

This Week's Citation Classic

Biesinger K E & Christensen G M. Effects of various metals on survival, growth, reproduction, and metabolism of *Daphnia magna*. *J. Fish Res. Board Can.* 29:1691-700, 1972. [US Environmental Protection Agency, National Water Quality Laboratory, Duluth, MN]

A bioassay procedure was developed for *Daphnia magna* to serve as a representative aquatic invertebrate test species to evaluate the toxicity of selected inorganic pollutants. In addition, certain biochemical parameters were measured in order to interrelate physicochemical properties of pollutant chemicals with toxic effects. A table was provided giving the principal components of the Lake Superior test water. [The SC² indicates that this paper has been cited in more than 255 publications.]

Daphnia as Little White Rats

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Interest in this report probably developed because the work was carried out when ecoenvironmental science was just gaining a healthy momentum and water quality studies were being promoted.

When an environmental wake-up call came to our society, especially from the publication of *Silent Spring*¹ in 1962, the federal government responded by strengthening its pollution control laws and by expanding its research facilities through the US Public Health Service, which led to the establishment of the National Water Quality Laboratory in Duluth, Minnesota. This facility began operating in 1964 in the "Old Main" building of the University of Minnesota, Duluth, where experimental aquatic bioassay systems were set up in the dark and dusty basement. Many early researchers were imported from the Taft Sanitary Engineering Center in Ohio, and early policies and procedures were

influenced by the work of C. Tarzwell² and D. Mount.³ With the new laboratory operating in 1966, then with about 25 scientists, water quality and aquatic toxicity studies were being conducted primarily with fish, invertebrates, and plankton-periphyton. After some trial and error, we chose *Daphnia magna* as one of the "white rats" to be tested and perhaps used as a representative indicator for aquatic invertebrate species.

We carried out basic bioassay studies with a variety of important water pollutants, to help provide indices for setting national water quality standards. In addition, there was an intent to carry on complementary and interdisciplinary biochemical and physiological studies, to try to obtain some insight as to the mechanisms and modes of action of these toxicants. A review of the effects of toxic agents on certain enzymes was later published,⁴ and work in this area continues, particularly by G. Veith, et al.⁵ *D. magna* evidently has continued to be a reasonable choice as a sensitive and useful indicator organism. A study with this species involving mixtures of inorganic agents was recently published.⁶

We hope that concern for the environment will continue to grow, that international cooperation will fully develop, that interdisciplinary endeavors will succeed, and that the quotation by Albert Schweitzer, given in the introduction to Rachel Carson's *Silent Spring*, will not come to pass: "Man has lost the capacity to foresee and forestall. He will end by destroying the Earth."

1. Carson R. *Silent spring*. Boston, MA: Houghton Mifflin, 1962. 368 p. (Cited 310 times.)

2. Tarzwell C. Pollution effects of organic insecticides to fishes. *Transactions of the 24th North American Wildlife Conference*. Washington, DC: Wildlife Management Institute, 1959.

3. Mount D & Warner R. A serial dilution apparatus for continuous delivery of various concentrations of materials in water.

US Public Health Service. Pub. no. 999-WP-23. Cincinnati, OH: US Department of Health, Education and Welfare, 1965.

4. Christensen G, Olson D & Riedel B. Chemical effects on the activity of eight enzymes: a review and a discussion relevant to environmental monitoring. *Environ. Res.* 29:247-55, 1982.

5. Veith G, DeFoe D & Knuth M. Structure-activity relationships for screening organic chemicals for potential ecotoxicity effects. *Drug Metab. Rev.* 15:1295-303, 1984.

6. Biesinger K, Christensen G & Fiandt J. Effects of metal salt mixtures on *Daphnia magna* reproduction. *Ecotoxicol. Environ. Safety* 11:9-14, 1986.

Received July 27, 1992