

Ovine Johne's Disease Risk Factor Study

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Background

- Level of clinical OJD varies considerably among sheep flocks in Australia
- *Why? What are the risk factors?*
Not clearly known.
- *Why would you care about risk factors?*
Knowledge → manipulation → disease control

Objective

To identify risk factors for OJD prevalence in infected flocks

GOAL – To provide producers with recommended practices for effective on-farm disease control

Study design

Cross sectional study

- **Reference Population:** All OJD infected sheep flocks in Australia
- **Study Population:** Flocks meeting the following selection criteria:
 - self-replacing Merino flocks infected with OJD for ≥ 3 years
 - ≥ 210 of ≥ 3 -yr old unvaccinated sheep available
- **Flock selection:** Enrolled 92 flocks that met the selection criteria and had owner approval for participation



Ascertainment of exposure status

Identified potential risk factors



Management factors

Soil Characteristics



Developed and tested questionnaire

Collected soil samples



Administered questionnaire to farmers

Analysed the soil samples



Developed the explanatory variables

Soil Explanatory variables

Ascertainment of disease status

Collected pooled faecal samples
7 pools of 30 pellets



Cultured faecal samples

Created 3
outcome
variables

Cohort OJD Prevalence Level

Log Pool MAP Numbers

Pool OJD Status

Data analysis

92 sheep cohorts



Exposure status

Questionnaire
Soil Samples



Disease status

Pooled faecal culture

- Ordinal Logistic regression analyses
- Linear mixed models
- Generalised linear mixed models

Results

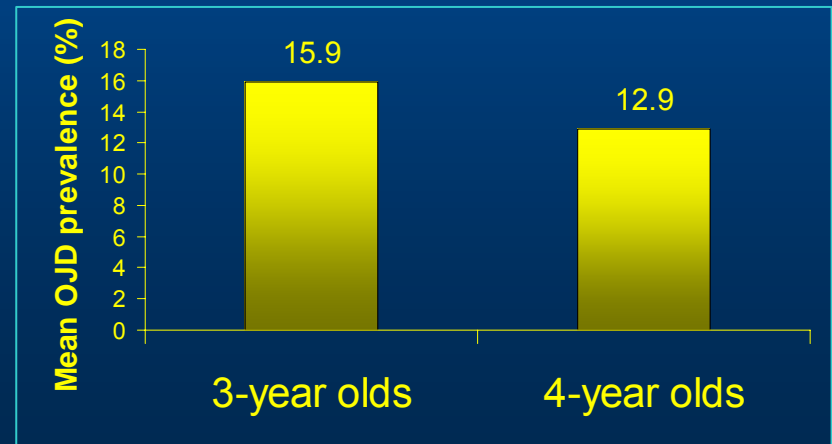
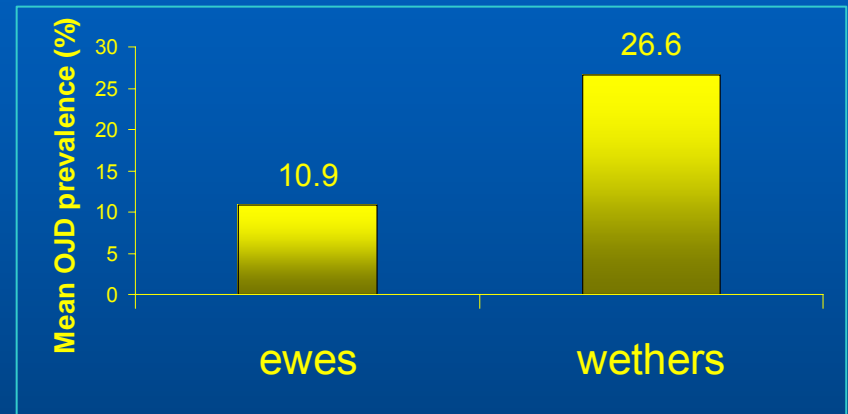
What factors were significantly associated with the outcomes

Cohort OJD prevalence

Overall: Mean = 14.8% Range = 0 – 58.9%

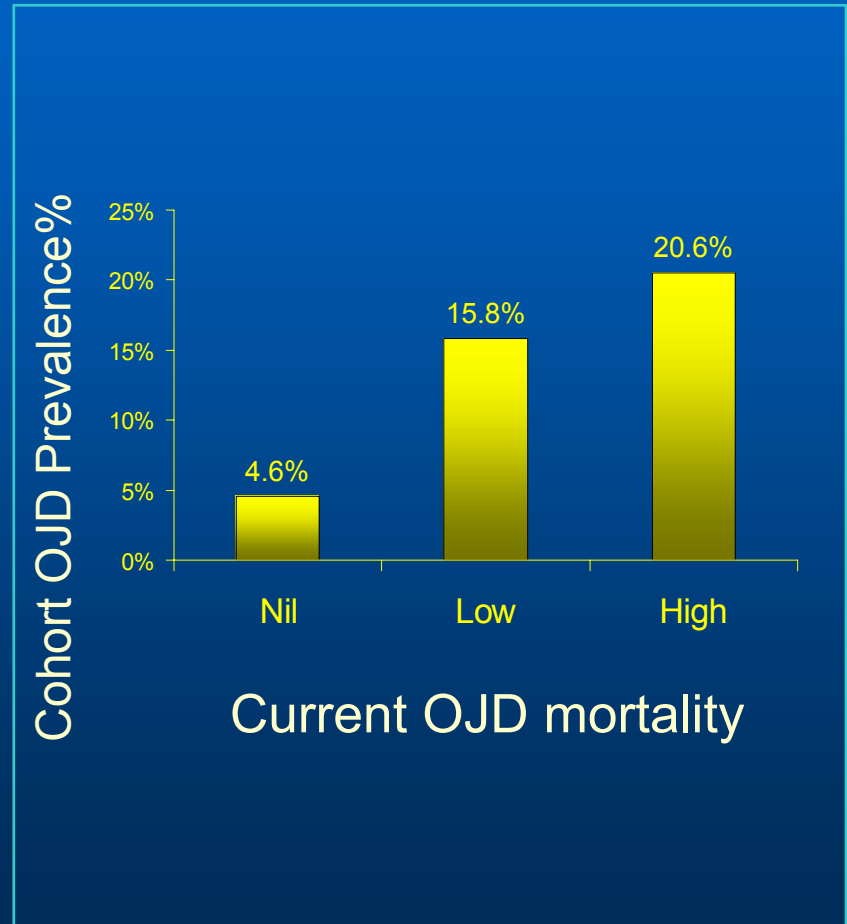
- **Wethers > ewes**
 - Usually raised on poor paddocks
 - Confirms anecdotal evidence

- **3 year olds > 4 yo**
 - May be due to losses in older cohort by the time of sampling



Cohort OJD prevalence

- Higher in flocks with high mortality
 - Supports inclusion as a confounder
 - Prevalence based on PFC can be used as an indicator of clinical expression of OJD



Lambing paddock stocking rate

High lambing paddock stocking rate → high prevalence

Why would stocking rate matter?



Other variables associated with young age and nutrition level

Lower condition score of dams at lambing → High OJD

Poor nutrition/higher stress → Lower CS → Higher MAP shedding

Lower condition score of weaners → High OJD

Poor nutrition → Lower CS → greater probability of infection

Longer period of growth check → High OJD

Indicative of inadequate nutrition or severe disease

More frequent application of super phosphate fertilizers → High OJD

Correlated with stocking rate

Gudair® Vaccination

Years since sheep vaccinated	Odds ratio	LCL	UCL	P
1-2 years	1			< 0.001
>2 years	0.07	0.01	0.31	
No vaccination	0.06	0.01	0.35	

Gudair® Vaccination

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1-2 years	1			< 0.001
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- Flocks vaccinating for 3-4 years had lower prevalence as compared to those vaccinating for 1-2 years
- May be the result of reduction in contamination levels across farm due to larger proportion of flock vaccinated

Gudair® Vaccination

Years since sheep vaccinated	Odds ratio	LCL	UCL	P
1-2 years	1			< 0.001
>2 years	0.07	0.01	0.31	
No vaccination	0.06	0.01	0.35	

- Flocks not vaccinating at all also had lower prevalence as compared to those vaccinating for 1-2 years
- Those not experiencing high mortalities were not going for vaccination
 - Only 3 of 14 not vaccinating had high mortalities

Organic Carbon %

- Higher OJD in sheep raised on soils with high organic carbon %
 - Organic carbon % is an indicator of organic matter and therefore soil fertility
 - Might increase water holding capacity of the soil
 - Might provide favourable nutrients for MAP survival
 - MAP might adsorb to organic matter or clay

Summary

- Higher OJD in sheep:
 - raised at higher stocking rate
 - who had a low condition score as weaners or whose dams had a low condition score
 - who faced a greater period of growth check/growth retardation
 - raised on properties with high organic carbon %
- Lower OJD
 - in sheep raised in flocks vaccinating for 3-4 years than those vaccinating for 1-2 years
 - in ewes than wethers
 - in 4-year olds than 3-year olds

Publication

+ Models
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Risk factors for ovine Johne's disease in infected sheep flocks in Australia

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