

This Week's Citation Classic

Mount D I & Brungs W A. A simplified dosing apparatus for fish toxicology studies. *Water Res.* 1:21-9, 1967.

[Aquatic Biology Activities, Basic and Appl. Sci. Program, Cincinnati Water Res. Lab., Federal Water Pollution Control Admin., US Dept. Interior, OH]

An apparatus is described that can dependably maintain various concentrations of substances in flowing water for long periods of time for toxicity tests. Failure, if it occurs, will nearly always be a failure to dose, so organisms are not overexposed. [The SCI® indicates that this paper has been cited over 205 times since 1967.]

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"Gadgets, especially ones made easily from readily available and cheap materials, often catch the fancy of scientists and tempt them to 'make one.' At the time this article was published, 'Earth Day' and environmental awareness had yet to happen. Budgets to do fish toxicology work were tiny at that time. Chronic life cycle tests with fish were of much interest but difficult to do. The low cost, simple construction, and extreme reliability, coupled with some intriguing features, made this gadget an attention getter.

"After the surge of work began as a result of the environmental movement, such a device was in great demand in many laboratories. Literally hundreds if not thousands of these diluters were built to do aquatic exposure work. As a result, the paper is frequently referenced in the methods section of many aquatic toxicology papers. I have seen the diluter referred to as the Mount-Brungs diluter without a reference, suggesting it is a 'household word' in the profession.

"A comparable device was described in an earlier publication.¹ That diluter,

while having some advantages over the latter type, has been almost ignored both in use and in the literature. The manner of publication may be partly responsible. However, some workers who tried to build the earlier type failed because I did not specify tube sizes, volumes, etc. I have been amazed at the absence of basic understanding about siphons, Venturis, surface tension, and simple hydraulic principles displayed by the users' questions asked of me. As a result, we put much more detail in the latter paper but not without difficulty from the publisher. Perhaps the detail was the necessary ingredient in the second paper that made it useful. (Or maybe it was because I wrote the paper lying on my back, while recovering from a back problem!)

"The original design was based on several features, one of which was an almost certainty that any dosing failure would be low not high. In long-term tests a short period of low dosing is acceptable but a high dose is likely to result in losing the entire test. Dosing principles are based on mixing volumes together rather than balancing flow rates since the former are more easily controlled. Particularly if the diluent water has particles such as algae, snails, or suspended solids, maintaining small flow rates constant is difficult. We also tried to avoid the need for electricity both to reduce the need for complicated equipment and to reduce cost.

"Many modifications are now employed and some commercial models are now on the market. The trend seems to be toward ever more complex diluters suggesting 'simple is not scientific' but simple may be more dependable! For more recent work in this field, see R.R. Garton, M.J. Hemmer, and A.R. Manley."²⁻⁴

1. **Mount D I & Warner R E.** A serial-dilution apparatus for continuous delivery of various concentrations of materials in water. Washington, DC: US Department of Health, Education, and Welfare, 1965. PHS publication no. 999-WP-23. 16 p.
2. **Garton R R.** Simple continuous flow toxicant delivery systems. *Water Res.* 14:227-30, 1980.
3. **Hemmer M J.** Pressurized proportional diluter for aquatic toxicological studies. *Water Res.* 14:243-6, 1980.
4. **Manley A R.** An apparatus for the preparation of varying concentrations of chemicals for toxicity tests with aquatic animals. *Water Res.* 14:1023-7, 1980.