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Embryonic neural stem cells & propofol-induced neurotoxicity

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Propofol is a widely used anesthetic agent for adults and children. Evidence suggests that propofol induces cell death in developing brain. Acetyl-L-carnitine (ALC) has been reported to prevent neuronal damage from a variety of causes *in vitro* and *in vivo*. To evaluate the ability of ALC in protecting propofol-induced neuronal toxicity, a rat embryonic neural stem cell (NSC) model was used.

Brain cortices were collected from fetal rats for NSC isolation and culture. On the 8th day *in vitro*, confluent NSCs were exposed to propofol or propofol plus ALC for 24 hours. NSCs were identified using anti-nestin antibody. Markers of cellular proliferation (EdU), mitochondrial health (MTT), cell death/damage (LDH) and oxidative damage (8-oxo-dG) were monitored to determine the effects of propofol on NSC proliferation; the nature of propofol-induced neurotoxicity; the degree of protection by ALC; and to explore the underlying mechanisms.

50 μM propofol caused a significant decreased number of dividing cells; affected mitochondrial health dose-dependently as evidenced by decreases in the metabolism of MTT. Propofol did not affect LDH release at concentrations of 10, 50 or 100 μM. 50 μM propofol significantly increased 8-oxo-dG formation and this effect was blocked by ALC.

These data suggest that clinically-relevant concentration (50 μM) of propofol induces rat embryonic NSC damage. The elevated levels of 8-oxo dG and its analogs in the culture medium suggest the occurrence of oxidative damage due to increased generation of reactive oxygen species. Co-administration of ALC effectively blocks at least some of the toxicity of propofol, presumably by scavenging ROS and/or reducing ROS production.

Biography

Fang Liu is a scientist in the Division of Neurotoxicology, National Center for Toxicological Research (NCTR)/United States Food & Drug Administration. Liu has been actively involved in biomedical research for more than ten years and has been an author and a co-author for more than 30 peer-reviewed scientific articles and book chapters in the areas of pharmacology, toxicology and molecular biology. Currently, she focuses her research on developmental neurotoxicity. She is a full member of the Society of Toxicology, Society for Neuroscience and the Arkansas Chapter of the Society for Neuroscience. She is also an editor and a reviewer of several reputed peer-reviewed journals.

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