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51-D

Radiation and Sources of Internal Dose

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What is Tritium (H-3) ?

- An isotope of Hydrogen with two neutrons

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What is Tritiated water ?

- Water in which at least one hydrogen atom is H-3

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How much H-3 is in the environment ?

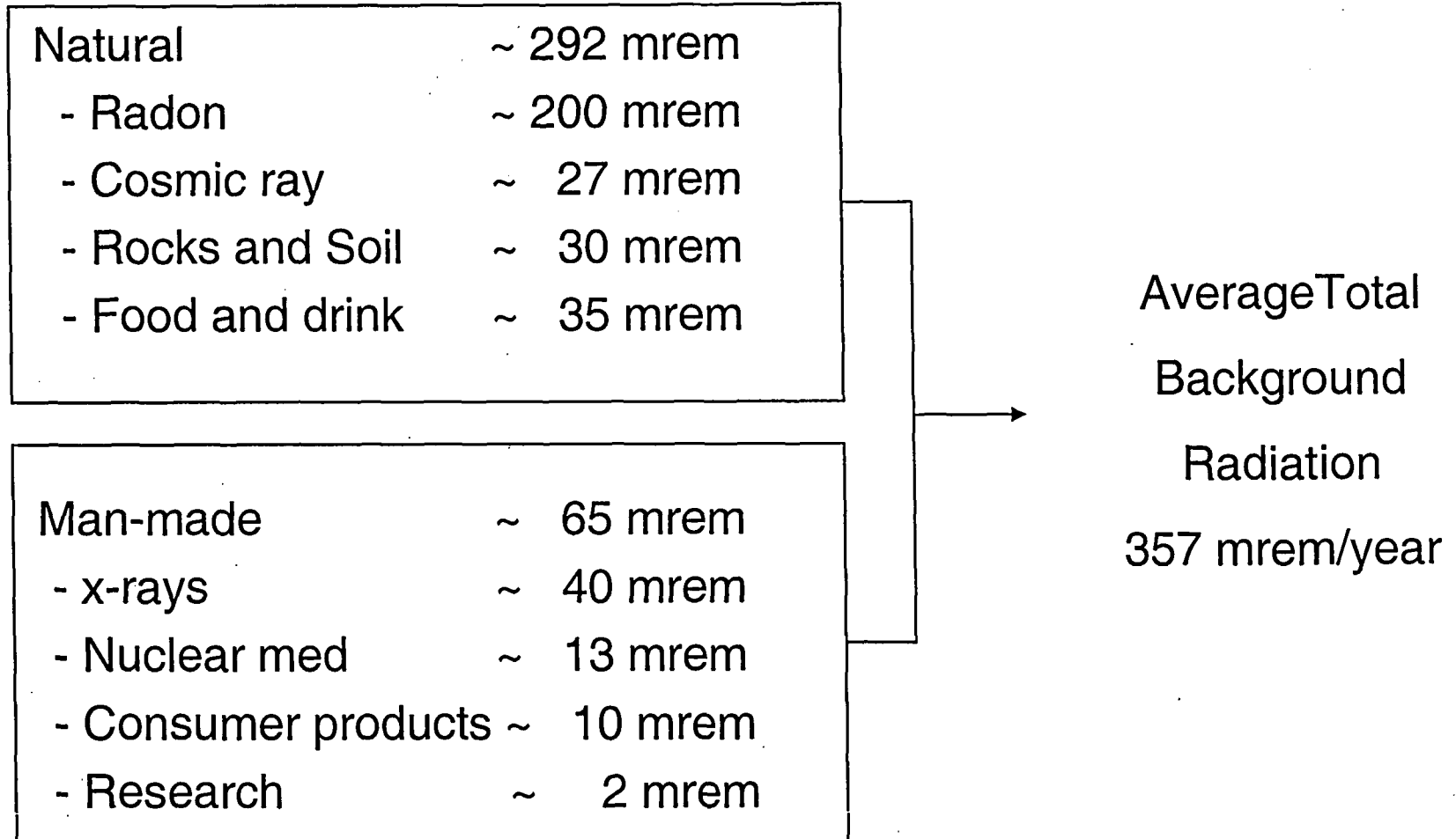
- Cosmic rays produce 4,000,000 curies per year
- The total tritium in the environment is about 70,000,000 curies

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Quantity of Radioactive Material

- Traditional unit - curie (Ci)
- Sub-unit - picocurie (pCi)
- Comparison
 - 1 pCi = 10^{-12} Ci or a trillionth of a curie

Sources of Radiation



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EPA Drinking Water Limit

- 20,000 pCi/l
- At this concentration, drinking 2 liters of water per day will result in a dose 4 mrem per year

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Tritium in Well Water

- The highest concentration of tritium found in a well supplying drinking water is:

1,524 pCi/l

- At this concentration, drinking 2 liters per day will result in 0.3 mrem per year.

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Other Sources of Internal Dose

Dose from C-14

- The concentration of C-14 in natural carbon is 7 pCi/g
- Human Reference Diet = 300 g carbon/day
- Resulting in 1.9 mrem per year from carbon in food

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Potassium-40 (K-40) Dose

- The concentration of K-40 in natural potassium is 820 pCi/g
- Human Diet = 2 - 5 g/day
- Resulting in a K-40 dose between 10 mrem per year and 25 mrem per year

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Annual Dose from K-40 In Specific Foods

- 1 banana per day = 2.6 mrem
- 1 8 oz. glass of orange juice per day = 2.5 mrem
- 1 medium baked potato per day = 4.3 mrem
- 1 cup Total raisin bran per day = 1.8 mrem
- 1 double burger sandwich per day = 2.9 mrem
- 1 large order of fries per day = 4.7 mrem
- 1 cup cantaloupe per week = 0.4 mrem
- 1 cup spinach per week = 0.6 mrem
- 6 oz halibut fillet per week = 0.7 mrem

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Smoking

- The average annual dose from Po-210 in tobacco is 2000 mrem
- Hot spots (bronchial bifurcations) may receive up to 16,000 mrem per year

Biological Effects

- We know that radiation may cause damage in tissue
- No effects have been found from low doses, under 10,000 mrem
- To be conservative, limits are set below doses where effects are detected

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Questions ??

