

Lead exposure in an Italian population: food content, dietary intake and risk assessment

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Background

Lead is a highly toxic heavy metal major source of human exposure. In released into the environment after this study, we determined lead natural and anthropogenic activities. contamination in food and Excluding populations in beverages consumed in a Northern Italy community and performed a lead contamination, food is the health risk assessment.

Methods

We collected a total of 908 food lead dietary intakes in a sample of samples and measured lead levels 719 adult individuals. We performed using inductively coupled plasma risk assessment using the margin of mass spectrometry. Using a exposure approach, based on validated food frequency exposure levels for both adverse questionnaire, we assessed the effect of systolic blood pressure and dietary habits and estimated daily chronic kidney disease.

Results

Foods with the highest lead levels to women (0.157 $\mu\text{g/kg-bw-day}$). include non-chocolate confectionery Top food contributors were (48.7 $\mu\text{g/kg}$), leafy (39.0 $\mu\text{g/kg}$) and vegetables, cereals, and beverages, other vegetables (42.2 $\mu\text{g/kg}$), and particularly wine. In relation to risk assessment, the estimated dietary $\mu\text{g/kg}$). The estimated mean lead intake was lower than levels intake was 0.155 $\mu\text{g/kg bw-day}$ in all associated with cardiovascular risk subjects, with little lower intakes in and nephrotoxicity. men (0.151 $\mu\text{g/kg bw-day}$) compared

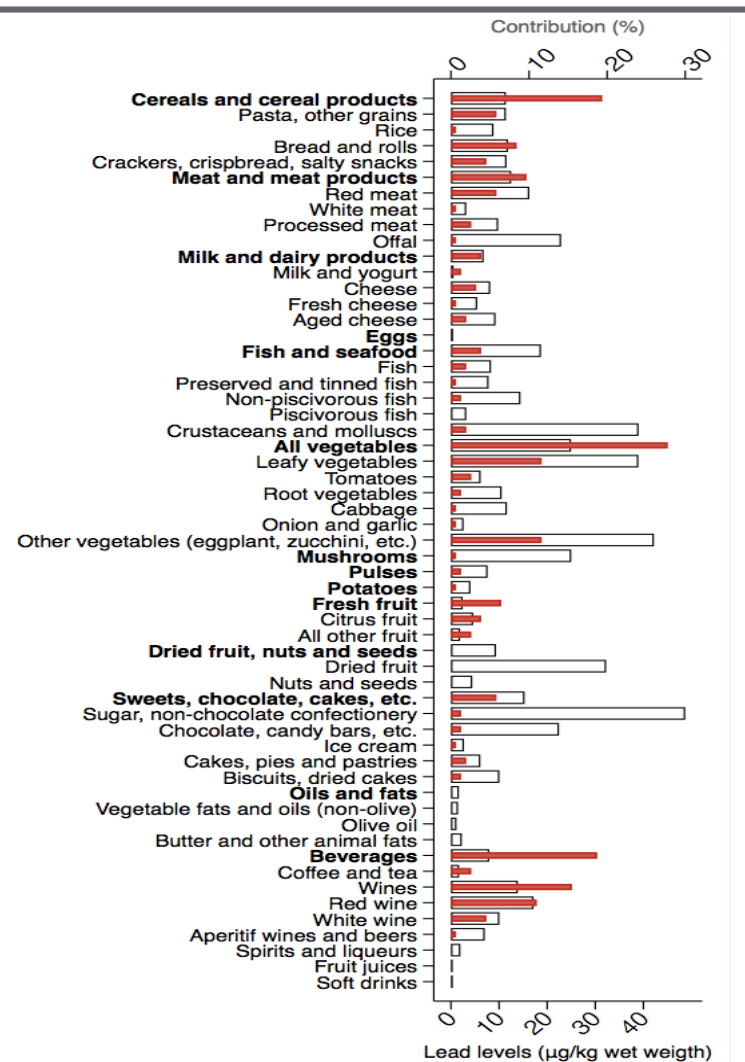


Figure 1. Lead levels in food ($\mu\text{g/kg}$ wet weight– white bars) and contribution to daily dietary intake of each food category (percentage – dark/red bars)..

	Mean	P25	P50	P75	P95	%
Total intake	0.155	0.111	0.148	0.188	0.279	100
Cereals and cereal products	0.030	0.017	0.027	0.039	0.063	19.35
Pasta, other grains	0.009	0.005	0.008	0.012	0.021	5.81
Rice	0.001	0.000	0.000	0.001	0.002	0.65
Bread and rolls	0.013	0.004	0.011	0.019	0.035	8.39
Crackers, crispbread, salty snacks	0.007	0.002	0.004	0.008	0.025	4.52
Meat and meat products	0.015	0.008	0.013	0.018	0.034	9.68
Red meat	0.009	0.004	0.007	0.011	0.023	5.81
White meat	0.001	0.000	0.001	0.002	0.004	0.65
Processed meat	0.004	0.002	0.003	0.005	0.011	2.58
Milk and dairy products	0.006	0.003	0.005	0.008	0.015	3.87
Milk and yogurt	0.002	0.000	0.001	0.002	0.005	1.29
Cheese	0.005	0.002	0.004	0.006	0.012	3.23
Eggs	0.000	0.000	0.000	0.000	0.000	0.00
Fish and seafood	0.006	0.002	0.004	0.008	0.018	3.87
Fish	0.003	0.001	0.002	0.004	0.009	1.94
Preserved and tinned fish	0.001	0.000	0.000	0.001	0.002	0.65
Non-piscivorous fish	0.002	0.000	0.001	0.002	0.007	1.29
Crustaceans and molluscs	0.003	0.000	0.001	0.004	0.013	1.94
All vegetables	0.043	0.024	0.038	0.057	0.095	27.74
Leafy vegetables	0.018	0.007	0.014	0.024	0.046	11.61
Tomatoes	0.004	0.002	0.004	0.006	0.011	2.58
Root vegetables	0.002	0.000	0.001	0.003	0.008	1.29
Cabbage	0.001	0.000	0.000	0.001	0.003	0.65
Onion and garlic	0.001	0.000	0.000	0.001	0.002	0.65
Other vegetables (eggplant, zucchini, etc.)	0.018	0.008	0.014	0.024	0.044	11.61
Mushrooms	0.001	0.000	0.000	0.001	0.003	0.65
Pulses	0.002	0.001	0.001	0.003	0.006	1.29
Potatoes	0.001	0.001	0.001	0.002	0.004	0.65
Fresh fruit	0.010	0.005	0.009	0.014	0.022	6.45
Citrus fruit	0.006	0.003	0.005	0.008	0.013	3.87
All other fruit	0.004	0.002	0.004	0.006	0.010	2.58
Dry fruit, nuts and seeds	0.000	0.000	0.000	0.000	0.001	0.00
Sweets, chocolate, cakes, etc.	0.009	0.003	0.006	0.012	0.028	5.81
Sugar, non-chocolate confectionery	0.002	0.000	0.001	0.002	0.007	1.29
Chocolate, candy bars, etc.	0.002	0.000	0.001	0.002	0.008	1.29
Ice-cream	0.001	0.000	0.000	0.001	0.002	0.65
Cakes, pies and pastries	0.003	0.000	0.001	0.004	0.011	1.94
Biscuits, dry cakes	0.002	0.000	0.001	0.003	0.007	1.29
Oils and fats	0.000	0.000	0.000	0.001	0.001	0.00
Beverages	0.029	0.005	0.017	0.044	0.090	18.71
Coffee and tea	0.004	0.002	0.003	0.004	0.009	2.58
Wine	0.024	0.000	0.010	0.040	0.085	15.48

Table 1. Estimation of lead daily dietary intake in all subjects (in $\mu\text{g/kg}$ of body weight/day) and percentage contribution (%) of each food to total intake.

Conclusions

Our study provides an updated exposure levels for adverse effects assessment of lead food are not reference health standards, contamination and dietary exposure and no safety threshold value can be established for lead. As a margin of exposure risk assessment consequence, other and more subtle approach suggests that risk of adverse effects may still occur in detrimental effects due to dietary vulnerable and occupationally lead intake is low in the investigated exposed individuals, particularly in population. Nonetheless these relation to the nervous system

Table 2. Margin of exposure (MOE) estimation using the lower bound of the benchmark dose (BMDL) of an extra risk of 1% (BMDL₀₁) for adverse effect on systolic blood pressure (SBP) and the BMDL for an extra risk of 10% (BMDL₁₀) for the nephrotoxic effects (NE) using either mean, median (P50) and 95 percentiles (P95) values of daily dietary intake (DDI) in overall population and divided by sex. DDI and BDML are in $\mu\text{g/kg bw-day}$.

	DDI			BMDL		MOE					
	Mean	P50	P95	SBP	NE	SBP			NE		
						Mean	P50	P95	Mean	P50	P95
All subjects	0.155	0.148	0.273	1.2	0.63	7.7	8.1	4.4	4.1	4.3	2.3
Men	0.151	0.146	0.244	1.2	0.63	7.9	8.2	4.9	4.2	4.3	2.6
Women	0.157	0.148	0.280	1.2	0.63	7.6	8.1	4.3	4.0	4.3	2.3

