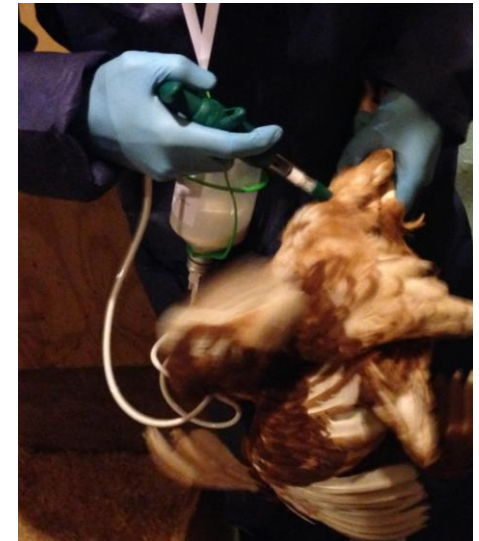




Progress towards a vaccine to control poultry red mite

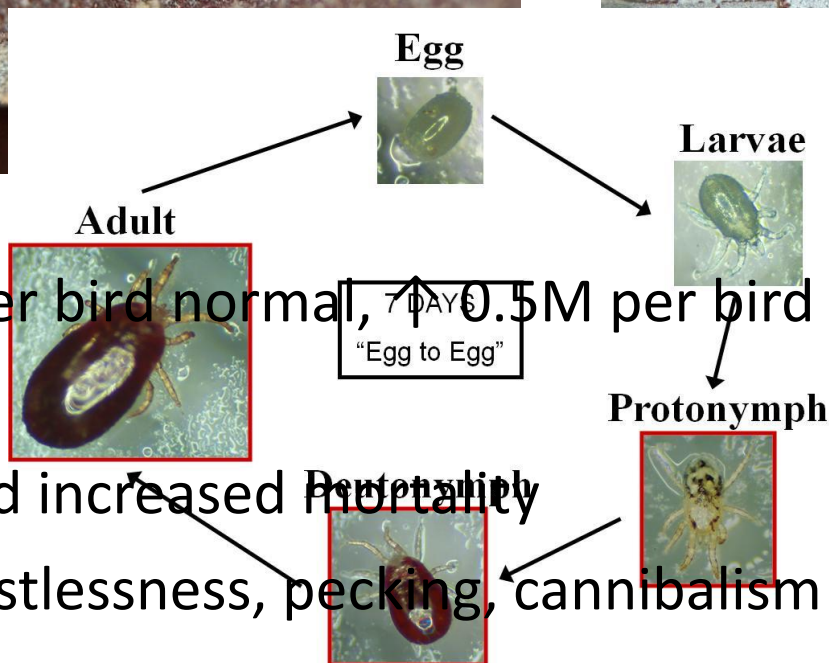
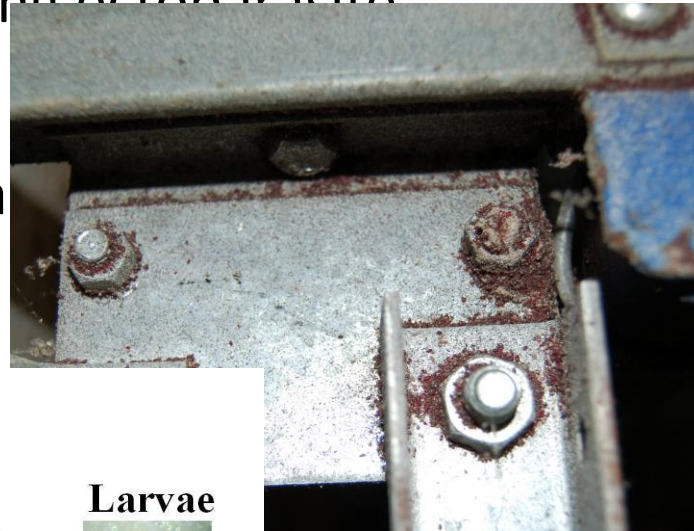
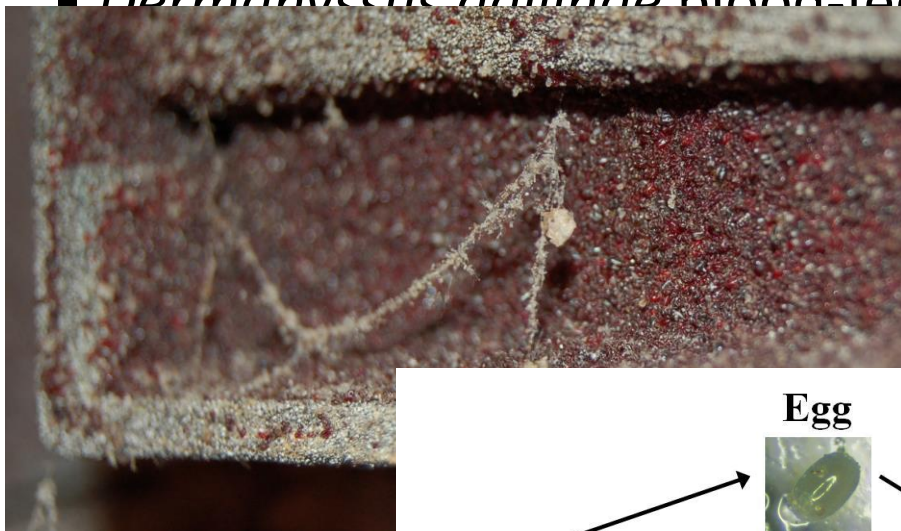


Alasdair Nisbet, Kath Bartley, Francesca Nunn, Tatiana Kuster, Dan Price, Stewart Burgess, Oivind Oines, Damer Blake, Fiona Tomley



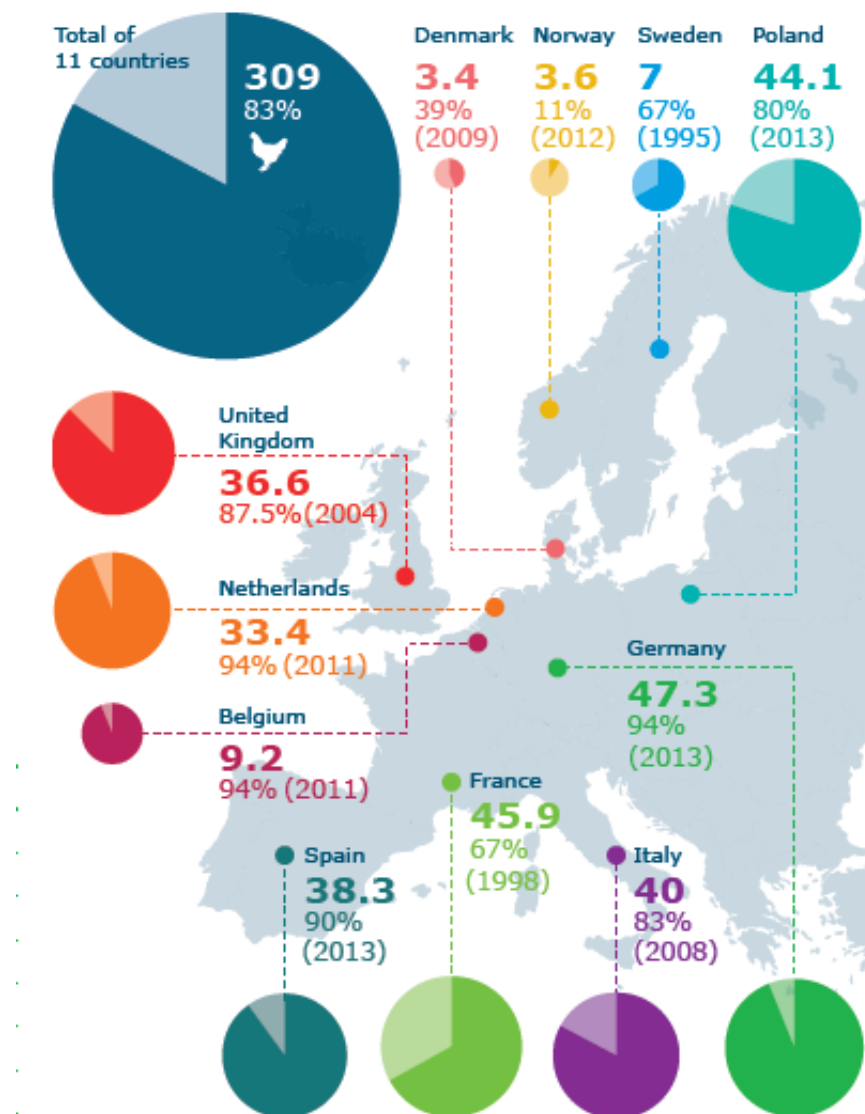
The problem

- *Dermanyssus gallinae* blood-feeding ectoparasite



- 50K mites per bird normal, $\uparrow$ 0.5M per bird severe
- Anaemia and increased mortality
- Irritation, restlessness, pecking, cannibalism $\downarrow$ egg output and quality

Figure 1 Number of laying hens per country in millions (2012)
and the percentages of farms with Poultry Red Mite



From Mul & Bens, Wageningen, 2014

Poultry Red Mite (*Dermanyssus gallinae*)

- Cost to the EU egg industry >230 million euros every year
- Current control using insecticides



Genomi

BEM



Exzolt
FLURALANER

ling from
ustry and
BSRC



zoetis

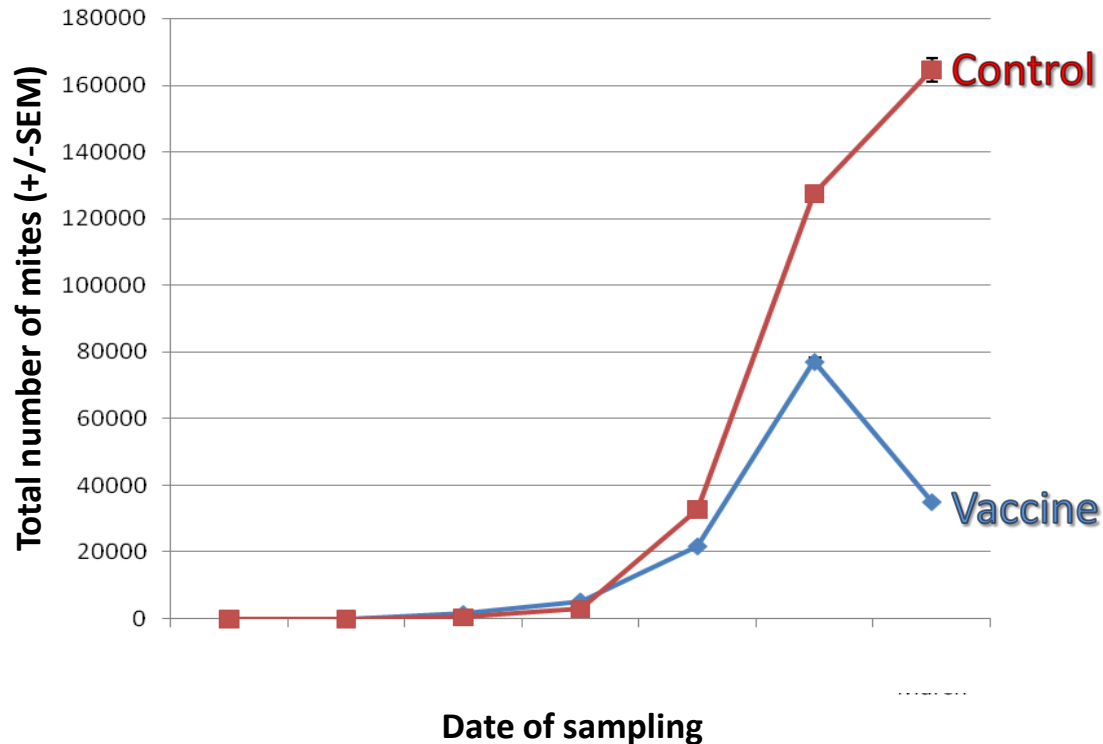
Vaccines.....

- Freedom from or reduced reliance on chemical acaricides:
 - Toxicity and environmental contamination
 - Egg taint
 - Cost of treatment and labour
 - Acaricide resistance
- Acceptable to industry and consumers
- Reduced risk of resistance
- Cost effective and long-lasting



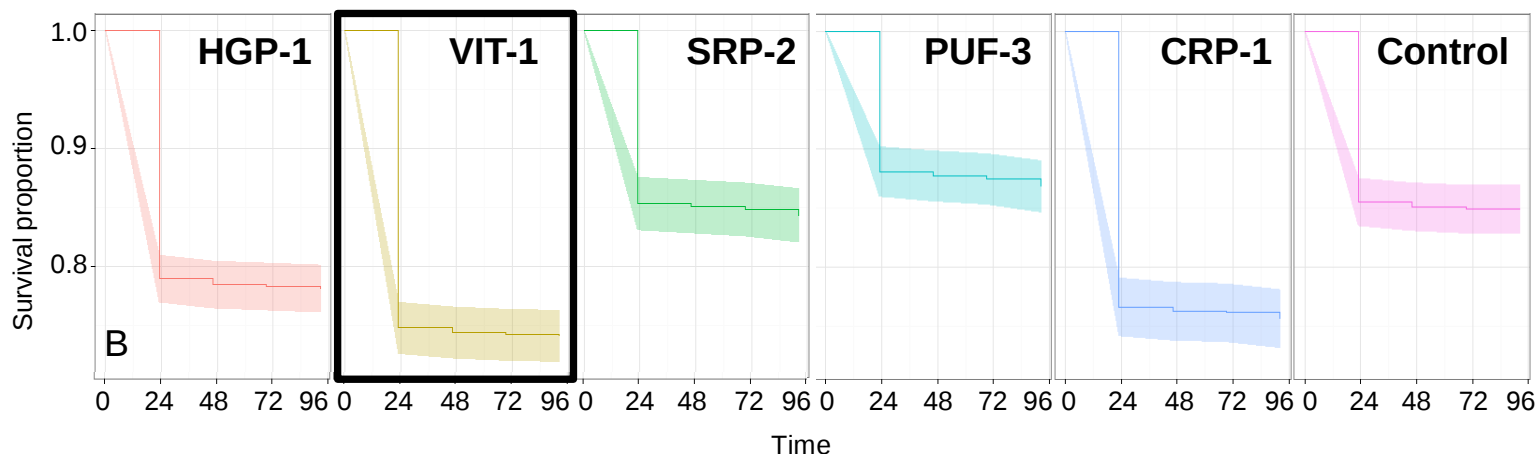
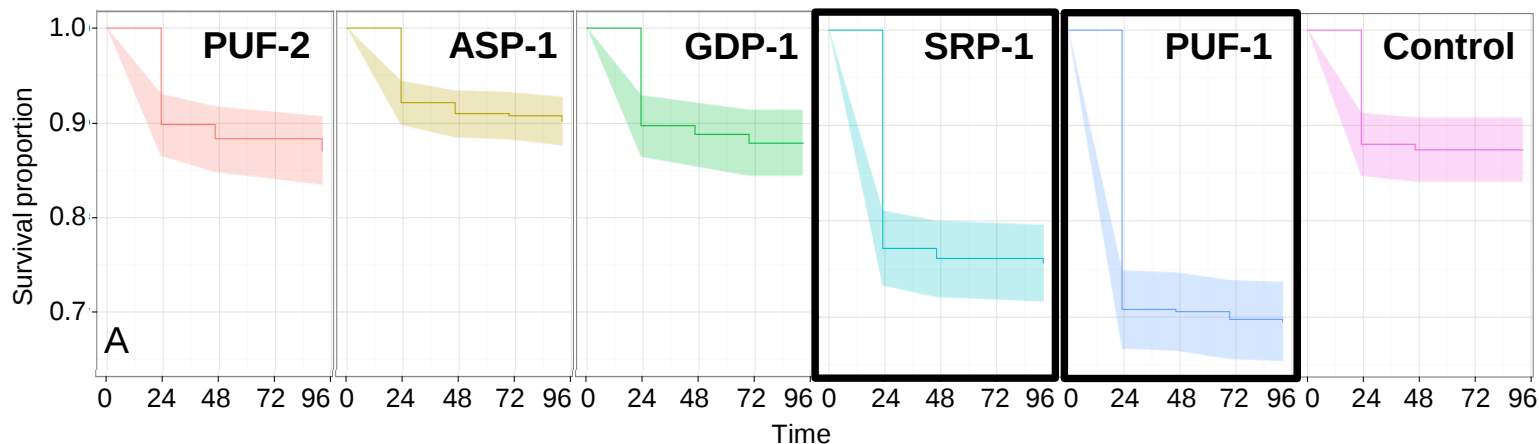
Vaccine field trial of PBS-soluble mite extract (SME)

Field trial - 384 hens per group



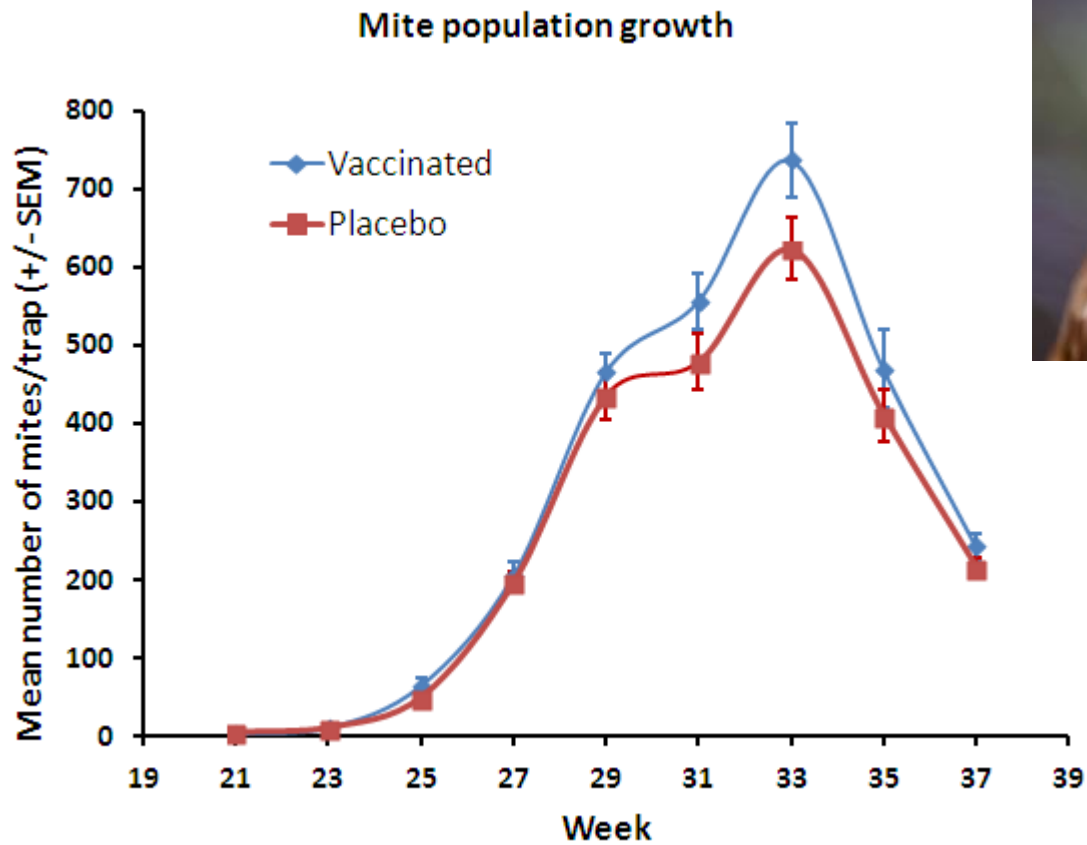
78% decrease in mite numbers in the vaccinated group

Survival analysis - the final cut of candidates.....



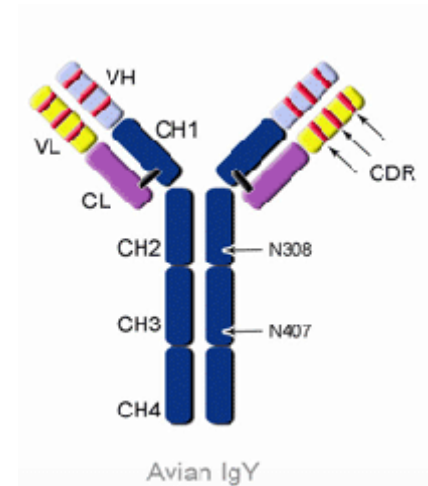
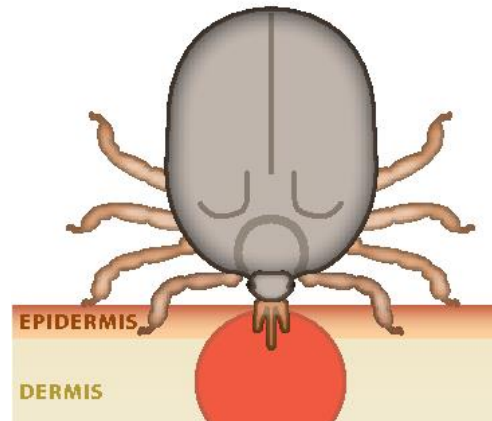
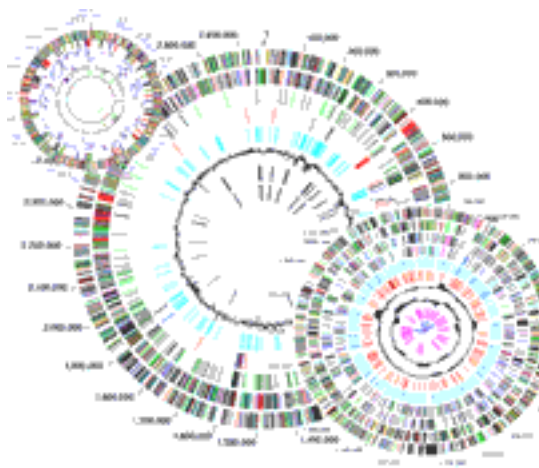
Mites feeding on blood containing IgY against vaccine candidates SRP-1, PUF-1 and VIT-1 were more than twice as likely to die than the controls after feeding ($p < 0.001$)

Field trial – Mite population data



3 key resources to rationally design better, effective vaccines:

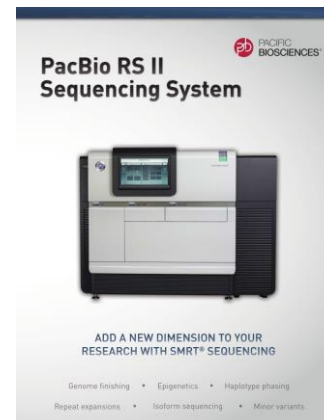
- 1) A well annotated genome
- 2) A reliable means of testing prototype vaccines in small efficacy studies in vivo
- 3) Prolonged efficacy of vaccine by immune stimulation

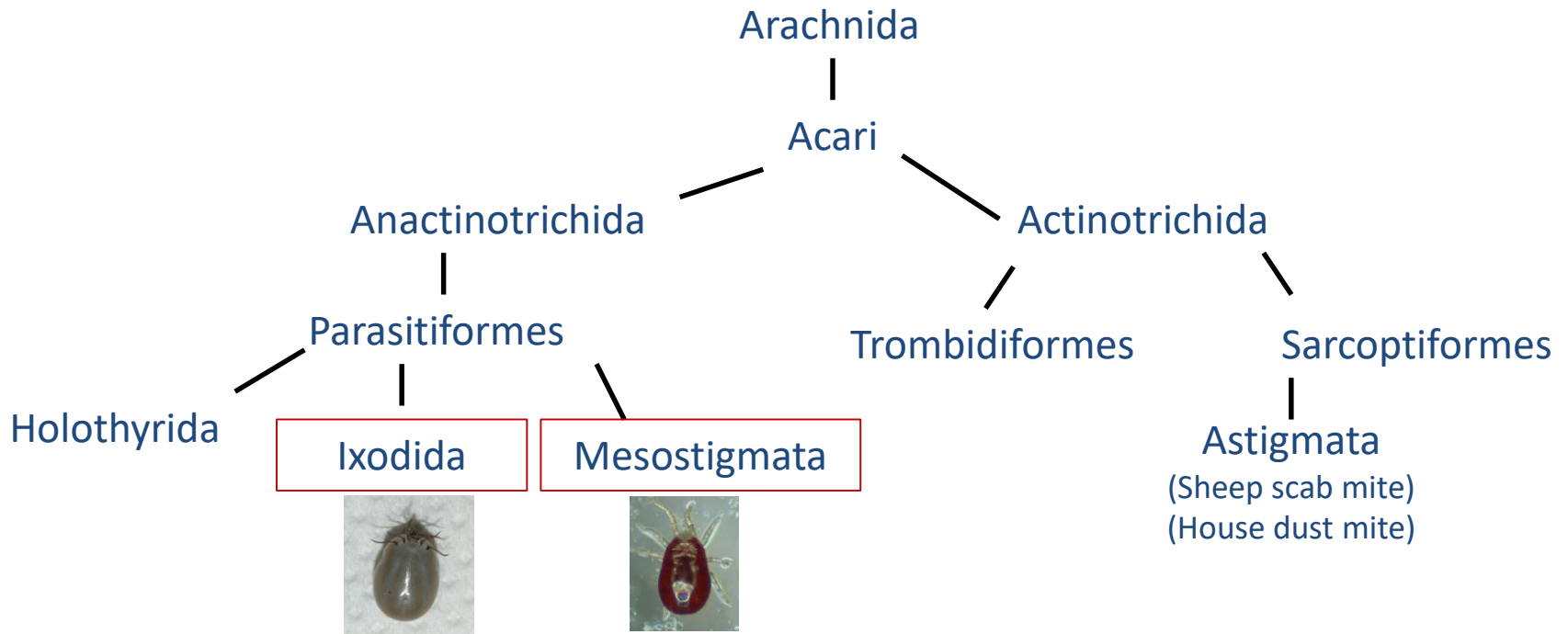


Genome:

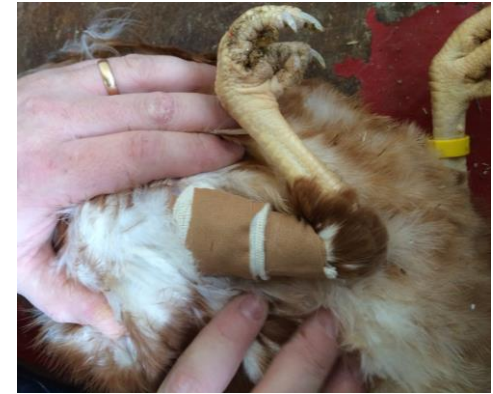
- **Assembly details:**

- Total assembly size = 959 Mb
- Number of scaffolds = 7,171 (>10kb = 7,160)
- Final output of 14,608 genes/transcripts
- BUSCO analysis shows 86% complete, 7% fragmented

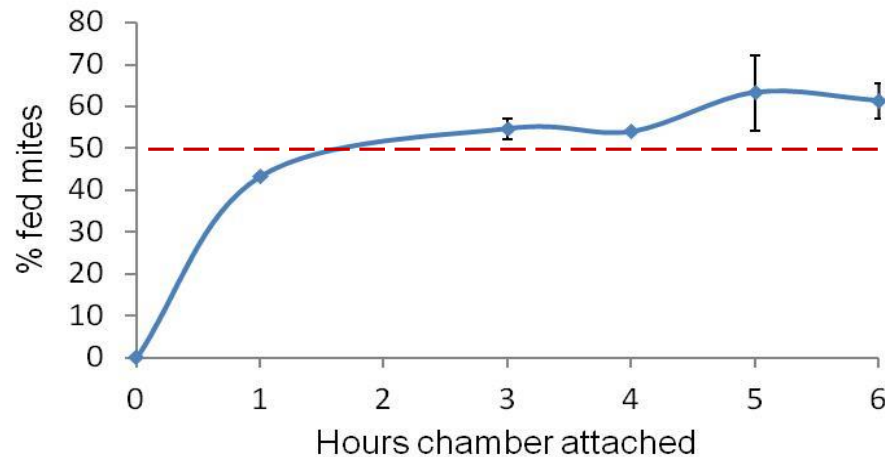




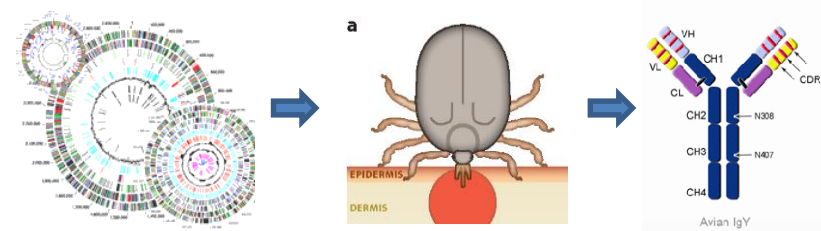
A reliable means of testing prototype vaccines in small efficacy studies in vivo



- Feeding mesh sizes differ for proto-, deutonymphs and adults



Combining the 3 key resources:



Pre-feed



Fed

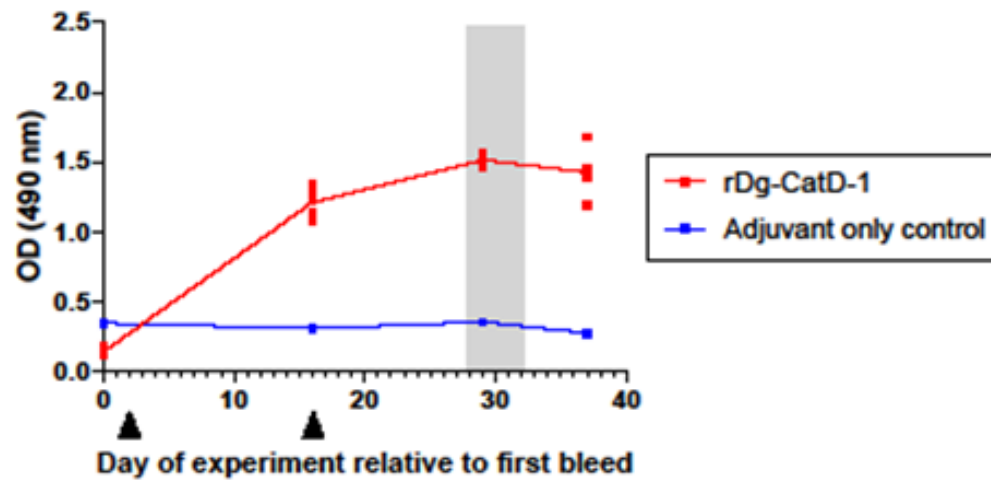
Genomic/Transcriptomic
resource

Vaccine candidate Dg-CatD-1
selected from feeding-induced
transcripts

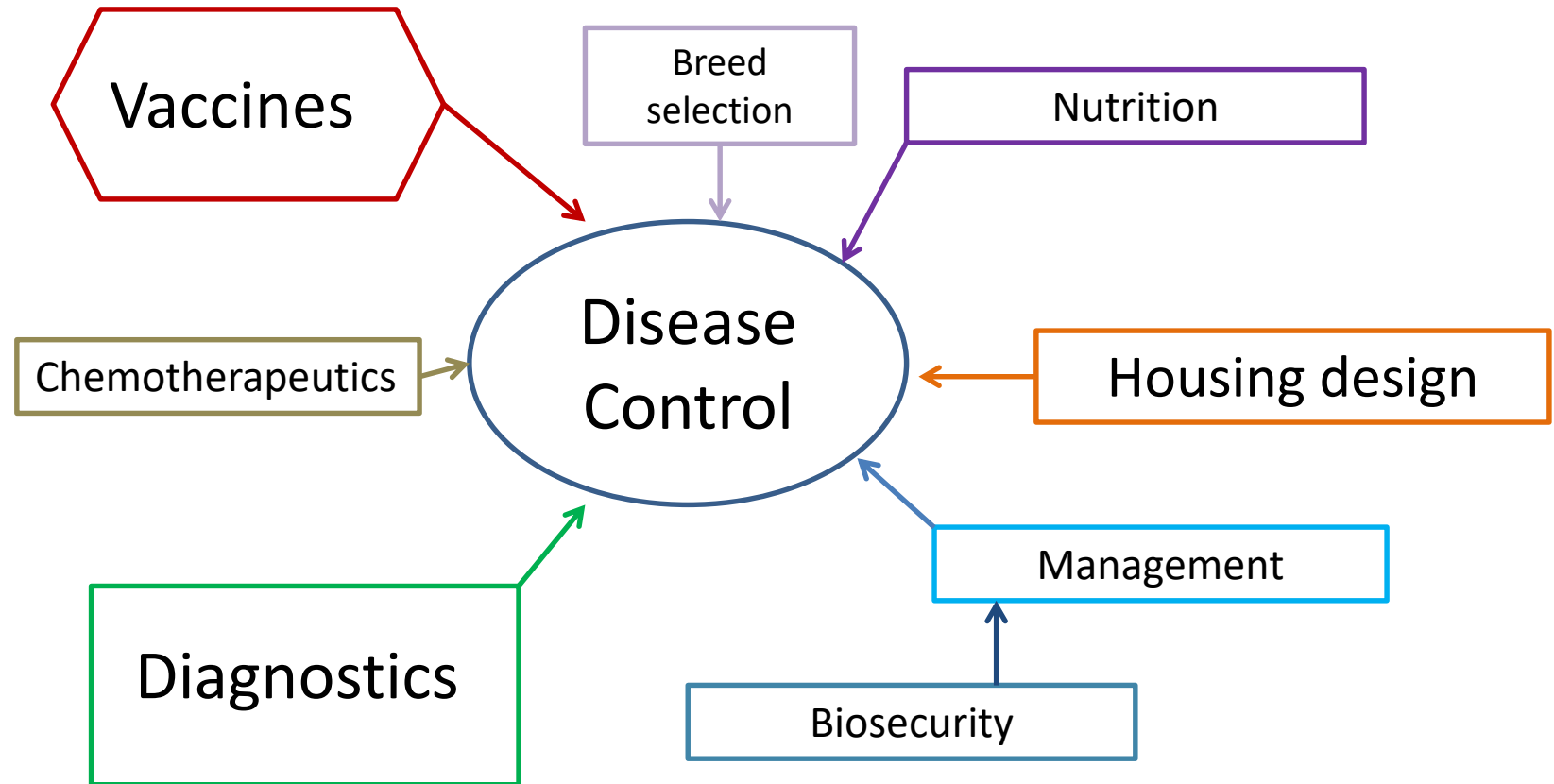
Adjuvant
Information

Vaccine efficacy
assessed





Vaccines are not “stand alone” interventions



Acknowledgments



Kath Bartley, Francesca Nunn, Dan Price,
Stewart Burgess



Tatiana Kuster, Damer Blake, Fiona Tomley



Veterinærinstituttet
Norwegian Veterinary Institute

Oivind Oines

Control Red Mite

