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## Inspections, Compliance, Enforcement, and Criminal Investigations

### Radiation Protection Terminology

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**DEPT. OF HEALTH, EDUCATION, AND  
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#### ITG SUBJECT: RADIATION PROTECTION TERMINOLOGY

The recent incident at the Soviet Union's Chernobyl nuclear power plant has heightened concerns for radioactive contamination in FDA regulated products. The potential hazard will undoubtedly necessitate increased sampling of both imported and domestic food products such as produce, milk, etc. A list of technical terms has been compiled to serve as a quick reference for the terminology associated with radiation protection. If you have any concerns and questions on radiation protection, contact the Regional Radiological Health Representatives (RRHR).

alpha particle ( $\alpha$ )	A charged particle emitted from the nucleus of an atom having a mass and charge equal in magnitude to a helium nucleus. It cannot penetrate the outer layer of the skin and represents very little external hazard.
becquerel (Bq)	A unit of measurement of activity. See the Conversion Table.
beta particle ( $\beta$ )	A charged particle emitted from the nucleus of an atom, with a mass and charge equal in magnitude to that of the electron. It has a penetrating range of a few feet in air and can be easily stopped by a thin sheet of metal or plastic.
counter	Geiger-Muller (G-M) counter  A radiation detection and measuring instrument consisting of a gas-filled tube and associated electronic circuits.  Scintillation counter  A radiation measuring instrument consisting of phosphor, photomultiplier tube, and associated electronic circuits for counting light emissions produced in the phosphor by ionizing radiation. It is a more sensitive device than the G-M counter.

curie (Ci)	<p>The special unit of activity. One curie equals <math>3.7 \times 10^{10}</math> nuclear transformations per second. This unit reflects the intensity of the radioactive source.</p> <p>Some common fractions are:</p> <p>    Millicurie: One thousandth (<math>10^{-3}</math>) of a curie (mCi)</p> <p>    Microcurie: One millionth (<math>10^{-6}</math>) of a curie (<math>\mu\text{Ci}</math>)</p> <p>    Nanocurie: One billionth (<math>10^{-9}</math>) of a curie (nCi)</p> <p>    Picocurie: One millionth of a microcurie (<math>10^{-12}</math>) (pCi)</p>
dose, absorbed	<p>The energy imparted to matter by ionizing radiation per unit mass of irradiated material. The unit of absorbed dose is the rad.</p>
dose equivalent (DE)	<p>The quantity that expresses all radiation on a common scale for calculating the effective absorbed dose. It is defined as the product of the absorbed dose in rads and certain modifying factors. The unit of DE is the rem.</p>
dosimeter	<p>A portable instrument for measuring and registering total accumulated gamma ray exposure. Two common types are the "self-reading" pocket size dosimeters and the TLD (thermal luminescent dosimeter) requiring laboratory processing. Dosimeter readings are normally in roentgens or milliroentgens.</p>
exposure	<p>A measure of the ionization produced in the air by X or gamma radiation. The special unit of exposure is the roentgen.</p>
gamma ray ( )	<p>High-energy, short wavelength electromagnetic radiation, emitted from the nucleus. Gamma rays are similar to X-rays, but are usually more energetic. It travels at the speed of light and is the most penetrating type of radiation.</p>
half-life, radioactive	<p>gray (Gy) A unit of absorbed dose. See the Conversion Table.</p> <p>Time required for a radioactive substance to lose 50% of its activity by decay. Each radionuclide has a unique half-life.</p>

## Radionuclide Half-life (approximate)

barium (Ba) 13 days  
140

cesium (Ce) 2 years  
134

cesium (Ce) 30 years  
137

cobalt (Co) 5 years  
60

iodine (I) 8 days  
131

strontium 30 years  
(Sr) 90

Protective Action Guides Refer to Federal Register, Oct. 22, 1982. for human food (FDA)

rad (radiation  
absorbed dose)

The unit of absorbed dose equal to 100 ergs per gram or 0.01 joule per kg.

radiation, background

Radiation arising from radioactive material in the environment. Background radiation due to cosmic rays and natural radioactivity is always present. The estimated total dose a person receives from natural radiation in the U.S. is 100 mrem/year.

radiation, external

Radiation from a source outside the body.

radiation, internal

Radiation from a source within the body (as a result of the deposition of radionuclides in body tissue).

radiation, ionizing

Any electromagnetic or particulate radiation capable of producing ions, directly or indirectly, in its passage through matter.

relative biological  
effectiveness

The RBE is a factor used to compare the (RBE) biological effectiveness of absorbed Radiation doses (i.e., rads) due to different types of ionizing radiation. The RBE is the ratio of rem to rad.

rem (roentgen  
equivalent man)

A special unit of dose equivalent. The dose equivalent in rems is numerically equal to the absorbed dose in rads multiplied by certain modifying factors. With X or gamma rays, the factor is close to

one, so 1 rem is equal to 1 rad.

roentgen (R)	The special unit of exposure. One roentgen equals $2.58 \times 10^{-4}$ coulomb per Kg. of air.
sievert (Sv)	A unit of dose equivalent. See the Conversion Table.
X-rays	Penetrating electromagnetic radiation whose wave lengths are shorter than those of visible light. In nuclear reactions, it is customary to refer to photons originating in a nucleus as gamma rays, and those originating in the extranuclear part of the atom as X-rays. These rays are sometimes called roentgen rays, after their discoverer, W. K. Roentgen.

### **CONVERSION TABLE**

	international	int'l system units	old special	conversion
quantity	unit & symbol		unit & symbol	
	used in Europe		factor	
	and Canada		used in U.S.	
activity	becquerel	s <sup>-1</sup>	curie (Ci)	1 Bq ?? 27 pCi
	(Bq)			
exposure	-	Ckg <sup>-1</sup>	roentgen (R)	1 Ckg <sup>-1</sup> ?? 3876 R
absorbed	gray (Gy)	Jkg <sup>-1</sup>	rad (rad)	1 Gy = 100 rad
dose				
dose	sievert	Jkg <sup>-1</sup>	rem (rem)	1 Sv = 100 rem
equivalent (Sv)				

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