Hematological and immunological impairment following in-utero and postnatal exposure to aluminum sulfate in female offspring of albino rats

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Abstract:

Aim: Aluminum (Al) is a ubiquitous element extensively utilized in many products like food additives, pharmaceuticals, and vaccines, but its hematotoxic and immunotoxic effects are not entirely clarified. The present study explored the developmental hematotoxic and immunotoxic properties of aluminum sulfate (AS) in rats' offspring. Methods: Forty female offspring (10 rats each) were given three incremental AS doses plus a control group, from conception through lactation and after weaning until reached eight weeks old (near adults). Spleen relative weights along with total and differential blood counts were evaluated. Spectroscopic Al levels in spleen and brain were analyzed. Three immunoglobulins (IgG, IgM, and IgE) and two cytokines, interferon-γ and tumor necrosis factor-α, were measured through the ELISA technique. Results: The results revealed a significant relative increase in splenic weights mostly observed in the highest AS dose treated group. Reduction in the total leukocytic count was noticed in the three AS treated groups with relative lymphocytosis. Additionally, a significant decline in RBCs counts and hemoglobin concentrations were recorded. Tumor necrosis factor-α was significantly elevated in the three Al treated groups, while, interferon-γ showed a non-significant reduction compared to the control group. A significant increment in IgG and decline in IgE concentrations with no change in IgM level among groups were observed. Conclusion: Perinatal AS exposure caused mostly non-linear dose-dependent hematotoxicity and immunological impairment especially for the acquired immunity either cellular or humoral. Further studies can examine the immunotoxic effect of Al on male offspring during different stages of immune development.

Keywords:

Aluminum sulfate, hematotoxicity, immunotoxicity, rats, offspring, developmental

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