

## Summary

Reproductive traits are usually characterized by low inheritance, and phenotypic selection is often slow and ineffective. In order to improve sheep fertility features such as ovulation rate and litter size, it seems to be more effective to select animals based on their genotype. It has been shown that various mutations in the *BMPR-1B*, *BMP-15* and *GDF-9* genes belonging to the TGF- transforming growth factor- (TGF- ) superfamily affect the number of ovulating follicles and litter size in sheep breeds. Mutations occurring in these genes have different effects and patterns of inheritance. All mutations increase the number of ovulation follicles in heterozygous individuals, but some mutations cause infertility in homozygous individuals where ovaries do not develop properly. Increase a litter size is crucial to the profitability of lamb production however it is just one of many factors that affect the profitability of sheep farming.

Studies in this study included the identification of polymorphisms in four genes belonging to the TGF- transforming growth factor (TGF- ) superfamily: *BMPR-1B*, *BMP-15*, *GDF-9* and *AMH*, and tissue expression analysis of *BMP-15*, *GDF-9* *AMH*. In the study material from 195 sheep breed was used: Romanowska (n = 71), Wrzosówka (n = 59), Cakiel podhalanski (n = 65). *BMP-15*, *GDF-9* and *AMH* gene coding polymorphisms were determined based on sequence analysis while *BMPRI-B* gene mutation based on PCR-RFLP.

Gene expression analysis was performed using Real-Time PCR. Statistical analysis showed a significant association (p 0,05) between the identified leucine deletion at *BMP-15* locus (c.28\_30delCTT) and increased heterozygous sheep abundance. Statistically significant differences in the level of fertility were also identified between individuals with *GDF-9* mutation - (c.978A> G, G6 - c.994G> A) and mutant carriers in two *BMP-15* and *GDF-9* genes simultaneously. Real-time PCR researches showed a statistically significant difference across age group in *AMH* gene expression, while tissues specific analysis of expression genes *BMP-15*, *AMH* showed expression only in ovarian follicular tissue and expression of *GDF- 9* gene in all examined tissues.