

Interdisciplinary AMR Research
Local and Global Knowledge Gaps
21st-25th November, European Parliament in Brussels

OVERCOME

Antimicrobial Resistance in Farm Animals

- | Minimized AM-Use Contributes to Public Goods
- | Phasing-Out Antimicrobials from Dairy Herds
- | Animal Robustness



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Animal Robustness

Overcome AMR in Farm Animals

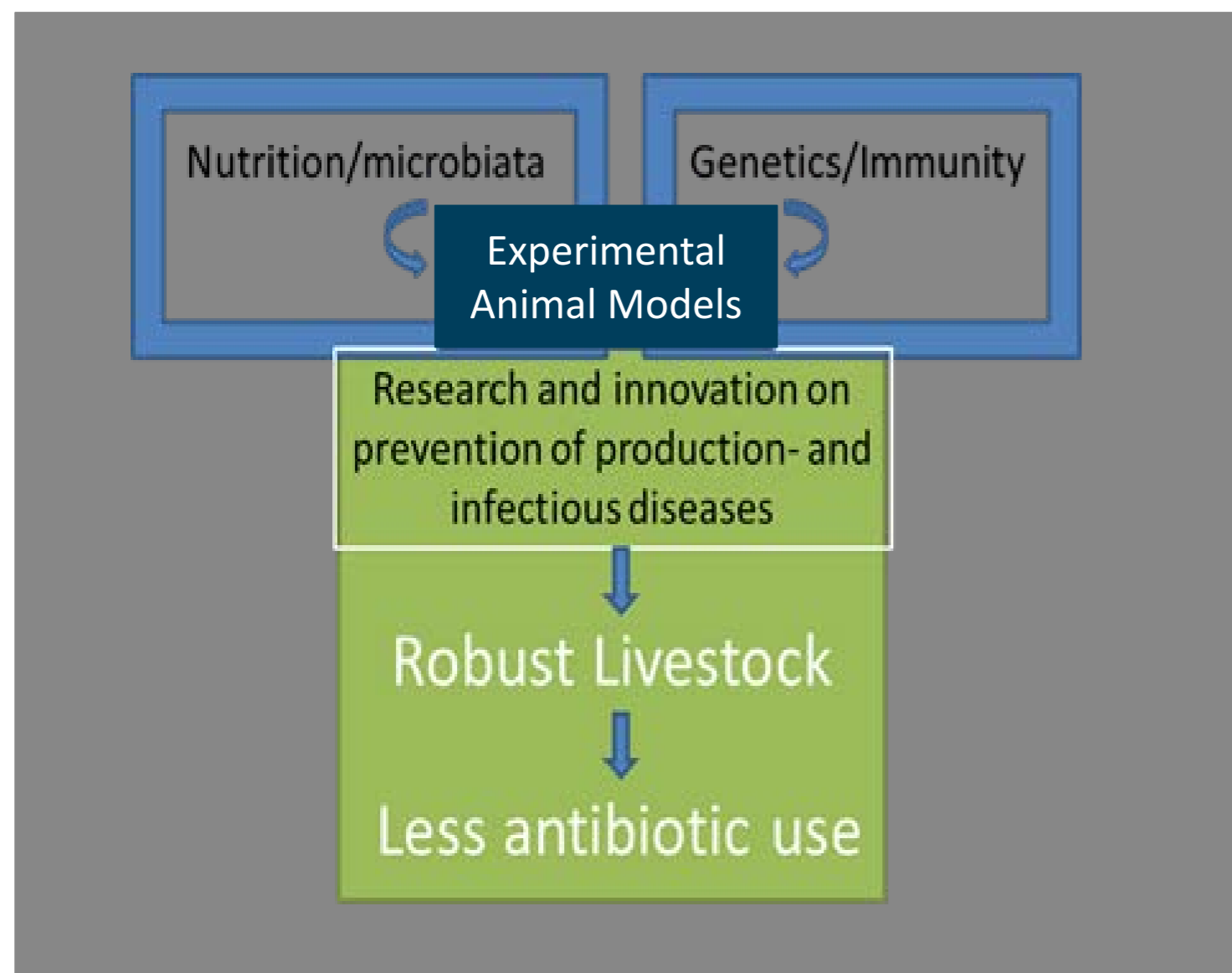
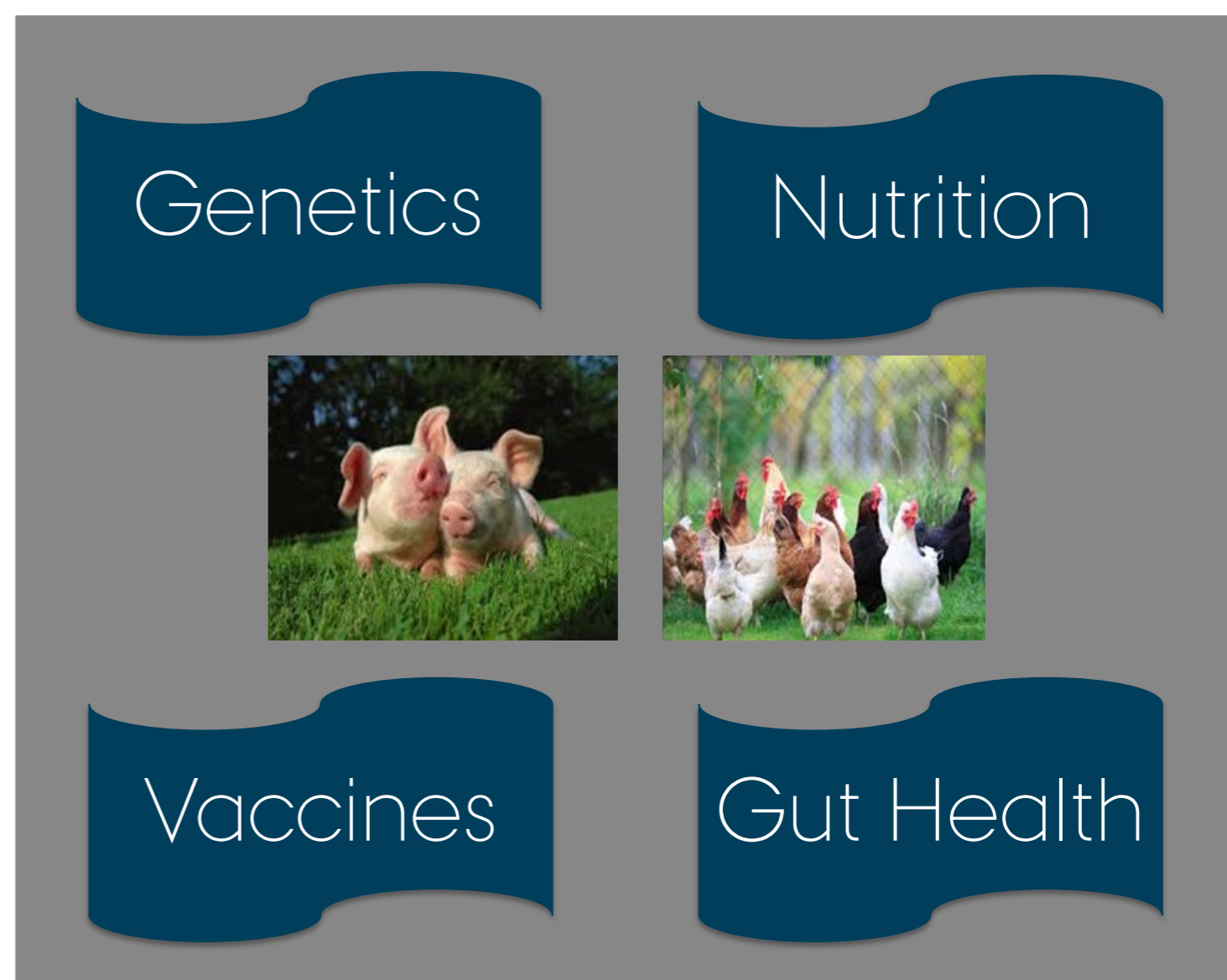
Antimicrobial Resistance (AMR) in animal herds is a major problem. In order to understand how to sustainably ensure animal health without the overuse of antibiotics, we conduct research on animal robustness and immunology to ask questions like; can animal robustness be improved through nutritional modulation of gut microbiota or selective breeding? Which immunological genes are most important? How can disease resistance to both bacterial and viral infections be improved through the use of vaccines?

Research Focus

We have focused our research tools on parameters relevant for gut health and disease prevention of livestock.

We combine *in vitro* and *in vivo* models as research tools to enhance our understanding of animal robustness, resistance and resilience towards infectious diseases.

Multidisciplinary approaches will be needed to effectively translate these findings to the animal industry.



Approaches

- Development of new vaccination strategies using chicken models differing in immune competence
- New feeding strategies and use of bioactive components to prevent post weaning diarrhoea in piglets
- Nutritional strategies using immunomodulatory natural feed components
- General strategies to improve gut health and overall robustness in control of infectious diseases.

Project Examples

- Antibacterial feed additives for weaning piglets against intestinal diseases.
- Alternatives to antibiotics and medical zinc to prevent post weaning diarrhea in pigs.
- Antimicrobial proteins in potatoes.
- Genetic selection for polyvalent resistance to infectious diseases in chickens.
- Modulation of the pig gut microbiome to increase feed efficiency and gut health.
- Utilization of hemp (Cannabis) products to prevent post weaning diarrhea in pigs.



Phasing-Out Antimicrobials from Dairy Herds

Overcome AMR in Farm Animals

Since the early 2000s, some of our research projects have focused on minimizing the use of antimicrobials (AMs) in organic herds. The aim of 'phasing out the need for AMs' were phrased mainly by the organic dairy sector, and they showed that it was possible to bring down the use to treatments of few acute disease incidences every year.

Animal Husbandry for Health Promotion

In an interdisciplinary action research project (2004-2005; veterinary, agricultural and social sciences) we followed a sample of herds closely. Farmers worked together in groups – 'Stable Schools' – towards a common goal of phasing out AM-use. After a year, farmers had dramatically reduced their use of AMs, and improved many aspects of animal health and welfare through changed animal husbandry including hygiene, good outdoor life, high quality feed, stress-minimizing housing systems, and investing time and action immediately when required.



Systems Thinking Key to Animal Husbandry

It sounds simple: basic, but skilful animal husbandry solutions were demonstrated as key. Recent international studies, in different types and sizes of organic and non-organic herds and different animal species, all point to the importance of:

- Farming systems development to enable good animal husbandry practices;
- Time, effort, skills, re-organisation of practices, and consequent action;
- Good communication between animal health professionals at farm level.

Responsible Action for One Health

Reducing the use of AMs will reduce the risk of AMR. With huge proportions of administered AMs going through the animal and into the environment, reducing the need for AMs in farming is a relevant One Health approach. These studies help us understand how to do this practically, and have raised important questions about the responsible handling of acutely diseased animals in the context of both animal welfare and AMR concerns.



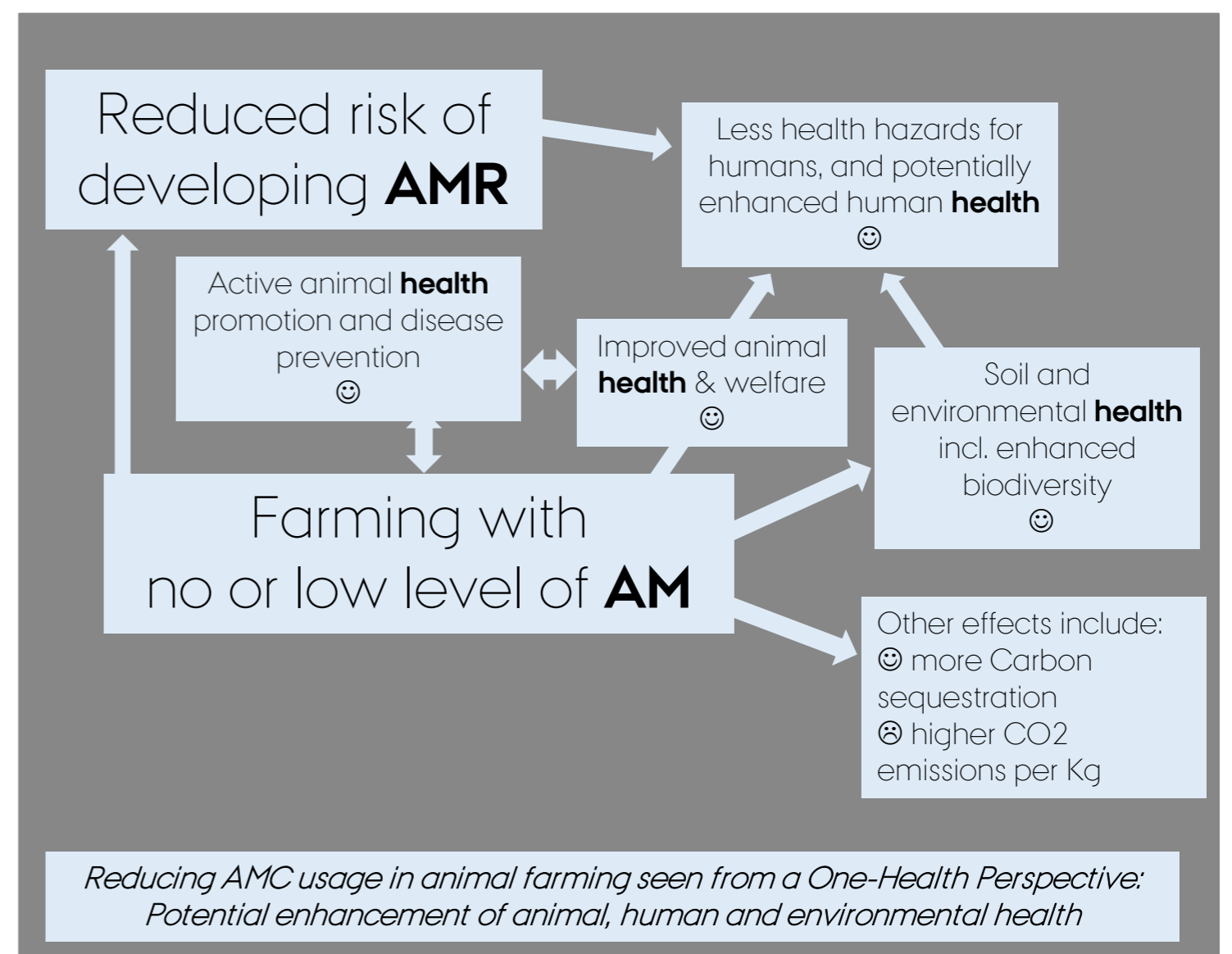
Minimized AM-Use Contributes to Public Goods

Overcome AMR in Farm Animals

Farming with no or low levels of antimicrobial (AM) treatments was found to contribute positively to enhanced biodiversity, soil fertility, animal health and welfare, and reduced the risk of AMR. Public goods were defined as 'goods or services that society wants its citizens to have access to, but which are normally not tradable and non-excludable'.

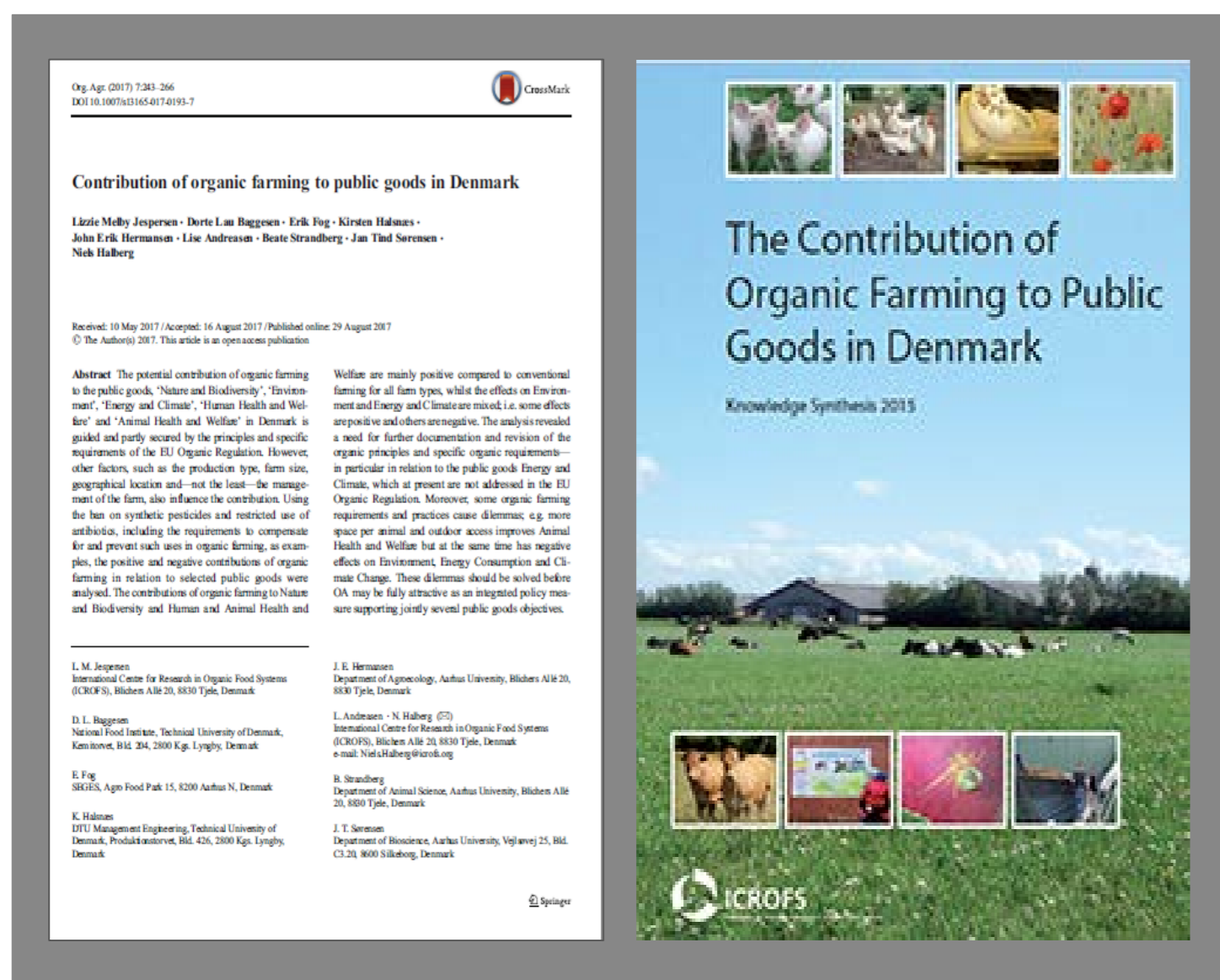
Conclusions from a Knowledge Synthesis

We identified and synthesised existing literature on organic animal farming (mainly Danish). This led to the overall conclusion, that by reducing the use of AMs, organic animal farming contributes to many aspects of public goods in Denmark, including lower levels of AMs in the environment and a reduced risk of AMR. However, precautions should be taken, e.g. organic regulation does not ensure high animal health and welfare per se, and the relation between AM consumption and AMR is complex.



Methodology: Knowledge Synthesis

A multidisciplinary team of 70 researchers and experts in organic production investigated the direct and indirect effect of organic regulation on public goods: Nature and Biodiversity, Environment and Soil Fertility, Energy and Climate, Human Health and Welfare, Animal Health and Welfare, and Rural Development, based on international scientific review papers, Danish research results documented in international peer-reviewed journals, Danish publications and other relevant literature.



Supporting EU 'Reduce, Replace, Rethink'

Our conclusions support and add to existing EU strategies. In the EU 'One Health Action Plan against Antimicrobial Resistance', the Commission will 'continue to promote animal husbandry [...] which support good animal health and welfare to reduce antimicrobial consumption'. Similarly, EMA/EFSA writes that 'some regulated production systems are able to operate with low antimicrobial use, and the farming practices which facilitate this should be further evaluated'.

