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Resveratrol targets retinoic acid signaling to prevent neural tube defects in a rodent model of diabetic embryopathy

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Abstract

Approximately 26 million Americans suffer from diabetes. In females, the problem is further aggravated by the fact that diabetes also affects embryonic development during pregnancy and causes embryonic defects known as diabetic embryopathy. Various birth defects, such as neural tube defects (NTDs), are reported to be associated with diabetic embryopathy. However, preventive measures and available therapies are not fully effective. Currently, resveratrol found in blueberries and red grapes is the focus of intense research and toted as a potential complementary and alternative medicine for the treatment of various diseases. It has shown promising results in the management of diabetes and prevention of diabetic complications. Using a rodent model of diabetic embryopathy, our studies have shown that resveratrol functions as a potent antioxidant. It protects embryos from oxidative stress and prevents apoptosis. Interestingly, resveratrol also prevents neural tube defects in the embryos. It reduces blood sugar and improves lipid profile of diabetic dams. Retinoic acid signaling components such as retinoic acid receptors and Rho GTPases play key roles in neural tube closing, and hyperglycemia impairs the expression and activation of retinoic acid receptors in the embryos of diabetic dams. Since resveratrol is a potent antioxidant, it may target retinoic acid signaling to prevent diabetic embryopathy and other complications such as nephropathy in diabetic pregnancies. Presently, our studies are focused to elucidate mechanistic pathways and gene targets of resveratrol which will serve as the basis for future clinical studies on the prevention of neural tube defects in diabetic embryopathy.

Biography

Ugra Singh completed his Ph.D at the age of 24 years from Kanpur University, India. He had his postdoctoral training at Cornell University, NY. During this period he studied tissue-transglutaminase and demonstrated that it is a dual function G-protein playing key role in neuronal differentiation. He has published more than 56 papers. Presently, he is an Associate Professor of Pathology in the department of Pathology, microbiology, and Immunology. His other interests include the studies on the role of retinoic acid signaling in the development of neuroblastoma and how the impairments in retinoic acid signaling may cause fetal alcohol spectrum disorders.