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Menangle




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Overview

- Organism
- Economic Impact
- Epidemiology
- Transmission
- Clinical Signs
- Diagnosis and Treatment
- Prevention and Control
- Actions to take



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In today's presentation we will cover information regarding the organism that causes Menangle and its epidemiology. We will also talk about the economic impact the disease could have. Additionally, we will talk about how it is transmitted, the species it affects, clinical signs, necropsy findings, and diagnosis and treatment of the disease. Finally, we will address prevention and control measures for the disease as well as actions to take if Menangle is suspected.

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The Organism



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The Organism

- Paramyxoviridae
 - Rubulavirus
- Syncytia and vacuolation
- Not highly contagious
 - Spreads slowly throughout the herd
- Does not survive in environment for very long


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Menangle is one of several recently discovered RNA viruses (ie, Nipah, Hendra and Tioman) in the family Paramyxoviridae. Menangle is in the genus Rubulavirus; other members of this genus include Newcastle (chickens) and the human mumps viruses. The organism is named for the city where the only outbreak occurred, Menangle, New South Wales, Australia in 1997. The virus is thought to infect pig fetuses by crossing the placenta, where it causes syncytia and vacuolation within the cells. The virus does not appear to be highly contagious but tends to spread slowly throughout the population. The virus does not appear able to survive in the environment for any length of time.

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Importance



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History and Economic Impact

- Newly isolated in 1997
 - New South Wales, Australia
 - Loss of fetuses and piglets
 - Reduced size and number of litters
 - Pseudopregnancy in sows
 - All postnatal pigs seroconvert
- Decreased number of animal will be economically damaging

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In 1997, a reproductive disease outbreak in New South Wales, Australia, led to the discovery of a new Paramyxovirus, called Menangle. The virus has the potential to cause a great economic impact when introduced into a naïve swine population. The loss of fetal and prenatal piglets, reduced piglet size and number per litter will greatly decrease the number of animals available for sale which will be economically damaging. Additionally, although some infected sows will return to estrus 28 days following mating, others will remain pseudopregnant for up to 60 days after mating, thereby delaying further breeding. Fortunately, all postnatal pigs do seroconvert to the virus within 10-14 days and develop a strong immunity to the virus. Persistent infections in swine do not occur and once the infection is endemic in the herd no further reproductive failures occur. [For Reference: In June 2003, the U.S. average pigs per litter was 8.88 pigs and breeding hog inventory was 5.94 million head, with 47% of the breeding herd reported as sows farrowed (or 2.8 million head). (Source: USDA, National Agricultural Statistics Service).]

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Epidemiology

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History

- 1997: New South Wales, Australia
 - 2,600 sow intensive piggery
 - 4 breeding units
 - 21 week period
 - Mummified fetuses and stillborn piglets
 - Reduced farrowing rates
 - Reduced number and size of litters



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In 1997, a reproductive disease outbreak in New South Wales, Australia, led to the discovery of a new Paramyxovirus, called Menangle. From April to October 1997, reproductive problems occurred within a 2,600 sow intensive piggery (4 breeding units). Pathological examinations revealed mummified and congenitally deformed piglets. Epidemiological studies showed reduced farrowing rates and a decline in the number and size of litters during the outbreak. Through preventative and control measures the outbreak was maintained to this limited area. Currently, the only outbreak of Menangle virus occurred in New South Wales, Australia (yellow) in 1997. There have been no reports of the virus anywhere else in the world. Map from Australian Tourism Net at <http://www.atn.com.au/nsw.htm>. [WA-western Australia, NT-northern territory, SA-south Australia, QLD-Queensland, NSW-New South Wales, ACT-Australian Capital territory (Canberra), VIC-Victoria, TAS-Tasmania]

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Transmission

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Transmission

- Animal
 - Exact mechanism unknown
 - Fecal-oral or urinary-oral suspected
 - Reservoir
 - Fruit bats (flying foxes)
 - Roost near piggery
- Human
 - Exact mechanism unknown
 - Very close contact with infected pig required

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Currently, the exact mechanism of transmission of Menangle virus is not known; however a fecal-oral or urinary-oral route is suspected. The reservoir for the virus is considered to be native fruit bats (in particular flying foxes). These animals have also been found to be the reservoir for other newly emerging Paramyxoviruses (i.e., Nipah and Hendra viruses). During the 1997 outbreak in New South Wales, Australia, two humans were infected with Menangle virus. Although the exact route of transmission is unknown, both individuals had very close contact with the infected swine. Another 250 persons with close contact to the infected swine were not affected by the Menangle virus.

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***Pteropus* species**

- Fruit bats, flying foxes
 - *Pteropus poliocephalus*
- Native to Australia
- Found seropositive for Menangle before and during 1997 outbreak



The grey-headed flying fox (*Pteropus poliocephalus*)


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Fruit bats (in particular flying foxes) are currently considered the primary reservoir for Menangle virus. A large breeding colony of gray-headed (*Pteropus poliocephalus*) and little red flying foxes (*Pteropus scapularis*) roosted within 200 meters of the affected piggery. Serology indicated that 34% of the bats had neutralizing antibodies to Menangle virus. Additionally, serology obtained prior to the outbreak also indicated these animals had been infected with the virus. Photo: Grey-headed flying fox (*Pteropus poliocephalus*) Courtesy of G.B. Baker, School of Resources, Environment and Society – The Australian National University at <http://sres.anu.edu.au/associated/batatlas/grey.html>.

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Animals and Menangle



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Clinical Signs

- Seroconvert in 10-14 days
- Reproductive disease
 - Fetal mummification and stillbirths
 - Reduced farrowing rate
 - Reduced number and size of litters
 - Abortions
- No clinical signs in postnatal pigs
- Other animal species seronegative

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Although the incubation period for Menangle is not known, pigs seroconvert to the virus in 10-14 days. The virus causes disease to the developing fetuses. Fetal mummification and stillbirths, some having deformities of the skeletal or nervous are the most commonly seen. Arthrogryposis, brachygnathia and kyphosis can also be seen. Additionally, there will be a reduction in the farrowing rate as well as the number and size of litters. No clinical signs have been seen in postnatal pigs of any age. Serology on a variety of wild and domestic animals (cattle, sheep, birds, rodents, cats and dogs) in the vicinity of the affected piggery tested seronegative for the virus.

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Post Mortem Lesions

- Mummification
- Stillborns
- Severe degeneration of brain and spinal cord
- Domed cranium
- Histopathology
 - Degeneration, necrosis of nervous tissue
 - Inclusion bodies
 - Nonsuppurative myocarditis



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Affected litters consist of a mixture of mummified, autolysed and fresh stillborn piglets and a few normal live piglets. Post mortem examination of the affected piglets may reveal severe degeneration of the brain or spinal cord (may be almost absent in some), arthrogryposis, brachygnathia, kyphosis, and occasionally fibrinous body cavity effusions and pulmonary hypoplasia may be seen. The cranium of some piglets may be slightly domed in some cases. Additionally, histological examination of the brain and spinal cord may show extensive degeneration and necrosis of the gray and white matter with infiltrations of inflammatory cells. Neurons may contain intranuclear and intracytoplasmic inclusion bodies. Nonsuppurative myocarditis can be found in some piglets. Photo: Affected litter at farrowing showing mummified fetuses and stillborn piglets with deformities from Australian Veterinary Journal 2001;79:192-8.

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Morbidity/ Mortality

- Farrowing percentage down to 38%
- Number of live piglets per litter declined
- Mummified fetuses, stillborn piglets
 - Arthrogryposis, skeletal deformities
 - Degeneration of brain and spinal cord
- Occasional abortions

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During the 1997 outbreak (Australia), the farrowing percentages decreased from an expected 82% to as low as 38% during the peak of the outbreak. Additionally the number of live piglets per litter declined from a mean of 9.7 to 8.1 during the outbreak. Mummified fetuses, stillborn piglets with arthrogryposis, craniofacial deformities and degeneration of the brain and spinal cord, were observed along with occasional abortions.

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Differential Diagnosis

- Classical swine fever
- Porcine reproductive and respiratory syndrome
- Porcine parvovirus
- Aujeszky's disease (pseudorabies)
- Blue eye paramyxovirus
 - (La Piedad Michoacan)

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Differential diagnoses for Menangle include classical swine fever, porcine reproductive and respiratory syndrome, porcine parvovirus, Aujeszky's disease (pseudorabies) and blue eye (La Piedad Michoacan) paramyxovirus.

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Sampling

- Before collecting or sending any samples, the proper authorities should be contacted
- Samples should only be sent under secure conditions and to authorized laboratories to prevent the spread of the disease

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Before collecting or sending any samples from animals with a suspected foreign animal disease, the proper authorities should be contacted. Samples should only be sent under secure conditions and to authorized laboratories to prevent the spread of the disease.

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Diagnosis

- Clinical
 - Increased proportion of mummified and stillborn piglets
- Laboratory Tests
 - Serology - antibody (sows)
 - Virus neutralization, ELISA
 - Virus isolation (piglet)
 - For definitive diagnosis
 - Brain, lung, myocardial tissue

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The most notable clinical signs of Menangle infection are the increased proportion of mummified and stillborn piglets with all other aged animals appearing asymptomatic. Sows can be tested for antibody specific to Menangle virus by virus neutralization or ELISA testing. Virus isolation and electron microscopy may be needed for definitive diagnosis. Tissue from the brain, lung and myocardium of piglets can be used. Serum from the farrowing sow should also be collected.

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Treatment

- No treatment
- No vaccine
- Once infected, no further reproductive failures occur

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Currently there is no treatment for Menangle virus, however once pigs seroconvert to the virus reproductive failures no longer occur. There is no vaccine available for Menangle virus.

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Menangle in Humans




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Public Health Significance

- Two human cases
 - Sudden fever, malaise, chills, drenching sweats, headache, myalgia
 - Followed by spotty, red, non-pruritic rash
 - No coughing, vomiting, or diarrhea
 - Recovered in 10-14 days




During the 1997 Menangle outbreak, two humans out of over 250 workers exposed to the infected pigs developed signs and were seropositive for the virus. One of the seropositive workers had frequent prolonged contact with birthing pigs and the other individual performed necropsies on infected pigs without wearing gloves or protective eyewear. Both individuals presented with a sudden onset of malaise, chills, drenching sweats, fever, severe headache and myalgia, but no coughing, vomiting or diarrhea were noted. Within 3-4 days both developed a spotty, red, non-pruritic rash. Both recovered after 10-14 days.

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Prevention and Control




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Recommended Actions

- Notification of Authorities
 - Federal:
 - Area Veterinarian in Charge (AVIC)
 - www.aphis.usda.gov/vs/area_offices.htm
 - State veterinarian
 - www.aphis.usda.gov/vs/sregs/official.htm
- Quarantine




If you suspect a case or outbreak of Menangle, contact your state and/or federal veterinarian immediately and establish a quarantine of the premise. Quarantine measures should be undertaken, especially for pigs 10-16 weeks of age, to reduce the spread of the disease.

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Prevention and Control

- Avoid contact between fruit bats and swine
- Spread through population by time signs of disease are seen
- Endemic population
 - Remove pigs ages 10-16 weeks
 - Restock with unexposed pigs or pigs known to be immune to the virus
- No vaccine available




In areas with native fruit bat populations, prevention of contact between bats and pigs is essential. In an outbreak situation, infection will most likely have spread through the population before the first affected litters are farrowed. In an endemic herd, the best prevention is to maximize the opportunity for infection of all selected replacement breeding stock prior to mating. To eradicate the disease from an endemic population, pigs ages 10-16 weeks should be isolated or removed from the population (most pigs become infected at 12-16 weeks of age, after colostral immunity wanes) or the herd should be restocked with unexposed pigs or pigs known to be immune to the virus. Currently there is no vaccine for Menangle available.

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Additional Resources



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Internet Resources

- APHIS-Center for Emerging Issues
– www.aphis.usda.gov/vs/ceah/cei/menangle.htm
- CSIROOnline
(Commonwealth Scientific & Industrial Research Organisation)
– www.csiro.au/index.asp?type=faq&id=Menangle
- Communicable Diseases Network Australia
– www.health.gov.au/pubhlth/cdi/pubs/pdf/batsgen.pdf


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Acknowledgments

Author: Glenda Dvorak, DVM, MS, MPH

Co-authors: Anna Rovid Spickler, DVM, PhD
Radford Davis, DVM, MPH, DACVPM

Reviewer: Bindy Comito Sornsin, BA

