



JOHN P. GIBBS, M.D., FACOEM  
VICE PRESIDENT HEALTH MANAGEMENT  
and CORPORATE MEDICAL DIRECTOR  
HEALTH MANAGEMENT DIVISION

405/270-2909  
405/270-3526  
jgibbs@kmg.com

December 1, 2005

Dr. Richard Johnston Jr  
University of Colorado Health Sciences Center  
School of Medicine, Room 2816  
Campus Box C290  
4200 E 9<sup>th</sup> Ave  
Denver, CO 80262

Dear Dr. Johnston,

As you know, scientific research is continuing to examine the prospective health effects of perchlorate, following the release of the National Academies of Science (NAS) report from the distinguished National Research Council (NRC) panel you led. Taken together, newly-released, peer-reviewed studies are backing up the NRC findings.

I am enclosing reprints or copies of four new, peer-reviewed studies for your information, and below are some brief summaries of each, along with some thoughts as to their significance as they relate to the NRC panel's report, "The Health Implications of Perchlorate Ingestion."

You will recognize that some of the preliminary science underlying the new studies was presented to the committee, yet was not considered by the committee in their final recommendations. Importantly, the new studies provide additional information backing the NAS panel findings that the 0.0007 mg/kg-day Reference Dose (RfD) is highly protective for pregnant women and their fetuses. Further evidence consistent with the 0.4 mg/kg-day No Observable Adverse Effect Level (NOAEL) identified by the committee for healthy adults has been published.

**I Braverman et al, 2005. The Effect of Perchlorate, Thiocyanate, and Nitrate on Thyroid Function in Workers Exposed to Perchlorate Long-Term** (Published in the *Journal of Clinical Endocrinology & Metabolism*, February 2005)

Twenty-nine workers at a perchlorate manufacturing facility and 12 volunteer community controls in southern Utah were studied in 2004. All workers and community controls were healthy white adult males with iodine-sufficient diets. The workers had all worked a minimum of two years at the facility and most had worked there much longer. Their work schedules are structured with three consecutive 12-hour shifts followed by three days off. About half of the workers had 12-hour shift perchlorate doses above the NRC NOAEL of 0.4 mg/kg-day and about half had doses below this level. There were no observed adverse thyroidal findings among these healthy workers.

Kerr-McGee Shared Services Company LLC

123 Robert S. Kerr Avenue, Oklahoma City, OK 73102 • P.O. Box 25861, Oklahoma City, OK 73125

The most significant finding in this study as it relates to the NRC committee report is that it demonstrated that with long-term perchlorate exposure, the thyroid adjusts by taking in iodine more efficiently. This observation substantiates the NRC committee assertion that with regard to inhibition of iodine uptake, "...*chronic exposure will have no greater effect than that resulting from short-term exposure. In fact, it may well have less effect because of the capacity of the pituitary-thyroid system to compensate for iodide deficiency by increasing iodide uptake.*" (NRC report, p. 117)

**II Crump and Gibbs 2005. Benchmark Calculations for Perchlorate from Three Human Cohorts** (Published in *Environmental Health Perspectives*, August 2005)

In *Crump and Gibbs 2005*, the authors performed benchmark dose calculations (BMDLs) based on combined raw data from *Braverman et al 2005* and *Lamm et al, 1999*. Both of these studies are "negative" in the sense that no adverse effect was found and thus a NOAEL could not be established. Benchmark calculations from such negative results, however, represent valid statistical lower bounds on the dose that accounts for a potential, but unobserved, adverse effect of long term perchlorate exposure.

The significant findings in this study as it relates to the NRC committee report are that the lowest perchlorate dose that could have had an unobserved decrease in free thyroxine or increase in TSH ranged from 0.21 to 0.92 mg/kg-day. This is highly consistent with NRC report stating that in adults it "*is likely to require sustained exposure to more than 30 mg of perchlorate per day (0.4 mg/kg per day for a 70-kg person)...*"

**III Tellez et al, 2005. Chronic Environmental Exposure to Perchlorate Through Drinking Water and Thyroid Function During Pregnancy and the Neonatal Period** (Published in *Thyroid*, September 2005)

*Tellez et al.*, of the Catholic University in Santiago, studied approximately 60 women during pregnancy and post partum in Taltal, a city in northern Chile where the entire municipal drinking water supply contains 110 to 115 ppb perchlorate. They compared these women's thyroid function during pregnancy and post partum with that of a similar number of pregnant women in each of two nearby cities: Antofagasta, with non-detectable perchlorate levels; and Chañaral, with 6 ppb perchlorate in the municipal drinking water.

Individual maternal perchlorate dose estimates were made based on urine perchlorate concentrations measured at the CDC, and 90% of the women studied in Taltal were receiving perchlorate doses between 0.0007 and 0.007 mg/kg-day (*between the RfD and the Greer NOEL*). Neonatal thyroid function at birth was also evaluated via cord blood testing in each of the three cities. There were no maternal or neonatal hypothyroid effects attributable to perchlorate in Taltal relative to the two control cities.

The significant finding in this study as it relates to the NRC committee report is that it confirms the conclusion "*that an RfD of 0.0007 mg/kg per day should protect the health of even the most sensitive populations.*"

**IV Capuco et al. 2005. Fate of dietary perchlorate in lactating dairy cows: Relevance to animal health and levels in the milk supply** (Published in *Proceedings of the National Academy of Sciences*, November 2005)

This was a carefully controlled USDA experimental study in dairy cattle administered perchlorate in doses of 0, 0.4, 4 and 40 mg/day for five weeks in order to study the impact on iodine and perchlorate concentrations in milk. Cattle are reported to have thyroid binding globulin (personal communication from Tony Capuco) and so one might expect that cattle are more quantitatively similar to humans in their thyroid response to perchlorate than rodents.

The significant findings in this study as it relates to the NRC committee report is that *“even at the highest dose of perchlorate, more than 100-fold greater than the NRC RfD, concentrations of thyroid hormones were not reduced.”*. Additionally, the authors concluded that *“based on milk samples analyzed, a 10-kg child and a 60-kg pregnant woman’s nutritional needs for calcium and protein could be met without the risk of exceeding the NRC’s RfD for perchlorate”*.

Thank you for your consideration. As you can see, the NAS panel’s desire that scientific research continues is being met, and the findings in these reports bolster the NAS panel’s conclusions and recommendations.

Sincerely,

John P. Gibbs, M.D.

  
cc Dr. Ellen Mantus