SUMMARY

Copper is an essential trace element that plays a key role in animal and human organisms. The aforementioned metal plays an important role in the process of cellular respiration, removal of free radicals, energy production, development of connective tissue, iron metabolism, maturation of the extracellular matrix, and neuroendocrine signaling. Moreover, copper plays a special role in the circulatory system. Cardiac muscle tissue requires much more copper than other tissues for contraction, biosynthesis of peptide hormones, and protection against oxidative stress.

This research aimed to assess the effect of increased copper supply in a diet (in the amount of 200% of the recommended daily intake) on a mature organism in middle age and on a young organism entering adulthood in a rat model, as well as to organize the state of knowledge about the effect of this metal on the cardiovascular system. The following research tasks were used to achieve the above–mentioned goal: determination of the content of selected micro– and macroelements in the liver, kidney, and serum; analysis of markers of oxidative stress level, functional tests of contractility of isolated aorta and isolated heart.

The obtained results extended the knowledge on the influence of copper on organisms in different age groups, which also allowed us to establish the following conclusions:

1. In the group of young rats entering adulthood, an increased dose of copper in the diet did not change the contractile force of isolated aortic rings as a result of noradrenaline action, in contrast to middle–aged rats. However, in both age groups, we observed increased vessel relaxation as a result of acetylcholine addition.
2. In the group of young rats, an increased dose of copper did not significantly change the parameters of oxidative stress in the blood and heart, in contrast to middle–aged rats. However, in both age groups, we observed increased production of hydrogen peroxide, nitric oxide, and superoxide anion radicals in the thoracic aorta of the rats.
3. In the group of young rats, we observed significant changes in the concentration of potassium, iron, calcium and chromium in the kidneys and magnesium in the liver.
4. In both age groups, we observed increased copper levels in the blood and liver, which may be important in the context of the described regulating vascular functioning.