DIETARY EXPOSURE TO CADMIUM IN A NORTHERN ITALY POPULATION

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Background and aims

Cadmium (Cd) is a heavy metal without nutritional relevance, which can be very harmful to the human health. It is not degraded, therefore, if released into the environment it can remain there for hundreds of years. Cadmium is used in Cd / Ni batteries and in the production of artificial fertilizers, with toxicological properties associated from its chemical similarity to zinc. It is introduced through diet and other sources in living organisms and tend to accumulate in various tissues and organs. Cd is transported to the liver where it is bound to some proteins, forming complexes transported to the kidneys where it accumulates and damages the filtration systems. Cd also causes numerous skeletal changes and damages to the nervous system. Finally, it is definitely carcinogenic (group I AIRC). Worldwide, the average daily intake of Cd from the diet has been estimated between 10 and 50μg/day, half of which from cereals, fruit and vegetables.

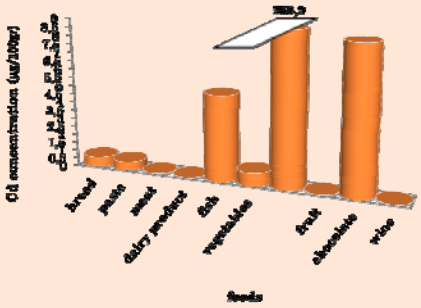
Methods

We selected foods characterizing the diet of Emilia-Romagna region population using the results of an EPIC survey, by selecting from a list of 233 foods foodstuffs and drinks having average consumption ≥3 g/day. Cd determinations of foods were performed at Iren Acqua Gas - IREN company, Reggio Emilia, using mass spectrometer inductively coupled plasma following mineralization of the food samples.From the results of the EPIC semiquantitative food frequency questionnaire administered to 1099 residents in the Emilia-Romagna region, we assessed daily foodstuffs consumption and we calculated dietary Cd intake.

Tab. 1 Cd concentration, average Cd intake, tolerable food Cd intake, tolerable total Cd weekly intake for class of foods and average food intake

	Cd (μg/100g)	Food intake (g/day)	Cd intake (μg)	Tolerable Cd intake (mg/kg of food)	Tolerable Cd weekly intake (μg/Kg)
Wild mushrooms	268.90	2.408	6.5	1.00	2.50
Chocolate	8.55	4.212	0.4	-	-
Vegetables	0.80	198.675	1.6	0.35	-
Cereales	1,14	138.290	1.6	0.10	-
Fish + mussels	5.10	16.630	0.9	1.15	-
		daily Cd intake	**11.11**		

Fig. 2 Cd concentration for class of foods



Results

The highest average concentrations of the metal (μg Cd/100 g food) were found in grains (average value 1.14), fish and mussels (5.10), chocolate (8.55), vegetables (0.8) and particularly in wild mushrooms (268.90), not unexpectedly according to earlier determinations *(Fig. 1, Tab. 1).*

The food intake of Cd in the study population resulted to be 11.11 μg/day, mainly due to the intake of wild mushrooms (6.50 μg/day Cd), cereals (1.60 μg/day Cd), fish and mussels (0.90 μg/day Cd), vegetables (1.60 μg/day Cd) and chocolate (0.40 μg/day Cd) *(Tab. 1).*

Considering that the Panel on Contaminants in the Food Chain of the European Food Safety Authority (CONTAM Panel) has set in 2010 the tolerable Cd weekly intake (TWI) as 2.5 μg/kg body weight, i.e. 25 μg/day for a 70-kg individual, therefore, the daily intake calculated in our population appears to exceed such limit. Considering the standards set by the EC Regulation No 1881/2006 of Dec 19, 2006 for maximum Cd levels in single foodstuffs, such as vegetables and fruits (0.35), wild mushrooms (1.0), cereals (0.1) and fish-mussels (1.15), in our study only wild mushrooms (2.69 mg/kg) exceed such imposed limits *(Tab 1).*

Conclusion

The Cd weekly intake characterizing our study population did not exceed the EFSA limits. However, considering the high toxicity of this heavy metal particularly for chronic exposure and the relatively high intakes which may characterize consumers of large amounts of wild mushrooms, vegetables, cereals and fish, the issue of dietary Cd intake in the Italian population and its related health effects appears to be an important public health issue.