EXOTIC
Classical swine fever
Fact sheet
May 2017

Introduction

Classical swine fever (CSF), also known as hog cholera, is a serious viral disease of pigs. CSF is important because:

- it can cause major economic losses in countries with industrial pig production
- feral pigs can act as a reservoir of infection
- the infectious agent is present in Australia's near northern neighbouring countries.

Aetiology

CSF virus is an RNA virus of the genus *Pestivirus* and family *Flaviviridae* [1].

Natural hosts

Pigs, *Sus scrofa* (domestic, feral and wild), are the only susceptible species.

World distribution

The disease occurs in much of Asia, Central and South America, and parts of Europe and Africa. Many countries have eradicated the disease. Classical swine fever virus has been reported in wild boar from several countries in Europe. During the 1990s large CSF outbreaks occurred in many European countries.

The disease spread in the 1990s eastwards across Indonesia from Sumatra to Java, Bali, Kalimantan, East Timor (1997) and West Papua on the island of New Guinea and is considered widespread in the eastern islands of Indonesia [2].

Occurrences in Australia

Four previous outbreaks of CSF occurred in Australia, between 1903 and 1961, with each lasting no more than about a year before being eradicated [3]. The virus was likely introduced into Australia from imported pig meat or food refuse from ships being fed to pigs.

Epidemiology

The virus is highly contagious and spreads rapidly by direct or indirect contact. Under natural conditions the oro-nasal pathway is the route of infection. Incubation is 2–14 days. Some infected pigs are born clinically normal but persistently viraemic with no antibody response: they are

important intermittent shedders of virus until dying in 6–12 months (domestic pigs). From limited data, feral pig shedders are thought to survive for only a few months (Cowled pers. comm.).

Where a feral pig population is free of the virus, infection can only be introduced from external sources such as contaminated food scraps, infected carcasses or by close contact with infected domestic pigs. Persistence of infection will be influenced by population size and density, and the age structure with younger susceptible animals contributing to the prolonged survival of the virus. Spread of infection will be limited, but can be influenced by illegal translocations by hunters or forced movements due to flooding, drought or human interference. Placental transmission is possible, some affected piglets may survive to shed virus for several months before showing overt disease [1, 3].

Factors that increase the risk of maintaining, transmitting and dispersing CSF (from AUSVETPLAN Wild Animal Response Strategy [4]):

- Feral pigs are found across 40% of Australia over a wide range of habitats [5].
- Anecdotal information indicates the range of feral pigs is slowly increasing [6].
- Feral pigs are opportunistic omnivores.
- Feral pigs have a potentially high rate of population growth when good quality food, water and shelter are abundant (producing two weaned litters every 12–15 months, with an average of 5–6 piglets per litter).
- Feral pigs are occasionally found in large groups, particularly in tropical Australia (groups of more than 100 observed around waterholes) during drought conditions.
- Pigs' wallowing habits may increase the probability of disease transmission.
- Feral pig habitat contiguity: where populations in large contiguous habitat, spread maybe more likely.
- Feral pigs can change behaviour, for example traveling longer distances or being more active at night, if they are subjected to intensive disturbance [7]. Dexter 1996 [8] considered that disturbance caused by shooting has little effect on surviving feral pigs changing their home range.
- Spread of CSF in Australia may be more likely to occur the virus was introduced the start of the dry season [9].

Factors that reduce the risk:

- Restricted access to water and shelter, particularly in hot environments limits dispersal.
- Feral pigs are mostly sedentary, with dispersal rates between, but not within, home ranges being low [5]. No seasonal or temporal trends have been observed in outbreaks of CSF in feral pigs overseas. Most foci of CSF in feral pigs are limited in size (ranging from a few squares to some ten thousand hectares [10].

Clinical signs

The clinical signs of CSF are extremely variable. The severity depends mainly on the age of the animal and virulence of the virus. Usually young animals are affected more severely. Intra-uterine infections can lead to foetal death or piglets being born with congenital abnormalities. If infection occurs in late gestation the piglets can survive and remain persistently infected. In older breeding pigs, the course of the infection is often mild or even subclinical.

In domestic pigs three forms of clinical disease, acute, chronic or mild are described, but this differentiation is not obvious with wild pigs. The most common signs in feral pigs (from experience in Europe) are unexplained deaths, animals being depressed and showing little fear of humans, and occasionally weakness of the hind legs with a staggering gait. They may have gummy eyelids and red or purple blotching on the ears, snout, limbs and body. Many pigs, positive on serological surveillance sampling, are subclinical.

CSF is difficult to diagnose based on clinical signs and confirmatory tests are needed.

Clinical pathology

The acute form may show severe leukopaenia. Other changes are non-specific and depend on the presenting condition (e.g. septicaemia).

Pathology

Lesions are caused by damage to large and small blood vessels with small haemorrhages occurring in numerous locations especially the renal cortex, bladder, larynx and trachea. Lymph nodes may be swollen, congested and haemorrhagic. The severity of lesions can vary widely.

Gross changes are reflected microscopically. Lesions in the central nervous system may include endothelial proliferation and perivascular cuffing and gliosis, without inclusion bodies, in the thalamus and medulla.

Differential diagnoses

Numerous diseases, both endemic and exotic, may show clinical symptoms similar to CSF.

Laboratory specimens

10 ml of serum and 5 ml of whole blood (EDTA) from each animal (up to 30). Samples should be kept cool during transport to the laboratory. Tissue samples to collect include lymph nodes of the mandible and pharynx, tonsils, spleen and mesenteric lymph nodes. Samples should be placed in sterile containers without fixative and kept cool.

Animal information should include age, sex, body condition, snout to tail/snout to nuchal crest length and group size, together with the GPS coordinates of the sampling location. Samples should be collected from pigs which are exhibiting clinical signs (including fever) but not moribund, and also from any aborted foetuses, stillborn pigs or runts.

Laboratory procedures

The following tests are available at CSIRO-AAHL for diagnosis of CSF (see AUSVETPLAN for more details):

- neutralising peroxidise-linked assay (considered the definitive test with high specificity and low cross-reactivity)
- qPCR
- antigen capture ELISA (tissue or blood)

- virus isolation and detection
- molecular sequencing
- ELISA (serum) [1].
- Other pestiviruses are present in Australia and include border disease (BD) of sheep and virus diarrhoea of cattle (BVD) [1]. Serological cross-reactions with BVD and BD viruses occur and might hamper serological diagnosis [10].

Prevention and control

CSF is present in near northern neighbouring countries and is most at risk of being introduced to Australia via infected animals or contaminated product via traditional trade routes into the feral pig population, or by illegal importation of pig products. If introduced, CSF could be difficult to manage once established in feral pigs, and could have a high impact on Australian pork industry.

Modelling indicates that CSF could establish in Australian feral pigs but may eventually die out (Cowled pers. comm.). Enhanced culling and containment would likely be used with wild pigs. Modelling indicates aerial shooting of feral pigs could result in rapid eradication of the disease if an outbreak is detected within 1-2 months. Aerial delivery of oral vaccines may also lead to disease eradication or containment in some circumstances.

'Stamping out' or 'modified stamping out' would be applied to production and backyard piggeries. An attenuated live vaccine (which does not prevent viral shedding) may be used to limit spread of infection [1].

An eradication program would include rapid determination of the extent of infection using quickly instituted serosurveillance and tracing of both pigs and pig products, followed by the application of mandatory biosecurity programs (e.g. quarantine and movement controls) [1].

Surveillance and management

Wildlife Health Australia administers Australia's general wildlife health surveillance system, in partnership with government and non-government agencies. Wildlife health data is collected into a national database, the electronic Wildlife Health Information System (eWHIS). Information is reported by a variety of sources including government agencies, zoo based wildlife hospitals, sentinel veterinary clinics, universities, wildlife rehabilitators, and a range of other organisations and individuals. Targeted surveillance data is also collected by WHA. See the WHA website for more information https://wildlifehealthaustralia.com.au/Our-Work/Surveillance and https://wildlifehealthaustralia.com.au/Our-Work/Surveillance/eWHIS-Wildlife-Health-Information-System. There are no reports of CSF in the National Wildlife Health Surveillance Database.

CSF is an OIE and nationally notifiable animal disease and there is an AUSVETPLAN Disease Strategy for CSF [1]. Surveillance to satisfy proof of freedom would be required should CSF be introduced to Australia. This could include targeted surveillance of feral pig populations in northern Australia.

CSF is included on the Northern Australia Quarantine Strategy list of diseases for targeted surveillance.

Research

The following research areas have been suggested:

- Further field studies along the lines of Caley 1997 [11] to better define the factors listed (in *Epidemiology*) that contribute to CSF becoming endemic in the feral pig population.
- Further modelling using the updated information from field studies to better define the disease risk taking into account both domestic and free-ranging pig populations.
- Further modelling to examine the time-lags, financial benefits and effectiveness of eradication measures (such as culling, vaccination and containment), to guide policy.
- Evaluation of feral population control, education and other mitigation actions. McMahon et al. 2010 [12] describes a basic model.
- Evaluation / improvement of perimeter, pre-border biosecurity measures as appropriate (Existing projects identified: http://aciar.gov.au/project/AH/2004/020 [2] and http://aciar.gov.au/project/AH/2006/156 [13]).
- Studies of the situation overseas in countries with the disease occurring in feral pig populations.
- Studies of disease patterns in feral pigs within Australia. e.g. *Brucella suis.*

Human health implications

There are no human health implications.

Conclusions

CSF virus is exotic to Australia but is present in near northern countries. If CSF virus were to be introduced to Australia it could establish in our feral pig population and would have significant impacts on the Australian pork industry. Ongoing surveillance and preparation is recommended.

References and other information

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Wildlife Health Australia recognises the Traditional Custodians of Country throughout Australia. We respectfully acknowledge Aboriginal and Torres Strait Islander peoples' continuing connection to land, sea, wildlife and community. We pay our respects to them and their cultures, and to their Elders past and present.

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