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Investigation of Immunotoxicity and Thyroid Disrupting Effects after Developmental Exposure to Perfluorohexane Sulfonate (PFHxS) in Rats

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Perfluorinated alkylates have been in use since the 1950s because of their water- and fat repellent properties. They are used as surfactants in many industrial and consumer products from food contact materials to furniture and fire-fighting foams. The compounds are persistent and widespread in the environment, and they bioaccumulate in the human body. Furthermore, compounds such as PFOA and PFOS are toxic due to their adverse effects on the immune system, the liver and the endocrine systems. Perfluorohexane sulfonate (PFHxS) is a shorter chained perfluorinated compound, which in epidemiological studies has been strongly correlated to reduced number of antibodies in response to vaccinations (*). Experimental animal studies which could confirm these correlations and cast light upon other toxic effects due to developmental exposure to PFHxS are however presently lacking.

In a developmental toxicity range-finding study, time-mated Wistar rat dams (n=8) were dosed by oral gavage with PFHxS from gestation day 7 through postnatal day (PND) 22 with doses of 0, 25, and 45 mg/kg/day. At sacrifice on PND 22 serum thyroxine (T4) levels were measured in the dams, and T4 and triiodothyronine (T3) levels were measured in one male and one female pup per litter (n = 5-7). Liver, thymus, and spleen were excised from male pups on PND 16.

No signs of overt toxicity were observed in the dams, and dam liver weights were not affected. Dam serum T4 levels were reduced to app. 40 % of control values. Exposure to PFHxS also dose-dependently reduced pup serum T4 levels to 60 % and 50 % of control levels, in the two dose groups respectively. Male pup liver weights were increased dose-dependently on PND 16. No significant effects on male pup thymus and spleen weights were seen.

This range-finding study is to our knowledge the first to show effects in pups after developmental exposure to PFHxS. A large study presently underway will provide more results on possible endocrine disruption and immunological endpoints. In this range-finding study no effects were seen on thymus and spleen weights at this early developmental stage. However, functional immune studies are needed to cast light upon the severe effects found in humans due to exposure to perfluorinated compounds as PFHxS.

(*). Grandjean et al., JAMA, 2012, 307(4); Mogensen et al., Environmental Health (2015) 14:47.