

## How antibiotic treatments impact development of resistant bacteria

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Synchronized delivery and immediate separation of the piglets from the sows to avoid colostrum intake. Credit: Leon Cantas, 2013

Leon Cantas' doctoral research shows that the immune response of the host to a bacterial infection may have a significant effect on the development of bacteria's resistance to antibiotics.



A well-balanced immune system in the gut and the correct choice and dosage of antibiotics can reduce the spread of resistance to antibiotics amongst gut microbiota.

An increasing resistance to antibiotics, which are in daily use for the treatment of infections in both humans and animals, is well documented. Many bacteria have become resistant to several types of antibiotics and there are hardly any <u>new antibiotics</u> available to combat multiresistant bacteria of this kind. It is important to make sure that antibiotics continue to be an effective treatment for the generations to come, but incorrect and excessive <u>use of antibiotics</u> can increase the occurrence of resistant microorganisms.

Cantas used <u>zebra fish</u>, <u>Atlantic salmon</u> and pigs as models to study the immune system's role in the development of resistance to antibiotics. He discovered that immune response was a key factor. The use of probiotics (immune-stimulating bacteria) during treatment increased the development of resistance in the gut microbiota, whereas treatment with immune-inhibiting medicines such as steroids or NSAID (Non-steroidal Anti-Inflammatory Drugs) lowered the development of resistance.

A well-balanced immune system in the gut appears to reduce the transmission of resistance to antibiotics between gut microbiota, but this balance may be affected by <u>intestinal infections</u>, sudden changes in diet or stress. Controlling so-called production stress (especially in intensive, livestock industries), improving routine procedures in order to ensure good animal health and increasing the focus on <u>animal welfare</u> are all factors that will help to promote an optimal <u>immune response</u> in the gut to <u>harmful bacteria</u>.

The use of probiotics is thought to be advantageous in combating infections, but can – due to their stimulation of the immune system – paradoxically increase the development of resistance to antibiotics in the



animal's normal gut bacteria. In contrast, the use of medicines which inhibit the immune system, combined with a restrictive choice of antibiotics, can lead to a reduction in the spreading of antimicrobial drug resistance.



By following up and developing the results of this doctoral project through further research, we will learn more about the effect of medicines used by doctors and veterinary surgeons to combat infections and this will help to ensure that effective antibiotics will still be available in the future.



DVM Leon Cantas defended his doctoral research on 6th June with a thesis entitled "Development of antimicrobial drug resistance - impact of the bacterial infection treatment".

Provided by Norwegian School of Veterinary Science

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