

Aujeszky's Disease



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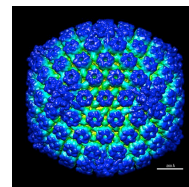


OIE Regional Workshop, Beijing, July/Aug 2018

Aetiology - Aujeszky's Disease Virus

Also called pseudorabies virus

- Alphaherpesvirus
 - Genus: *Varicellovirus*
 - Porcine herpesvirus 1 (PHV-1)
 - Single serotype
 - Genotypic differences
- Highly contagious
- Natural hosts
 - Domestic and feral swine
 - Can become latent carriers
 - **Most mammals are susceptible**
 - Including rodents
 - Infections of cattle, sheep, goats and dogs also common in some countries
 - Generally **NOT** considered to infect humans
- Can persist for several days in the environment
- Can be present in aerosol form, under favourable conditions



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History

- 1902, Hungary
 - Aladar Aujeszky first identified ADV in cattle and dogs
 - Determined swine are natural hosts
- Mainly found only in E Europe
- 1931, U.S.
 - "Mad itch" recognized as Aujeszky's disease
- 1983, U.S.
 - 18.8% U.S. breeding swine seropositive
- 1989 – worldwide, confirmed in 43 countries



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Economic Impact

- Trade restrictions
- 1988 study – U.S. epizootic
 - Newborn pig mortality
 - 76.5% of total net losses (TNL)
 - Estimated \$24/inventoried sow/week
 - Nursery pig mortality (12.6% TNL)
 - Sow culling and deaths (9.4% TNL)
- 2012, China (Yu et al 2014)
 - "highly pathogenic" variants (?)
 - 35% abortion in sows
 - 50% morbidity & 5-7% mortality in young and older pigs
 - All animals vaccinated
 - Severe respiratory disease – REALLY ADV?



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Morbidity/mortality

- Morbidity
 - Up to 100%
 - Up to 30% abortions
 - Often no signs in feral pigs
- Mortality
 - Highest in younger animals
 - Decreases with age
 - Always fatal in other species
 - Co-infections can lead to higher morbidity and mortality



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Aujeszky's Disease Eradication

USA

- 1989
 - National Aujeszky's disease Eradication Program implemented
 - USDA-APHIS, States and producers
 - Over 8000 herds identified
- 1992
 - Over 1000 herds still positive
- 2004
 - U.S. commercial swine herds declared AD free
 - Still present in feral swine

United Kingdom

- 1983
 - Voluntary control scheme – initially about 75% of farmers
 - Slaughter & compensation
 - No DIVA vaccine at the time
 - Funded by slaughter levy
- 1989
 - Last case in UK
- 1991
 - Eradicated in UK
 - NOT present in feral swine or dogs



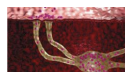
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Geographic Distribution

- Europe, South & Southeast Asia, Central & South America
- Other reports
 - Cuba, Samoa, Rwanda
- All U.S. states are ADV free
 - Presence of ADV in feral swine a concern for domestic herds
- Disease is notifiable in the EU
 - Virus circulating in wild boar – occasional positives
 - Occasional outbreaks in domestic swine
- Situation in rest of the world unclear – rarely reported to OIE – endemic in most of Asia



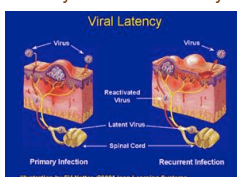
ADV infection



- Virus replicates in epithelium of tonsils and nasopharynx
- Virus spreads from primary site to CNS, then to spinal cord and along nerve trunks
- Virus induces inflammation & necrosis of tissues – large enough to be grossly visible
- Virus may cross the placenta to infect some or all fetuses. In reproductive tract, can cause vaginitis and necrotic placentitis. Virus and lesions also present in infected fetuses

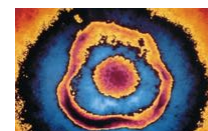
ADV latency

- A general property of herpesviruses
- Viral DNA persists in some cells
 - virus not replicating – no infectious virus produced
- Has potential for re-activation
- Pigs exposed to high levels of ADV likely to become latently infected carriers
- Major sites for latency
 - Trigeminal ganglion
 - Olfactory bulb
 - Tonsils



Infection in pigs of different ages

- Infectious dose
 - 10^{1-3} TCID₅₀ in suckling pigs
 - 10^4 TCID₅₀ in young pigs
 - 10^{4-5} TCID₅₀ in adult pigs



- 100x to 1000x more virus needed to infect vaccinated pigs
- Severity of disease is not dependent on increasing virus load

Transmission: Pigs

- Most common
 - Respiratory
 - Oral
 - Nose-to-nose contact
 - Semen
- Aerosol
 - High humidity, low UV
- Fomites
 - Contaminated bedding and water
 - Meat products or carcasses
- Venereal – feral swine
 - Piglets – transplacentally
- Latent carriers possible (It's a herpesvirus!)
 - stress reactivation



Transmission: Other Species

- Contact with infected pigs
- Ingestion of contaminated raw meat
- Rarely lateral transmission



- Rodents? Susceptible but role as reservoirs unclear

Clinical Signs: Pigs

- Incubation period: 2 to 6 days
- < 1 week old piglets
 - Fever, listlessness, anorexia
 - Neurological signs
 - Tremors, paddling, seizures, dog-sitting, walking in circles
 - High mortality within 24 to 36 hours
- Older piglets
 - Similar signs
 - Vomiting and respiratory
 - Lower mortality



Clinical Signs: Pigs

- Weaned pigs
 - Respiratory and neurological signs
 - Fever, anorexia, weight loss
 - conjunctivitis
 - Recover in 5 to 10 days
- Adult pigs
 - Usually mild or inapparent infection
 - Respiratory signs
 - Lung – other pathogens
 - Neurological signs
 - Muscle tremors, convulsions
 - Pregnant sows: reproductive signs
 - Abortion, resorption
 - Mixture of weakborn, stillborn and mummified
- Feral swine often asymptomatic

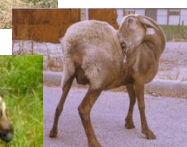
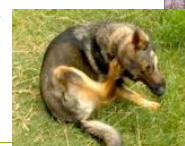


Summary of clinical signs of ADV in pigs



Clinical Signs: Other Species

- Cattle, sheep & goats
 - Intense pruritus
 - Licking, rubbing, gnawing, self-mutilation
 - Neurological signs
- Dogs and cats
 - Similar to cattle and sheep
 - Pharyngeal paralysis & salivation
 - Resembles rabies
- Death in 1 to 2 days



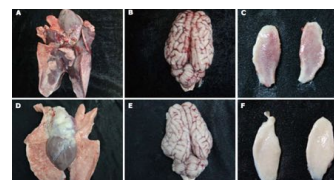
Post Mortem Lesions

- Lesions often subtle or absent
- Serous or fibrinonecrotic rhinitis
- Pulmonary edema, congestion, consolidation
- Congested and hemorrhagic lymph nodes
- Necrotic foci in other organs



Newly emerging virulent strain in China?

- Since 2011 - more severe clinical disease
 - Genetic differences
- Contradictory claims about conventional vaccine efficacy
 - Disease in vaccinated farms?
 - Can occur – antibody negative cohorts previously reported in vaccinated farms
- Severe disease of new strain in lungs, brain & tonsil (top row) compared to infection with conventional strain (bottom row)



Differential Diagnosis

- Pigs
 - Porcine polioencephalomyelitis
 - Classical or African swine fever
 - PRRS
 - Hemagglutinating encephalomyelitis infection
 - Streptococcal meningoencephalitis
 - Swine influenza
 - Erysipelas
 - Nipah virus infection
 - Salt or organic poisoning
- Other species
 - Rabies
 - Scrapie in sheep/CAE in goats

PREVENTION AND CONTROL

Controlling ADV: Quarantine and Disinfection

- Isolation and testing of new animals
- Biosecurity measures
 - Prevent entry
 - Double fencing
- Disinfection
 - Phenols, quaternary ammonium compounds
 - Inactivated by heat, sunlight



Prevention

- Depopulation and repopulation
 - Premises cleaned, disinfected
 - Left empty for 30 days
 - ADV survival
 - Straw, 30-40 days
 - Water, 7 days
 - Concrete, 4 days
- Test and removal
 - Test breeding herd monthly
 - Remove positive animals
- Offspring segregation
 - Vaccinate breeding herd
 - Remove young weaned pigs



Vaccination



- Protects pigs from clinical signs
- Decrease virus shedding
- Does NOT provide sterile immunity NOR does it prevent latent infections
- Attenuated, inactivated, gene-deleted vaccines
 - Vaccinated pigs which become infected can be detected
 - gB vs gE

The Bartha K61 strain

- Bartha K61 is a naturally occurring strain that lost its virulence by a defect in the glycoprotein called gE (formerly called gI)
 - This is why we call it "gE negative"
- Colonises trigeminal ganglia but doesn't re-emerge
 - Can also prevent latency following subsequent infection with field virus
- The strain is thymidine kinase positive
 - Responsible for the "latency" of the virus
 - Essential for replication of antigen in the vaccine
- Thymidine kinase-positive vaccines are essential for the intranasal route
 - Superior to MLVs that are thymidine kinase negative!



Requirements for successful vaccination

- Good vaccine!
- Proper storage and temperature monitoring
- Appropriate equipment
- Good technique
 - Diluent
 - Needle-changing
 - Disposal of half-used bottles
- Good timing
 - Age of pigs?
 - Other vaccines?
- Immaculate record-keeping



Summary

- ADV is controllable, at the farm level, production level – and even country-level!
- In endemic countries, a good vaccination regime and biosecurity are essential
 - Including cats, dogs and rodents
- Veterinarians should always be alert to ADV
 - Monitoring of vaccine coverage and high-risk groups is essential
 - Boar studs, nucleus herds
 - Latent infections and fast, multi-site spread
 - Structured, active surveillance of 4-6m.o. stock

Acknowledgments

Online presentation: Center for Food Security & Public Health, Iowa State University

Authors: Katie Spaulding, BS; Anna Rovid Spickler, DVM, PhD

<https://www.slideshare.net/siamakZohari/aujeszkys-disease>

Dr Marika Genzow of BI – for her presentation of 2016!

The Pig Site

<http://www.thepigsite.com/diseaseinfo/11/aujeszkys-disease-ad/>

ResPig

<http://www.respig.co.uk/diseases/aujeszky.asp#control>