Summary

The aim of the work was to determine the effect of high pressure homogenization (pconst. = 100 MPa) carried out at different temperatures (4ºC, 20ºC, 40ºC, 60ºC) and compare it with homogenization, commonly used in industry, carried out at 20MPa and temperature 60ºC, on selected characteristics of milk, buttermilk and non-fermented dairy drinks (milk and buttermilk in ratio 1: 1).

The use of high pressure homogenisation, at a pressure of 100 MPa, resulted in reduction of the total bacterial count in all tested products. The reduction in bacterial counts was proportional to the used temperature. It has been shown that the use of high pressure homogenisation carried out at 4ºC resulted in a reduction in the bacterial count corresponding to traditional homogenization.

The high pressure homogenization at 4ºC resulted in a reduction size of fat globules (Dv10, D32, D43, Dv50, Dv90) only in the tested samples of buttermilk and unfermented milk drinks. The use of traditional homogenization contributed to the achievement of the values of fat globule dispersion close to high pressure homogenization carried out at 20°C or 40°C, depending on the research material. Moreover, smaller sizes of dispersed phase in buttermilk, higher in buttermilk and milk combined in equal volumes, and the highest in milk were found. The increase in dispersion of the emulsion phase resulted in a multiple increase of its surface.

Homogenization contributed to the increase in the amount of protein associated with the milk phase, as a result of its adsorption on the surface of fat globules. As the temperature and pressure of homogenization increased, the number of plasma proteins absorbed on the surface of the fat globules increased.

The composition of milk fat globule and buttermilk proteins subjected to homogenization was dependent on process parameters, i.e. pressure and temperature. The identification and quantitative analysis of fat globule proteins has shown that as a result of homogenization in their composition, in addition to the components of native capsules, plasma proteins, mainly casein, enter. Among the whey proteins adsorbed on the surface of fat globules, β-lactoglobulin is mainly undergoing, while at higher temperature, high-pressure homogenization α-lactalbumin. The proteins of the native fat globule membrane constituted a greater proportion of total proteins in the fat globule from homogenized buttermilk as compared to analogous milk samples. The smaller size of fat globules and the lower content of plasma proteins in the fat globules of homogenised buttermilk as compared to milk is

associated with the higher protein content with a molecular weight ≥ 40kDa (including envelope proteins) and phospholipids in buttermilk rather than in milk.

In the tested samples, comparable content of fractions of phospholipids (phosphatidylethanolamine and sphingomyelin) was fund. The exception was phosphatidylcholine, which was the most in buttermilk (220.69mg / 100g fat), and the least in skimmed milk (61.97mg / 100g fat).

The antioxidant capacity and fatty acid profile did not depend significantly on the product tested and the applied pressure and temperature of homogenization.

The share stress and viscosity of the tested products depended on the chemical composition and properties of the emulsion and colloidal phase.

High-pressure homogenisation carried out at a temperature of ≥ 20°C contributed to the reduction in the shear stress of all analyzed samples in comparison to the control sample, the more the higher the temperature was used. The direction of changes in the shear stress and viscosity as a result of high pressure homogenisation carried out at 4ºC was varied depending on the research material, i.e. they increased in the case of milk and decreased in the other two unfermented beverages. The products subjected to traditional homogenization were characterized by values of shear stress and viscosity coefficients formed at the level of high pressure homogenisation carried out at a temperature of 40°C and even 20 °C.