

US EPA ARCHIVE DOCUMENT

Data Evaluation Report
Ecological Effects Branch

- 1. Chemical: Arsenic Acid
- 2. Test Material: Arsenic Acid, purity 76.1% ai, Lot No. 203 received from the sponsor on 5/2/90.
- 3. Study Type: 96-hour Static Acute Test with rainbow trout, Oncorhynchus mykiss.
- 4. Study Identification:

Study Director: LeLievre, Maura
 Study Laboratory: Springborn Laboratories, Wareham, Mass.
 Study Dates: August 20-24, 1990
 Study Identification: Study No. 10823.04906125.103
 Sponsor: Chemical Manufacturers Assoc., Washington, DC
 EPA Identification: MRID 416200-03

- 5. Reviewed by: Brian Montague, Fisheries Biologist
 Ecological Effects Branch
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1/2/91

- 6. Approved by: Les Touart, Acting Section Supervisor
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Les Touart 1/2/91

7. Conclusions: The test has been conducted under acceptable guideline procedures and results support the study author's conclusions. It should be noted that pH used in the test was higher (8.1) than normally recommended and may have led to slightly reduced effects on the test fish due to buffering action on acidic test material. Behavioral effects were noted at much lower dosages. The reported LC₅₀ for arsenic acid was 72 mg ai/L (CL's 51-110 mg/L) with a No Observed Effect Concentration of 3.4 mg ai/L.

8. Recommendations: N/A

9. **Submission Purpose:** Submitted in response to reregistration guideline requirements for chromated arsenical wood preservative compounds.
10. **Study Protocol and Methodology:** Test procedures were based on EPA/OTS 1985 guidelines for toxicity testing and are summarized in Springborn protocol No. 010190/FIFRA 72-1.

Test Organisms: Rainbow trout were obtained from a commercial supplier in Montana and acclimated for over 14 days in open system 500 liter fiberglass tanks at pH 6.9-7.1 and a temperature of 13 - 15°C. During acclimation the fish were fed dry pellet food daily until 48 hours prior to study initiation. Thirty fish were sampled to determine an average weight of 0.82 (0.48 - 1.55) gms and an average length of 41 (37 - 52) mm. This represented 25% of the 120 total fish used in testing.

Dilution Water and Test Solution Preparation: Dilution water was soft reconstituted water formulated from dionized water according to ASTM (1980) recommended procedures. The dilution water had the following characteristics: Hardness - 40 mg/L as CaCO₃, Alkalinity - 31 mg/L as CaCO₃, pH - 8.0, conductivity- 200 micro ohms/cm, and TOC - 0.733 mg/L. A stock solution of 100,000 mg/L was prepared by addition of 10 gms active ingredient (13.1459 gms test material) to distilled water to 100 ml of volume. Appropriate amounts of this stock solution were added to 15 liters of dilution water for each of the 11 test concentration groups. These 15 liter preparations were stirred for 30 seconds before addition to the 18.9 liter glass aquarium test vessels. One control aquaria was used and contained dilution water only.

Test Materials and Methods : Test vessels were maintained in a temperature controlled system at 12±2°C. Due to falling oxygen levels gentle aeration was applied at 24 hours and continued until the 96-hour test period was completed. A 16D/8N photoperiod was employed. At test initiation, immediately following test solution preparation, ten trout were impartially selected and added to each test vessel. Loading was estimated to be approximately 0.55 gms/L of test solution.

All aquaria were observed and monitored at 0, 24, 48, 72, and 96 hours. Water samples for later analysis of arsenic acid concentration were removed at the initiation and termination points of the study. Atomic adsorption spectroscopy was used in analysis procedures and average recovery levels were approximately 100% of the nominal concentration estimates.

11. Reported Test Results: Mortality and water quality parameters are summarized below:

Mean Measured Concentration	Mortality Percentages			p ^H Range	D.O. Range MG/L
	24 hr	48 hr	96 hr		
150 ppm	100	100	100	3.0	8.4 - 9.2
94 ppm	0	30	30	4.1 - 6.0	7.8 - 10.2
55 ppm	0	0	30	5.5 - 6.7	7.6 - 10.2
29 ppm	0	10	40	5.8 - 6.9	6.5 - 9.6
19 ppm	0	0	0	6.1 - 6.9	6.1 - 9.9
11 ppm	0	0	0	6.5 - 7.3	7.2 - 10
6.0 ppm	0	0	0	6.5 - 7.1	6.5 - 9.7
3.4 ppm	0	0	0	6.6 - 7.3	6.8 - 10
2.2 ppm	0	0	0	6.6 - 7.8	7.3 - 10
1.1 ppm	0	0	0	6.7 - 7.8	7.1 - 9.3
0.68 ppm	0	0	0	6.8 - 7.9	7.1 - 10
controls (0.35 ppm)	0	0	10	7.0 - 8.1	6.9 - 10

The dissolved oxygen levels represent a range of 58 - 94% saturation at the recorded temperature range of 12 - 13°C. Mortality levels corresponded with those achieved in a previous range test in which 50, 30, 18, 11, and 6.5 mg ai/L concentrations produced respective mortality levels of 30%, 30%, 10%, and 10% after 96 hours of exposure. Sublethal effects observed in the definitive test included lethargy, loss of equilibrium, darkened pigmentation, and respiratory stress. The one mortality seen in the control vessel exhibited lethargic behavior. Respiratory stress was not apparent after 48 hours, following the aeration of test vessels.

12. Study Author's Conclusions: "Incidental observations of darkened pigmentation and erratic swimming were recorded among fish exposed to treatments ≤ 3.4 mg AI/L, however, these observations were not considered to be significant adverse effects to the exposure of Arsenic Acid.... It is not, however, possible to determine to what extent the low pH of the test solutions contributed to the toxicity of the test material at the upper end of the concentration range. Nevertheless, these results provide a reliable estimate of the relative acute toxicity of Arsenic Acid to rainbow trout....The 96-hour LC₅₀ (95% confidence interval) for rainbow trout exposed to Arsenic Acid was calculated by probit analysis to be 72 (51 - 110) mg AI/L. The "No Observed Effect Concentration" was 3.4 mg AI/L."

13. Reviewer's Discussion: The study has generally shown the test material to be slightly toxic to rainbow trout under aerated conditions. Given the indicated oxygen reduction

tendencies of Arsenic Acid it is questionable as to whether a static test was the best design to employ. A flow-through test would have negated the need to introduce aeration to maintain acceptable water quality. However introduction of gentle aeration is acceptable under ASTM guidelines if oxygen levels begin to fall below 60% saturation and if a comparable unaerated sample shows less than 20 % greater concentration than the aerated sample. The laboratory has not provided any data on an unaerated test vessel. The initial use of 8.0 pH dilution water is understandable given the acidic properties of the test material, but may not accurately reflect real world conditions. Despite these departures from guideline recommendations the concentration analysis indicated little degradation of the test material and test organisms did receive 96 hours of exposure to Arsenic Acid at the indicated concentration levels. The 10% mortality experienced in the control vessel does not appear to be caused by the small amount of contamination (which may have actually been an error in analysis) as there were no other mortalities in the seven lowest concentration levels (0.68 - 19 mg AI/L). The study author has based the NOEC on behavior signs seen at 6.0 mg/L, though darkened pigmentation and erratic behavior were noted at 0.68 mg/L.

Adequacy of Study:

Classification: Core

Rationale: Ai dose based on the measured concentrations supports the author's conclusions. The discrepancies in the study procedures were not felt by the reviewer to have adversely affected the final results.

Repairability: N/A