

Precision of acute copper and ammonia toxicity tests with glochidia and juvenile mussels

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Study objective

Evaluate the intra- and inter-laboratory precision of acute toxicity tests with glochidia and juvenile mussels

Five laboratories participating in the round robin test

- U.S. Geological Survey, Columbia, MO
- U.S. Geological Survey, La Crosse, WI
- North Carolina State University, Raleigh, NC
- Oklahoma State University, Stillwater, OK
- Wisconsin State Laboratory of Hygiene, Madison, WI

Collecting gravid mussels



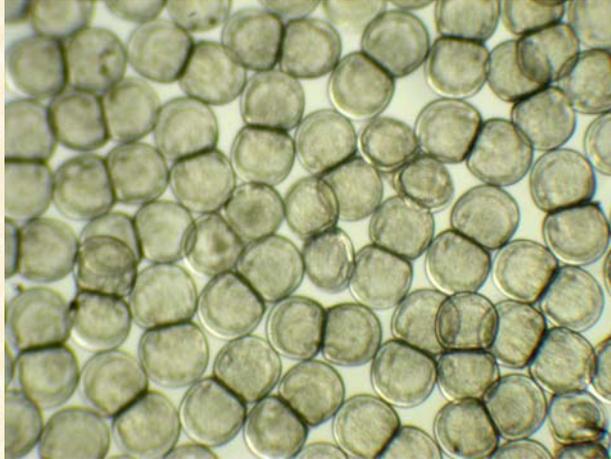
Gravid female mussels held in water flow-through tank



Isolating glochidia from a female mussel



Conditions for acute toxicity test with glochidia



Test species: Fatmucket and mucket

Test type: Static

Chemicals: Copper, ammonia, and chlorine

Test duration: 24 and 48 h

Temperature: $20 \pm 1^\circ\text{C}$

Test solution volume: 100 ml

Age of organism: <2-h or 24-h old

organisms/chamber: about 1000

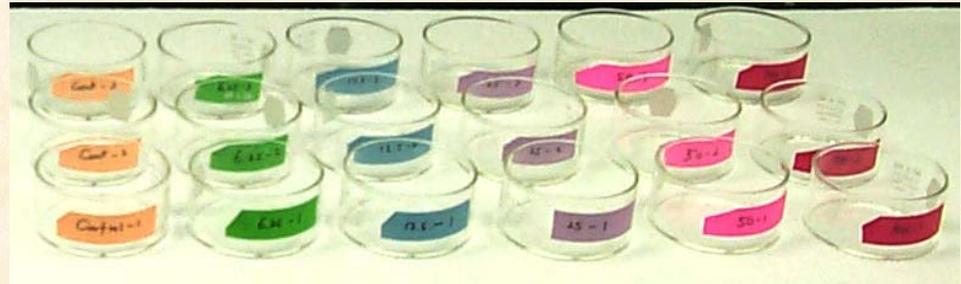
replicates/concentration: 3

Dilution water: ASTM hard (170 mg/L, pH 8.3)

Dilution: Control and 5 concentrations

Endpoint: Survival (shell closure with NaCl)

Acceptability: >90% survival in control



Conditions for acute test with juvenile mussels



Test species: Fatmucket

Test type: Static renewal

Chemicals: Copper

Test duration: 96 h

Temperature: $20 \pm 1^\circ\text{C}$

Dilution water: ASTM hard (170 mg/L, pH 8.3)

Dilution: Control and 5 concentrations

Acceptability: >90% survival in control

Test solution volume: 40 ml

Age of organism: <5-d

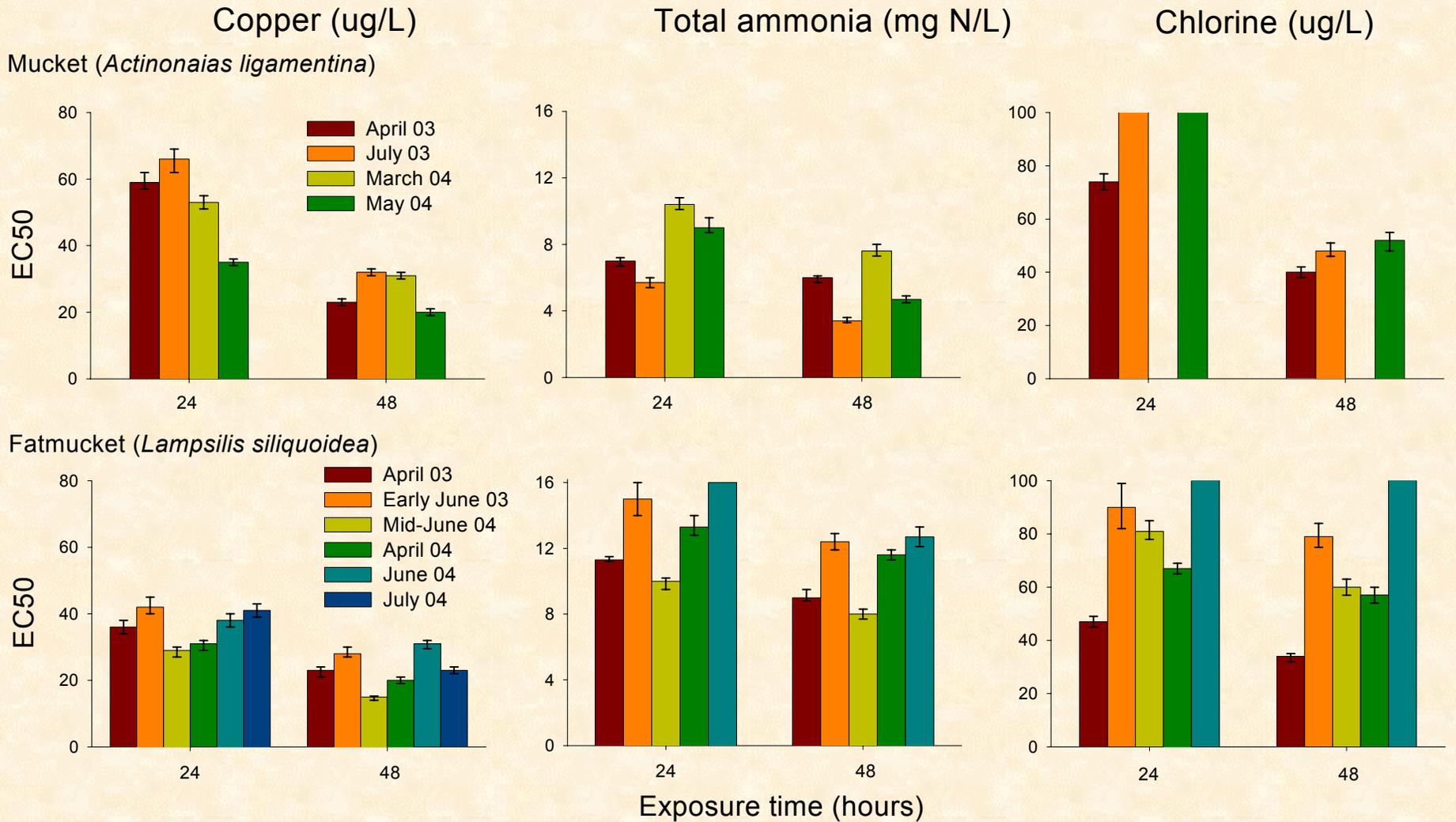
organisms/chamber: 5

replicates/concentration: 4

Endpoint: Survival (foot movement)

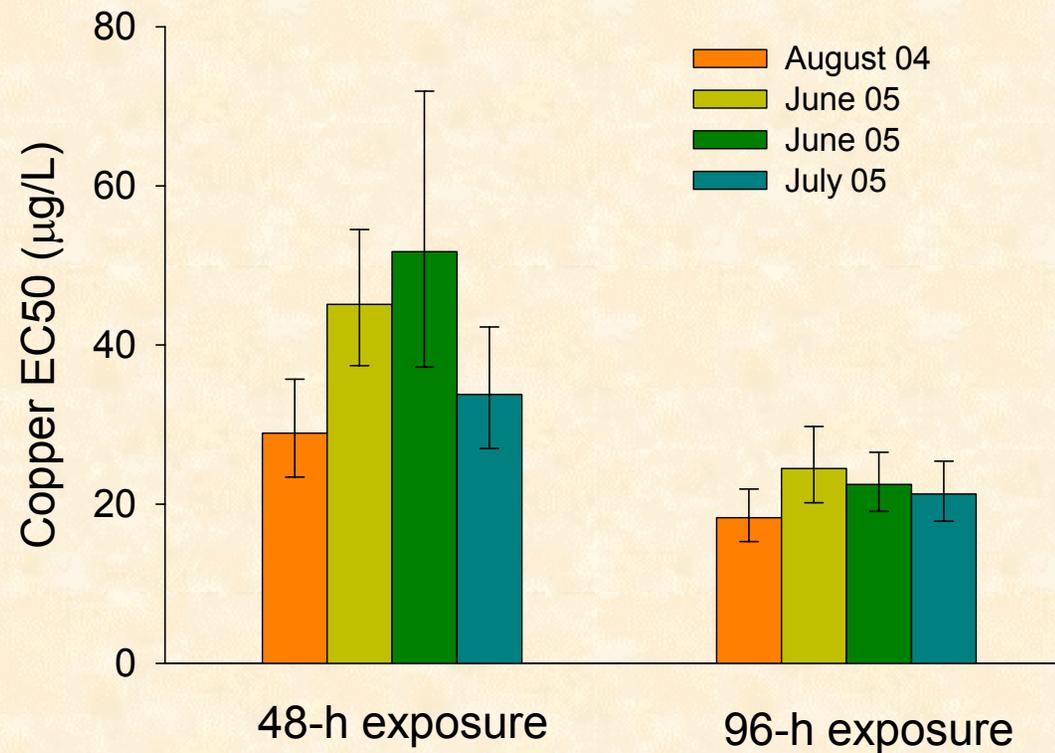


EC50s of three chemicals for glochidia tested in a single laboratory within a year and between years



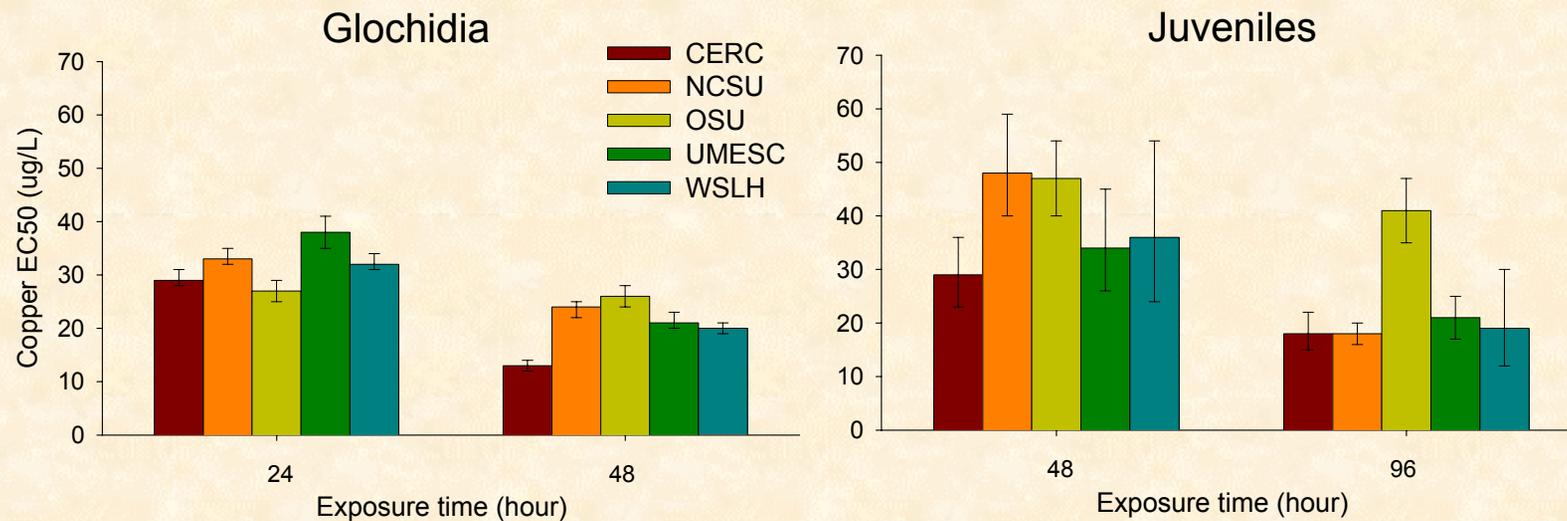
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EC50s of copper for newly-release juveniles of fatmucket tested in a single laboratory



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Copper EC50s for glochidia and newly-released juveniles of fatmucket tested at five laboratories



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Intra- and inter-laboratory precision of LC50s from static acute tests using single chemical

Species	Exposure time (h)	N	CV (%)	References
Intralaboratory				
<i>Daphnia magna</i>	24, 48	8-11	14-77	USEPA 1993
<i>Daphnia magna</i>	48	7-13	10-72	Lewis and Weber 1985
Fathead minnow	96	9-12	20-120	USEPA 1993
Mucket glochidia	24, 48	3-4	13-36	This study
Fatmucket glochidia	24, 48	5-6	15-38	This study
Fatmucket juveniles	48, 96	4	15-28	This study
Interlaboratory				
<i>Daphnia magna</i>	48	11-12	51-166	USEPA 1993
<i>Daphnia magna</i>	48	7-13	10-55	Lewis and Weber 1985
Fathead minnow	96	10-12	38-53	USEPA 1993
Rainbow trout	96	10-12	50-88	USEPA 1993
Fatmucket glochidia	24, 48	5	13-24	This study
Fatmucket juveniles	48, 96	5	22-42	This study

Conclusions

- Variability associated with glochidia and juvenile mussel tests is similar to that in previous studies with common test organisms
- Acute toxicity tests with glochidia and juvenile mussels have acceptable repeatability both within and between laboratories