found in tropical and subtropical regions of southern and central Asia, Africa, Australia, the Phillipines and other Pacific islands. Fruit bats in Australia have recently been identified as the reservoir of two other new viruses, equine morbillivirus and a lyssavirus, which cause disease in humans and domestic animals.

The following species in the vicinity of the affected premises were tested for neutralizing antibodies to Menangle virus, and were seronegative: rodents (n=19), birds (n=13), cattle (n=60), sheep (n=70), cats (n=25), and dog (n=1).

Pteropodids are not naturally present in the U.S., though they may be imported and exist in U.S. zoos, private collections, or research facilities. The U.S. Fish and Wildlife Service maintains data files on wildlife imports in LEMIS (Law Enforcement Management Information System). The LEMIS system includes only a portion of total wildlife imports. Other imports are recorded in a U.S. Customs database which CEI did not have access to. According to the LEMIS database, there were no imports of the three bat species which tested positive for the new virus (*Pteropus poliocephalus*, *Pteropus alecto* or *Pteropus conspicillatus*), into the U.S. during 1995, 1996 or 1997. There was however, a shipment in 1995 of 65 live bats of the Pteropus genus, of unidentified species, imported into the U.S. from Jamaica. During 1995, 1996 and 1997 there were 4,250 live bats, of genera other than Pteropus, imported into the U.S. from Canada, the Solomon Islands and Jamaica.

What is Australia's place in the international market for affected animals and animal products?

Australia has traditionally played a minor role in the international market for swine and swine products. However, recent involvement of a Danish company in the Australian swine industry is aimed at increasing Australia's swine production capacity with a goal of exporting to Asian markets. This Danish company is involved in building a swine operation in Queensland with a production capacity of one million pigs per year, which would increase Australian pig production by 37%.

(Source: FAS Attache Report, Australia Livestock Annual, 8/1/97)

What is Australia's production and trade in affected animals and animal products?

Recent restructuring of the Australian pig industry resulted in a loss of around 1,100 producers, leaving 3,600 pig farming operations in 1997 (FAS Attache Report, 8/1/97). The FAO Agricultural

Trade Database reports that Australia produced 2,684,000 head of swine in 1997, accounting for only 0.3% of world production. Australia's pigmeat production in 1997 was 324,865 metric tons, accounting for 0.4% of world production of pigmeat. Australia's production of bacon and ham, pigmeat sausage, and meat preparation of pigs accounted for 0.12%, 0.22% and 0.03% of world production respectively.

Pigmeat production in Australia is focused on domestic consumption. Australia imported a small amount of pigmeat from Canada, totaling 6,000 metric tons in 1996. Australia exported small numbers of live swine, accounting for 0.01% in world exports in 1996. Similarly, Australia exported a small amount of pig meat, accounting for 0.26% of world exports in 1996.

Table 1. Total Australian Exports of Live Pigs and Pig Meat

Export Item Description	1994	1995	1996
Live Pigs (numbers)	1,700	3,147	1,855
Pig meat (metric tons)	6,341	5,892	6,326

Source: FAOSTAT Database, Food and Agriculture Organization

What are the U.S. imports of affected animals or animal products from Australia?

Imports of swine and swine products from Australia are minimal. The U.S. imported 18 live not for breeding swine in Jan-July 1998, 20 breeding swine in 1997, and none in 1996 (Table 2). Total imports of live swine into the U.S. from all countries in 1997 were 3,179,578, thus imports from Australia account for less than 0.001%. There were no imports of swine semen from Australia reported in the U. S. Department of Commerce World Trade Atlas. The proportion of total U.S. imports of fresh or frozen pork originating in Australia was 0.01% in 1997 and 0.03% during Jan-July 1998.

Table 2. U.S. Imports from Australia

Import Item Description	1996	1997	1998 Jan-July
Live Swine (number) purebred breeding not purebreed >50kg	0 0	20 0	0 18

Meat: Pork, fresh or frozen (kg)	0	14,549	28,154
Prepared Meat Other Hams/Cuts (kg)	0	411	0
Prepared Meat of Swine/Other (kg)	0	10,086	0
Hog Sausage/Casing (kg)	3,520	13,210	0
Pig, Poultry Fat Rendered (kg)	0	0	0

Source: World Trade Atlas, US Dept. of Commerce

CEI's interpretation(s)

At present, the risk to the U.S. from this apparently new paramyxovirus appears low. The U.S. imported a small number of live swine from Australia in 1997 and 1998. Imports of swine meat and products from Australia to the U.S. are minimal. The outbreak was limited to three premises and does not appear to have spread. The suspected animal reservoir does not occur naturally in the U.S.

The risk to the U.S. could change, however. The following circumstances would warrant a reevaluation of risk: other reservoirs are identified, new cases are reported in Australia or elsewhere, U. S. imports of live swine, swine products or the reservoir species from Australia increase, or research into this new virus reveals information that would impact transmission risk.

Though at present the risk of introduction to the U.S. of this new virus appears low, should introduction occur, the impact on the U.S. pork industry is potentially great. The following recommended actions, listed in priority order, are suggested to prevent introduction:

References

Chant K, Chan R, Smith M, et al. Probable Human Infection with a Newly Described Virus in the Family *Paramyxoviridai*. Emerging Infectious Diseases Journal, April-June 1998; 4:273-275.

Fenner F, Bachmann PA, Gibbs EP, et al. Veterinary Virology. 1993. Academic Press, Orlando, FL.

Love RJ, Kirkland PD, Philbey AW et al. Reproductive failure associated with a new virus in the

Paramyxoviridae family. Symposium on a new viral disease of pigs: clinical aspects and epidemiology, Australian Veterinary Association conference, May 1998.

Philbey AW, Kirkland PD, Ros AD et al. An Apparently New Virus (Family *Paramyxoviridae*) Infectious for Pigs, Humans, and Fruit Bats. Emerging Infectious Diseases Journal, April-June 1998; 4:269-271.

Ross AD, Philbey AW, Kirkland PD, et al. The natural and experimental pathology of infection with a virus in the family *Paramyxoviridae in pigs*. Symposium on a new viral disease of pigs, Australian Veterinary Association conference, May 1998.

Timoney JF, Gillespie JH, Scott FW, et al. Hagan and Bruner's Microbiology and Infectious Diseases of Domestic Animals. 1988, 8th Ed. Cornell University Press, Ithaca, NY.