

## SUMMARY

*Mastitis* is one of the most common diseases in dairy cows, the course and severity of clinical symptoms of which is determined by many factors related to the type and pathogenicity of the microorganism, the cow's immune response to infection, but also environmental factors. In the majority of cases, udder infections are caused by bacteria, among which *Streptococcus uberis* currently plays a dominant role.

The aim of the study was to develop the characteristics of *S.uberis* as an etiological factor of *mastitis* in cows by: assessing the epizootic occurrence of *S. uberis* in dairy herds located in the Kujawsko-Pomorskie Province, determining the relationship between the percentage of isolated *S. uberis* strains and the zoohygienic situation in breeding, assessing the intensity of the immune response in cows with mastitis caused by *S. uberis* based on the determination of serum amyloid A and pro-inflammatory cytokine levels in milk and serum of cows, establishing phenotypic drug sensitivity profiles of *S. uberis* to antibiotics most commonly used in the treatment of *mastitis* in cows, and analysis of molecular determinants of drug resistance in *S. uberis* strains causing *mastitis* in cows. The research material consisted of 194 milk and blood samples collected from Holstein-Friesian (HF) cows on 28 farms located in the Kujawsko-Pomorskie Province with a total herd size of 1,241 cows.

The results of our own research indicate that *S. uberis* is one of the major causative agents of mastitis in dairy cows. *S. uberis* strains accounted for 17.0% of all bacterial strains isolated from the milk of cows with *mastitis*. In addition, the infectious potential of this environmental pathogen has been demonstrated. The ability of *S. uberis* to activate the immune system of the udder has been confirmed by a significant increase in the levels of all tested, functionally closely related cytokines (IL-1 $\beta$ , IL-6, IL-8, IL-12 $\beta$ , TNF- $\alpha$ ) and amyloid A in the milk of cows with *mastitis* compared to the milk of healthy cows. The assessment of drug sensitivity of *S. uberis* strains allowed for the identification of 21 different profiles. The most common pattern was simultaneous resistance to tetracycline, erythromycin and lincomycin. Multidrug resistance was found in 33.3% of *S. uberis* strains. 20.0% of *S. uberis* strains were sensitive or moderately sensitive to all antibiotics. Cefoperazone, cefquinome, cephalixin, penicillin and ceftiofur showed the highest *in vitro* activity. Molecular studies confirmed the presence of 36 genes determining resistance to various groups of antibiotics. The presence of at least one resistance gene was found in 66.7% of *S. uberis* strains. The largest proportion were *tet* genes responsible for resistance to tetracyclines.

The need to limit antibiotic-based therapy necessitates preventive measures. Our own research has shown that one of the most effective ways to eliminate *S. uberis* infections is to maintain the cleanliness of cows, but also of the entire environment in which these animals live. The higher the level of udder skin hygiene, the lower the exposure to environmental microbial infection. In our own research, in herds with a high level of cow cleanliness (I and II), the frequency of isolation of *S. uberis* strains from the milk of cows with mastitis was significantly lower compared to herds with a cleanliness level of III and IV. However, our own research results have shown that the effect of pre- and post-dipping in the case of environmental pathogens such as *S. uberis* may not be satisfactory. The percentage of cows from which *S. uberis* strains were isolated was higher in herds where post-dipping preparations or a combination of pre- and post-dipping preparations were used compared to herds where there was no pre- or post-milking teat disinfection. This phenomenon is likely to be caused by the possibility of transmission of environmental pathogens constantly present on the skin of the teats and in the teat canal, especially when the teats of successive cows are dipped in the same container containing the disinfectant.

Preventive measures should focus not only on proper milk collection hygiene procedures, but also on the introduction of DC therapy and the use of vaccinations against

bacteria that cause *mastitis*. The application of long-acting antibiotics to selected cows during the dry period, i.e. the physiological exclusion of cows from milk production, reduces the use of antimicrobial drugs during lactation and has no impact on animal welfare or farm economics. In herds where SDCT therapy was introduced, nearly 6 times fewer *S. uberis* strains were isolated per cow compared to herds not using this form of mastitis therapy. Our own research has also confirmed the effectiveness of vaccines targeting *S. uberis*. The percentage of *S. uberis* strains per cow was significantly lower in vaccinated herds compared to unvaccinated herds (1/49.4 vs 1/33.3). The particularly significant positive effect of the use of a vaccine targeting *S. uberis* should be emphasised.

Keywords: cows, mastitis, *Streptococcus uberis*