

SUPPORTING INFORMATION

Arsenic, lead, and cadmium in U.S. mushrooms and substrate in relation to dietary exposure

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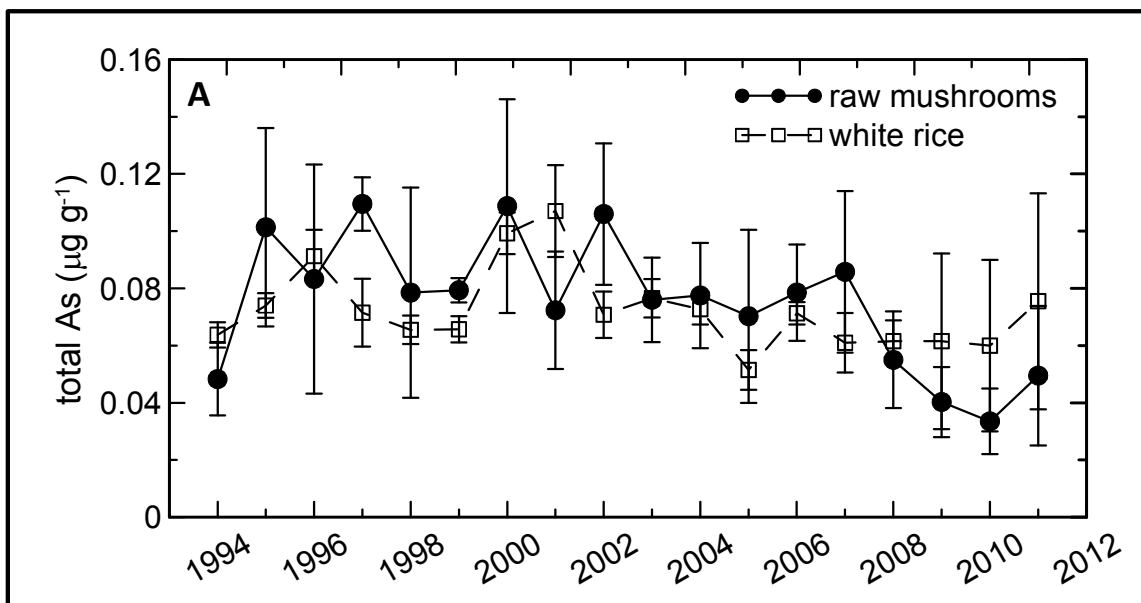


Figure S1. Comparison of total As (average \pm standard deviation) detected in raw mushrooms and white rice sampled 3 to 4 times per year during the FDA's *Total Diet Study* from 1994 to 2011. Note that dry weights were not attained prior to sample digestion and thus reveal actual consumable concentration in prepared products in the TDS.

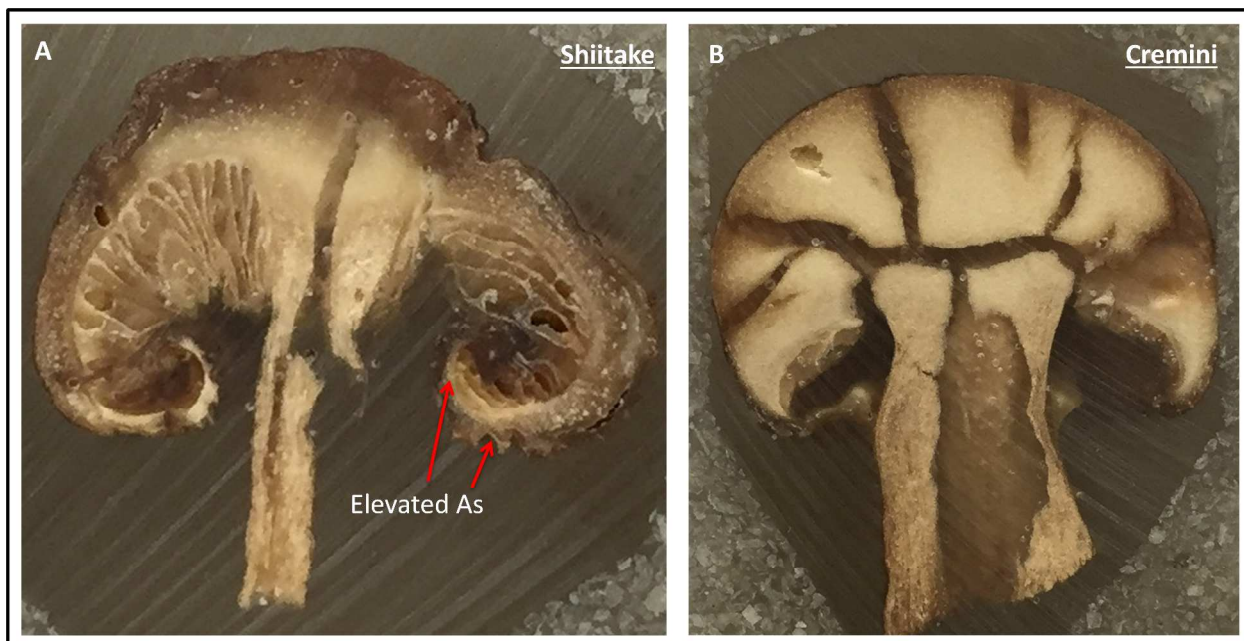


Figure S2. Photographs of Shiitake (A) and Cremini (B) mushroom fruits used to prepare thin sections for XRF images shown in Figures 2 and 3.

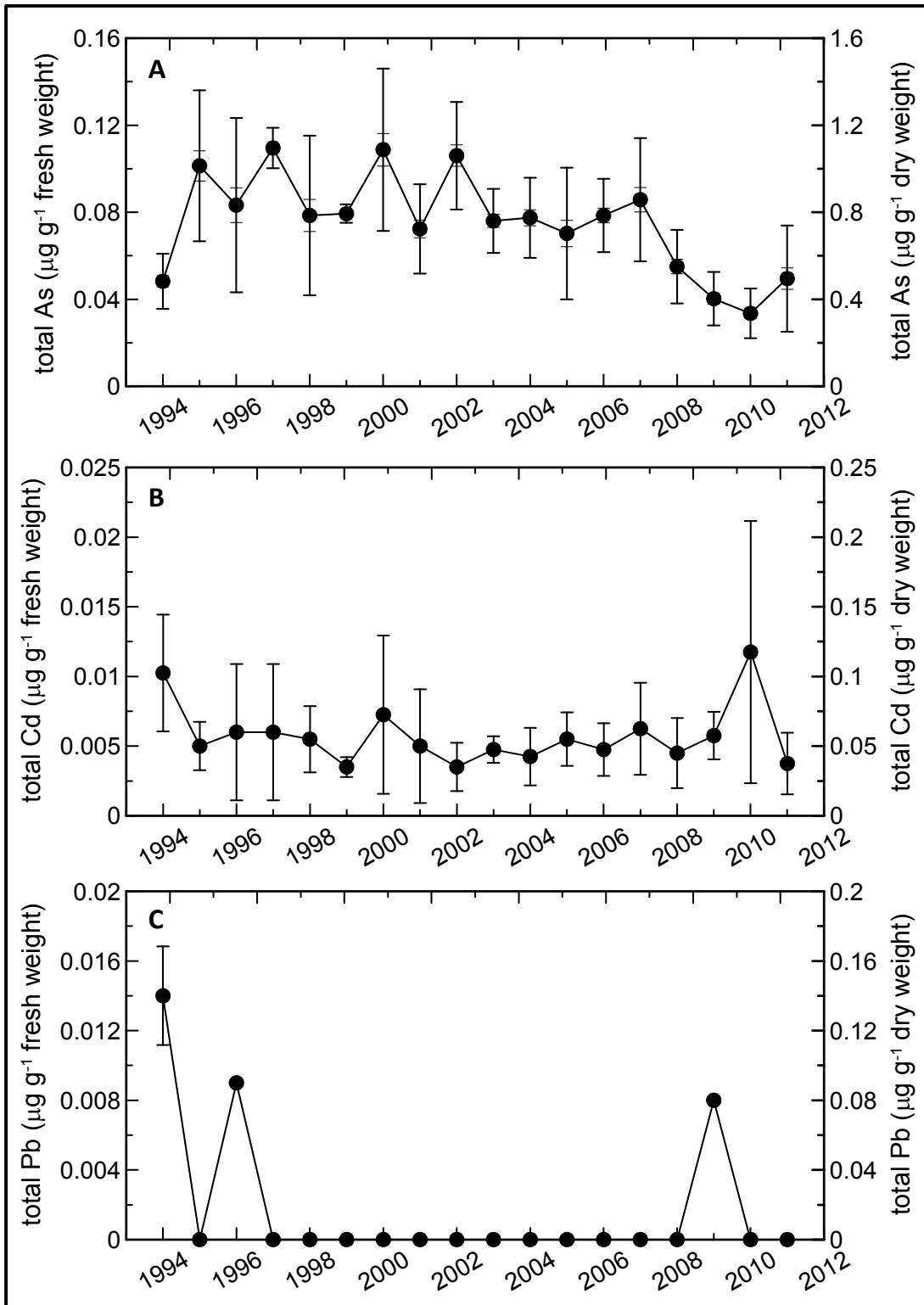


Figure S3. Total As, Cd, and Pb (average \pm standard deviation) detected in raw mushrooms sampled 3 to 4 times per year during the FDA's *Total Diet Study* from 1994 to 2011 expressed on both a fresh weight (reported) and dry weight basis.

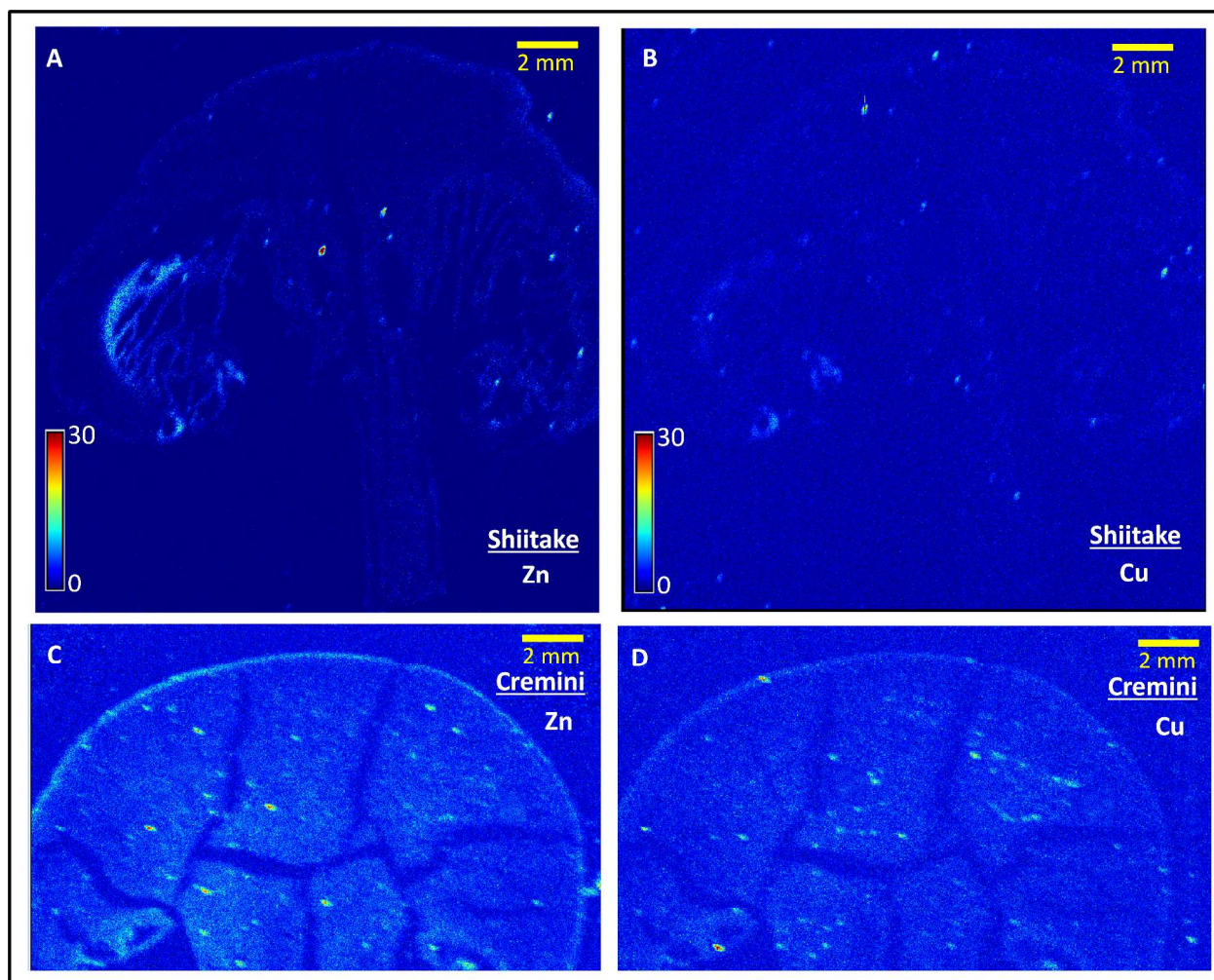


Figure S4. X-ray fluorescence images showing localization of Zn (A, C) and Cu (B, D) in 30 μm -thin sections of Shiitake (A-B) and Cremini (C-D) mushroom fruits obtained in Chester County, PA, USA. Both mushrooms had similar total As concentrations of $0.37 \mu\text{g g}^{-1}$. Color scale corresponds to fluorescence intensity for each element. Numbered boxes in A-B correspond to locations of higher resolution images shown in Figure 3.

Table S1. Analytical recoveries of Cd, Pb, and As in two certified reference materials. IPE 883 = WEPAL Dianthus straw (Cd = 85.5, Pb = 3070, As = 129 $\mu\text{g kg}^{-1}$) and NIST1568a = National Institute of Standards and Technology rice flour (As = 290 $\mu\text{g kg}^{-1}$) certified reference material (CRM).

CRM	Cd	Pb	As
	measured values ($\mu\text{g kg}^{-1}$)		
IPE 883	93.3	3240	124
NIST 1568a	n.m.*	n.m.	298
	n.m.	n.m.	303
	n.m.	n.m.	292
	% recovery		
IPE 883	109	106	96
NIST 1568a	n.m.	n.m.	103

*n.m. = not measured

Table S2. Descriptive statistics for total dry-weight As concentrations in 40 mushroom samples from farms in Chester County, PA and a supermarket in Menlo Park, CA.

Mushroom type	Species	n	----- $\mu\text{g g}^{-1}$ As-----			
			mean or value	median	min	max
White Button	<i>A. bisporus</i>	11	0.388	0.421	0.085	0.997
Cremini	<i>A. bisporus</i>	6	0.604	0.502	0.418	0.900
Portobello	<i>A. bisporus</i>	7	0.394	0.400	0.162	0.508
Shiitake	<i>L. edodes</i>	5	0.191	0.143	0.072	0.444
Royal Trumpet	<i>P. eryngii</i>	2	0.355	0.355	0.176	0.535
Oyster	<i>P. ostreatus</i>	3	0.230	0.105	0.096	0.490
Forest Nameko	<i>P. nameko</i>	1	0.539	-	-	-
Maitake	<i>G. frondosa</i>	1	0.439	-	-	-
Enokitake	<i>F. velutipes</i>	1	0.357	-	-	-
Alba Clamshell	<i>H. tessellatus</i> (Bunapi-Shimeji)	1	0.292	-	-	-
Brown Clamshell	<i>H. tessellatus</i> (Buna-Shimeji)	1	0.431	-	-	-
Chanterelle	<i>C. cibarius</i>	1	0.133	-	-	-
All samples		40	0.380	0.420	0.072	0.997
Pennsylvanian samples		33	0.373	0.421	0.072	0.997
Californian samples		7	0.413	0.418	0.176	0.644

Table S3. Descriptive statistics for dry-weight inorganic As concentrations in 17 mushroom samples from farms in Chester County, PA and a supermarket in Menlo Park, CA.

Mushroom type	Species	n	----- $\mu\text{g g}^{-1}$ As _i -----			
			mean or value	median	min	max
White Button	<i>A. bisporus</i>	6	0.342	0.350	0.020	0.628
Cremini	<i>A. bisporus</i>	4	0.436	0.487	0.160	0.609
Portobello	<i>A. bisporus</i>	4	0.190	0.210	0.100	0.240
Royal Trumpet	<i>P. eryngii</i>	1	0.416	0.416	0.416	0.416
Forest Nameko	<i>P. nameko</i>	1	0.378	-	-	-
Maitake	<i>G. frondosa</i>	1	0.307	-	-	-
	All samples	17	0.333	0.307	0.020	0.628
	Pennsylvanian samples	15	0.335	0.307	0.020	0.628
	Californian samples	2	0.314	0.314	0.250	0.378

Table S4. Descriptive statistics for total dry-weight Pb concentrations in 25 mushroom samples from farms in Chester County, PA and a supermarket in Menlo Park, CA.

Mushroom type	Species	n	----- $\mu\text{g g}^{-1}$ Pb-----			
			mean or value	median	min	max
White Button	<i>A. bisporus</i>	10	0.240	0.092	0.042	0.924
Cremini	<i>A. bisporus</i>	4	0.080	0.076	0.048	0.119
Portobello	<i>A. bisporus</i>	5	0.074	0.061	0.042	0.138
Shiitake	<i>L. edodes</i>	1	0.106	-	-	-
Royal Trumpet	<i>P. eryngii</i>	1	0.052	-	-	-
Oyster	<i>P. ostreatus</i>	2	0.051	0.051	0.047	0.055
Forest Nameko	<i>P. nameko</i>	1	0.082	-	-	-
Maitake	<i>G. frondosa</i>	1	0.298	-	-	-
	All samples	25	0.149	0.081	0.042	0.924
	Pennsylvanian samples	23	0.156	0.081	0.042	0.924
	Californian samples	2	0.066	0.066	0.050	0.082

Table S5. Descriptive statistics for total dry-weight Cd concentrations in 25 mushroom samples from farms in Chester County, PA and a supermarket in Menlo Park, CA.

Mushroom type	Species	n	----- $\mu\text{g g}^{-1}$ Cd-----			
			mean or value	median	min	max
White Button	<i>A. bisporus</i>	10	0.123	0.135	0.052	0.170
Cremini	<i>A. bisporus</i>	4	0.136	0.138	0.100	0.169
Portobello	<i>A. bisporus</i>	5	0.116	0.109	0.042	0.202
Shiitake	<i>L. edodes</i>	1	0.445	-	-	-
Royal Trumpet	<i>P. eryngii</i>	1	0.220	-	-	-
Oyster	<i>P. ostreatus</i>	2	0.212	0.212	0.173	0.251
Forest Nameko	<i>P. nameko</i>	1	0.373	-	-	-
Maitake	<i>G. frondosa</i>	1	0.278	-	-	-
	All samples	25	0.164	0.149	0.042	0.445
	Pennsylvanian samples	23	0.157	0.149	0.042	0.445
	Californian samples	2	0.238	0.238	0.103	0.373