Abstract of the doctoral dissertation of Alicja Wierzbicka, M.Sc., entitled:

Analysis of Factors Modulating the Effects of Vitamin S Supplementation: Literature Review, Transcriptomic and Epigenomic Studies

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Vitamin D_3 is synthesised in the epidermis of animals under the influence of sunlight and heat. Provitamin D_3 (7-dehydrocholesterol) is converted into cholecalciferol in a non-enzymatic reaction. The limitation of skin exposure to the sun caused mainly by modern lifestyle and animal husbandry systems leads to a health-threatening cholecalciferol deficiency.

Due to the scale of the problem, vitamin D is now one of the most widely recommended dietary supplements. However, there is considerable controversy about the form and dosage of this supplement. The European Union guidelines for pigs do not specify a minimum dose of vitamin D, while the maximum daily dose is 50 µg/kg of feed (2000 IU), supplemented either as cholecalciferol or as calcidiol. Nevertheless, research suggests that the effects of the intake of these respective metabolites are different. In addition, current European recommendations do not specify doses for particular technology groups. Meanwhile, numerous studies show that the need for vitamin D is related to the physiological state of the animal, as well as to sex.

This PhD thesis aims to address several questions regarding vitamin D supplementation, including:

→ Are there sex differences in vitamin D concentration and effect?

→ Does long-term supplementation with an increased dose of cholecalciferol and the use of calcidiol in the diet cause changes in mRNA expression in porcine muscle tissue?

→ Does long-term supplementation with an increased dose of cholecalciferol and the use of calcidiol in the diet cause changes in miRNA expression in porcine lung tissue?

→ What is the effect of long-term supplementation with an increased dose of cholecalciferol on methylation levels and mRNA expression in porcine lung tissue?

Based on the literature review, there are factors that may cause intersex differences in vitamin D levels and effects. On the other hand, the results of the nutrigenomic study showed that muscle tissue, unlike lung tissue, is not a direct target for cholecalciferol and calcidiol. Furthermore, increased intake of cholecalciferol and the use of calcidiol in the pig diet appear to significantly affect the miRNA profile of lung tissue, and increased intake of cholecalciferol on the methylation and mRNA of this tissue.