DEPARTMENT OF
Nuclear Engineering
UNIVERSITY OF CALIFORNIA, BERKELEY

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UCB Food Chain Sampling Results

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Radionuclides, once deposited by rainwater or air onto the ground, will find their way through the ecosystem. We are already tracking its path from **rainwater** to **creek runoff** to **tap water**, but we would also like to monitor how much these isotopes that make their way into our food. For example, how much gets taken up by the grass and eventually winds up in our **milk**?

We have been collecting produce that is as local as possible to test for the radioactive isotopes. We might expect different kinds of plants to take up different quantities of cesium and iodine, so we are trying to measure as many different plants and fruits as we are able to. So far, we have measured **grass**, **wild mushrooms**, **spinach**, **strawberries**, **cilantro**, **kale**, and **arugula**. We have also measured local **topsoil**.

The topsoil, grass, and wild mushroom samples collected so far all come from the same place, so comparing grass samples to each other is a fair "apples to apples" comparison. For most of the produce, different samples came from different markets and different farms, so there will be many factors influencing the results. This variety of produce helps provide a picture of the food chain as a whole. But for understanding the time-dependence of the food chain results, the grass and soil is what to look at.

In the tables below, we are providing two numbers for each of the isotopes. The first is a standard concentration unit of Becquerel per kilogram (Bq/kg) which is the number of particles decaying per second in each kilogram of the sample. The number in parentheses after the activity is the number of kilograms that one would need to consume to equal the radiation exposure of a single round trip flight from San Francisco to Washington D.C. (0.05 mSv). For more information on how this equivalent dose is calculated, the details are here: **How Effective Dose is Calculated**

The experimental setup used for the food testing is the same setup used for the **Rainwater Collection Experiment**.

Topsoil

source: Alameda, CA

Collection Date	Sample Mass	I131	I132	Cs134	Cs137	Te132	Data
	kg	Bq/kg (kg**)	Bq/kg (kg**)	Bq/kg (kg**)	Bq/kg (kg**)	Bq/kg (kg**)	
04/06/2011 10:15	1.04	12.42±1.24 [MDA=0.25] (89)	less than MDA [MDA=0.38]	0.99±0.10 [MDA=0.25] (2.6E+03)	1.53±0.15 [MDA=0.33] (2.4E+03)	less than MDA [MDA=0.17]	data
04/08/2011 08:00	0.91	7.55±0.76 [MDA=0.31] (1.5E+02)	less than MDA [MDA=0.51]	0.41±0.08 [MDA=0.31] (6.3E+03)	0.90±0.12 [MDA=0.39] (4.1E+03)	less than MDA [MDA=0.19]	data
04/13/2011 08:00	1.30	3.79±0.38 [MDA=0.18] (2.9E+02)	less than MDA [MDA=0.25]	1.04±0.10 [MDA=0.21] (2.5E+03)	1.16±0.12 [MDA=0.26] (3.2E+03)	less than MDA [MDA=0.13]	data

Grass

source: Alameda, CA

Collection Date	Sample Mass	I131	I132	Cs134	Cs137	Te132	Data
	kg	Bq/kg (kg**)	Bq/kg (kg**)	Bq/kg (kg**)	Bq/kg (kg**)	Bq/kg (kg**)	
04/03/2011 10:00	0.4	9.93±0.99 [MDA=0.31] (1.1E+02)	less than MDA [MDA=0.61]	6.99±0.70 [MDA=0.37] (3.7E+02)	7.04±0.70 [MDA=0.42] (5.3E+02)	less than MDA [MDA=0.26]	data
04/05/2011 08:30	0.36	6.82±0.68 [MDA=0.54] (1.6E+02)	less than MDA [MDA=1.07]	4.39±0.44 [MDA=0.72] (5.9E+02)	3.80±0.38 [MDA=0.79] (9.7E+02)	less than MDA [MDA=0.34]	data
04/06/2011 20:00	0.26	6.02±0.60 [MDA=0.65] (1.8E+02)	less than MDA [MDA=1.09]	4.61±0.46 [MDA=0.85] (5.6E+02)	5.26±0.53 [MDA=0.93] (7E+02)	less than MDA [MDA=0.40]	data
04/11/2011 07:30	0.51	1.55±0.15 [MDA=0.29] (7.2E+02)	less than MDA [MDA=0.38]	1.63±0.16 [MDA=0.30] (1.6E+03)	2.20±0.22 [MDA=0.39] (1.7E+03)	less than MDA [MDA=0.16]	data

04/14/2011 08:00	0.45	1.03±0.12 [MDA=0.39] (1.1E+03)	less than MDA [MDA=1.19]	1.38±0.15 [MDA=0.48] (1.9E+03)	1.24±0.18 [MDA=0.61] (3E+03)	less than MDA [MDA=0.31]	data

Wild Mushrooms

source: Alameda, CA

Collection Date	Sample Mass	I131	I132	Cs134	Cs137	Te132	Data
	kg	Bq/kg (kg**)	Bq/kg (kg**)	Bq/kg (kg**)	Bq/kg (kg**)	Bq/kg (kg**)	
04/02/2011 10:00	0.39	7.35±0.73 [MDA=0.37] (1.5E+02)	less than MDA [MDA=1.15]	less than MDA [MDA=0.33]	less than MDA [MDA=0.40]	less than MDA [MDA=0.22]	data

Spinach

source: various local organic farms

Collection Date	Food Mass	I131	I132	Cs134	Cs137	Te132	Data
	kg	Bq/kg (kg**)	Bq/kg (kg**)	Bq/kg (kg**)	Bq/kg (kg**)	Bq/kg (kg**)	
04/08/2011 (Best By Date)	0.284	1.47±0.15 [MDA=0.50] (7.5E+02)	less than MDA [MDA=0.88]	less than MDA [MDA=0.43]	less than MDA [MDA=0.62]	less than MDA [MDA=0.29]	data
04/06/2011 (Purchase Date)	0.3	1.44±0.15 [MDA=0.54] (7.7E+02)	less than MDA [MDA=1.66]	less than MDA [MDA=0.89]	less than MDA [MDA=0.60]	less than MDA [MDA=0.28]	data
04/07/2011 (Purchase Date)	0.25	2.50±0.25 [MDA=0.63] (4.4E+02)	less than MDA [MDA=0.97]	0.89±0.19 [MDA=0.73] (2.9E+03)	1.14±0.25 [MDA=0.96] (3.3E+03)	less than MDA [MDA=0.38]	data

Strawberries

source: various local organic farms

Purchase Date	Food Mass	I131	I132	Cs134	Cs137	Te132	Data
	kg	Bq/kg (kg**)	Bq/kg (kg**)	Bq/kg (kg**)	Bq/kg (kg**)	Bq/kg (kg**)	
04/01/2011	1.23	0.21±0.03 [MDA=0.10] (5.3E+03)	0.35±0.07 [MDA=0.29] (4.3E+05)	0.71±0.07 [MDA=0.13] (3.6E+03)	0.72±0.07 [MDA=0.15] (5.1E+03)	less than MDA [MDA=0.07]	data
04/07/2011	1.06	0.32±0.04 [MDA=0.15] (3.5E+03)	less than MDA [MDA=0.41]	0.50±0.06 [MDA=0.19] (5.2E+03)	0.48±0.07 [MDA=0.23] (7.7E+03)	less than MDA [MDA=0.10]	data

Cilantro

source: various local organic farms

Purchase Date	Food Mass	I131	I132	Cs134	Cs137	Te132	Data
	kg	Bq/kg (kg**)	Bq/kg (kg**)	Bq/kg (kg**)	Bq/kg (kg**)	Bq/kg (kg**)	
04/04/2011	0.5	less than MDA [MDA=0.34]	less than MDA [MDA=0.41]	less than MDA [MDA=0.34]	less than MDA [MDA=0.56]	less than MDA [MDA=0.15]	data

Kale

source: various local organic farms

Purchase Date	Food Mass	I131	I132	Cs134	Cs137	Te132	Data
	kg	Bq/kg (kg**)	Bq/kg (kg**)	Bq/kg (kg**)	Bq/kg (kg**)	Bq/kg (kg**)	
04/06/2011	0.34	less than MDA [MDA=0.64]	less than MDA [MDA=0.81]	less than MDA [MDA=0.87]	0.65±0.17 [MDA=0.62] (5.7E+03)	less than MDA [MDA=0.34]	data
04/07/2011	0.38	0.93±0.13 [MDA=0.47] (1.2E+03)	less than MDA [MDA=0.64]	1.14±0.20 [MDA=0.80] (2.3E+03)	0.59±0.15 [MDA=0.57] (6.2E+03)	less than MDA [MDA=0.28]	data

Arugula

source: various local organic farms

Purchase Date	Food Mass	I131	I132	Cs134	Cs137	Te132	Data
	kg	Bq/kg (kg**)	Bq/kg (kg**)	Bq/kg (kg**)	Bq/kg (kg**)	Bq/kg (kg**)	

04/07/2011	0.38	0.41±0.07 [MDA=0.24] (2.7E+03)	less than MDA [MDA=1.11]	less than MDA [MDA=0.35]	0.66±0.12 [MDA=0.45] (5.6E+03)	less than MDA [MDA=0.19]	**data**

** The number in parentheses is the number of kilograms of the item that one would need to consume to equal the radiation exposure of a single round trip flight from San Francisco to Washington D.C. (0.05 mSv). To see how we calculate these numbers, please visit **our explanation of the equivalent dose calculation**.

Note: "MDA" is the estimated minimum detectable activity for a given isotope in the detector.

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