PHYSIOLOGICAL RESPONSES OF THE ROCK CRAB, CANCER IRRORATUS, EXPOSED TO SUBLETHAL LEVELS OF SILVER: COMPARISON OF FOOD CHAIN AND SEAWATER EXPOSURE

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ABSTRACT

PHYSIOLOGICAL RESPONSES OF THE ROCK CRAB, CANCER IRRORATUS, EXPOSED TO SUBLETHAL LEVELS OF SILVER: COMPARISON OF FOOD CHAIN AND SEAWATER EXPOSURE

A laboratory study was set up to investigate the physiological effects of sub-lethal doses of silver to the rock crab (Cancer irroratus). Crabs were exposed to 20 ppb and 40 ppb silver in solution of $AgCl_2^-$ for periods of 1, 3 and 7 weeks. At the end of each exposure period, 8 crabs from each exposure level were sacrificed and serum osmalaity, gill tissue respiation and silver accumulation in tissues (gill and hepatopancreas) were measured. A food chain exposure to silver was conducted as well by feeding another group of crabs the silver containing tissues of the blue mussel (mytilus edulus) for periods of 1, 3 and 6 weeks. The same physiological measurement were made on the crabs exposed to silver via the food chain as those crabs exposed to silver via the water column.

Gill tissue respiration of the crabs was affected by all means of exposure resulting in a lowered metabolic activity. Crabs exposed to 20 ppb silver and those fed silver-containing mussels showed increased respiration rates after 1 week of exposure, but after 6 and 7 weeks respectively, demonstrated an acclimation at a depressed metabolic rate. Crabs exposed to 40 ppb silver in the water column demonstrated an initial lowered respiratory rate (1 week) followed by a higher acclimated rate at 3 and 7 weeks. Serum osmolality of crabs fed silver through the food chain was not significantly affected while crabs exposed to silver in solution (20 ppb and 40 ppb) showed significantly depressed osmolality after a long term (7 weeks) exposure--the serum becoming close to isosmotic with its seawater environment. Silver was accumulated in the hepatopancreas by a concentration factor of 2.3 x in crabs exposed via the food chain, while no silver was accumulated in the gills. Crabs exposed to 20 ppb and 40 ppb silver in the water column accumulated silver in both the gills and hepatopancreas by concentration factor of 5.6 x and 3.3 x respectively.