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Chromium VI-induced reproductive toxicity: Mechanisms and intervention

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Environmental exposure to endocrine disruptors (EDCs) is linked to several ovarian diseases such as premature ovarian failure, polycystic ovary syndrome, early menopause and infertility in women. Hexavalent chromium (CrVI) is a heavy metal EDC, widely used in more than 50 industries including chrome plating, welding, wood processing and tanneries. Recent data from USEPA indicate increased levels of Cr in drinking water from several cities in the US, which predisposes Americans to various health problems. Our previous findings demonstrated that prenatal and early postnatal exposure to CrVI caused ovarian failures in F1 offspring. Two main goals of our laboratory are to identify the molecular mechanism behind CrVI-induced reproductive failure, and to identify intervention strategies to mitigate CrVI-induced female reproductive failures. Pregnant rats were treated with potassium dichromate (CrVI) during prenatal period (gestational days) 9.5-14.5, or postnatal period from postnatal day (PND)-1 - 21, through drinking water, and the fetuses or pups were exposed to CrVI through transplacental transfer and mother's milk, respectively. Ovaries were removed from the fetuses and postnatal rats, and various analyses were performed. Results showed that gestational exposure to CrVI: (i) increased germ cell/oocyte apoptosis and advanced germ cell nest (GCN) breakdown; (ii) increased POF markers spatio-temporally during GCN breakdown; and (iii) decreased POF markers during postnatal follicle development. Resveratrol (RVT), a polyphenolic component in grapes and red wine, has been known for its cytoprotective actions against several diseases. However, beneficial effects of RVT against early exposure to endocrine disrupting chemicals (EDCs) have not been understood. Lactating mother rats that were exposed to CrVI received resveratrol (RVT) supplementation (10 mg/kg body wt., through oral gavage daily). Lactational exposure to CrVI increased atresia of follicles by interfering with steroidogenic pathway and oxidative stress pathways. RVT mitigated the effects of CrVI and protected against CrVI-toxicity of the ovary.

Biography

Sakhila K Banu has completed MPhil in Endocrinology in 1993 from the University of Madras, Tamil Nadu, India. She completed PhD in Endocrinology in 2002 from the University of Madras, Tamil Nadu, India and Post-Doc in Molecular Oncology 2004 from the University of Montreal, Canada. She is Assistant Professor in the Department of Veterinary Integrative Biosciences College of Veterinary Medicine & Biomedical Sciences Texas A&M University.

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