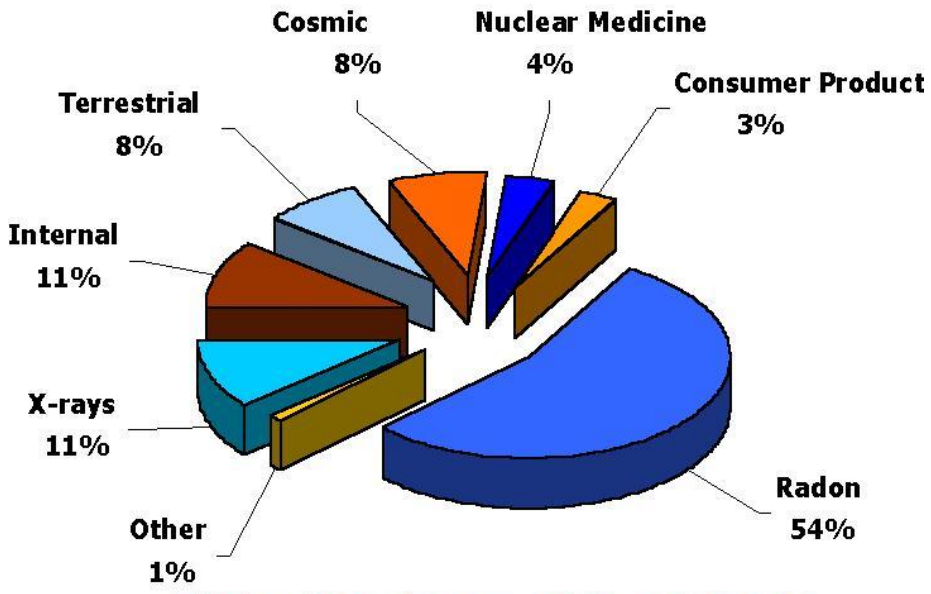

Our exposure to many unavoidable sources of radiation is a fact of life, and one that can seldom be modified by simple lifestyle changes. Each year, on average, a single human is exposed to sources of radiation from the food supply, cosmic rays, the ground beneath your feet and various medical diagnostic and treatment regimens. Health physicists, professionals who monitor and determine the consequences of human radiation impacts, have estimated that the average human accumulates about 365 millirem/year (3.65 milliSeivert/year) as a typical radiation 'background' exposure. The pie graph above shows the breakdown of this exposure in terms of the known categories of sources.

Problem 1 - A health physicist wants to study the day-to-day exposure changes using a device called a dosimeter. What is the daily radiation exposure rate in A) milliRem? B) microSeiverts?

Problem 2 – On the pie graph above, three categories are natural and unavoidable (terrestrial, internal and cosmic) while four categories can be altered by lifestyle choices (Radon, X-rays, Nuclear medicine and consumer products). What is the total exposure rate from the natural, and the total exposure rate from the lifestyle contributions to your annual background exposure in A) milliRem/year B) microSeiverts/day?

Problem 3 - The Japan 2011 earthquake caused nuclear power plant exposures amounting to an additional 50 microSeiverts/hour for someone living 30 km from the Fukushima Nuclear Plant. A) How many microSeiverts is this per day? B) In terms of the three components 'Lifestyle', 'Natural' and 'Fukushima', how will the percentage contributions to the daily radiation dose change when the Fukushima source is included in terms of microSeiverts/day?

Problem 1 - A health physicist wants to study the day-to-day exposure changes using a device called a dosimeter. What is the daily radiation exposure rate in A) milliRem? B) microSeiverts?

Answer: 365 milliRem/year x (1 year/365 days) = **1 milliRem/day**. B) 3.65 milliSeiverts/year x (1 year/365 days) x (1,000 microSeiverts/1 milliSeivert) = (0.01)x (1000) = **10 microSeiverts/day**.

Problem 2 - On the pie graph, three categories are natural and unavoidable (terrestrial, internal and cosmic) while four categories can be altered by lifestyle choices (Radon, X-rays, Nuclear medicine and consumer products). What is the total exposure rate from the natural, and the total exposure rate from the lifestyle contributions to your annual background exposure in A) milliRem/year B) microSeiverts/day?

Answer:

Unavoidable	**Lifestyle**
Terrestrial = 8%	Radon = 54%
Internal = 11%	X-rays = 11%
Cosmic = 8%	Medicine = 4%
	Consumer = 3%
Total = 27%	**Total = 72%**

A) For 365 milliRem/year:
Unavoidable = 0.27 x 365 milliRem/year = **99 milliRem/year**
Lifestyle = 0.72 x 365 milliRem/year = **263 milliRem/year**

B) For 10 microSeiverts/day:
Unavoidable = 0.27 x 10 = **2.7 microSeiverts/day**
Lifestyle = 0.74 x 10 = **7.4 microSeiverts/day**.

Problem 3 - The Japan 2011 earthquake caused nuclear power plant exposures amounting to an additional 50 microSeiverts/hour for some one living 30 km from the Fukushima Nuclear Plant. A) How many microSeiverts is this per day? B) In terms of the three components 'Lifestyle', 'Unavoidable' and 'Fukushima', how will the percentage contributions to daily dosage change when the Fukushima source is included in terms of microSeiverts/day? Answer: If the pie graph is based upon 10 microSeiverts/day total, of which 2.7 microSeiverts/day are unavoidable background radiation, and 7.4 microSeiverts/day are from various Lifestyle choices. Then:

A) The Fukushima radiation at 30 kilometers is 50 microSeiverts/hour or in terms of a daily dosage, 24 hours x 50 microSeiverts/hour = **1200 microSeiverts/day.**

B) The total dosage would be 2.7 + 7.4 + 1200 = 1210 microSeiverts/day. The contributions would then be
Unavoidable = 100% x (2.7/1210) so **Unavoidable = 0.2 %**
Lifestyle = 100% x (7.4/ 1210) so **Lifestyle = 0.6 %**
Fukushima = 100% (1200/1210 so **Fukushima = 99%**