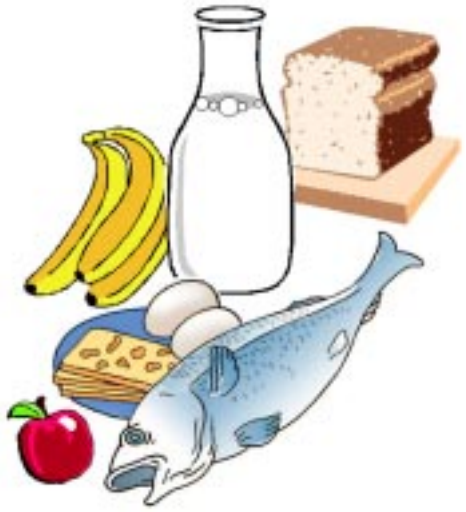
Internal Exposure from Radioactivity in Food and Beverages

All of the foods that we eat and beverages we drink contribute to some extent to our internal exposure to radiation. These foods are naturally radioactive. They contain elements like potassium and carbon that are essential for good health and cannot be eliminated from our diets, but also trace quantities of uranium, thorium, and other elements.



Potassium-40

Potassium-40 is a radioisotope of naturally occurring potassium. Potassium-40 contributes 18 millirem to our average annual radiation dose.

Directions: Use the chart entitled "Potassium Content and Potassium-40 Activity in Some Selected Foods" to answer the following questions.

1. List four foods you have eaten this week that contain potassium.

2. If the radioactivity of 1 gram of natural potassium is 30 disintegrations per second (d/sec) and a small banana contains about 0.4 grams of natural potassium, what is the number of disintegrations per second of this banana? ("Disintegrations per second" is a standard measurement of the intensity of the radiation emitted by any radioactive substance.)

3. The activity of the radioactive potassium-40 in your body is about 60 disintegrations per second per kilogram (d/sec/kg) of body weight.

   a. How much do you weigh? (in pounds) _____

b. If 1 kilogram (kg) = 2.2 lbs., how much do you weigh in kilograms? _____

c. Given the activity of potassium-40 above, what is the activity of potassium-40 in your body in disintegrations per second (d/sec)? _____

Carbon-14

The second largest contributor to our annual internal exposure is carbon-14, a naturally occurring radioactive isotope of carbon. It contributes about 1.2 millirem to our average annual radiation dose.

4. Our bodies are about 23 percent carbon by weight. Because it contains some carbon-14, the carbon in your body has an activity of 227 disintegrations per second per kilogram.

   a. Based on your weight in kilograms (from question 3b), how much of your body is carbon? Express your answer in kilograms of carbon._____

   b. Given the activity of carbon-14 in the carbon of your body, and your weight in kilograms, what is the total activity (disintegrations per second) of the carbon in your body?

Radioactivity in Water

5. Your local city or town's water supply must be tested regularly for many pollutants, including alpha and beta emmitters as well as radium and uranium. Obtain test results from your nearest municipal water supply organization. (The results may be available online via the Web.) Note how far from EPA limits your water supply may be. Then compare them with results for the same contaminants for the Las Vegas Valley Water District for the year 2004. The Las Vegas results can be found at http://www.lvwd.com/assets/pdf/wqr2004_complete pdf. Is there cause for alarm? Why or why not?

Your Health and Radioactivity in Food and Beverages

6. Should you try to eliminate all potassium or carbon or water from your diet in an effort to reduce your annual internal exposure to ionizing radiation? Why or why not? _____

Potassium Content and Potassium-40 Activity in Some Selected Foods

Food	Portion	Potassium (milligrams)	Potassium-40 (disintegrations per second)
Meat, fish, poultry			
Hamburger	4 ounces	960	29
Salmon, canned	3.5 ounces	350	10.5
Tuna, canned	3.5 ounces	240	7
Chicken, fried	1/4 chicken	240	7
Hot dogs	2 regular	200	6
Bacon	1 strip	17	0.5
Vegetables			
Red kidney beans	1/2 cup	980	29
French fries	3.5 ounces	650	19.5
Potato, baked	1 average	500	15
Broccoli	1 stalk	270	6.6
Tomato	1 small	240	5.7
Corn	1 ear	200	6
Green beans	1/2 cup	100	3
Fruits and fruit juices			
Banana	1 small	370	9
Orange	1 medium	300	7
Orange juice, frozen	1/2 cup	230	7
Apple	1 medium	160	5
Lemonade, frozen	1/2 cup	18	0.5
Milk and milk products			
2%	1 cup	380	11.4
Whole	1 cup	370	11
Yogurt (skim milk)	1 cup	320	9.6
Ice cream	4 ounces	50	1.5
Other beverages			
Hot chocolate	1 packet	190	5.7
Pepsi Cola	12 ounces	13	0.4
Coca Cola	12 ounces	4	0.1
Sprite	12 ounces	0	0
Cereals			
Bran, flakes	1 ounce	140	4.2
Oatmeal	1 cup	130	4
Wheat, shredded	1 ounce	50	1.5
Corn, flakes	1 ounce	14	0.4
Rice, crisped	1 ounce	14	0.4
Bread, crackers, cookies			
Graham crackers (2)	1/2 ounce	50	1.5
Whole wheat, 1 slice	1 ounce	70	2.1
White, 1 slice	1 ounce	30	0.9
Miscellaneous			
Sunflower seeds	3.5 ounces	920	27.6
Peanuts	1/2 ounce	110	3.3
Peanut butter	1 tablespoon	100	3
Egg	1 large	65	2

Source: Potassium concentrations from U.S. Dietary Goals, *U.S. Department of Agriculture, 1977 and Natow, A.B. and J. Heslin*, Nutrition for the Prime of Your Life, *New York, McGraw, 1984*.