TECHNICAL NOTE TN758 / January 2022

Ovine Pulmonary Adenocarcinoma (OPA)

Summary

- OPA is an infectious lung cancer caused by Jaagsiekte sheep retrovirus
- It spreads mainly through aerosol transfer (nose to nose contact)
- Affected animals struggle to breathe and lag behind the flock when handled
- Ultrasound examination of the lungs can be used for early diagnosis
- Confirmatory diagnosis is made by post-mortem examination and histopathology
- Purchase of clinically healthy but infected replacement animals is the biggest risk factor for the introduction of OPA to a flock
- There is no vaccine or effective treatment
- Flock management practices can help to reduce the spread of infection

Introduction

Ovine pulmonary adenocarcinoma (OPA also known as Jaagsiekte – "driving sickness") is a contagious viral disease that leads to lung cancer of sheep. Goats can be infected too but this is uncommon. It is caused by Jaagsiekte sheep retrovirus (JSRV). OPA is one of the five iceberg diseases, along with maedi visna (MV), Johne's disease, Border disease and caseous lymphadenitis (CLA). They are known as iceberg diseases because the visibly diseased sheep are only the tip of the problem, with many subclinically infected individuals within the flock. These diseases usually present as poor performance with obvious clinical signs often absent until late in the disease process.

OPA is a significant production limiting disease in many countries of the world including the UK, where it is present in all four nations. However, the disease is not present in New Zealand, Australia, Falkland Islands, or Iceland. OPA is a notifiable disease in Ireland. Each year between 60 and 85 cases are diagnosed in veterinary labs in Scotland, England, and Wales, but this is certainly an underestimate as few sheep deaths are investigated.

Fallen stock surveys in the North of England identified OPA in 5.6% of sheep carcases and 0.9% of apparently healthy cull ewes were found to have OPA in an abattoir survey. When the disease is first identified in a flock, losses can be as high as 20% within the first few years. Ongoing losses are then estimated to be around 1 to 5% per year.

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Affected animals most commonly show signs of disease at 3 to 4 years of age, but the condition is occasionally identified in lambs as young as 2 months old. Once clinical signs develop, affected sheep die within days to months. In addition to mortality, production losses such as increased ewe barren rate and reduced lamb weight gains are likely because of poor ewe body condition. The impact of this has not yet been quantified and the true economic cost of the disease is unknown.

Transmission

The JSRV virus is found in the fluid from the lungs of infected sheep and is mainly transmitted through the air by inhaling infective respiratory droplets. Close contact such as housing and trough feeding provides ideal conditions for the virus to spread. The virus can also be transmitted from ewe to lamb via milk or colostrum. It is likely that sheep with advanced OPA tumours pose the greatest risk for JSRV transmission, but that OPA-affected sheep will be able to transmit the virus before clinical signs are seen. Many more sheep are infected with JSRV than ever develop OPA in their commercial lifespan. It is not known whether sheep that are infected with JSRV but do not have OPA are able to transmit the virus.

Young lambs are most susceptible to JSRV infection and the time between infection and clinical signs developing (incubation time) is dependent on the age of sheep at infection and the dose of JSRV.

Clinical signs of disease

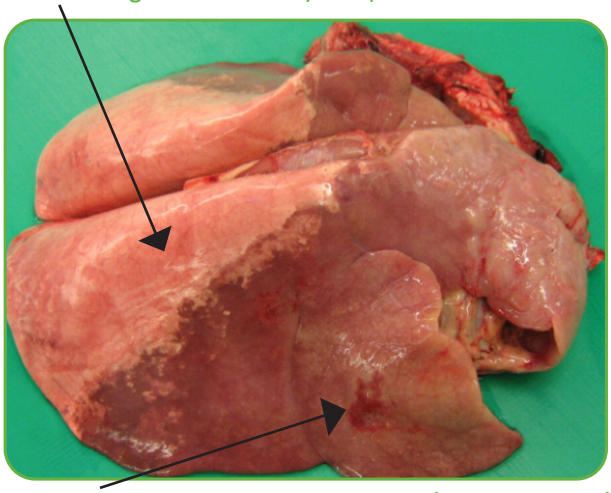
- **Progressive weight loss (despite appearing to have normal appetite).**
- **Increased cases of pneumonia in adult animals that fail to respond to antibiotics.**
  - **Secondary bacterial infections and other concurrent infections of the lung are common.**
- **Normal temperature unless there is also a bacterial infection.**
- **Increased number of "sudden" deaths.**
  - **Although these deaths appear sudden, the lung tumours may have been present for months to years. These are usually a result of Pasteurella pneumonia and affected sheep can be in good body condition at the time of death.**
- **Animals seen lagging behind the flock when gathered or handled.**
- **Animals struggling to breathe (flared nostrils and increased breathing rate) particularly after exercise.**
- **In around two thirds of advanced cases fluid can be seen running out of the animal's nostrils when the head is lowered.**
  - **10 to 40 ml per day of frothy, clear or at times pinkish fluid/mucus is common but this can be up to 400 ml per day.**
- **Around one third of cases don't produce any fluid.**
- **Cases peak in January and February due to affected sheep being unable to cope with adverse weather conditions and nutritional restrictions at that time of year.**
- **Deaths can occurs days to months after clinical signs are first seen.**

Diagnosis

The identification of fluid coming from an animal's nostrils following the "wheelbarrow test" (see Box 1) is diagnostic for OPA, although use of this test is no longer advised because of the stress to the animal. However, if no fluid is seen then diagnosis can be challenging as ill-thrift is a feature of many other diseases of sheep.

There is no commercially available laboratory test for the diagnosis of OPA in live animals. A PCR test has been used in research studies, but it lacks the sensitivity for field diagnosis in individual animals. Ultrasound examination of the lungs has been established as a valuable tool for the early identification of cases, before clinical signs develop, while the affected sheep still has some cull sale value. The sensitivity and specificity of ultrasound scanning varies depending on operator experience, tumour location and size (see Box 2).

Normal lung – indicated by the pink area.



OPA lesion – indicated by the darker (purple/greyish) area extending over most of the lungs.

The gold standard for OPA diagnosis is post-mortem examination followed by histopathology. OPA affected lungs are enlarged, heavy, oedematous and fail to collapse. The tumours appear darker (purple/greyish) than normal lung tissue and are usually firm and well demarcated. However, other infections can appear similar on gross examination, so histopathology is required to confirm a diagnosis of OPA.

Box 1

Wheelbarrow test

This test involves raising the hind limbs and lowering the head to check whether or not fluid will flow from the nostrils. Do not confuse OPA lung fluid with saliva, nasal secretions, or rumen contents in dead sheep. OPA lung fluid is generally frothy, clear or at times pinkish. A positive result is diagnostic, but OPA cannot be ruled out if no fluid is found.

This test can cause significant distress to the animal and should only be performed if there are means to euthanase the animal immediately after testing.

N.B. This photo was taken when the sheep was already dead.

Box 2

Transthoracic ultrasound

Ultrasound examination of lungs can only detect tumours over 1 cm in size in the ventral areas of the lungs. Therefore, it is not possible to guarantee absence of OPA in individual animals. This technique can also be used to identify other conditions such as abscesses or pleurisy which may be treatable. Both sides of the chest need to be scanned as tumours may be present in only one lung. The speed of progression is highly variable, but in some cases, small tumours can grow to a large size within 3 months. As a result, it is recommended that any sheep with suspicious lesions at scanning are quarantined and scanned again 2 months later.

Regular scanning at 6 to 12-month intervals with prompt culling of all positive sheep can be used as an OPA risk reduction strategy within a flock.

Veterinary surgeons experienced in the technique can scan up to 120 adult sheep per hour but 60 to 80 is a more realistic figure. Typical fees are £1 to £2 per head.

Control & Prevention

The purchase of clinically healthy but infected replacement animals is the biggest risk factor for the introduction of OPA to a flock.

Ideally, a closed flock should be maintained but this is not practical for most farms that need to buy in replacement tups. Therefore, stock should preferably be purchased from trusted sources that have scanned their whole flock and have a low prevalence of OPA. Scanning added animals at purchase or during the quarantine period helps to reduce the risk of introducing animals that have OPA to a flock. However, it does not guarantee that they are not infected with JSRV. Sudden deaths or ill thrift in added animals should be investigated. In addition, good biosecurity including double fencing farm boundaries is key to avoid transmission from neighbouring stock.

Once introduced to a flock for the first time JRSV can spread quickly and high numbers of individuals can succumb to OPA. To minimise transmission there are two aspects to consider:

1. Reducing contact between individuals.

Transmission is most likely to occur when animals are in close contact, so reducing the stocking density is advisable particularly when animals are housed. Shifting from indoor to outdoor lambing is also recommended. Feeding may be a key transmission point, therefore regular shifting of feeding sites and the use of snackers should be implemented. If trough feeding is necessary, regular cleaning and disinfection is required.

As young animals are most susceptible to JRSV infection, maintaining sheep in single age groups can reduce contact with older individuals that may have OPA lesions.

To reduce transmission from infected ewes, lambs may be removed at birth and artificially reared. This must be carried out before they are licked by the ewe or ingest colostrum. This technique is likely to only be practical in small pedigree flocks. Similarly, embryo transfer may be used to preserve valuable genetics, but is expensive and raises welfare concerns.

2. Removing infected animals as soon as possible.

In addition to culling animals identified as having OPA offspring from these individuals should not be retained as they are also likely to be infected. Operating a test and cull system to remove OPA cases at the earliest opportunity should lead to a decrease in new infections and reduce the flock prevalence over time.

The JSRV virus can survive in the environment for many days, so any pens or buildings which have housed affected individuals should be thoroughly disinfected and any grazing areas should be rested for several weeks.

Regular monitoring of body condition score can aid identification of suspect cases, however further investigation to confirm the diagnosis will be required. It should be noted that this strategy will not identify pre-clinical OPA cases that may nonetheless be shedding JSRV.

In flocks concurrently infected with OPA and Maedi Visna, destocking may be the only option as the two diseases act synergistically to increase transmission and losses.

OPA control should be part of your flock health plan and discussed with your vet.

The future

The Moredun Research Institute has an active OPA research programme with the aim of developing a diagnostic test that can be used to identify infected animals at an early stage. Such a test would allow more effective control and reduce the suffering caused by this disease.

They are also investigating the potential application of ultrasound scanning to reduce disease prevalence and form the basis of a risk based OPA health scheme to aid trading of sheep.

There is currently no ongoing work to develop a vaccine against this disease.

Authors

Laura Henderson, SAC Consulting
Heather Stevenson & Sue Tongue, SRUC
Chris Cousens, Moredun Research Institute
Ed Hill, Thrums Veterinary Group

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