

The Use of Vaccine Programmes in Livestock Systems



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Vaccines Pillar

Viruses, Bacteria and Parasites

Host-pathogen interaction

Immune responses

protective

immuno-pathology

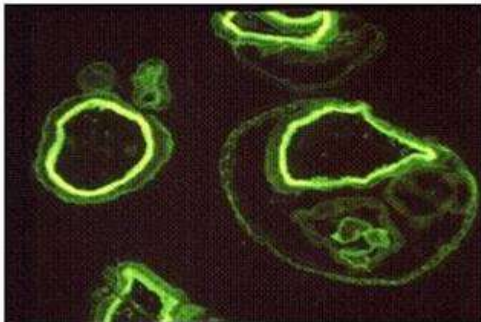
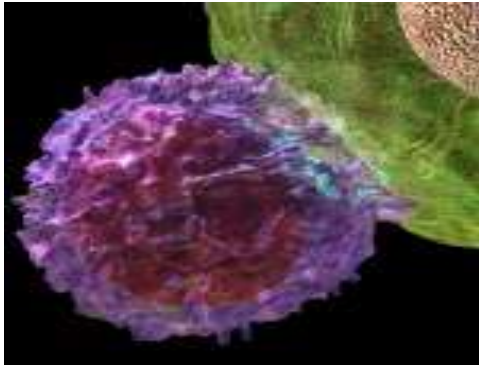
pathogen evasion

Vaccination

live

killed

recombinant



Some Moredun Vaccine Successes

Braxy
(*Clostridium*
septicum)

Lamb
dysentery
(*Clostridium*
perfringens
type B)



Louping ill
virus



Pasteurella
pneumonia

(*Mannheimia*
haemolytica)



Cost Benefits of Disease Prevention

Sheep – top 5 issues

| Disease | Cost Benefit of Disease prevention (£ per animal in flock or herd) |
|----------------|---|
| Lameness | £4.40 per ewe |
| Abortion | £10.90 per ewe |
| Sheep Scab | £10.50 per ewe |
| Worms | £3.50 per lamb |
| Liver fluke | £5.60 per lamb |



How are these values calculated?

Lameness (footrot and scald)

- Calculation of cost per ewe – If 10% of the flock is affected , the cost per ewe in the flock is **£8.98**. (= Sum of reduced performance, additional feeding post lambing, replacement costs, labour to treat lame ewes, antibiotics and anti-inflammatories, foot bathing, longer finishing time for lambs)
- Incorporating vaccine into health plan:
 - Cost of vaccine: £2 per ewe
 - Cost of labour to administer vaccine: £0.19 per ewe
 - Cost of foot bathing: £0.6 per ewe
 - Disease occurrence : £1.60 per ewe
- Cost per ewe minus benefit per ewe = **£4.39**

Cost Benefits of Disease Prevention

Sheep – top 5 issues

| | Disease | Cost Benefit of Disease prevention (£ per animal in flock or herd) |
|--------------------------|-------------|--|
| Vaccines available | Lameness | £4.40 per ewe |
| | Abortion | £10.90 per ewe |
| Vaccines being developed | Sheep Scab | £10.50 per ewe |
| | Worms | £3.50 per lamb |
| | Liver fluke | £5.60 per lamb |

Cost Benefits of Disease Prevention

Cattle – top 5 issues

| Disease | Cost Benefit of Disease prevention (£ per animal in flock or herd) |
|------------------------|--|
| BVD | £42 per cow |
| Johne's | ? |
| Respiratory disease | £76 per calf |
| Diarrhoea (calf scour) | £47 per calf |
| Liver fluke | £87 per calf |

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Vaccination is a tool for management, not a silver bullet

- For example, vaccinations to prevent calf scour (coronavirus, rotavirus, *E.coli*) will only work if used in association with adequate colostrum intake, clean calving environment, clean well-bedded calf pens



New ways to tackle the threat of worms:

The development of vaccines



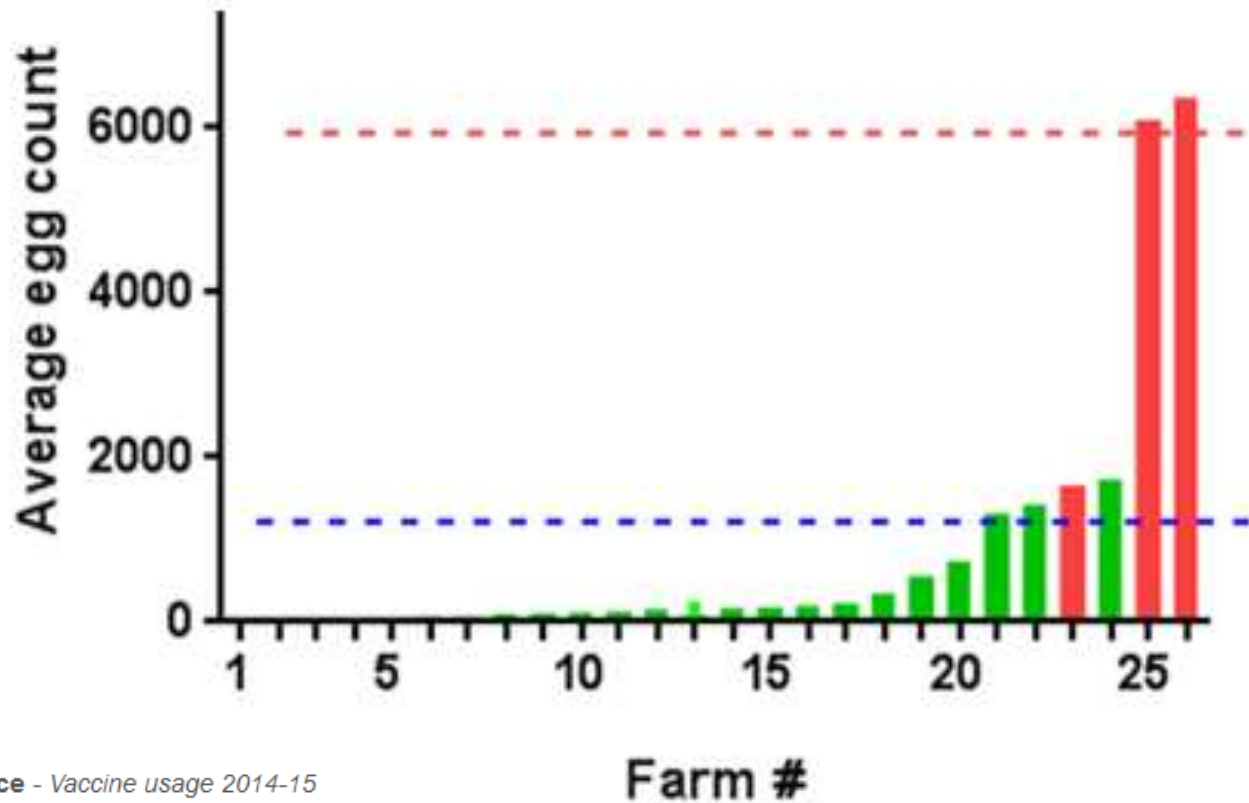


APVMA
Registered
October 1st,
2014



All 300,000
doses of vaccine
sold by word of
mouth within
10 days

No large
pharma
involved



First year performance - Vaccine usage 2014-15

About 50,000 lambs on some 35 New England properties between Walcha and Tenterfield NSW received a course of Barbervax. Two worm egg count kits were supplied to each customer to monitor the vaccine performance.

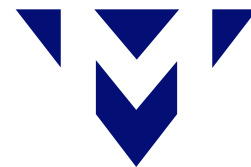
The results are shown in the graph.

Red bars - Farm did not follow label advice.

Green bars - Farm followed label advice correctly.

Blue dotted line - Drench threshold advised by Wormboss.

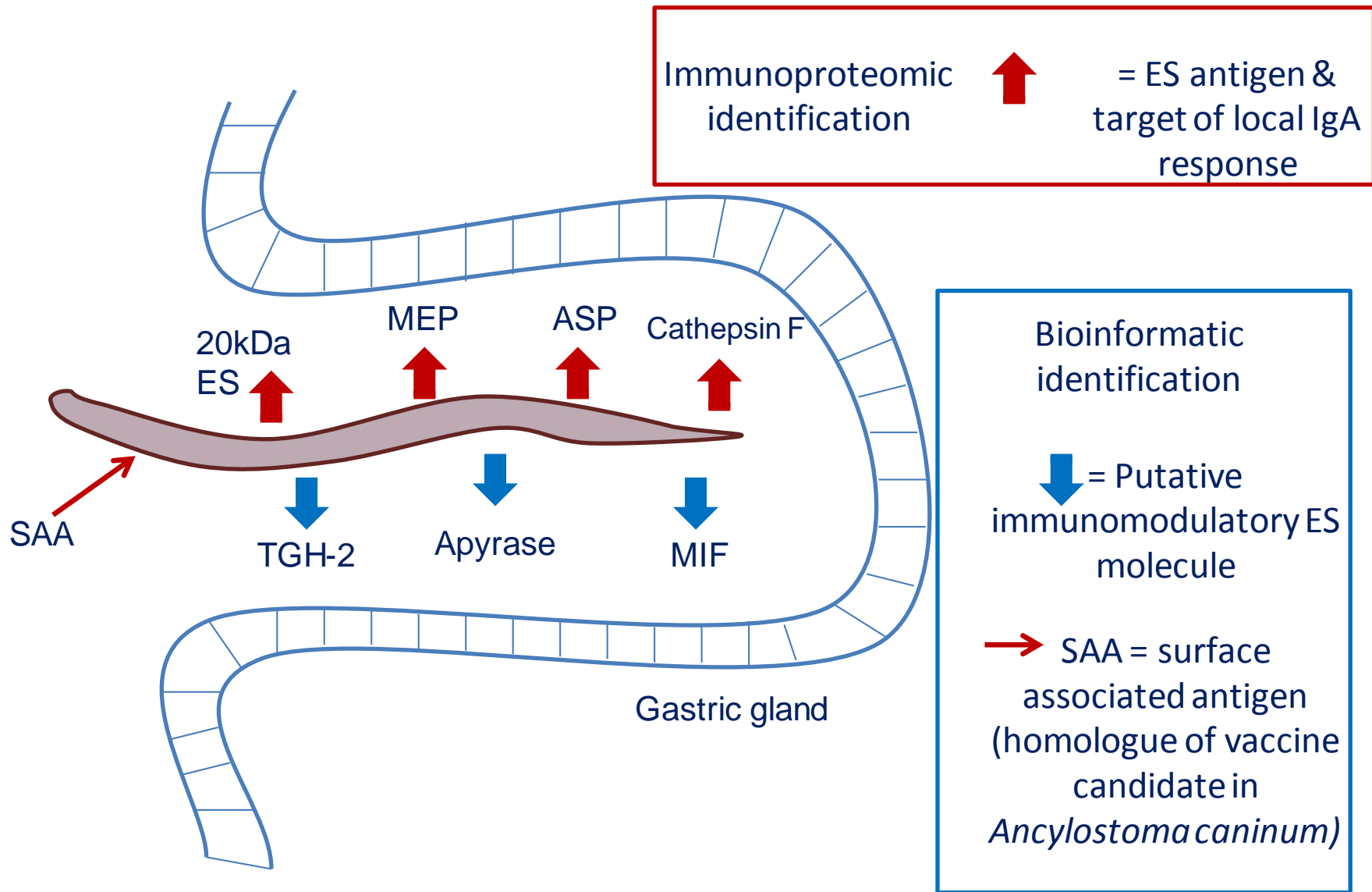
Red dotted line - Disease and or deaths by Barbers Pole likely.



Teladorsagia circumcincta vaccine development

- Gut vaccine approach has not been successful thus far
- Natural immunity does develop against *T. circumcincta*
- Route to a successful vaccine may be to mimic that immunity

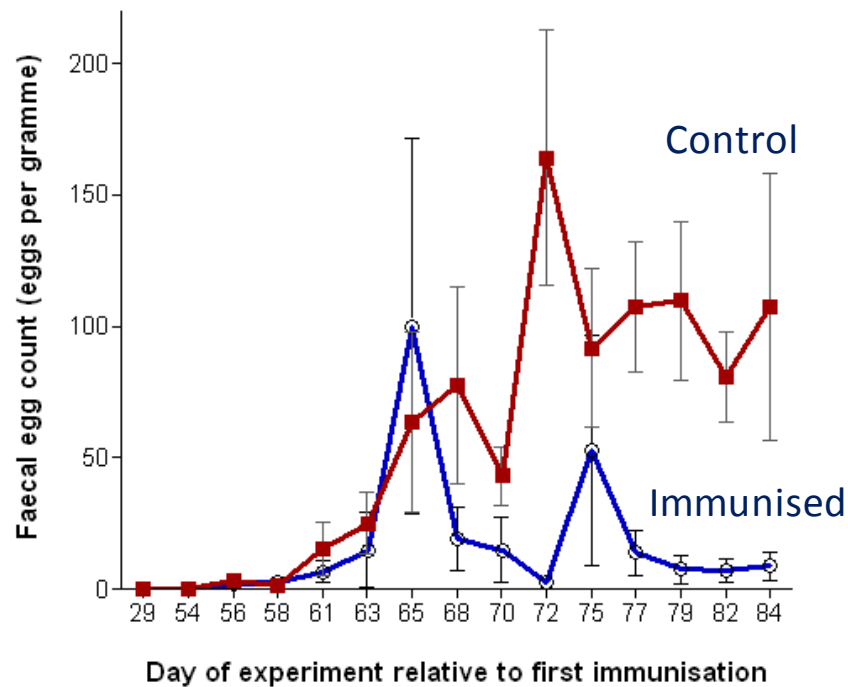




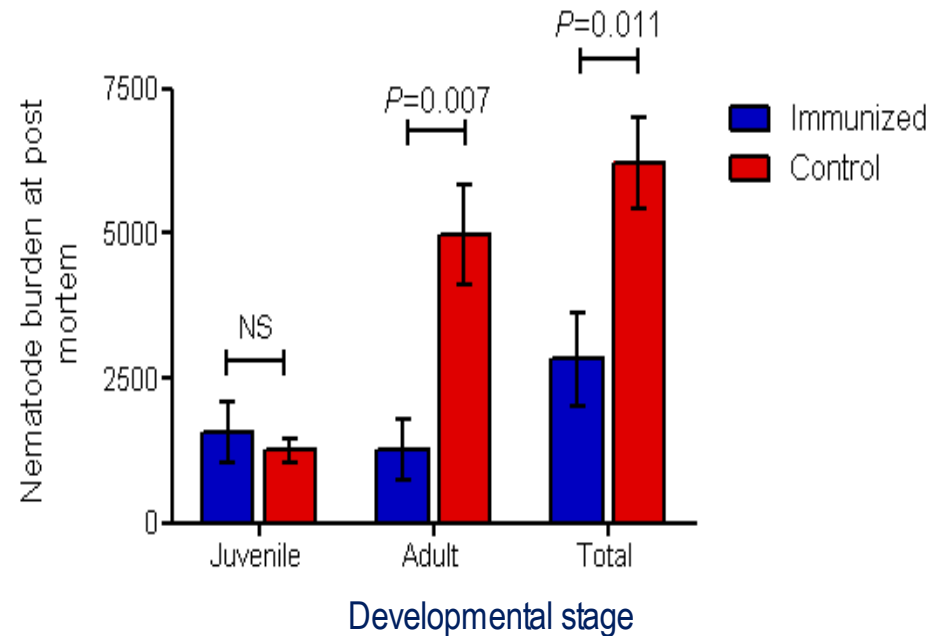
We generated recombinant versions of 8 molecules and combined them and tested in independent vaccine trials

Teladorsagia circumcincta recombinant antigen cocktail Trial 1

Cumulative faecal egg count reduced
by 70% ($P < 0.001$)

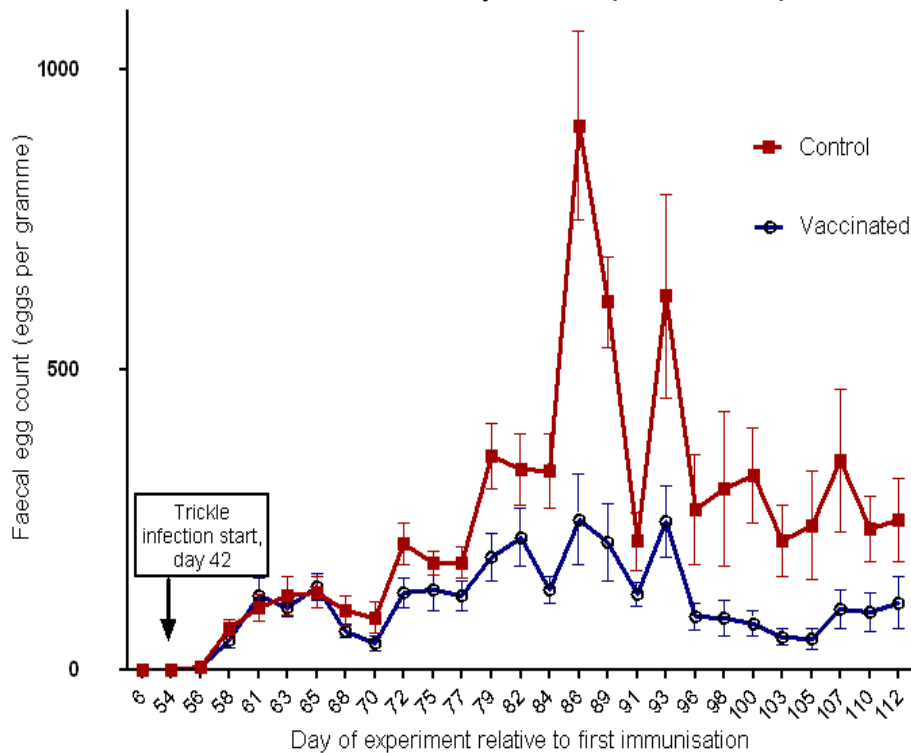


Adult worm burden reduced
by 75% ($P = 0.007$)

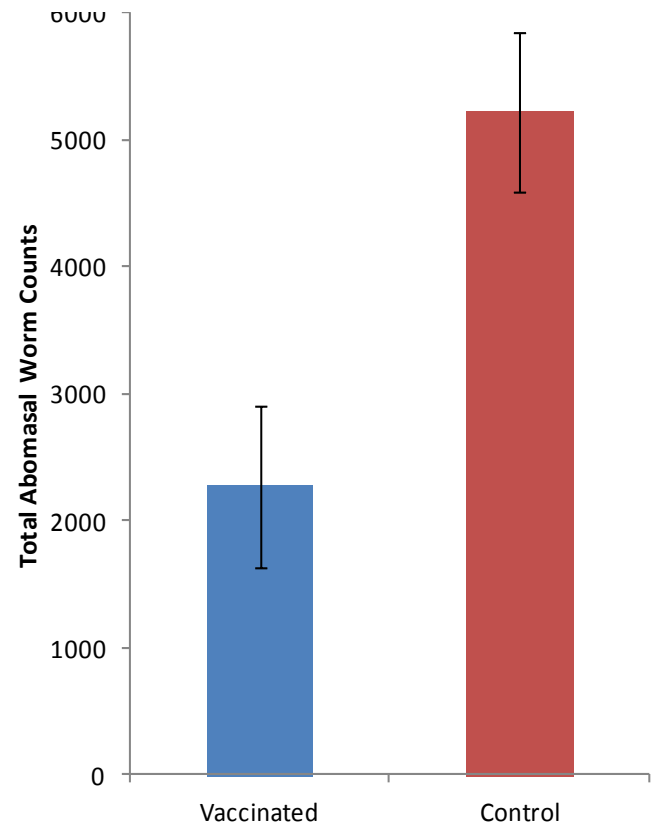


Teladorsagia circumcincta recombinant antigen cocktail Trial 2

Cumulative faecal egg count
reduced by 58% ($P=0.024$)



Worm burden reduced by 56%
($P=0.020$)



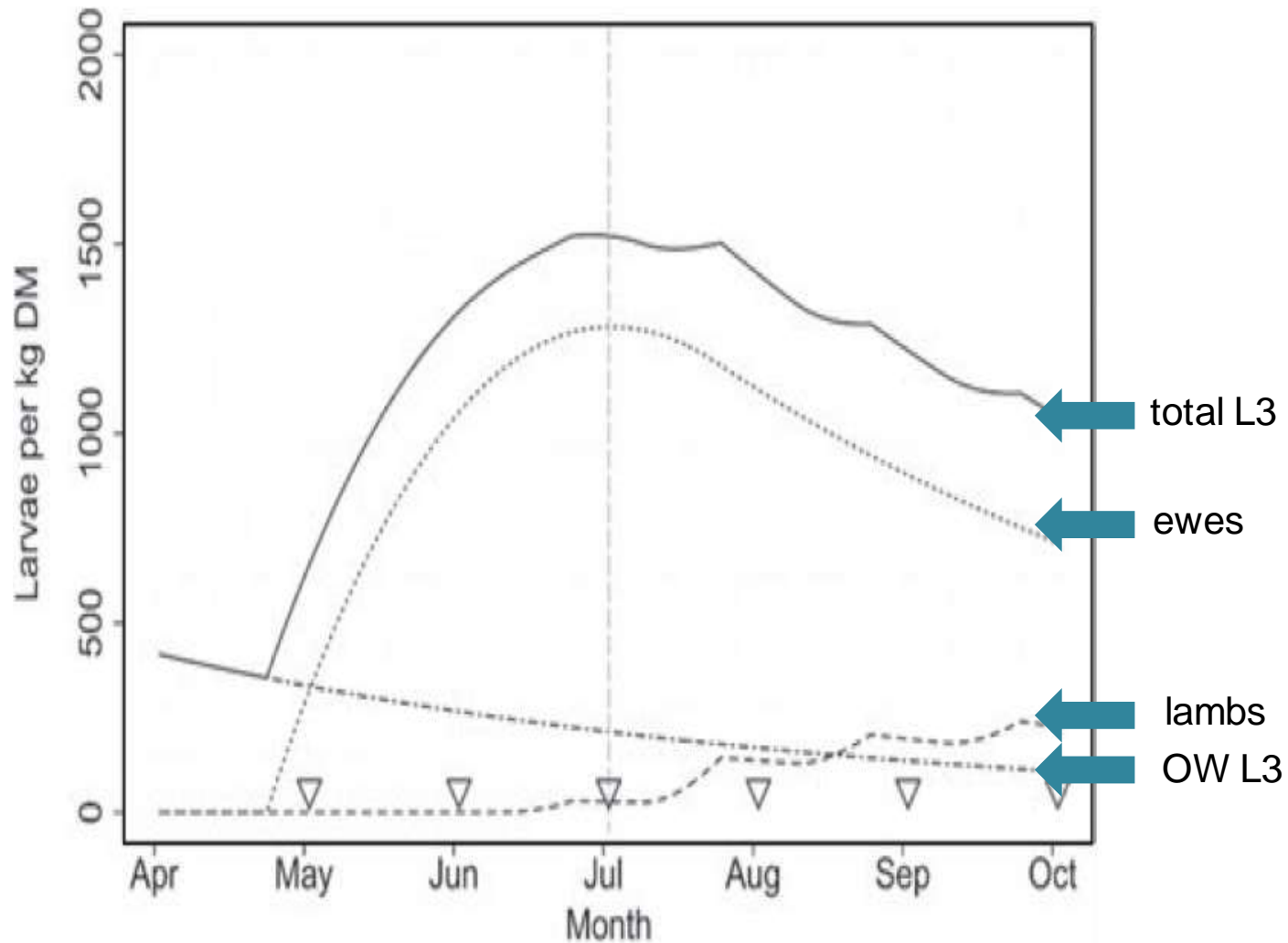
The way forward with the *Teladorsagia* vaccine...

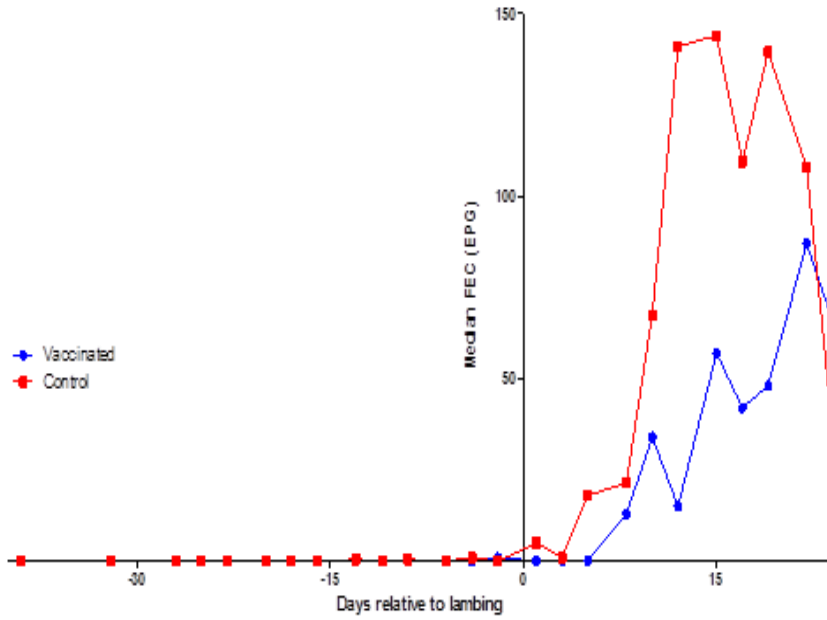
- Protection higher than in any other system using a recombinant vaccine against a parasitic nematode in the definitive host
- Efficacy variable in younger lambs

Is there a practical solution?



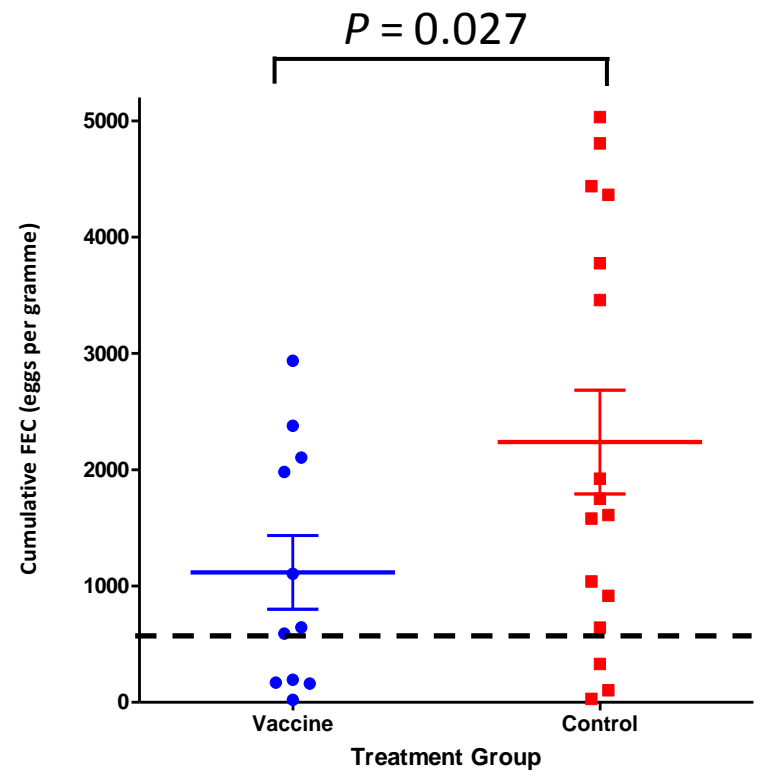
Can vaccination overcome the PPRI?





Median FECs during trickle infection period

Cumulative FEC during trickle infection period



Conclusions and future directions

- *Haemonchus* control by vaccination is now a reality
- *Teladorsagia* control by vaccination is a possibility
- Other species.....*Nematodirus*, *Trichostrongylus*...

