Ghent University developed a tool to measure antimicrobial usage in animals with the main message "calculating is knowing". Since June 2011 the "Antibiotics check" (AB-check) is online, with financial support of the Belgian pork quality label "Certus" (Belpork vsw) and the Belgian agricultural organization "Boerenbond".

By Merel Postma and Jeroen Dewulf

The AB-Check was being developed by Prof. Dr. Jeroen Dewulf, Dr. Davy Persoons and veterinary surgeon Merel Postma, from the Unit of Veterinary Epidemiology of the Faculty of Veterinary medicine, Ghent University, Belgium, as part of the project "RED AB" (reduction antimicrobial usage). The AB-Check is incorporated in the website www.abcheck.ugent.be, which is available completely free of charge. The tool offers farmers and their herd veterinarians the opportunity to calculate and benchmark their within-herd-antimicrobial necessity.

The researchers from the University work by the slogan "Check, improve and reduce". The antimicrobial usage should be evaluated, the herd management and biosecurity level of the herd should be improved and with that the amount of antimicrobials used be reduced. But, first of all it is important that sufficient calculating methods are available which make it possible to define the current situation. Analysing all combined data will provide the opportunity to advice herd specific improvements. With this it is important to reduce the antimicrobial necessity as much as possible.

The website

The visitors of the website have the choice between different languages: Dutch, French, English and German. The website also offers broad interesting background information on antimicrobials, the "Defined Daily Dose Animal" and antimicrobial resistance. The AB-check is available for pigs, poultry, and turkey at the moment. In the future a module for ruminants will also be available (Fig. 1).

The AB-check for pigs

Within the porcine module for example the farmer is asked to provide the following data:

- Animal category: Reproduction animals: sows, gilts and boars; Production animals: nursing and nursery unit piglets; and Finishers
- Route of administration: injection, drench, spray, feed or water
- Name of the antimicrobial product
- Total used amount of the antimicrobial product for the overall duration of treatment (for every product combined for the overall treatment duration). For example if 100 animals have been treated for three days with 20 ml/product/day, this will give a total antimicrobial amount of $100 \times 20 \times 3 = 6000$ ml
- Unit of the product used
- Weight of the animals at the moment of treatment
- Number of animals treated
- Duration of treatment
- Indication: preventive versus curative

The calculation method

The calculation method

The administered antimicrobial usage

The used amount of antimicrobials is displayed in milligrams. The administered amount in milliliter or gram (that one animal receives on one day) is being multiplied with the amount of milligrams active substance per product. Combined, this amount will be multiplied by the total number of animals and the overall therapy duration. In this way it is possible to get the amount of administered milligrams active substance.

DDDA

DDDA, "Defined Daily Dose Animal" – is inspired from the in human medicine used DDD (Defined Daily Dose). This value expresses the actual average daily dose of normal usage for an antimicrobial product for the main indication. The value of the DDDA is being established based on the registered dosage, when more than one dosage prescription is available (for example several indications). Furthermore a factor is added for long acting antimicrobial substances.

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The problems with antimicrobial resistance claim to reduce antimicrobial usage to a minimum

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UDDA
The abbreviation UDDA stands for “Used Daily Dose Animal” and is being calculated based on the used dosage, duration of therapy, number of animals and the weight of the animals at the moment of treatment.

UDDA divided by DDDA
When the treatment incidence based on UDDA is divided by the treatment incidence based on DDDA this value gives the opportunity to check whether the used dosage was correct. If this value is not equal to one, this means that the dosage is not optimal. A tolerance of 20% is accepted.

For example:
- UDDA/DDDA > 1.2 = over dosed
- 0.8 < UDDA/DDDA < 1.2 = correct dosage
- UDDA/DDDA < 0.8 = under dosed

The formula from Timmermans is being used to calculate the treatment incidence (Fig. 2).

Period at risk
The period at risk is the period (in days) an animal is at risk of being treated with antimicrobials. For finishers this is the age till slaughter. For breeding animals it is advised to use the duration of one production cycle – this will be recalculated to the length of one year.

Weight of the animals
This is the total weight of the animals in a certain animal category at the moment of treatment. To become this value the total number of animals is multiplied by the weight of the animals at the moment of treatment.

Treatment incidence
The antimicrobial treatment usage is being expressed in treatment incidences (T.I.). The treatment incidence is a value that expresses how many animals out of 1000 have received a daily dose of antimicrobials at a certain herd. It also gives an idea on which percentage of their period at risk an average animal on this herd receives a daily dose of antimicrobials. The treatment incidence is being calculated based on the actually used dosage and treatment duration (UDDA) and based on the registered dosage and duration (DDDA). Dividing those two treatment incidence gives an idea whether the animal was treated with the correct dose or an under or over dose.

The project in the field
The participation in the project is on a voluntary basis and consists in total of four herd visits by veterinary surgeons for the university with intervals of six until nine months. During the first herd visit all relevant data on herd management, the current antimicrobial usage (by means of the treatment incidence) and the biosecurity level of the herd (with use of the by Ghent University developed Biocheck) are collected. After analysing these data a herd specific plan of action is being put together which emphasises on increasing sensibility towards responsible use of antimicrobials, the reduction of antimicrobial usage and the optimisation of the herd management. In a third phase there is an evaluation: do the proposed actions lead to the expected results? In the fourth and last phase it is being checked whether the antimicrobial usage in the herd is reduced and the production parameters have im-
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Fig. 2: Timmermans formula describes the intensity of the treatment.

proved. During the complete duration of the project both the farmer and the herd veterinarian are involved and consulted. The analysis of herd data is performed anonymously.

First results of the AB-Check

To this date 64 porcine herds are participating in the project on a voluntarily basis and some first results are available (Fig. 3):

- When comparing the biosecurity level of the first herd visit with the third herd visit there is an increase of 4.5% to be found. Both internal biosecurity (+ 7.7%) as well as external biosecurity (+ 1.3%) showed an increase.
- The number of weaned sows per year increased by 1.0 piglet on average.
- Piglet mortality was reduced by 3.0% since the beginning of the project from 14.2% to 11.2%.
- Antimicrobial usage could clearly be reduced (herd visit one versus herd visit three):
  - Breeding animals: –26.2%
  - Piglets: –37.9%

Unfortunately for the finishers an increase of 10% was seen. In twelve out of fourteen herds during both the first and third herd visit no standard antimicrobial therapies for finisher were used. One herd completely stopped (- 100%) with the standard treatment of finishers by our advice. For one herd it was decided, because of a herd extension, to use more antimicrobials to try to limit potential risks. The corresponding antimicrobial usage increased with 220%. This was in no way related to the recommendations from the advisors of Ghent University. The average increase in antimicrobial usage of 10% over all herds is due to the sole influence of this one herd with the extension of the number of animals.

The results show that in herds with an average to high usage, clear and guided advices for improved biosecurity levels and herd management can help to reduce antimicrobial usage without negative influences on production results.

The RED AB project is being evaluated as very instructive by the agricultural sector. For the farmers it is important to get an idea on the amount of antimicrobials they use for their herds and how they can be benchmarked compared to their colleagues. Furthermore they appreciate to get insight in their herd management and biosecurity level and hands on practical advises.

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Treating incidence = \( \frac{\text{Amount of antimicrobials administered (mg)}}{\text{DDDA} \text{ or } \text{UDDA} (\text{mg/kg}) \times \text{period}} \times 1000 \times \text{At risk} \text{ (days)} \times \text{kg animal} \)

Merel Postma
became responsible for the RED AB project at Ghent University after graduating her veterinary medicine studies at Utrecht University (The Netherlands).

Professor Jeroen Dewulf
graduated as a veterinarian and is since 2006 professor in veterinary epidemiology at Ghent University, Belgium. He is co-author of the annual “Belgian report on antimicrobial consumption in animals” (BelVetSac). Furthermore he is founder and chairman of the Belgian “Centre of expertise on antimicrobial use and resistance in animals” (AMCRA).

“Animal-to-human transmission

Using whole genome sequencing, scientists have found two independent human cases of infection have been linked to livestock. Cambridge scientists have linked two human cases of infection with the antibiotic-resistant superbug MRSA to farms in Denmark. The study, published in the journal EMBO Molecular Medicine, suggests the methicillin-resistant *Staphylococcus aureus* (MRSA) bacteria was transmitted from livestock to the farmers.

The type of MRSA which was found in both of the human cases was only discovered two years ago by Dr Mark Holmes and his colleagues from the University of Cambridge. The new strain’s genetic makeup differs greatly from previous strains, which means that the “gold standard” molecular tests currently used to identify MRSA do not detect it.

For this study, the scientists used whole genome sequencing to investigate two cases of the new MRSA where the patients lived on farms to see if the same strain could be found in the animals on the farm. Holmes, the senior author, said: “Having found this new MRSA in both people and animals on the same farm it was likely that it is being transmitted between animals and people. By looking at the single differences in nucleotides, or SNPs, in the DNA sequences of each isolate, it became obvious that in both farms we looked at human and animal MRSA were almost identical. In one case, the results also clearly showed that the most likely direction of transmission was from animal to human.”

The study raises questions about whether cows could be a reservoir for new strains of MRSA. It was previously not clear whether MRSA was transmitted to cows from humans or to humans from cows, but the new research indicates that the livestock is the likely source of these new strains.

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