

HISTOLOGICAL FINDINGS IN CADMIUM-TREATED SHRIMP POSTLARVAE, *Litopenaeus vannamei*, AND DEVELOPMENT OF POLYMORPHIC MARKERS ASSOCIATED WITH CADMIUM EXPOSURE

John Keating, Martha Delaney, Dawn Meehan-Meola, Acacia Alcivar-Warren

Pathology Section, Department of Clinical Sciences and Department of Environmental and Population Health, Cummings School of Veterinary Medicine at Tufts University, North Grafton, MA 01536 USA

Cadmium (Cd) is a ubiquitous environmental pollutant of increasing worldwide concern. Preliminary results from ongoing studies using wild and cultured shrimp indicated that Cd levels are higher in wild than cultured shrimp, though these levels have not been shown to pose a risk to human health. However, the effects of Cd on the biology and gene expression of the commercially important shrimp *Litopenaeus vannamei* are unknown. The overall hypothesis is that Cd exerts effects on shrimp at both biological and molecular levels. The changes at the biological and molecular level may provide a way to identify genes responsible for toxicity and/or tolerance of Cd exposure both acute and chronic. To test the hypothesis, a small-scale pilot project was initiated to obtain baseline information on histopathological changes and to develop the genomic tools needed to find genes associated with Cd exposure. The study goals are to (1) observe histopathologic changes in control and Cd-treated postlarvae (PL) during a 48 hour period, (2) determine utility of Cd-related genes from other species to develop EST-SSR markers for linkage mapping in shrimp. *L. vannamei* PL at stage 42 was exposed to a range of concentrations of CdCl₂ (0, 0.01, 0.10, 1.00, and 10.00 ppm) for 48 h.

Results showed (1) variable histological changes in shrimp exposed to different concentrations of Cd. Histological lesions were limited to the integument, musculature, gills, hepatopancreas and midgut/hindgut. None were associated with any evident infectious etiology (i.e. viruses, bacteria, fungi and protozoa). Gills more frequently showed degeneration and necrosis of superficial/epithelial layers. Infrequent lesions were found in the midgut/hindgut, varying from mild (necrosis and sloughing of scattered epithelial cells) to severe (segmental ulceration with expansion of the lamina propria by hemocytes and distention of gut lumen by sloughed cells). (2) Work is under way to develop EST-SSR from Cd-treated shrimp. Preliminary results show that 53% (23/46) of primers from genes known to be affected by Cd in other species (human, fish, mouse and other arthropods) can be used for PCR amplification with shrimp DNA. 61% (14/23) of these Cd-related genes were polymorphic in a panel of mapping families being used to develop a linkage map for shrimp (*ShrimpMap*).

In summary, this study reports the first histopathological changes induced by Cd exposure in *L. vannamei* postlarvae. In addition, results show that primers flanking single or multiple SSRs from vertebrate and invertebrate genes are an efficient approach to quickly develop markers useful for linkage mapping in shrimp.

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