

## **Abstract**

The prevalence of obesity has already epidemic dimensions. Recently, the obesogens have been identified as the main cause in addition to excessive food intake, the lack of physical activity and the genetic background. These substances damage the metabolic processes, interfere with the hormonal functions and impair the energy balance in behalf of gaining weight and obesity.

The theoretical part of this work deals with obesity, adipose tissue, lipid droplet and obesogens. From the obesogens there is closely specified a group of persistent organic pollutants (POP) from which one representative was used in the practical part of this work.

The aim of the practical part was to describe the cellular model of differentiation the mesenchymal stem cell into adipocytes and to investigate the effect of one of the most frequently occurring obesogen on the expression genes of lipid metabolism and insulin signalling pathway.

The morphological changes were observed in cells during differentiation (at days 0, 4, 10 and 21). The mesenchymal cells of the elongated spindle shape changed into adipocytes filled with lipid droplets. Oil Red O staining was used for quantification of accumulated lipids. The differentiation to adipocytes was confirmed by fluorescence immunocytochemistry using a specific protein FABP4. The cell viability was determined by using the PrestoBlue™ Cell Viability Reagent. During the differentiation there were not observed any significant changes in the cellular viability.

During the differentiation, the adipocytes were exposed to the effect of the substance from the group of persistent organic pollutants, nominally DDE. The addition of lipids to the differentiation medium simulating nutritionally toxic environment reduced significantly the expression of genes regulating adipogenesis (OCT4, PPARG and PPARGC1B) by differentiating adipocytes. The exposure of DDE significantly increased the expression of genes of lipid metabolisms and the insulin signalling pathway (INSR, AKT2, ACLY, LIPE and FASN) compared to the differentiation medium with added lipids.

This work confirms that POP are not only passively stored in the adipose tissue but what is more they can impair metabolic functions. They can have an important role in the development of obesity and it's complications.

**Key words:** lipid droplet, adipose tissue, obesity, obesogens, DDE, mesenchymal stem cells, adipocytes