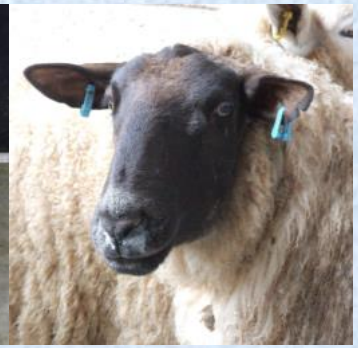
Dr Chris Cousens
Moredun Research Institute

11th Oct 2023

Ovine pulmonary adenocarcinoma (OPA or Jaagsiekte)



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Ovine pulmonary adenocarcinoma (OPA) is an infectious lung disease of sheep:

- Deaths
- Unexplained loss of condition
- Breathing difficulty
- Excessive fluid from the nose
- Pneumonia

Lung fluid

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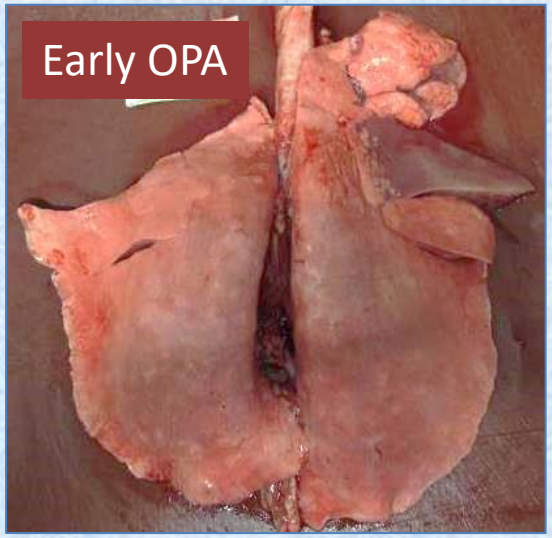

Clinical signs are generally not apparent until the tumours are very large.

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How much of a problem is OPA ?

Accurate figures not known:
Found throughout the UK
1% in an abattoir study of cull sheep
6% in a fallen stock study
1-2% in most affected flocks (can be >6% per yr)

Economic drain
Welfare issue
Wasted GHG emissions

Definitely a disease causing concern to flock owners in recent years

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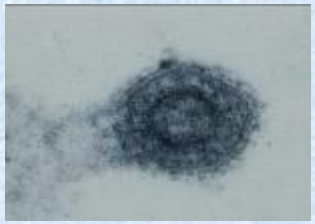
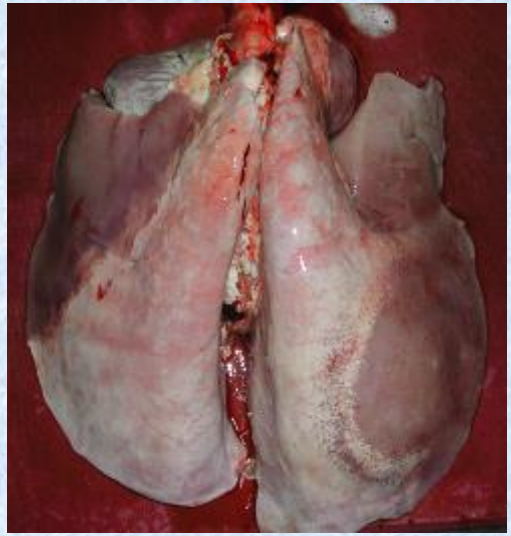
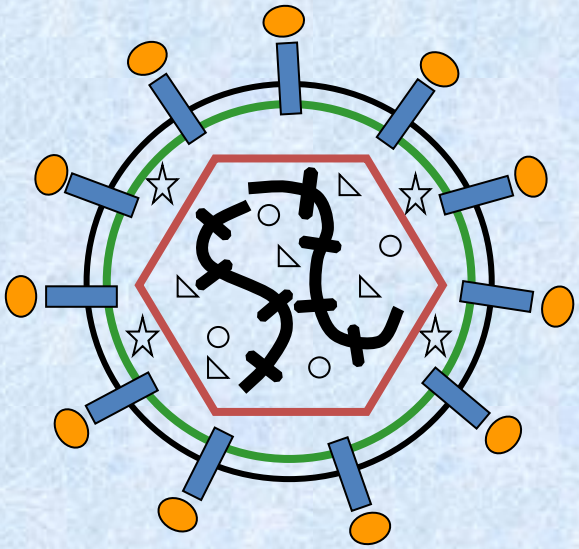
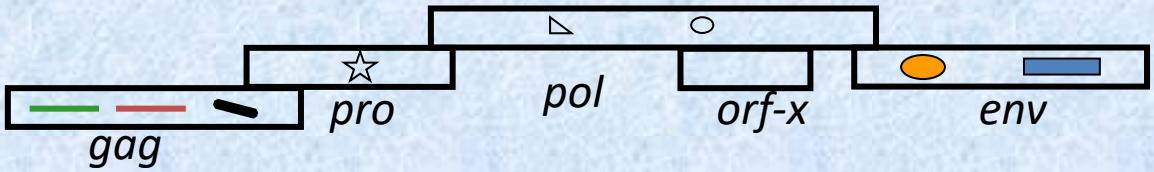
OPA is caused by Jaagsiekte Sheep Retrovirus (JSRV)





Cell derived lipid bilayer
SU – surface component
TM – transmembrane
MA – matrix protein
CA – capsid protein
NC – nucleocapsid protein
RNA
PR - protease
IN – integrase
RT – reverse transcriptase





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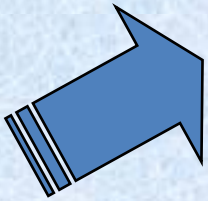
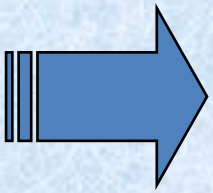
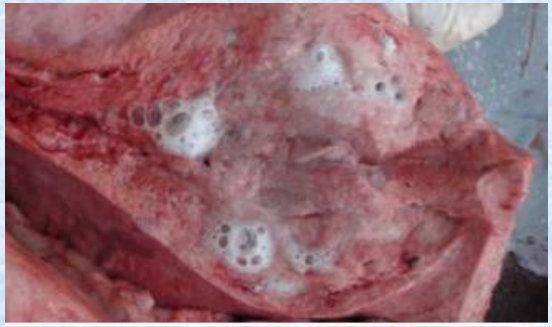
Transmission of OPA





Virus is produced by the tumour cells into the lung secretions

Lung fluid contains 10^7-10^9 virus particles per ml.



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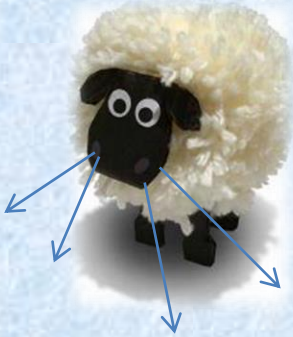
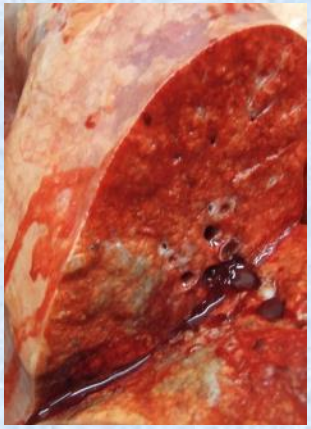


Even without apparent lung fluid, infection can spread within the flock.



Sheep that appear to be completely healthy can carry and pass on the virus.

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Transmission of OPA

JSRV can be transmitted from ewe to lamb by close contact and in milk.

When the ewe has clinical OPA, JSRV can be transmitted to the foetus *in utero.*

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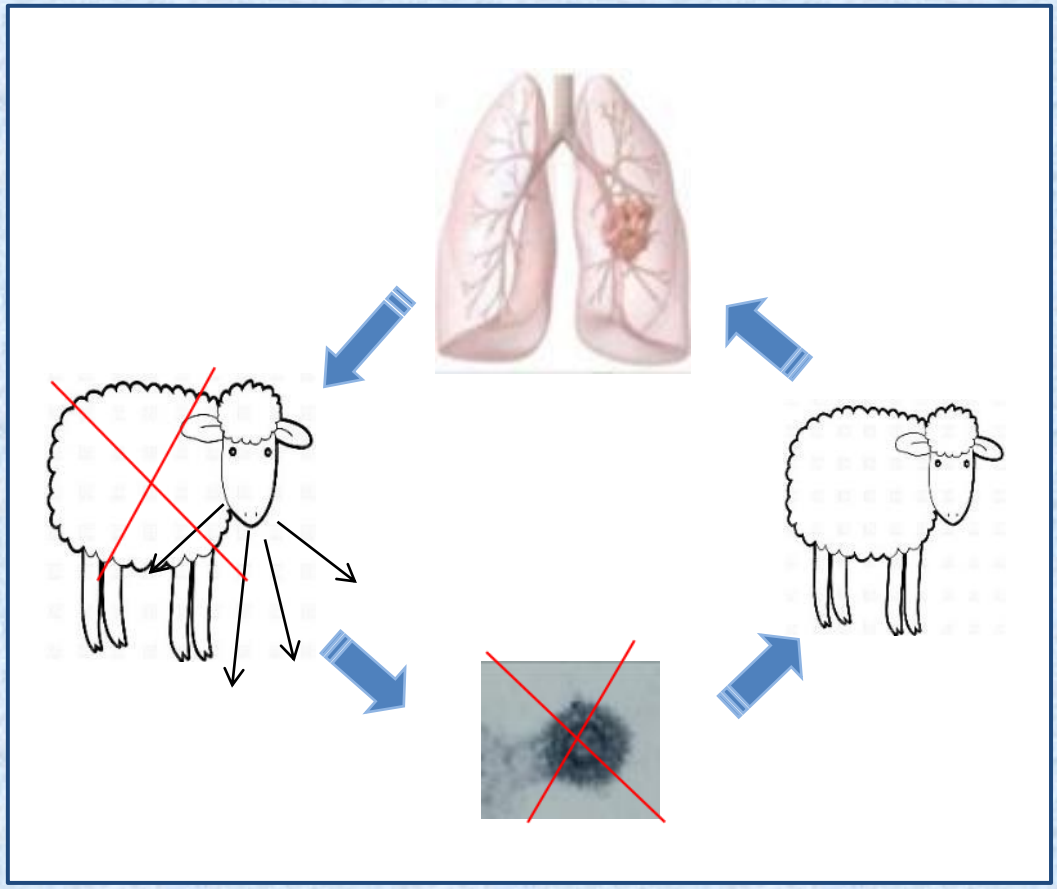
No Treatment.

No vaccine.

Instead, to reduce the risk of transmission we need to identify sheep with OPA as early as possible and remove them from the flock.



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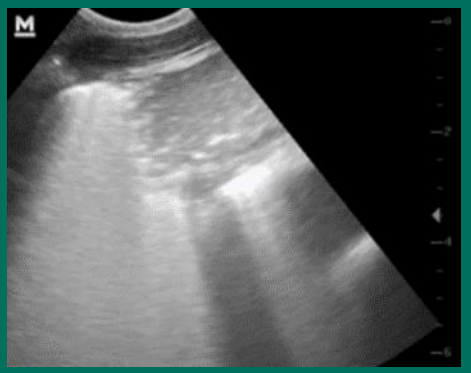
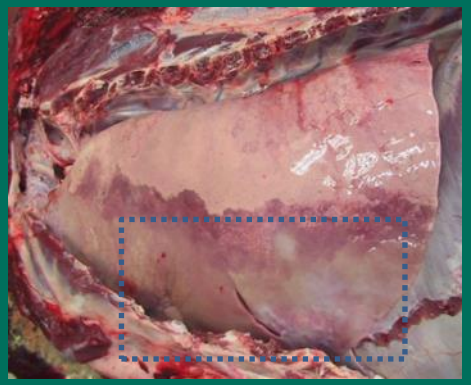
There are no good laboratory diagnostic tests for pre-clinical OPA.

Currently the best option is ultrasound scanning of the chest





On-farm ultrasound scanning

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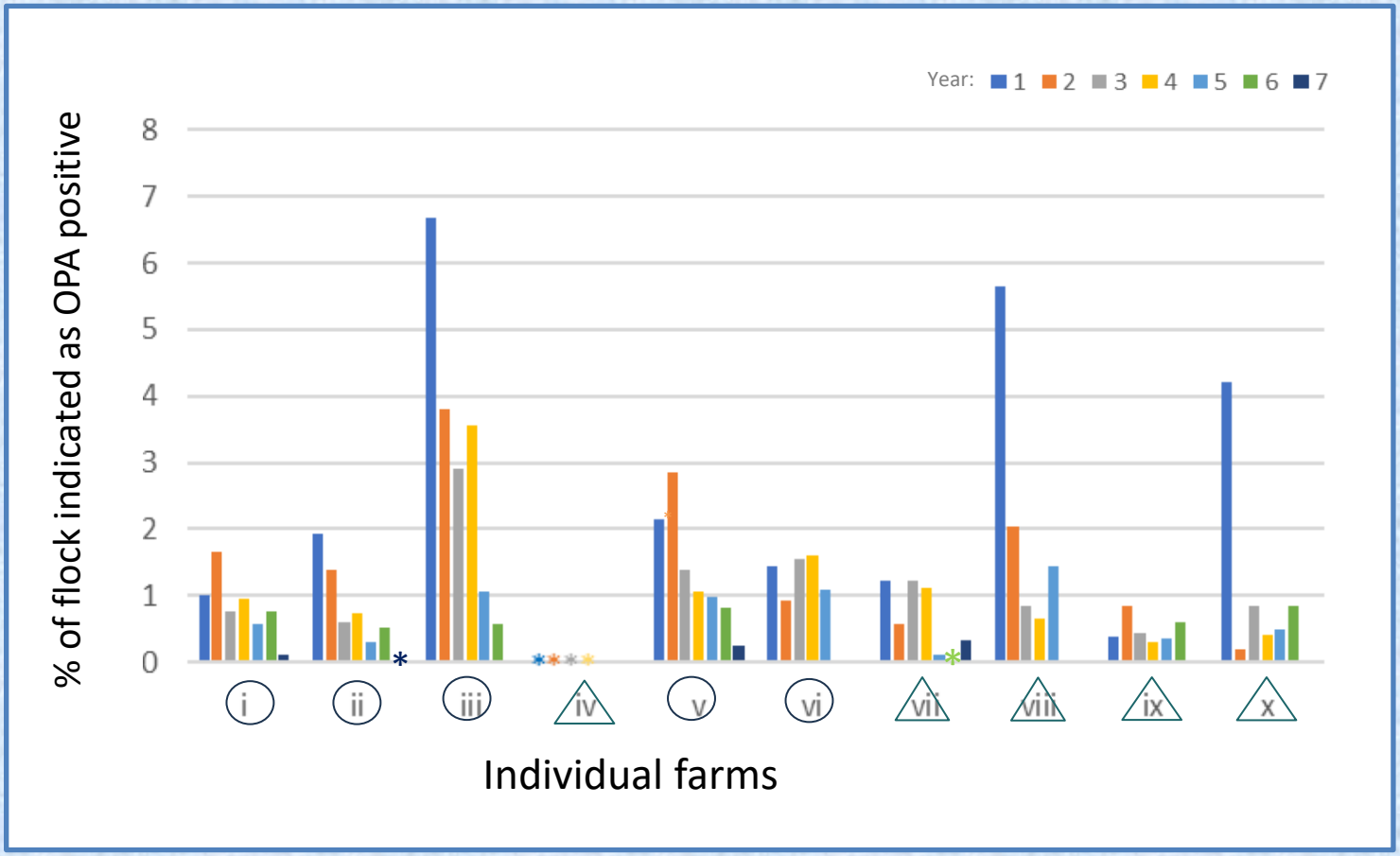
Whole flock test-and-cull with 6-12mo repeat screening



We started with 20 project flocks. 10 continued for 4 years or more.

◯ screened 2x per year

△ screened once per year

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Efficacy of on farm ultrasound scanning

Sensitivity	0.76 (95% CI: 0.72-0.79) to 0.99 (95% CI: 0.97-0.99).	very few positives (>1cm) were missed
Specificity	0.998 (95% CI: 0.998-0.999)	negative diagnosis is nearly always correct

Efficacy will vary with different scanners
Also depends on other respiratory disease prevalent in the flock.

Discuss in advance re: culling decisions

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- Ultrasound screening looks useful for most flocks.
  - to help to **reduce disease prevalence** (and therefore risk of passing on disease)
  - or to **show that a flock is low risk** (several negative whole flock scans)

- BUT the results must be interpreted properly
- A single scan is a snapshot -“the vet did not find a lesion in the scannable region of the lungs of that sheep on that day”.
- To reduce risk of spreading OPA all sheep in the flock should be scanned and positives should be removed. Scanning only sale sheep should not be considered sufficient.

- Sheep with pre-clinical OPA are a risk of transmission to others in the flock and especially to their lambs

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Next .....

Eradication ?

Assurance-type schemes?

- Ultrasound scanning (& PME)
- PME of a proportion of the flock
- Follow up of cull ewes & fallen stock

- Pathology confirmation

The SG working group on OPA is discussing how a potential assurance scheme could work and who would run it

Meanwhile it is important to share the message about how to properly interpret ultrasound scanning results

PME= post mortem examination

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OPA/Jaagsiekte risk management

OPA is a progressive viral disease causing lung tumours resulting in exercise intolerance, weight loss, and eventual death in affected animals. OPA virus affects all breeds of sheep and has been identified across all regions of the UK. OPA control strategies have been limited by the lack of an effective screening test for live animals. The basis of control in affected flocks has been the identification and culling of suspect sheep.

Lung Scanning- a new diagnostic tool

1. Lung scanning provides a diagnostic tool which supports an OPA RISK REDUCTION STRATEGY.
2. Lung scanning can identify developing tumours before clinical signs appear and therefore aids EARLIER IDENTIFICATION OF AFFECTED ANIMALS.
3. Monitoring sheep over a period of time with REPEATED SCANS CAN INCREASE CONFIDENCE IN THE RESULT.
4. Lung scanning is a positive development but it does have limitations; it CANNOT GUARANTEE ABSENCE OF OPA

More information on OPA can be found in Moredun's fact sheet on OPA or on their website at http://www.moredun.org.uk/research/practical-animal-health-information/disease-summaries/ovine-pulmonary-adenocarcinoma-opa-or

LIVESTOCK HEALTH SCOTLAND

Lung Scanning Strategies

Research which will demonstrate the value of different targeting and monitoring strategies is underway while systematic work by veterinarians in the field is building up experience and confidence in the technique. At this point in time two approaches are being adopted.

1. Scanning to Reduce the Risk of the Introduction of OPA

Lung scanning at purchase within a quarantine period can be used to identify sheep with OPA including those in the early stages of tumour development. This approach REDUCES THE RISK OF INTRODUCING OPA affected sheep into a new flock. The technique cannot guarantee animals are free of disease; however, risk reduction is likely to be enhanced by further monitoring at 6-12 month intervals.

2. Scanning in OPA affected flocks

Lung scanning could be adopted as the basis of a test and cull policy in affected flocks, allowing the earlier removal of OPA affected animals whilst the sheep are still of some cull value. In addition, removing OPA cases earlier will reduce the exposure of other sheep in the flock to the OPA virus and should result in a decrease in the number of new infections.

A programme of repeated annual scanning is likely to be required to make a positive impact on flock health.

DEVELOP an OPA RISK REDUCTION STRATEGY WITH YOUR FARM VETERINARIAN

OVINE PULMONARY ADENOCARCINOMA (OPA)
ADVICE FOR FARMERS

OPA is a lung cancer in sheep caused by a virus, Jaagsiekte sheep retrovirus. OPA is always fatal.

The virus is spread between sheep by the respiratory route and also via colostrum and milk.

Warning signs of OPA?

- Unexplained loss of condition
- Breathing difficulty
- Evidence of excessive fluid from the nose when the head is down (usually clear, sometimes foamy, often the consistency of washing up liquid)
- Cases of pneumonia that don't respond to antibiotic treatment (or improve but then go downhill again)
- Deaths, particularly at times of stress such as bad weather, lambing time etc.

Actions to take?

- Veterinary investigation to confirm the cause of illness or death

Options if OPA is confirmed:

- Minimise close contact - e.g. housing, feeding troughs
- Cull suspect cases asap - OPA cases will not survive and meanwhile they are a risk of transmission to other sheep in the flock
- Cull lambs of OPA affected ewes - The lambs are very likely to become infected and will be a transmission risk
- Test-and-cull - currently ultrasound scanning is the best option to identify OPA as early as possible. Discuss this with your vet to weigh up advantages and limitations of the technique
- Replacement of whole flock

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To find out more about on-farm scanning
Search for “Moredun OPA control youtube”

OPA Control - Research and Diagnosis

The Moredun Group
YouTube - 26 Sep 2019

https://www.youtube.com/watch?v=d_pMIDepay4

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Other OPA research at Moredun:

Transmission

How much virus is produced at different disease stages?

Is virus from exhaled air more infectious than virus in lung fluid?

Diagnostic tests

Vaccination

Understanding pathogenesis

Why do some but not all JSRV infected sheep develop OPA?

What is the difference in tumours that are controlled and tumours that develop rapidly? -immune cells in and around the OPA tumours. Gene expression profiles.

One Health- OPA as a model of human lung cancer

Thank you for listening
Any questions?

The Scottish Government
Riaghaltas na h-Alba

Clyde Wind Farm

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