Caprine arthritis encephalitis (CAE)

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Caprine arthritis encephalitis (CAE), commonly known as 'big knee', is caused by a lentivirus or 'slow' virus associated with nervous disorder (encephalomyelitis) in kids and slowly-developing disease syndromes in older goats.

Symptoms can vary markedly between animals with most well managed goats showing no obvious clinical signs.

The virus occurs mainly in improved dairy goat breeds and is spread primarily via infected colostrum and milk. Control programs have been conducted in many countries but CAE is still causing problems in dairy goat populations worldwide, including within NSW.

CAE is a market access issue. The International Organisation for Animal Health (OIE) sets a minimum standard for live goat imports that includes:

- the animals showed no clinical sign of CAE on the day of shipment
- animals over one year of age were subjected to a diagnostic test for CAE with negative results during the 30 days prior to shipment, or
- CAE was neither clinically nor serologically diagnosed in the sheep and goats present in the flocks of origin during the past 3 years, and no sheep or goat from a flock of inferior health status was introduced into these flocks during this period.

CAE is also considered an animal welfare issue and causes major production losses through mastitis, ill-thrift, arthritis, pneumonia, ascending paralysis and encephalitis in kids.

The virus

The CAE virus belongs to a family of viruses (lentivirus) that can integrate into the DNA of a host cell and then use the host's own cell to reproduce itself (retrovirus). Once a host cell is infected, it remains infected for life. The only way to remove infection is to destroy the infected cell.

The CAE virus infects mainly white blood cells and travels through the body inside these cells. Any secretion from an infected goat that contains white blood cells (milk, blood, saliva, tears, respiratory secretions) will contain the virus. It can also be found in the cells surrounding oocytes (egg cells) and in semen.

Antibodies to the virus don't provide protection but are good indicators of exposure and infection. It can take two months, and rarely up to two years, for antibodies to develop after exposure to the virus.

The virus is very susceptible to inactivation by heat (56 degree C for 10 minutes) and by chemical disinfection, but is resistant to UV. It does not survive well outside the host as it is cell associated.

The disease

Caprine retrovirus is an OIE listed disease.

The disease occurs when the cells carrying the latent virus mature and multiply in different body ‘target’ organs – mammary gland, lungs, tendons sheaths, joints and nervous tissue.

The clinical signs that can occur in an infected goat are mainly due to the body's reaction against the virus infected cells. Clinical signs include:

- viral mastitis, with an increase of white blood cells in the milk and a decreased resistance to mastitis. ‘Hard udder’ (indurative mastitis) can occur
- arthritis in any joints, most notably the carpal joints ('big knee), due to inflammation of the tendon sheaths and joint lining (synoviae)
- pneumonia following inflammation in the lung tissue
- neurological disease due to inflammation in the brain and its covering (meningitis/encephalitis) or inflammation in the spinal cord, resulting in progressive paralysis.

Kids less than 6 months of age are more likely to show neurological disease.

The majority of CAE infected goats do not show any outward clinical signs, although viral mastitis may be present in does.

Clinical signs can arise in a previously sub-clinical goat if the goat is exposed to stressful situations such as poor nutrition and overcrowding. Well managed infected goats may never show clinical signs.

**Epidemiology**

The main spread of the virus between goats is through the ingestion of infected milk by kids or adults. Adult goats can also become infected by exposure to infected milk droplets during milking.

The virus can also be spread by respiratory secretions, saliva and tears when goats are kept in close quarters.

Transfer sometimes occurs by blood on gear such as vaccination needles, tattooing equipment, dehorners and foot/hair shears, or through exposure to open wounds.

Venereal spread in semen and in utero spread to kids, are less likely but can occur.

The virus usually enters a clean property in an infected goat. The goat may or may not be antibody positive for CAE at the time of blood testing because of the delay between exposure to the virus and the development of antibodies.

**Zoonotic risk**

People drinking milk from infected does can develop antibodies to the CAE virus. There is no evidence that this contact has resulted in persistent viral infection.

There is a strong cross reactivity between surface glycoproteins on the CAE virus and the HIV virus. It’s been postulated that the false positive reactions to HIV in some people may be due to previous exposure to the CAE virus in goat milk.

**CAE control**

Detecting sub-clinically infected goats is the key to preventing CAE spread.

Infected goats are detected by serological testing. The most accurate test is the ELISA test although some countries still use the less specific AGID test.
Repeated blood testing during a 12 month period will detect the majority of infected goats (a very small number may take longer to seroconvert).

The CAE status of goats should be determined in goats 6 months and older. Adult does should not be tested in the period from one month either side of kidding as inconsistent results could occur. No goat should be tested within one month of any vaccination.

CAE Certification

Dairy goat herds are at greater risk of being infected with CAE because both kids and adults are managed intensively. Knowledge of the testing history of the adult herd (especially within the last 12 months), and assessment of the herd management as low risk, provide confidence when certifying for CAE status.

Where the herd is not accredited and there is no history of testing within the previous 12 months, all animals over 6 months of age should be tested. Any ELIZA positive animal indicates that infection could be present in the herd and the CAE status of the herd is positive.

Further information on CAE Accreditation can be obtained from the DPI website under Goat Health.


For further information on CAE please contact Diane Ryan, Industry & Investment NSW, ph 4640 6378, diane.ryan@industry.nsw.gov.au

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ISSN 1832-6668

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Job number 9162

TRIM number PUB10/103