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Occupational Health Pathfinder

Radiation

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KEY POINT SUMMARY:

- Radiation is energy that comes from a source and travels thru space and may be able to penetrate various materials
- Ionizing radiation can change the electrical charge of molecules or atoms
- Non-ionizing radiation ranges from extremely low frequency (ELF) to the higher end of ultra violet (UV) radiation
- Visible light, microwaves and radiowaves are examples of non-ionizing radiation
- Examples of ionizing radiation include UV at the short wavelength end of the UV range thru x-rays to particulate alpha, beta and gamma rays
- Different forms of radiation are experienced in a number of occupational settings from medicine and healthcare (x-rays etc), outdoor work (extreme sunlight) to industrial and construction (lasers *etc*)
- The OSHA website provides guidance on the regulations that employers need to be aware of with regards to radiation

Overview

According to the Health Physics Society, *"radiation is energy that comes from a source and travels thru space and may be able to penetrate various materials".* Radiation is either ionizing (changes the electrical charge of molecules or atoms) or non-ionizing (a series of electromagnetic waves). The electromagnetic spectrum is used to illustrate radiation according to its frequency and wave length spanning from non-ionizing to ionizing radiation. Different forms of radiation are experienced in a number of occupational settings from medicine and healthcare (x-rays *etc*), outdoor work (extreme sunlight) to industrial, nuclear installations and construction (lasers *etc*).

Radiation and its impact on health

Non-ionizing radiation ranges from extremely low frequency (ELF) with long wavelengths (often km in size) thru radiowaves and microwaves to ultraviolet (UV). Visible light appears in the non-ionizing range and is detectable to the human eye. Natural sunlight is at the UV range and can be damaging to biological systems if exposed in excess. Outdoor workers, particularly in hot climates, are susceptible to sunburn on exposed skin which poses a greater risk to developing skin cancers. Welders are also exposed to UV radiation (see our Welding Pathfinder). Power lines, electric cables and electrical systems emit ELF. There are different schools of thought regarding the health effects following exposure to ELF but some studies have suggested a link to certain forms of cancer *eg.* leukemia after prolonged and intense exposure.

Ionizing radiation has extremely short wavelength down to wavelengths of subatomic size. Examples include UV at the short wavelength end of the UV range thru x-rays to particulate alpha, beta and gamma rays. Workers from healthcare, medical, defense, nuclear installations and weapons production industries are potentially exposed to ionizing radiation. Depending on the type and intensity of ionizing radiation, biological systems such as tissues and cells can be penetrated causing local or systemic (whole body) damage and sickness. Where radiation penetrates and alters the genetic material of cells, cancers can occur.

Regulatory measures

Employers should be aware of all the regulations associated with radiation in the workplace. The OSHA website is a fantastic resource and their page on 'Radiation' (see our essential links section) leads you to specific pages regarding non-ionizing and ionizing radiation with separate links to the regulations pages. Additionally, there is an e-tool titled 'Eye and face protection' with pages specifically for those working with lasers in industries such as healthcare and construction: www.osha.gov/SLTC/etools/eyeandface/ppe/laser_safety.html.

FIND OUT MORE...

OSHA website
www.osha.gov/SLTC/radiation/index.html

US EPA
www.epa.gov/radiation/

National Institute for Occupational Safety and Health
www.cdc.gov/niosh/topics/emf/

Business Owner Briefing
Elements of a Comprehensive RF Protection Program: Role of RF Measurements (OSHA, 1995)
www.osha.gov/SLTC/radiofrequencyradiation/elem_com.html

Medical Director Review
"Reducing ultraviolet radiation exposure among outdoor workers: State of the evidence and recommendations" (Glanz et al. 2007)
www.ehjournal.net/content/6/1/22