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Review article

Challenges and priorities for modelling livestock health and pathogens in the context of climate change

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AIM

- Present a framework of key challenges for modelling livestock health and pathogens in the context of climate change,

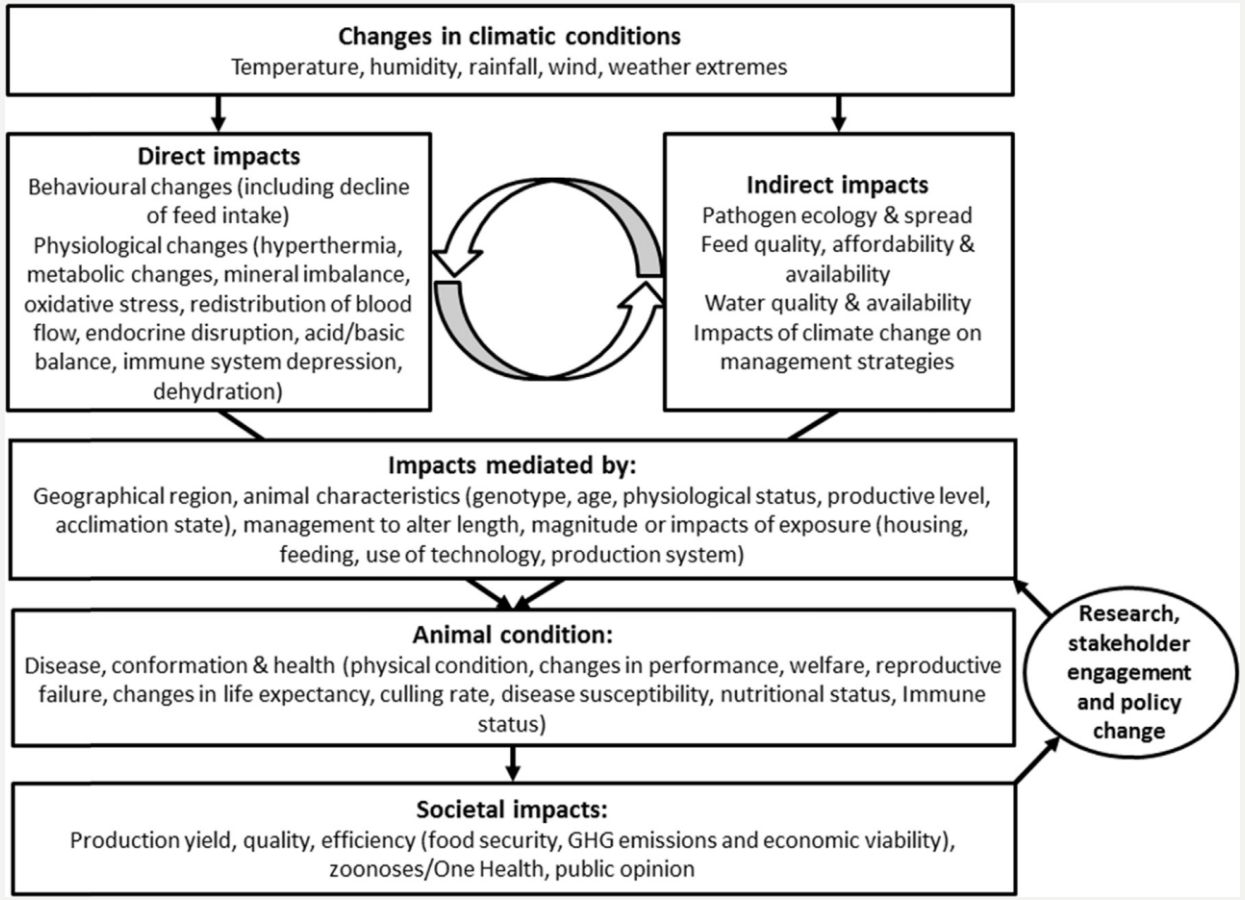
- Provide a clear focus and agenda for future research and funding, and acting to bring together modellers and experimental researchers in livestock health in Europe around a set of common objectives.

1) FACCE JPI (Agriculture, Food Security and Climate Change Joint Programming Initiative) knowledge hub MACSUR (Modelling European Agriculture with Climate Change for Food Security; www.macsur.eu)

2) GRA (Global Research Alliance) Animal Health and GHG Emissions Intensity Network (http://tinyurl.com/GRA-health).

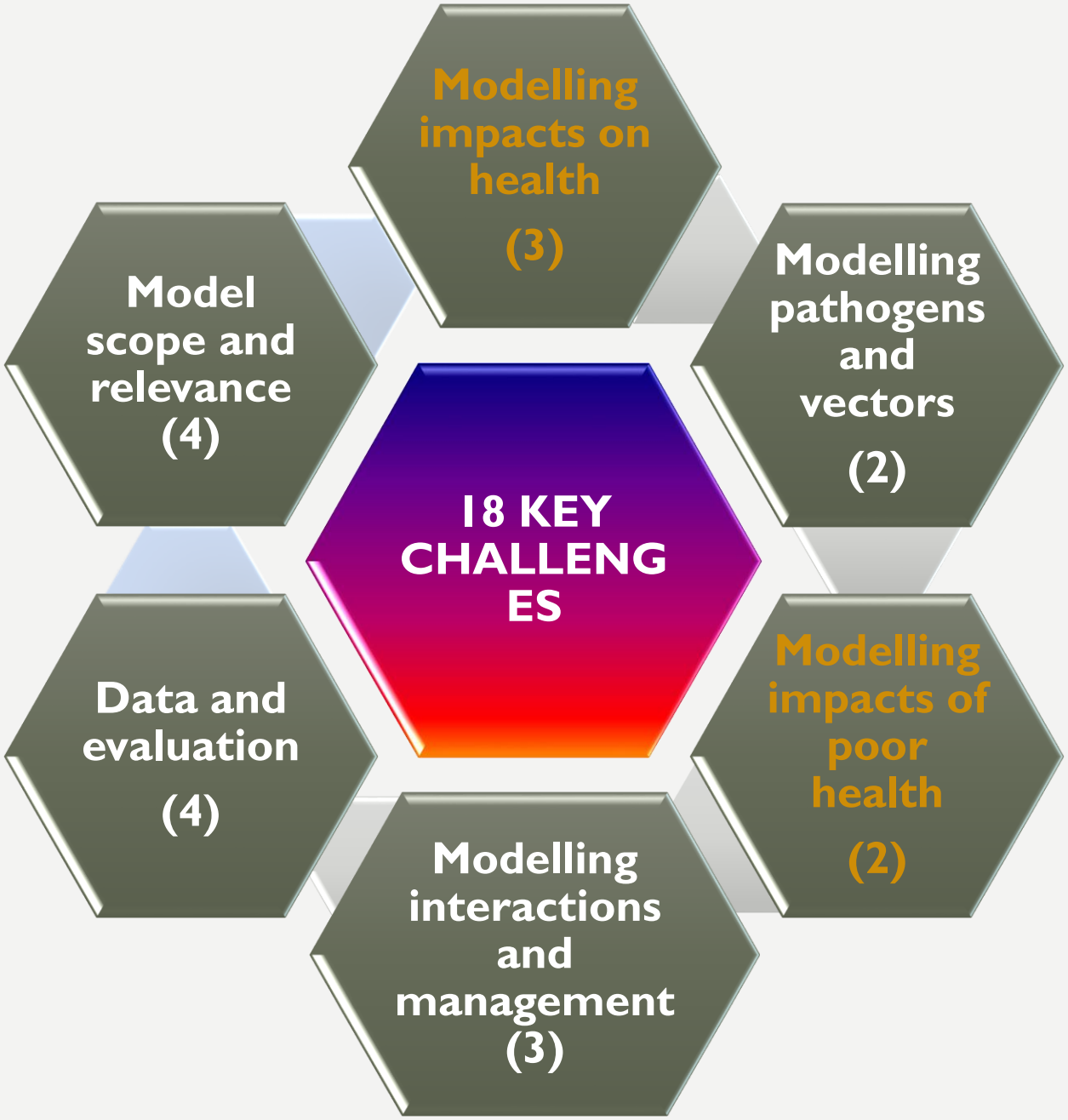
PROCESS

- A map of the impacts of climate change on livestock health, and the mediation of these effects by management



PROCESS

- The workshop, involving 15experts from across Europe, was held at the University of Reading (UK) on the 24th June 2015.
- A questionnaire was then used to collect views from network partners unable to attend the event.
- Contributing partners were asked to review the literature relating to the research challenges identified, in order to (i) explore any novel ideas generated by the workshop process; and (ii) to evaluate the challenges.


Modelling impacts on health (3)
Modelling pathogens and vectors (2)
Modelling impacts of poor health (2)
Modelling interactions and management (3)
Data and evaluation (4)
Model scope and relevance (4)
18 KEY CHALLENGES

MODELLING CC IMPACTS ON ANIMAL HEALTH (CC-HEALTH)

- CC – increased frequency and severity of extreme events
- Impacts of heat stress on cow health, productivity, product quality
- THI values and milk production response to high temperature vary across environments and systems
- Empirical functions but do not consider livestock charateristics e.g. breed, milk yield and level of acclimation affect the occurance of heat stres and impacts on production
- OPTIBARN aims to build a new indicator – both climatic and animal parameters
- A dynamic mechanistic thermal balance model (Thompson et al., 2014)
- Process-based modelling needed, including different levels of production intensity or coverage and different types of cattle production

PRIORITIES CC-HEALTH

- Develop modelling capacity,
- Data comparisons across regions and systems
- Experimental systems in different regions
- Grassland and livestock health modellers work together
- Livestock modellers engage with crop and grassland modellers

IMPACTS OF HEALTH ON GHG EMISSIONS

- Diseases will increase GHG emission intensity
- Only a few studies (Özkan et al., 2015a; Skuce et al., 2016; MacLeod et al., 2016) have quantified the impacts of livestock ill-health on these emissions
- Garnsworthy (2004) modelled the impacts of fertility and herd replacements on GHG emissions
- Williams et al. (2013) used a systems-based Life Cycle Assessment (LCA) approach to quantify the impacts of different diseases on GHG emissions from cattle

PRIORITIES HEALTH-GHG

- A review of current data is required
- different effects of specific health conditions on GHG emissions intensity
- investigation and modelling of the consequences of disease control measures on emissions.

HIGHLIGHTS

- Need for inventories
- Need for collaboration and learning
- Collaboration between socio-economic and biophysical disciplines
- Need for more comprehensive validation of empirical relationships
- Development of modelling capacity
- Long-term development of shared resources

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- Global Research Alliance Animal Health Network

AND

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