ABSTRACT

Chronic non-communicable diseases (NCDs), including obesity, type 2 diabetes, and cardiovascular diseases, are a very serious problem in the 21st century. One of the main NCD risk factors is unhealthy lifestyle, which is very often associated with the excessive dietary intake of poor-quality fat and highly processed food that is low in most nutrients (e.g. vitamins and minerals, including magnesium). Magnesium is a divalent chemical element, which the body needs to function properly. It is responsible for a number of functions, such as building bones and teeth and activating many enzymes. It also contributes to the metabolism of nutrients, including fat, in the body.

The aim of this paper was to assess the effect of an increased content of magnesium in the form of magnesium oxide in experimental diets containing various types and amounts of edible fat (butter, beef tallow, palm fat, and rapeseed oil) on selected biochemical parameters, accumulation of fat and minerals in selected organs, tissues, and faeces, and mRNA expression of genes related to fat metabolism in Wistar rats.

The research was divided into two experiments involving growing Wistar rats, during which the rodents were fed diets with different amounts of animal fat (butter and tallow fat) in experiment I and vegetable fat (palm fat and rapeseed oil) in experiment II, as well as the varying amounts of magnesium.

The research results indicate that the addition of magnesium to high-fat diets generally affected the examined parameters in a way directly associated with the fatty acid composition of the fat used. It has been shown that incorporating a doubled amount of magnesium oxide into high-fat diets:

→ containing butter, palm fat, and rapeseed oil significantly lowered insulin concentration and HOMA-IR and IRI/G insulin resistance indicators,

→ containing butter, beef tallow, and palm fat significantly lowered the CRI-I and CRI-II Castelli risk indexes, generally affecting the lipid profile,

→ did not significantly affect the total fat content in selected internal organs of Wistar rats in either experiment,

→ generally had a positive effect on the regulation of liver function by normalising liver enzymes and significantly reducing the concentration of MDA. In general, it did not affect the examined parameters of oxidative stress,

→ had a positive effect on the mRNA expression of genes associated with fat metabolism.