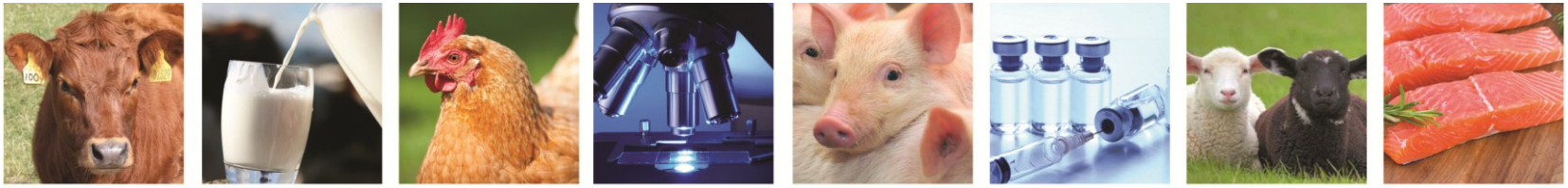

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Overview of Research Challenges

Chris Warkup

Biosciences KTN

The Scottish Government

Knowledge Transfer Network
Biosciences

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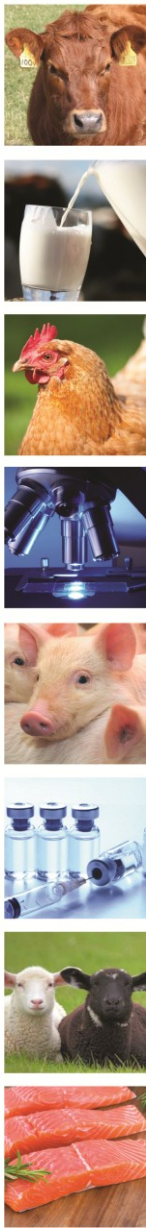

Context and Scope

- Context:
  - Reducing the impact of endemic and emerging pests and diseases a win-win-win (economic, environmental and social)
  - Follows on from CEDFAS
  - Rapid development of research tools
  - Aligned with industry priorities
- Scope:
  - Pre-competitive, innovative, industrially relevant research to underpin the capacity of the sector to tackle endemic and emerging pest and [infectious] disease problems
  - Farmed animal species
    - Cattle (dairy and beef), chickens (broilers), pigs, salmon, sheep
  - Research themes overlap and the call document is not an exhaustive list – if in doubt talk to ARC Industry Members

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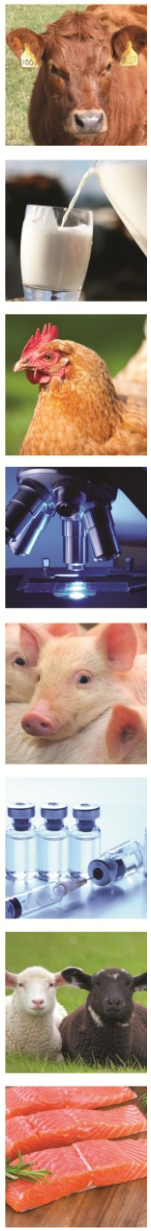

Four Themes

(for this first call)

- Understanding the basis of resistance/resilience to pest and disease
- Developing novel tools for defining disease biomarkers and phenotypes ...
- Understanding variation in vaccine responsiveness, immuno-competence ... and disease outcomes
- Determining the effects of selection for production traits on immune function

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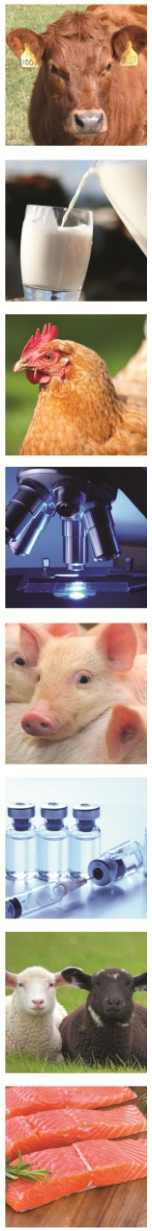

Understanding the basis of resistance/resilience to pest and disease

- Genetic and molecular mechanisms through which innate and adaptive resistance in a population is conveyed
- Dissecting the aetiology/mechanisms of complex disease syndromes
- Informing the design and delivery of novel therapeutics and vaccines
- Pathogen virulence factors, pathogen evolution, strain variation, molecular epidemiology and susceptibility to intervention

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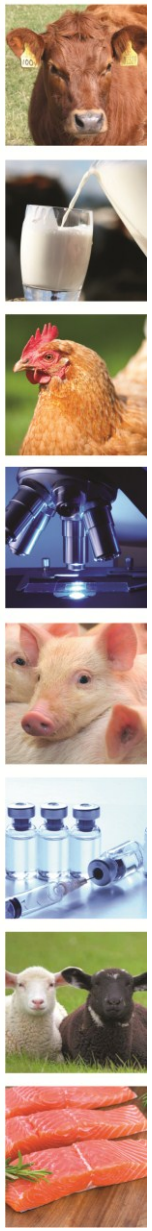

Developing novel tools for defining disease biomarkers and phenotypes to inform breeding strategies for subclinical diseases and increased disease resistance

- Dissecting the aetiology/mechanisms of complex disease syndromes in order to deliver new disease diagnostics or markers for use in selection
- Tools that differentiate exposure, infection and disease progression within individuals and populations
- Development of high-throughput *ex-situ* or *in-vitro* phenotypes
- Novel uses of routine health data
- Novel routes to disease resistance (proof of concept or an experimental tool)

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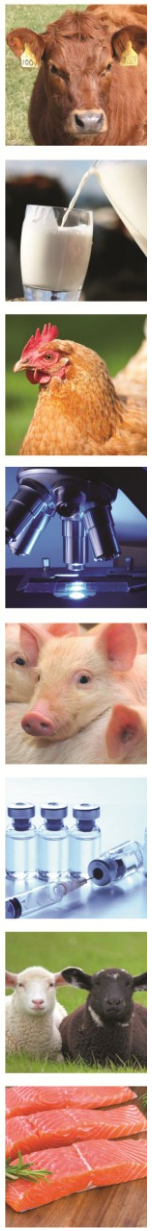

Understanding variation in vaccine responsiveness, immuno-competence at different development stages and disease outcomes

- Exploring genetic variation in responsiveness to vaccines
- Determining the potential for combined selection and vaccination strategies
- Understanding the development of innate and adaptive immunity for improved choices in breeding programmes
- Development of immuno-modulation approaches

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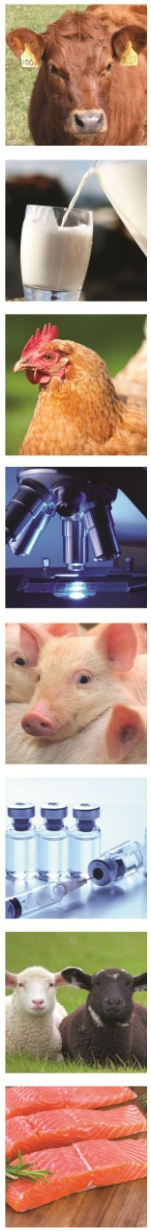

Determining the effects of selection for production traits on immune function

- Has selection for production traits compromised population susceptibility to infectious disease?
- Identification of specific resistance alleles that may be used in selective breeding
- [Improved understanding of best strategies - resistance, tolerance & vaccination/intervention]
- [Development of improved approaches to selection]
- Examining the co-evolution of hosts and pathogens

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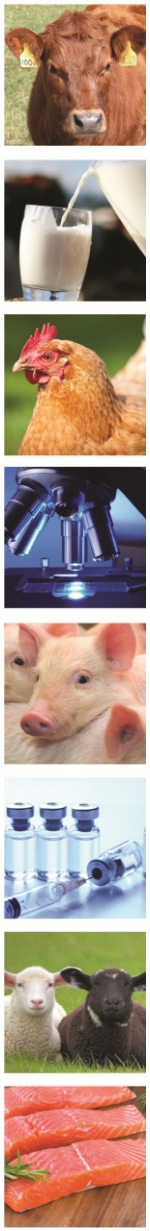
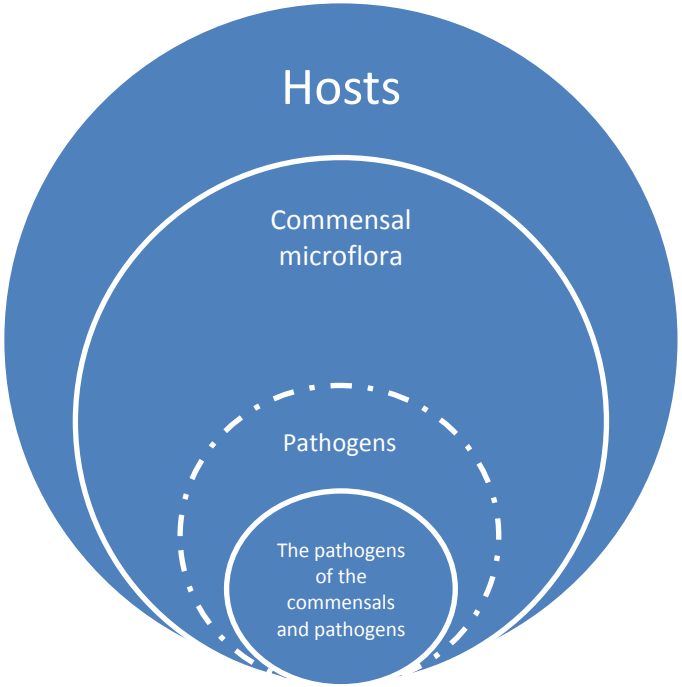
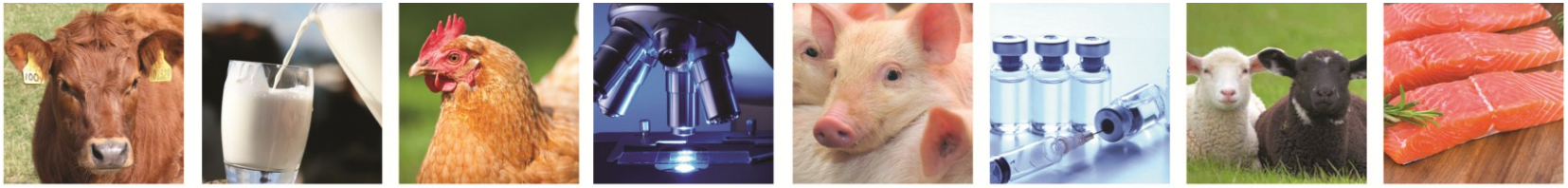


Closing Comments

- Pre-competitive, innovative, industrially relevant research
- To underpin the capacity of the sector to tackle endemic and emerging pest and [infectious] disease problems
- New tools enable new approaches
- Collaborative, interdisciplinary approaches strongly encouraged
- If in doubt ask:
  - Prof. Andy Tait (ARC Co-ordinator)
  - Steering Group members
  - Biosciences KTN
  - BBSRC

Co-evolving Populations





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Thank you for your attention

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