



CORE organic II

SafeOrganic

Restrictive use of antibiotics in organic animal farming – a potential for safer, high quality products with less antibiotic resistant bacteria



Danish Crown svineslagteri, Horsens Nord - Foto: © copyright Claus Sjödin 2005 / www.claussjodin.com



Main research questions :

Antimicrobial resistance (AR) in the food-chain is a concern due to risk of treatment failure of humans.

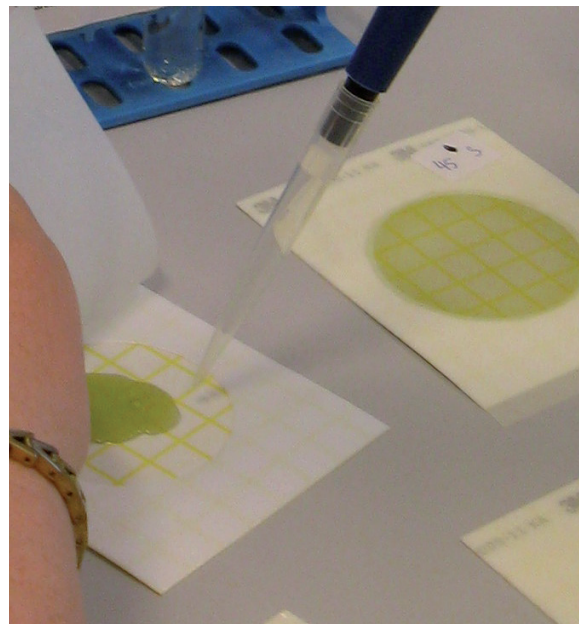
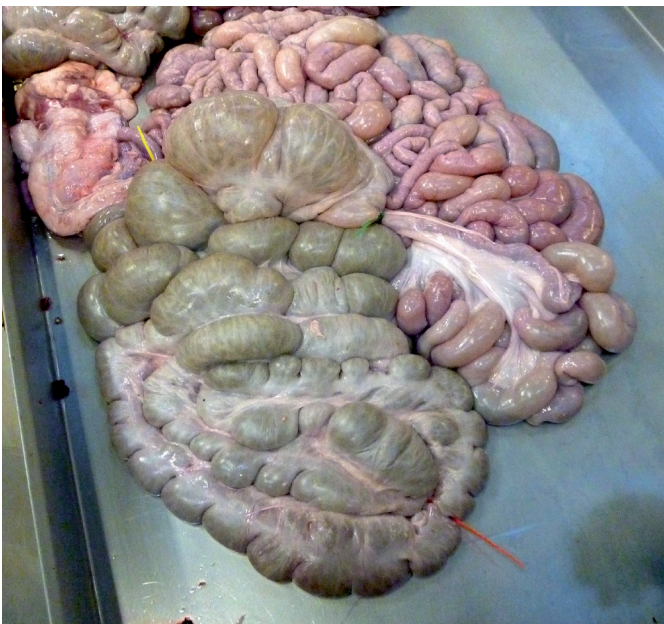
- Do restrictions on antimicrobial (AB) usage in organic pig production lead to lower AR levels in organic pigs compared to conventional ones?
- Is lower AR a quality trait of organic pork?
- Does slaughtering of organic and conventional pigs together abolish this potential quality trait?
- Can markers for imprudent AR use in organic pig herds be identified?

Main outcomes at this stage?

Antimicrobial resistance in bacteria from organic vs. conventional pigs was compared for approx. 25 herds of each production system in Denmark, France, Italy and Sweden. Faeces sampled at farm or at slaughterhouse from two to five pigs per herd was analysed. Sampling of colon content at slaughter within four hours from delivery was found to describe the AR status of the herd with a reasonable certainty.

For both production systems, tetracycline (TET) resistance in *Escherichia coli* was present in most herds in France, Italy and Denmark. This was unexpected. However, the magnitude (proportion) of TET resistance carried by individual animals seemed to be lower in organic pigs than in conventional pigs. In Sweden, the AR was generally low.

Resistance towards ampicillin, cefotaxime, chloramphenicol, ciprofloxacin, gentamicin, nalidixic acid, streptomycin, sulphonamides, tetracycline and trimethoprim was analysed for in 2-5 *E. coli* isolates per pig. The conventional pigs had generally more resistant *E. coli* than organic pigs, although differences were seen between the four countries. This and the identification of potential markers for imprudent use of AB is still under analysis.



The genes encoding resistances to chloramphenicol (cat), streptomycin (strA), sulphonamides (sul2, sul1) and tetracycline (tetA, tetB) were quantified for the total microbiota in the pig gut by a non-culture dependent real-time PCR method. No significant differences in AR gene levels were found, but conventional pigs tended to carry higher levels.

Slaughtering organic and conventional pigs at the same line may lead to cross-contamination of organic carcasses with AR from conventional pigs. In France, organic pigs were slaughtered before conventional pigs and in Denmark the opposite way. The occurrence of tetracycline resistant *E. coli* in the intestines differed significantly between conventional and organic pigs. On the carcasses, there were apparently no longer any difference and this may imply cross-contamination although the mechanisms behind this are not yet clear.

Organic pigs may carry a more diverse bacterial population in the gut due to less selective pressure from antimicrobials and this could potentially characterize the organic pig. However, by PFGE typing, almost every bacterial isolate of *E. coli* carried its own PFGE profile and by this method there was no support of a larger genetic diversity in organic pigs. Likewise, the assessment of the diversity of the gut microbiota supported no substantial differences between organic and conventional pigs.

Recommendations to end-users

Overall, the finding of lower AR levels in *E. coli* of organic pigs still support a quality trait of organically produced pork.

Preliminary data analysis indicates that initiatives are needed in the slaughter process both in terms of separating slaughtering and ensuring optimal hygiene and cleaning in order to maintain this quality of organic pork.

Certain AR genes can be carried inherently by gut bacteria and any use of antimicrobials will enhance this resistance. So, a strict discipline in restricting the AB use at herd level is crucial to maintain low levels of AR and to be able to exploit this quality trait in marketing and branding.





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Relevance

Lower AR levels in organic than in conventional animals were found in Denmark, France and Italy, and a lowering of the AR levels in the conventional production is considered achievable. This is supported by the Swedish data, where both production systems have very low levels of AR.

Data indicates that the prevalence of resistant bacteria build up during the day of slaughter, which point to the importance of good hygiene at the slaughter line.

New and important research questions

An investigation for management factors that are main responsible for the lower AR levels in organic pigs is essential before a relevant transfer of knowledge to conventional production systems can take place.

When considering AR associated to the gut microbiota, it should be investigated whether AR genes carried by distantly related bacteria confers a risk for AR transfer to human pathogens and thus a risk of treatment failure?



Find all publications at orgprints.org/view/projects/SafeOrganic.html.



Further information

This project is funded via the ERA-net CORE Organic II by national funds to each partner. CORE Organic II is a collaboration between 21 countries on initiating transnational research projects in the area of organic food and farming. In 2011, CORE Organic II selected SafeOrganic and 10 other projects.

Read more at coreorganic2.org/SafeOrganic.