Press Release
final project report

Project No. QJ1210119 “Development and production of veterinary kits for the determination of minimum inhibitory concentrations of antimicrobials by a standardized microdilution method and a new concept of evaluating the effectiveness of antimicrobials by MPC determination.

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During the project fulfilment, recommended procedures for antimicrobial susceptibility/resistance testing in bacterial pathogens causing most serious diseases of farm animals, dogs and cats have been developed and transferred to practical use. Testing of bacterial pathogens for antimicrobial susceptibility/resistance is necessary in deciding which targeted antimicrobials would be effective in treatment. In most cases today, treatment of bacterial infections with antimicrobials is inevitable, both in human and veterinary medicine. Within the project, the use of recommended diagnostic methods has been supported by the development and production of diagnostic tools – kits for the detection of antimicrobial susceptibility or resistance of bacterial pathogens in various animal species. As the final outcome in this project, we recommended methods for treatment of selected bacterial infections in pigs, cattle and poultry which are most frequently diagnosed or incur considerable economic losses to farm animal breeders in the Czech Republic.
Kits for testing resistance to antimicrobials have been developed under the project for the needs of veterinary diagnostics. However, if applying the "One Health" principle, the results have practical implications for human medicine. They also help us define and subsequently achieve the objectives of the Ministry of Health and Ministry of Agriculture’s National Action Plan for control of antimicrobial resistance. Requirements for the formulation of the National Action Plans come from, e.g., the EPSCO Council conclusions and these were adopted by the EU Council in June 2016. Meanwhile, a National Action Plan is also being prepared in the Czech Republic, and will be defined as a non-legislative task of the government of the Czech Republic. An active role in its preparation is being played by the Group working on antimicrobials at the Ministry of Agriculture, with representatives of the VRI and ISCVBM research teams. One way of fulfilling the primary objective of the National Action Plan which is to control antimicrobial resistance will be the implementation of this project’s results in the diagnosis of antimicrobial resistance or susceptibility of important veterinary pathogens. For this purpose, there is no alternative diagnostic tool in terms of availability, quality or price.

The main outcomes of this project:
1) Veterinary diagnostic kits for testing susceptibility or resistance of animal pathogens by determination of minimum inhibitory concentrations (MIC).
2) Methodical procedure for antimicrobial resistance testing in veterinary medicine, including recommended procedures for antimicrobial treatment of selected serious bacterial diseases of farm animals.

During the entire project implementation period of 5 years, veterinary diagnostic kits for testing antimicrobial resistance of bacterial pathogens in animals were developed and put into production. The kits vary with the antimicrobials being tested, animal species and disease from which the bacterial pathogen is derived (pigs, cattle, mastitis of dairy cows,
poultry, cats and dogs) or according to pathogen type that causes the disease (gram-positive and gram negative bacteria specific to veterinary medicine). Currently, the following outcomes of the project are registered as part of the project implementation: It includes 5 verified production technologies and 5 certified methodologies in the form of standard operating procedures – testing of antimicrobial resistance in certain types of pathogens (from selection and collection of samples, transport of samples, diagnostics of pathogens, antimicrobial resistance testing, to the interpretation of results). Production of kits and testing procedures are fully in line with international standards for testing antimicrobial resistance in bacteria (European Committee on Antimicrobial Susceptibility Testing – EUCAST and Clinical Laboratory Standard Institute – CLSI).

The list of developed diagnostic kits that are on offer for diagnostic laboratories:

- Kit for the determination of resistance of bacterial pathogens of pigs
- Kit for the determination of resistance of bacterial pathogens of cattle
- Kit for the determination of resistance of bacterial pathogens of poultry
- Kit for the determination of resistance of mastitis-causing gram-negative bacteria
- Kit for the determination of resistance of mastitis-causing gram-positive bacteria
- Kit for the determination of resistance of bacterial pathogens of dogs and cats
- Kit for the determination of resistance of gram-negative pathogens
- Kit for the determination of resistance of gram-positive pathogens
- Kit for the determination of resistance of pathogens specific to veterinary medicine

In addition, all kits on offer are produced in three modifications based on the growth medium suitable for the examined bacteria:

- Cation adjusted Mueller-Hinton broth
- Cation adjusted Mueller-Hinton broth with lysed horse blood
- Veterinary fastidious medium
The selected variety of antimicrobials in different kits was specifically developed in order to enable testing of the efficacy of antimicrobials that are registered for use in veterinary medicine in the CR and EU; antimicrobials that are only used in veterinary medicine are also included here, which makes the offer for customers unique and more interesting. Moreover, only antimicrobials developed for treatment of defined diseases of a certain animal species have been selected for particular kits; or, in kits divided according to the characteristics of the pathogen, the effectiveness of various agents against the tested pathogens is taken into account. Another selection criterion was the possibility of application of the results of resistance testing using these kits in projects focused on monitoring of antimicrobial resistance of bacteria by harmonized procedures so that the kits might contain the monitored antimicrobials under various national and international programmes or in various epidemiological studies, particularly if the pathogens have zoonotic potential or are important for food safety monitoring.

Methodical procedures for testing of antimicrobial resistance in veterinary medicine and recommended procedures for antimicrobial treatment of serious bacterial diseases of farm animals are based on previous results in a comprehensive procedure for the determination of sensitivity/resistance of bacterial pathogens in farm animals and the recommended antimicrobial treatment based thereon. According to the frequency and severity of the disease they cause, the following target pathogens have been chosen for each species to date:

- **Pigs:**
  - respiratory diseases – *Actinobacillus pleuropneumoniae*
  - enteric diseases – *Escherichia coli*

- **Cattle:**
  - respiratory diseases – *Mannheimia haemolytica*
  - enteric diseases – *Escherichia coli*

- **Poultry:**
  - enteric diseases – *Escherichia coli*
  - sepsis – *Enterococcus faecalis*
Recommended procedures for the use of antimicrobial treatment of particular diseases are procedures for treatment of defined diseases, from clinical signs through prevention and prophylaxis, disease diagnostics, including identification and determination of the resistance source. Treatments and medications of the first, second and third-line treatment options were designed, including justification of the proposals, on the basis of results of long-term monitoring of resistance by literature review of the latest knowledge of resistance trends in the investigated pathogens.

Results of this project have already been transferred to practical users and are exploited in veterinary diagnostic laboratories, not only within the National programme for monitoring resistance of pathogens important for veterinary medicine to antimicrobials. The main benefit derived from the results of the project is their use for achieving the objectives set by the EU. It also complies with the demands of national strategies determining antibiotic treatment, which are aimed, among others, at controlling their overuse. This can significantly reduce the development of bacterial resistance to antimicrobials and to preserve the efficacy of these drugs for the future. This requires accurate, rapid and targeted diagnostics which is provided by the implementation of the project. In December 2016, the principal investigator of this project was honoured with the award of “Medica Veterinaria” for her exceptional contribution to veterinary medicine.