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Sublethal Antimony (III) Exposure of Freshwater Swamp Shrimp (Macrobrachium Nipponense): Effects on Oxygen Consumption and Hepatopancreatic Histology

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ABSTRACT

This study was an attempt to realize the effects of antimony on freshwater swamp shrimp (*Macrobrachium nipponense*). An experiment of this nature, which have not previously been carried out in this species. First, median lethal concentrations were determined in acute toxicity tests. The 96-h LC50 value was 6.748 (5.728-7.950) mg Sb/l for adult *M. nipponense* and 1.635 (1.271-2.103) mg Sb/l for juvenile *M. nipponense*. Juvenile *M. nipponense* were exposed to 4 different sublethal levels of antimony (0.1, 0.4, 0.8, and 1.2 mg Sb/l) over a 7-d test period and a 7-d recovery period. After 30 min (acute), there was an increase in the amount of oxygen consumed in all exposed groups. On days 3, 7, and 14, decreases in oxygen consumption were significant ($p < 0.05$) for the higher-exposure level groups (0.8 and 1.2 mg/l). Light microscopy investigations showed histopathological alterations in the hepatopancreas which correlated with exposure concentrations. The alterations included degenerative changes in the lumen, a reduction in the lumen volume, and injury to epithelial cells in the histoarchitecture of hepatopancreas.

KEYWORDS

 Antimony, *Macrobrachium Nipponense*, Oxygen Consumption, Hepatopancreas

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References

- [1] J. Bustamante, D. Lennart, V. Marie, F. Bruce, and O. Sten, " The semiconductor elements arsenic and indium induce apoptosis in rat thymocytes," *Toxicology*, Vol. 118, pp. 129– 136, 1997.
- [2] K. Takayanagi, " Acute toxicity of waterborne Se(IV), Se(VI), Sb(III), and Sb(V) on red seabream (*Pargus major*)," *Bulletin of Environmental Contamination and Toxicology*, Vol. 66, pp. 808– 813, 2001.
- [3] B. Venugopal and T. D. Luckey, " Metal toxicity in mammals (II)," Plenum Press, 1978.
- [4] H. Huang, S. C. Shu, J. H. Shih, C. J. Kuo, and I. D. Chiu, " Antimony trichloride induces DNA damage and apoptosis in mammalian cells," *Toxicology*, Vol. 129, pp. 113– 123, 1998.
- [5] S. J. Teh, S. M. Adams, and D. E. Hinton, " Histopathological biomarkers in feral freshwater fish populations exposed to different types of contaminant stress," *Aquatic Toxicology*, Vol. 37, pp. 51– 70, 1997.
- [6] H. W. Ferguson, " Systemic pathology of fish," Iowa State University Press, 1989.
- [7] R. Lloyd, " Pollution and freshwater fish," Blackwell Press, 1992.
- [8] S. Chinni, R. N. Khan, and P. R. Yallapragada, " Oxygen consumption, ammonia-N excretion, and metal accumulation in *Penaeus indicus* postlarvae exposed to lead," *Bulletin of Environmental*

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- [9] G. R. Uitsch, M. E. Ott, and N. Heisler, " Standard metabolic rate, critical oxygen tension, and aerobic scope for spontaneous activity for trout (*Salmo gairdneri*) and carp (*Cyprinus carpio*) in acidified water," *Comparative Biochemistry Physiology A*, Vol. 67, pp. 329– 335, 1980.
- [10] J. P. Wu and H. C. Chen, " Effects of Cd and Zn on oxygen consumption, ammonium excretion, and osmoregulation of white shrimp (*Litopenaeus vannamei*)," *Chemosphere*, Vol. 57, pp. 1591– 1598, 2004.
- [11] A. L. Jr. Buikema, B. R. Niederlehner, and J. Jr. Cairns, " Ological monitoring. Part IV. Toxicity testing," *Water Research*, Vol. 16, pp. 239– 262, 1982.
- [12] D. J. Finney, " *Probit analysis*," Cambridge University Press, 1971.
- [13] P. T. Heitmuller, T. A. Hollister, and P. R. Parrish, " Acute toxicity of 54 industrial chemicals to sheepshead minnows (*Cyrinodan variegatus*)," *Bulletin of Environmental Contamination and Toxicology*, Vol. 27, pp. 596– 604, 1981.
- [14] H. C. Lin and P. P. Hwang, " Acute and chronic effects of antimony chloride ($SbCl_3$) on tilapia (*Oreochromis mossambicus*) larvae," *Bulletin of Environmental Contamination and Toxicology*, Vol. 61, pp. 129– 134, 1998.
- [15] L. H. Chen, J. L. Yang, and H. C. Chen, " Effects of antimony chloride (III) on aquatic organism: acute test, serum metabolic enzyme activities, and blood cell deformation," *Environmental Science: An India Journal*, Vol. 2, pp. 1– 7, 2006.
- [16] L. H. Chen and J. L. Yang, " Acute toxicity of antimony chloride ($SbCl_3$) and its effects on oxygen consumption of common carp (*Cyprinus carpio*)," *Bulletin of Environmental Contamination and Toxicology*, Vol. 78, pp. 459– 462, 2007.
- [17] J. B. Sprague, " Measurement of pollutant toxicity to fish. III. Sublethal effects and safe concentrations," *Water Research*, Vol. 5, pp. 245– 266, 1971.
- [18] A. S. Murty, " *Toxicity of pesticides to fish*," CRC Press, 1986.
- [19] S. Chinni, R. N. Khan, and P. R. Yallapragada, " Oxygen consumption, ammonia-N excretion, and metal accumulation in *Penaeus indicus* postlarvae exposed to lead," *Bulletin of Environmental Contamination and Toxicology*, Vol. 64, pp. 144– 151, 2000.
- [20] A. Soegianto, M. Charmantier-Daures, J. P. Trilles, and G. Charmantier, " Impact of cadmium on the structure of gills and epipodites of the shrimp *Penaeus japonicus*," *Aquatic Living Resource*, Vol. 12, pp. 57– 70, 1999.
- [21] B. R. McMahon, " Respiratory and circulatory compensation to hypoxia in crustaceans," *Respiration*