Column

Student: Evelien de Olde (870427001)
Major: Applied Animal Science, Van Hall Larenstein
Thesis title: Risk assessment and risk management of Extended Spectrum Beta-Lactamases introduction and spread in pigs in Agroparks in the Netherlands.
Date: 9th of June 2009

Agroparks offer opportunities

In the Netherlands, the use of antimicrobials is increasing, as well as the level of resistant bacteria observed in food animals. In the total spectrum of antimicrobials, beta lactams, that include antibiotics like penicillins and cefalosporins, represent a class of antimicrobials which are important for the treatment of bacterial infections. The beta lactam antibiotics can be inactivated by Extended Spectrum Beta Lactamases (ESBL) which are bacterial enzymes. The worldwide emerge of ESBL has been mentioned by the WHO as a matter of particular recent concern. In the transmission of ESBL's from animals to humans food borne transmission is likely to contribute to the dissemination, since the genes are transferable within and between bacterial species. (MARAN 2007)

Agroparks are spatial clusters of different agro-production chains with spatial combination of agro-processing, agro logistics and trade and demonstration. High productive agriculture and processing of agricultural products will take place in a high technological way. Because in agroparks a combination of both large scale farming and processing is made, ensuring food safety and safety of animal and public health and managing the risks for introduction and spread of ESBL's in agroparks is necessary. For that reason Alterra, (part of Wageningen UR) research institute for the green living environment and active in the development of agroparks, was interested in a study after the risks and risk management of ESBL in agroparks.

Method
As agroparks and a list of risk factors did not yet exist, the best indication of the risks could be reached by expert analysis. A quantification of expert opinion was chosen as the methodology to improve the reliability of the research. After making a first start with a list of risk factors, derived from literature, fifteen experts from five different countries and with different backgrounds (public health and animal health), were involved to add, select and rank risk factors for the introduction and spread of Extended Spectrum Beta Lactamases. On the basis of these first results and arguments, Dutch experts made a final selection of most important risk factors. After this selection was made researchers, entrepreneurs, agropark specialists and veterinarians were involved in brainstorming management solutions for these risks.

Results
The most important risk factors concern the use of antimicrobials, internal bio-security and external bio-security. The most crucial risk factor is the total amount antibiotics used which determines the selection pressure and in that way promotes ESBL emergence, evolution and spread. Also transport and movement of animals and spread by persons were important risk factors.

Decreasing the use of antibiotics by improving animal health and the management of the living conditions in the stables is one of the major solutions. Also hygiene and

treatment protocols, good education of employees, design stables with bio-security principles and reduced transport of animals by closed farm systems were often mentioned as important measures.

Conclusions
Agroparks with large scale farming and a new farming system with closed production chains and certified quality management, can offer new opportunities to manage risk factors for the introduction and spread of ESBL spreading bacteria and other resistant pathogens. The pig farm of the future agropark Nieuw Gemengd Bedrijf is expected to be able to manage several of the mentioned risk factors and as a consequence have a lower risk for the introduction and spread of ESBL.

The research led to an international cooperation and gathering of scientific knowledge, a list or risk factors, with possible practical solutions and has highlighted the emergence of ESBL. The results can be used when developing agroparks and large scale farms to make a step forwards in ensuring food safety and safety of animal and public health, through preventing introduction and spread of ESBL in pigs by more sophisticated animal husbandry practices.

Recommendations
As ESBL is observed in many different environments and because of the impact of ESBL on both animal and public health, a multi disciplinary approach for further research is needed. The willingness of the different parties involved to cooperate on this topic should be applied also in the future as international networks are needed to exchange ideas and solutions for managing animal health and more specific topics like ESBL. Field surveys and experimental research will be needed to further elaborate the list of risk factors and their solutions. This will require investments from different parties and sectors to do further research and implement ideas to prevent future problems of antimicrobial therapy failure.

Reference:
MARAN 2007 - monitoring of antimicrobial resistance and antibiotic usage in animals in the Netherlands in 2006/2007. 2009. CIDC, Lelystad