

TOXICITY OF CHROMIUM TO FISH

During the past year we have investigated the toxicity of hexavalent chromium in the form of potassium dichromate to a bottom-living marine flatfish. Our objective was to determine sublethal (threshold) effects of high valence chromium in the ocean. In the past, most studies on the toxicity of chromium to fishes have been conducted with freshwater species. A marine species, the speckled sanddab (*Citharichthys stigmaeus*), was selected for our study because it adapts rapidly to the aquarium environment and can be collected at the depths at which municipal wastes are discharged into the coastal waters. This fish is an active, aggressive feeder; thus we monitored feeding behavior as well as mortality in these tests.

The sanddabs (3.7 to 12.0 gm) were trawled from Santa Monica Bay and maintained in recirculating laboratory aquaria at 12°C for up to 5 months. Three experiments were conducted in aerated 20-gallon aquaria. In the first, conducted under static conditions, we tested concentrations of hexavalent chromium from 15.6 to 1,000 mg/l. The pH was not adjusted and so fell below 6.0 in the two highest concentrations. Ammonia-nitrogen levels steadily climbed until they exceeded 1 mg/l at the end of 5 days. The two longer-term tests were conducted under continuous-flow conditions using seawater from Marineland. In the third test, the seawater was exposed to ultraviolet light to control possible bacterial contamination. In these last two experiments, ammonia-nitrogen levels did not exceed 0.5 mg/l, and the pH range stayed normal at 7.5 to 7.9. Temperature in all three tests was in the range of 11.7 to 12.7°C, and the dissolved oxygen level was 7.4 to 8.9 mg/l. Chromium levels were monitored during the final test; although levels in the two highest concentrations varied during the first weeks of the test, all concentrations changed less than 5 percent during the final 2 weeks. Water quality analyses were made by Jean Wright.

Estimates for the median lethal concentrations (1.050) for 4 and 21 days are 31 and 5.4 mg/l hexavalent chromium, respectively. Estimates for median effective concentrations (EC50) for the feeding response for 4, 14, and 21 days are 15, 3.7, and 2.2 mg/l hexavalent chromium. Histological examination revealed no signs of damage to gills or intestine as a result of exposure to 10 mg/l or less of hexavalent chromium. Other specimens have not been examined. The experiments were aborted when all fish, including the controls, were found to have extensive cartilaginous gill lesions. Similar lesions were observed (though at lesser frequency) in freshly-caught specimens, and this disease, which apparently is not related to sewage or chromium, is currently being investigated.

The concentrations of hexavalent chromium that affect feeding responses in the speckled sanddabs appear to be about one-half the lethal concentrations. If all the dissolved chromium presently discharged in primary and secondary wastewaters were in the hexavalent form, the concentrations would still be too low to cause death or affect feeding behavior in speckled sanddabs. Additional experiments are planned to determine a threshold for these responses and to examine more sensitive responses, such as chromium bioaccumulation in various organs and effects on blood chemistry. Similar tests are now underway to determine lethal and sublethal effects of trivalent chromium on the same fish.