

Cadmium Concentrations in Human Kidney and Liver Tissues from Western Australia

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Non-occupational environmental exposure to metals is currently of concern since little is known about the health effects of long-term exposure to relatively low concentrations of potentially hazardous substances.

Kidney and liver cadmium concentrations have been studied by several research groups (FRIBERG et al. 1974) suggesting relationships between cadmium and disease states and causes of death. There is evidence to suggest that persons dying of cardiovascular disease and hypertension have an increased kidney cadmium level (FRIBERG et al. 1974). A strong positive correlation between elevated liver cadmium and death from heart disease has been reported (VOORS et al. 1977). However, there remains conflicting evidence on the relationship between elevated cadmium and cardiovascular disease.

Many studies of cadmium tissue concentrations have been conducted in various parts of the world, but there is a paucity of Australian information on this subject.

MATERIALS AND METHOD

Tissue samples were obtained at post mortem investigations from 100 males aged 2 months to 88 years and females aged 4 months to 94 years. Samples from disease and accident victims were from the metropolitan area of Perth, Western Australia (population 800,000). The tissue samples analysed did not show any evidence of gross pathology. The kidney cortex samples were taken from the lower pole and liver samples from the superior anterior surface of the right lobe. Samples were analysed by atomic absorption spectrometry after acid digestion (SPICKETT & LAZNER 1978). From an original population of 100 autopsies, 91 kidney samples and 89 liver samples were analyzed.

RESULTS AND DISCUSSIONS

The aim of the present investigation was to provide some reference data for Western Australia and to compare the levels determined with data obtained in other parts of the world.

TABLE 1

CADMIUM CONCENTRATIONS IN KIDNEY CORTEX AND LIVER TISSUE

(Concentrations are expressed in terms of $\mu\text{g}\cdot\text{g}^{-1}$ wet weight using the conversion factors described by FRIBERG et al. 1974)

COUNTRY	Kidney Cortex		Liver		REFERENCE
	Mean	Range	Mean	Range	
United Kingdom	18	3.2-33	2.0	1.2-3.7	CURRY and KNOTT 1970
Sweden	22	-	1.1	-	ELINDER 1976
W. Germany	15	5.3-18	2.2	0.4-3.9	PISCATOR et al. 1971
USA - Carolina	38	9.1-79	3.2	0.1-22	HAMMER et al. 1973
USA - New York	26	9.9-88	1.3	0.4-5.4	OLERU 1976
Japan - Kobe	70	15-140	5.7	1.1-23	SUMINO 1975

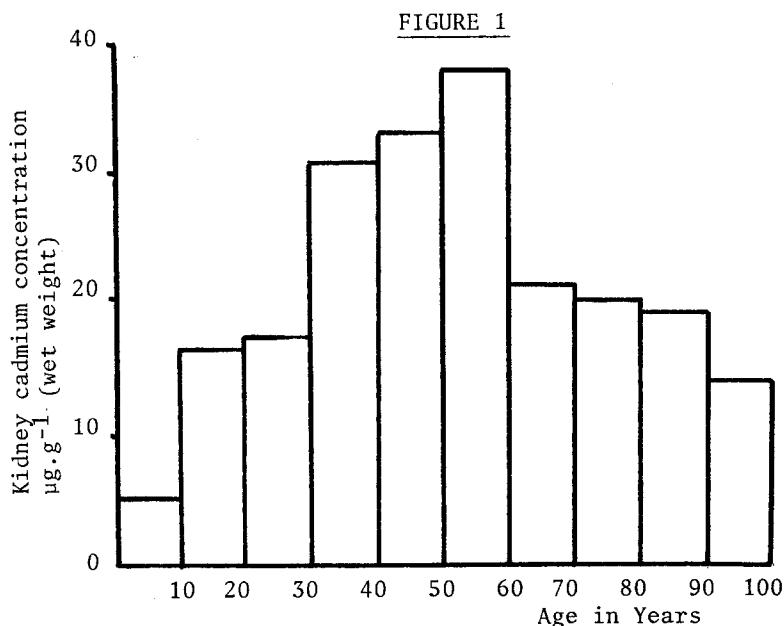
The range of cadmium concentrations in the kidney and liver tissues were 1.0-100 and 0.1-7.4 $\mu\text{g.g}^{-1}$ wet weight respectively, and the means of the concentrations were 24 and 2.1 $\mu\text{g.g}^{-1}$ respectively. A brief list of recent reports is given in Table 1 for comparison.

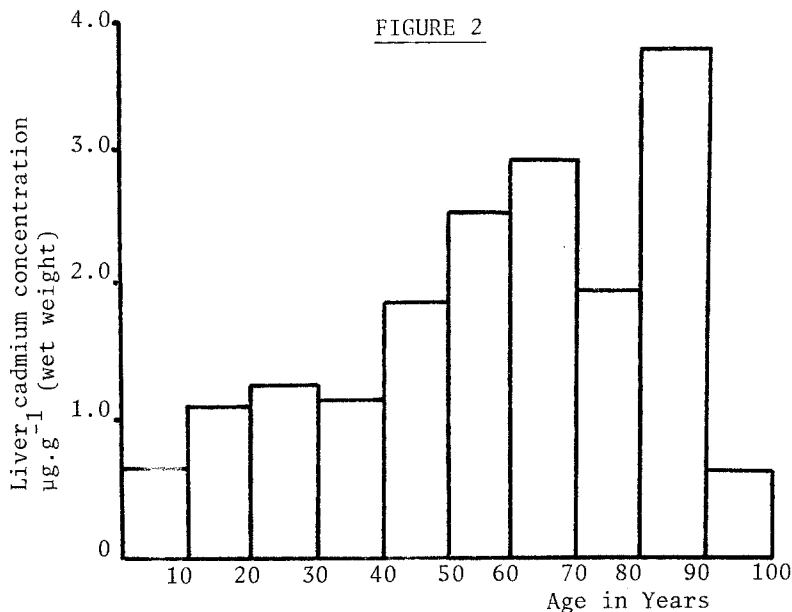
In general terms, the values obtained in this study were lower than those obtained in the U.S.A. and Japan, but marginally higher than those obtained in Europe. The results agree with other studies carried out in various parts of the world in that the renal cadmium concentrations increase up to middle age, followed by subsequent decrease (Figure 1).

At present there are no explanations for these changes but several suggestions have been put forward (HAMMER et al. 1972).

The observed increase in liver cadmium concentration with age (Figure 2) shows a positive correlation ($r = 0.44$) up to the eighth decade, which is also similar to other work. Because liver cadmium concentration has a steady increase with age, it seems that it would represent a better indication of total body burden than kidney cadmium concentration.

Substantially lower tissue cadmium levels were expected for a city such as Perth, which has relatively low industrial activity and is isolated from large industrial centres. The tissue cadmium levels obtained probably reflect the fact that a significant proportion of the population of Perth originated from other Australian states and from overseas and that much of the processed food is obtained from areas with greater industrial activity.





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