Title: **Mutagenic Effects of Selected Toxicants Found in Wisconsin's Groundwater (Study No. 35)**

Investigators:

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Objectives: To test the mutagenic and interactive effects of volatile organic compounds and pesticides by adding various concentrations to human lymphocyte (white blood cell derived from lymphatic tissues) cultures and comparing chromosome damage of treated versus control cultures. The final goal was to relate in vitro (in a test tube) results with parallel mouse experiments to aid in the development of a model assessing human risk of drinking water contaminants.

Background/Need: Because of widespread use of atrazine in Wisconsin, it was important to determine whether atrazine could cause genetic damage to lymphocytes or bone marrow cells, and also if there was any interaction of atrazine with other herbicides used in Wisconsin.

Methods: Human blood samples were taken and exposed to alachlor, atrazine or a negative control culture. 30- and 90-day mouse feeding experiments were done in which mice were given drinking water with combinations of alachlor and/or atrazine, or atrazine and/or linuron, with cyclophosphamide used as a positive control, acetone used in an equivalent concentration to that used to dissolve the herbicides as a negative control to contaminated water sources. Bone marrow and spleens were extracted from the mice to obtain lymphocytes for cultures after sacrifice. Chromosome damage and mitotic index was then scored.

Results: Chromosome-type aberrations which reflect genetic damage were significant only in the 90-day exposure group of mice receiving atrazine and atrazine plus alachlor. The 90-day exposure group also experienced mitotic indices higher than the controls which may imply replacement of damaged cells. The atrazine/linuron group drank considerably more water than comparison groups and also showed increases in kidney and splenic index which may reflect toxic effects due to the increased consumption of water containing the combination of atrazine and linuron, resulting in accumulation of damaged cells.

Conclusions:

Some correlation exists concerning chromosome damage between in vivo (in a living organism) and in vitro experiments. Herbicides may interact in a synergistic manner to cause statistically significant chromosome damage at concentrations below that at which individual herbicides cause damage. Combinations of herbicides may increase water consumption in experimental animals causing higher consumption of contaminated water than previously estimated. Chemical combinations may be of greater importance than higher levels of single chemicals.

Recommendations/ Implications:

Regulatory standards of water contamination may be underestimated due to the failure to account for additive effects of contaminants.

Availability of Report:

This report is available for viewing and loan at

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Alachlor, atrazine, health effects, linuron, pesticides

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