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THE INFLUENCE OF VITAMIN K2 ON LIPID PRECURSORS OF INFLAMMATION IN PALMITATE-INDUCED INSULIN RESISTANT HEPG2 CELLS

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Introduction. Vitamin K2 (menaquinones) is one of the two most often found types of Vitamin K in the human diet and is also synthesized by gut bacteria conversion of Vitamin K1. Vitamin K2 has several subtypes, determined by isoprene chain length. The use of menaquinone seems to have beneficial effect on the metabolic pathologies treatment such as inflammation or type 2 diabetes mellitus (T2DM).

Aim: the aim of the study was to evaluate the influence of the Vitamin K2 (VK2) on the inflammatory process in HepG2 cells in order to better understand the interplay between VK2 supplementation and content of pro- and anti-inflammatory lipids that may lead to inflammation development.

Material and methods. The study was carried out on Human liver hepatocellular carcinoma cells (HepG2) incubated with VK2 and/or palmitic acid (PA). The concentrations of intracellular fatty acids were measured by gas liquid chromatography (GLC). Furthermore, on the basis of the fatty acid composition, the sum of ω-3 and ω-6 polyunsaturated fatty acids (PUFAs) in the tested single lipid fraction were determined. The expression of proteins involved in inflammatory process such as cyclooxygenase 1 (COX-1), arachidonate 15-lipoxygenase (15-LO), tumour necrosis factor alpha (TNF alfa) and interleukin 6 (IL-6) were detected by Western Blot procedure.

Results and discussion. The concentration of triacylglycerols (TAG) was significantly elevated in HepG2 cells incubated with PA and VK2 compared to the control and PA group. Moreover, simultaneous incubation with PA and VK2 showed significant increase in activities of n-3 pathway in TAG fraction compared to the control group and the group incubated with PA. The treatment with PA combined with VK2 resulted in a markedly elevated concentration of 20:4 in DAG fraction in comparison to the control group and the group incubated with PA. HepG2 cells incubated with PA and VK2 showed lowered intracellular expression of tumour necrosis factor alpha and interleukin 6 compared to the PA group. Furthermore, the exposure of HepG2 cells simultaneously to PA and VK2 caused a considerable increase in 15-LO expression compared to the control and PA group.

Conclusions. Our study showed that vitamin K2 increased deposition of palmitate into triacylglycerols and increased the concentration of anti-inflammatory n-3 PUFAs in this fraction what seemed to be a protective mechanism against inflammation development. Moreover, vitamin K2 not only stimulated the synthesis of anti-inflammatory lipids, but also had anti-inflammatory effects showed in reduction of 20:4 fatty acid in DAG fraction. In addition, vitamin K2 also stimulated the expression of 15-LO that catalyzes the synthesis of anti-inflammatory compounds.