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Vanadium and chromium mediated impairments in the immunological reactivity of rats with aseptic inflammation

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Chronic inflammation is a consequence of the immune system dysfunction. Such dysregulation of the immune response may induce chronic diseases, such as autoimmune diseases, diabetes, and malignant transformation of cells. Xenobiotics, including vanadium and chromium, were shown to induce inflammatory changes leading to chronic inflamation. The purpose of this research was to study the process of aseptic inflammation accompanied with intoxication with salts of heavy metals. In our study, sexually mature rats were administered aseptic inflammation (AI) alone or ammonium vanadate and potassium dichromate (AV/PD) at a dose of 5 mg/kg of BW for two weeks and after that aseptic inflammation was modeled. Lymphatic organs were studied on day 1, 7, and 14 after the onset of aseptic inflammation. Administration of AV/PD and AI resulted in structural changes in lymphatic organs and anemia observed throughout the experiment. We observed a decrease in the cellularity of the bone marrow and thymus, ratio of thymic cortex to medulla, and dystrophic changes in thymic cells and their scarcity. Also, we detected increased levels of anti-inflammatory cytokines in serum: IL-10 on day 1 and TGF-β on day 7 and 14 after the beginning of the experiment in the group AI+AV/PD comparing to intact rats and AI group. Phenotypical analysis demonstrated that by the end of experiment freshly obtained splenocytes of AI and AI+AV/PD rats contained increased percentage of $His48^{+}CD11b/c^{+}$ and $His48^{high}CD11b/c^{+}$ cells, and decreased number of induced $CD3^{+}CD4^{+}IFN\gamma^{+}$, $CD3^{+}CD4^{+}IL\text{-}4^{+}$ and $CD3^{+}CD8^{+}$ cells, comparing to control animals. Interestingly, during the next period of the experiment, we observed significant decrease of induced $CD3^{+}CD4^{+}IFN\gamma^{+}$, $CD3^{+}CD4^{+}IL\text{-}4^{+}$ and $CD3^{+}CD8^{+}$ cells in the AI+AV/PD group comparing to AI group.

Thus, it is possible that an elevated sera IL-10 and TGF-β1 observed in mice with chronic inflammatory processes administered with AV/PD result of abundant accumulation of $His48^{+}CD11b/c^{+}$ and $His48^{high}CD11b/c^{+}$ cells myeloid cells in the periphery, and, in turn, it could participate in the maintaining of the immunosuppressive environment that supports persistence of chronic inflammatory conditions. Therefore, intoxication with vanadium and chromium salts may support immunosuppressive environment, contributing to chronic inflammation development.

Biography

Aliya Tokusheva is a PhD student at the Asfendiyarov Kazakh National Medical University. She studies molecular mechanisms of epigenetic regulation of tissue-specific expression of genes, revealing the effect of heavy metal compounds on the variability of the genome of immunogenesis organs and the mutual regulatory influence of important links of these mechanisms on the course of the inflammatory process.

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