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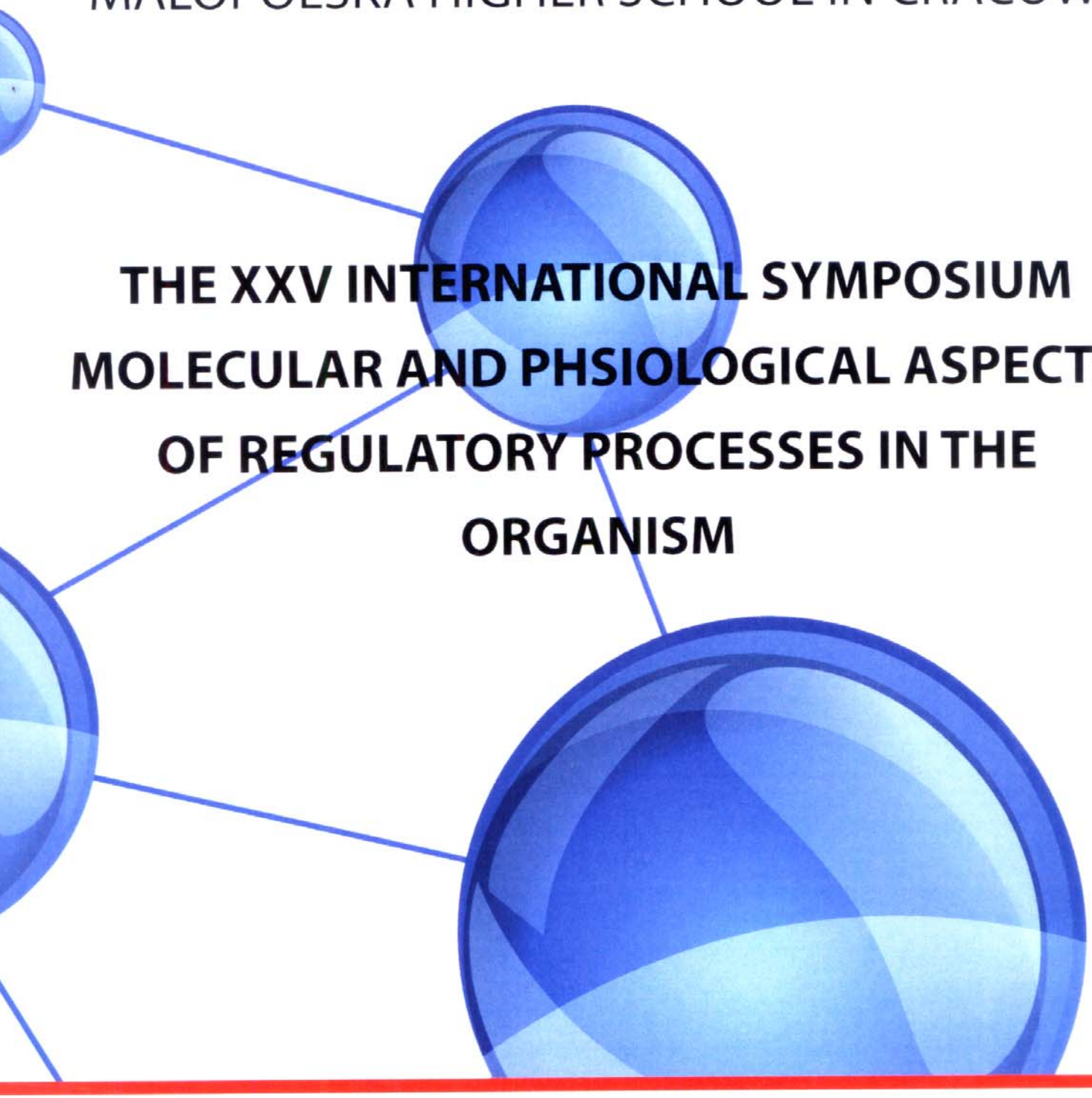

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Anti-inflammatory properties of zinc nanoparticles in RAW 264.7 cells activated with LPS

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Zinc oxide nanoparticles (ZnO NPs) are being widely investigated due to their unique properties. Many experiments with zinc oxide nanoparticles has been done using cell lines. These experiments has shown that zinc oxide nanoparticles exhibited anti-cancer and anti-bacterial activity. It is mainly related to their ability to induce oxidative stress signaling cascades which leads to bacterial and cancer cells death. What is more results of the experiments on cancer cells have shown that zinc oxide nanoparticles did not damage healthy cells, eg. rat astrocytes, while negatively influenced cancer cells. On the other hand the ability of zinc oxide nanoparticles to induce the production of reactive oxygen species (ROS) may cause cell damage and may lead to cell apoptosis. What is more zinc oxide nanoparticles may induce genotoxicity.

There are many chemical and physical methods of synthesis of nanoparticles. The properties of different kinds of zinc oxide nanoparticles may depend on the method of their synthesis. The chemical synthesis method may lead to the adsorption of chemicals on the surface of the nanoparticles, which may in turn cause adverse effects in medical applications, eg. may induce toxicity. Recently more concern is being put on the new methods of synthesis on zinc oxide nanoparticles which are biosynthesis methods, which employ plants, fungi, bacteria and enzymes.

The purpose of this study was to evaluate the interactive effects of lipopolysaccharide (LPS) and zinc nanoparticles in RAW 264.7 cells. The highest content of monounsaturated fatty acids was detected in RAW 264.7 cells co-treated with LPS and ZnO NPs. The highest expression of cyclooxygenase (COX-2) and prostaglandin synthase E2 (cPGES) was noted in macrophages activated with LPS. Incubation of RAW 264.7 cells with ZnO NPs resulted in significant repression of the pro-inflammatory proteins. Our data suggest anti-inflammatory properties of zinc oxide nanoparticles.

Results of experiments on cell line RAW 264.7 with biosynthetized zinc oxide nanoparticles has shown that these nanoparticles in concentration up to 1 mg/ml did not have cytotoxic activity on cells and have antioxidant, antibacterial and anti-inflammatory activity. The anti-inflammatory activity of zinc oxide nanoparticles is probably related to their ability to supress the production of pro-inflammatory cytokines (eg IL-1B, IL-6, TNF-alfa). Moreover zinc oxide nanoparticles dose dependently inhibits the mRNA production of pro-inflammatory cytokines and other pro-inflammatory agents such as COX-2 (cyclooxygenase – 2) and iNOS (inducible form of Nitric Oxide Synthase).

Further research is needed, especially comparing lipid changes after ZnO NPs treatment with relation to the duration and progression of the inflammatory-state-related diseases.

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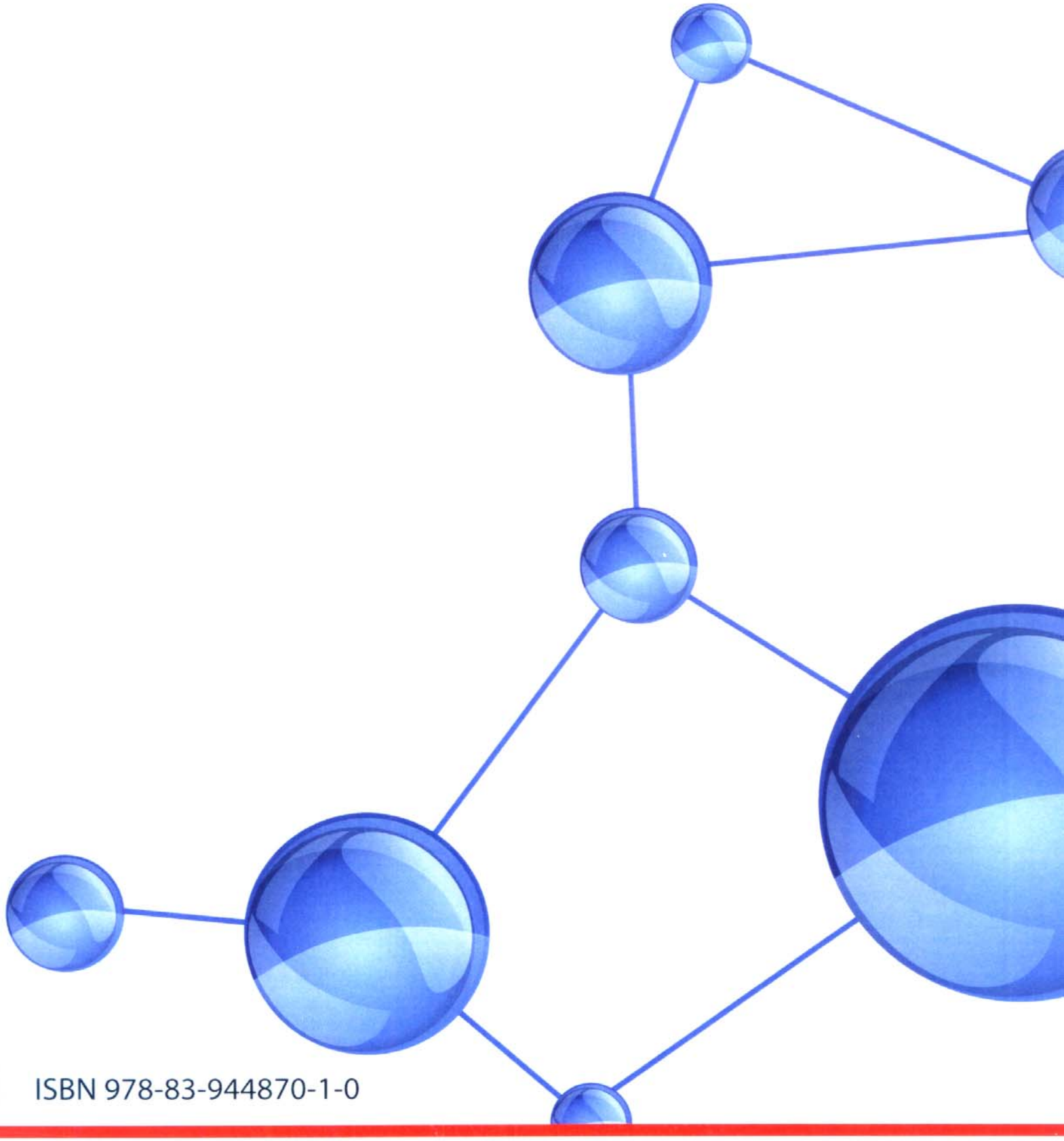

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