

Retention of a Single Oral Dose of Cadmium in Tissues of the Softshell Turtle, *Trionyx spinifer*

by K. M. ROBINSON and M. R. WELLS

Department of Biology
Middle Tennessee State University
Murfreesboro, Tennessee 37130

INTRODUCTION

In this century industrial use of cadmium and cadmium compounds has increased greatly causing a sharp increase in environmental contamination (FRIBERG et al., 1971). Concomitantly there has been an increased incidence in both acute and chronic cases of clinically identifiable cadmoisis (FLICK et al., 1971). The effect of a single oral dose of cadmium has been studied in rats (DECKER et al., 1957; MOORE et al., 1973) and goats (MILLER et al., 1968). In all cases less than 10% of the dose was retained for 6 days. In the rat the only organs which retained significant amounts of cadmium were the kidney, liver, and gastrointestinal tract (DECKER et al., 1956; MOORE et al., 1972). The purpose of this study was to investigate the retention of a single oral dose of cadmium in tissues of an aquatic vertebrate, the softshell turtle, *Trionyx spinifer*.

METHODS

Softshell turtles (127-277 g) were collected from the Stones River in Cannon County, Tennessee. Turtles were anesthetized with chloroform, weighed, and orally fed 2 mg of cadmium (as cadmium acetate) via a plastic tipped syringe which was inserted into the lower esophagus or stomach. Three turtles were dissected at 48 and 96 hours after dosing. The liver, kidney, stomach, small intestine, and large intestine were removed for analysis. Contents of the stomach, small intestine, and large intestine were discarded. Each tissue was homogenized with distilled water (10% w/v) in a Waring blender. The tissues were dissolved with approximately 0.25 g of tetramethyl ammonium hydroxide (pentahydrate) added directly to tissue aliquots. All homogenates had completely dissolved after two hours at room temperature. Aliquots of the tissues were analyzed directly in a Perkin-Elmer Model 303 atomic absorption spectrophotometer. Young female softshells (76-90g) were collected from the Stones River in Rutherford County, Tennessee at a site downstream from a sewage effluent which serves several plating industries. These turtles were analyzed without dosing for possible cadmium contamination from the river.

RESULTS

Turtles collected in Cannon County, Tennessee were free of cadmium in the tissues assayed. However, cadmium was detected in

Send Correspondence to: DR. M. R. WELLS
MTSU BOX 252
MIDDLE TENNESSEE STATE UNIVERSITY
MURFREESBORO, TENNESSEE 37130

the turtles trapped in Rutherford County, Tennessee. Cadmium levels ranged from a high of 9.87 ppm in the kidney to a low of 0.19 ppm in the small intestine.

All turtles assayed showed no visible effects from the cadmium treatment. Forty-eight hours after forced feeding, the tissues assayed had retained 9.43% (+ 1.50) of the total cadmium fed. Ninety-six hours after feeding, the tissues had retained 4.02% (+ 0.52) of the total cadmium fed (Table 1). The liver retained the greatest amount of cadmium at both time periods. The concentration of cadmium (ug Cd/g wet weight) was greatest in the small and large intestine at 48 hours after dosage. By 96 hours, the concentration was greatest in the liver.

TABLE 1
RETENTION OF CADMIUM IN THE SOFTSHELL TURTLE,
TRIONYX SPINIFER, FOLLOWING A SINGLE ORAL DOSE OF 2 MG CADMIUM

| Tissue | % of oral dose | | Concentration (ppm) | |
|---------|----------------|-------------|---------------------|-------------|
| | 48 hours | 96 hours | 48 hours | 96 hours |
| Stomach | 1.25 + 0.45 | 0.18 + 0.05 | 6.24 + 1.36 | 1.23 + 0.47 |
| S. Int. | 3.43 + 1.93 | 0.32 + 0.01 | 20.70 + 13.17 | 2.20 + 0.15 |
| L. Int. | 0.58 + 0.28 | 0.22 + 0.06 | 12.48 + 5.15 | 5.12 + 0.71 |
| Liver | 3.90 + 0.36 | 3.09 + 0.50 | 7.27 + 0.46 | 5.91 + 1.06 |
| Kidney | 0.27 + 0.06 | 0.21 + 0.01 | 3.45 + 1.44 | 2.60 + 0.20 |

DISCUSSION

The clearance of cadmium by the softshell turtle is in general agreement with studies on mammals. Apparently the soft-shell turtle is able to tolerate relatively large concentrations of cadmium initially and over long periods of time. The stream habitat of the turtles trapped in Rutherford County, Tennessee has a history of fish kills caused by high concentrations of heavy metals (BURDICK et. al., 1973). At the time of the fish kills, there were no turtle kills. Turtles were observed actively feeding on dead fishes which had high concentrations of heavy metals. Based on these data, the concentrations of cadmium presently found in effluent from treatment plants serving plating industries has little effect on the health of turtles.

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