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Available Issues Japanese	
Author: <input type="text"/> ADVANCED	Volume <input type="text"/> Page <input type="text"/>
Keyword: <input type="text"/> <input type="button" value="Search"/>	<input type="text"/> <input type="text"/> <input type="button" value="Go"/>



[TOP](#) > [Available Issues](#) > [Table of Contents](#) > [Abstract](#)

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[\[Image PDF \(577K\)\]](#) [\[References\]](#)

Tolerable daily intake of cadmium in human estimated based on oral cadmium administration in female rats

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Abstract:

In Japan cadmium (Cd) concentration in rice is higher than other countries. Therefore daily cadmium intake is larger than the case of other countries. So in this study, we tried to extrapolate the results of animal experiments to estimate the level of tolerable daily Cd intake of human.

Female Wistar rats (6 weeks old) were given Cd at a dose of 2, 5, 10, 20, 30 and 60 mgCd/kg (as CdCl₂) by a gastric tube daily for consecutive 6 days a week for 60 weeks.

Animals were sacrificed at 0, 5, 10, 30, 40 and 60 weeks after oral Cd administration. Cd concentration in the kidney, urinary excretion of enzymes (NAG, AAP, GST), serum enzymes (GGT, ALP), amino acid, protein, glucose, and calcium were determined. The urinary excretion of Pyridinoline (Pry) and Deoxypyridinoline (Dpry) was also determined. Benchmark dose (BMD) was calculated from our experimental data by power model of BMD software ver. 1.3.2 that was released from U.S. Environmental Protection Agency (EPA). The dose to estimate BMD was set two ways renal Cd concentration and oral Cd administration dose. Tolerable daily intake was estimated as 10%BMD divided by uncertainly factors (UFs). Namely, 10%BMD for the kidney was calculated as 32.8ug/g-tissue. On the other hand, the case of oral Cd administration dose was calculated as 2.52mgCd/kg-bw/day at the 60 weeks after Cd administration. The relationship between oral Cd dose and the cumulative renal Cd concentration calculated 0.9mg/kg-bw/day and 32.8ug/g-tissue at the 60 weeks. The value of UFs is determined as 1000. As the result, tolerable daily intake of Cd was estimated respectively as 0.9ug/kg-bw/day from the renal

Cd concentration, and as 2.5ug/kg-bw/day from the oral Cd administration dose.

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