

CHAPTER 1.9 - Reduced Volume Acute Screening (RVAS) Tests

The purpose of this chapter is to describe a screening tool developed by the UW State Laboratory of Hygiene's Biomonitoring Lab for use when assessing multiple effluent or receiving water samples for toxicity.

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Reduced Volume Acute Screening (RVAS) Tests

In the mid 1990's the SLH/WDNR Biomonitoring Team developed a "reduced volume acute screen" (RVAS) test for use by those who wish to screen a large number of samples for toxicity. These reduced volume tests are described below as a different approach to toxicity testing which may be used to help identify effluent and receiving water toxicity "hot spots", conduct a "quick check" on an effluent or receiving water, plan future work within watersheds, evaluate the effectiveness of past actions, and/or monitor effluents and receiving waters to document measurable environmental improvements. RVAS tests can provide a useful measure of toxicity while using less time, smaller sample volumes, and allowing users to focus more time on problem areas.

The RVAS is a scaled-down version of the standard acute toxicity test. The RVAS test is completed on the same organisms and under similar test conditions as the standard test. However, in the RVAS test fewer dilutions, younger organisms, smaller test chambers, and fewer renewals of test treatments require lower sample volumes and fewer samples. Only 1 sample, 1 liter in volume, is needed to complete a RVAS test. Because of the smaller test size, a lab can perform 5-10 RVAS tests in the time it previously took to complete 2 standard acute tests.

What Are The Benefits Of RVAS Tests?

Besides being able to complete up to 10 times as many tests, there are other benefits to performing RVAS tests. Since RVAS tests only require one sample of small volume, samples can be taken and mailed to the lab via regular mail or UPS. The small sample size does not require the large volumes of ice and the coolers required by standard toxicity tests. Grab samples can also be taken, where appropriate.

RVAS tests can be performed on multiple discharges as an initial screen to determine if concern exists and to discover whether follow up work is necessary. Further attention, such as standard toxicity tests or other actions, can then be focused on problem areas highlighted by the screening tests. Samples for RVAS tests can be collected during regularly scheduled compliance inspections along with other non-toxicity test samples. Although they cannot be directly compared to permit compliance requirements, RVAS tests can indicate whether a toxicity problem exists.

RVAS tests can maximize monitoring resources and help users identify targets or "goals" for improvement and choose most cost effective mechanisms to reduce problems (most bang for the buck!). After problem areas have been identified, users can focus on confirming the presence of toxicity and determining the cause of the problem. By providing information that shows the biggest problem areas, RVAS tests can help insure that actions and resources are best applied to the worst pollution problems.

For more information regarding RVAS test methods, contact the Biomonitoring Coordinator or the SLH Lab (608-224-6230).

Wolf River Basin Pilot

In order for the Department to determine whether the RVAS test may be useful for Basin teams to help shift emphasis away from regulatory type controls to risk management, pollution prevention, and source reduction opportunities, the SLH/WDNR Biomonitoring Team conducted a pilot in 1996 in cooperation with the Wolf River Basin Team. Among the objectives of this pilot was to examine the benefits and usefulness of RVAS tests in regards to maximizing WDNR and SLH staff and monitoring resources for future use by GMU teams. This pilot was intended to identify ways in which the SLH can meet the needs of WDNR teams, to help SLH staff understand the WDNR's approach to protecting water quality, and to design other new tools for WDNR use in the future.

Algal tests were included in the RVAS tests conducted in the Wolf River Basin pilot. These algal tests were included because the SLH/WDNR Team was investigating plant toxicity tests for potential future use in permit-required WET test batteries. During this study, algal methods were evolving, therefore some of the algal results collected during this pilot may not be useful for determining whether toxicity was present (i.e., test results may have been compromised by experimental test procedures).

During this pilot, 45 effluent (municipal and industrial) and 20 receiving water samples were screened for toxicity, using the RVAS test. Of the 45 tests completed on effluent samples, 18 (40%) failed (failed w/algae only - w/out algae, only 24% failed). Many of the municipal and industrial facilities that were tested had never performed WET tests. Of those that had previously conducted WET tests, RVAS results correlated well with past WET data. Of the 22 receiving water samples tested (from 16 different sites), only 4 (from 3 sites) failed the RVAS test. Of these 4 samples, 2 failed the algae test. In 1997, the SLH conducted standard WET tests on those effluents and receiving waters which failed RVAS tests, in order to further define problems and establish test procedures. For more detail regarding the information gathered during the Wolf River Basin pilot, contact the Biomonitoring Coordinator, or call the UW State Laboratory of Hygiene's Biomonitoring Lab at (608) 224-6230.

How Can RVAS Tests Fit In With Other Activities?

RVAS tests are not intended to replace, nor should they replace, standard WET compliance-checking tests. They are probably best used to point out only severe toxicity. RVAS tests really only check for persistent, acute toxicity. RVAS tests are a scaled-down version of the standard acute test and do not provide a measurement of chronic toxicity. When a situation calls for an acute or chronic WET test to be done, users should be careful when deciding whether it is appropriate to use the RVAS test. The RVAS test is most useful in situations where a quick check for acute toxicity is needed.

RVAS tests may fit well into planning and evaluation studies done on a are or region-wide basis. Up front receiving water and effluent monitoring can identify problem areas that need attention; actions can then be focused on those areas and follow up monitoring can show whether progress has been made. Data collected during basin planning could be compared to data collected in subsequent years to evaluate water quality improvements, decreases in pollutant loadings, and the effectiveness of the basin plan. RVAS tests can also provide useful measurements for determining progress, including: ambient water quality monitoring trends, numbers of permittees with toxicity problems, percent of receiving waters with identified toxicity problems, etc.

For more information regarding RVAS tests, to discuss developing a screening strategy for a group of facilities or receiving waters, or to set up a discussion with the SLH/WDNR Biomonitoring team, contact the Biomonitoring Coordinator or SLH Biomonitoring Lab (608 224-6230).