Take 5 To prepare

East of England Ambulance Service NHS Trust

Resilience and specialist operations team briefing note:

Radiation

Every day in the UK, a wide range of radiation types are used in industrial, medical, research and communications applications. Some of these applications cause harmful exposure risks that must be effectively controlled. Radiation is generally classed as either ionising or non-ionising, with the former generally having more energy than the latter.

Ionising radiations include X-rays, gamma rays and particulate radiation (alpha, beta, and neutron radiation) and are produced from X-ray sets or radioactive substances. They are typically used in medical exposures, industrial radiography equipment and gauges used in industry for process control but may also be produced from naturally occurring radioactive substances, including radon gas.

Non-Ionising radiations include radiofrequency and microwaves; from plastic welding and some communication transmitters, infra-red; from very hot, glowing sources in glass and metal production, Ultraviolet (UV) rays; from welding or the sun and visible radiation from high-intensity light sources such as lasers.

Hazards

Ionising radiations can cause dermatitis, burns, cell damage, cataracts, and changes to the blood.

Microwaves and radio frequencies can cause heating of any exposed parts of the body, infra-red rays can cause skin burns and cataracts and UV light can cause skin burns, skin cancer, conjunctivitis, and arc eye. Lasers can cause permanent, severe damage to the eyes and skin.

Exposure to ionising and UV radiation can damage DNA and can cause health effects, such as cancer, later in life. The risks are small for low levels or exposure, but exposure to high levels of ionising and non-ionising radiations can cause acute effects such as burns, tissue and organ damage.

Measuring Radiation

Radiation is measured in a number of different ways, the Trust issued Electronic Personal Dosimeters (EPDs) detect both Beta and Gamma radiation and read these sources in a unit called the Sievert (Sv). This is a very large measurement that is normally subdivided into a milli sievert (mSv) or a micro sievert (µSv). To put this into context, 1µSv is about 1/10th of the radiation dose received on a flight to Spain and it is not unusual to receive up to 10µSv dose from natural background radiation everyday.

Effects of Radiation

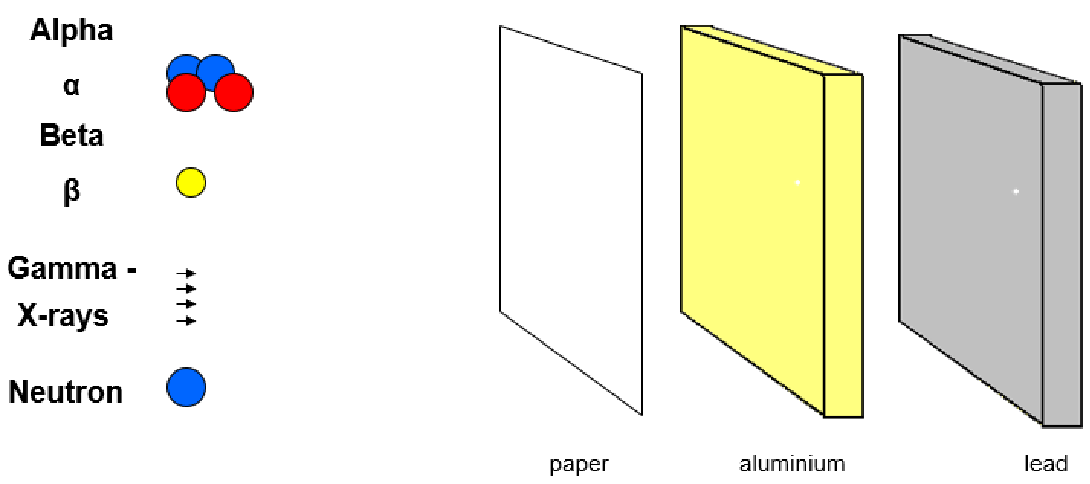
Initial symptoms of radiation poisoning include nausea, vomiting, loss of appetite and malaise. There is then usually a symptom free period followed by a second phase of symptoms that in addition to the initial symptoms, will include diarrhoea, haemorrhage and fever.

Ionising Radiation

Alpha (α) Alpha particles are large and slow. They will not travel far and can be likened to a balloon. As such, due to their size they can be stopped quite easily by something as simple as s sheet of paper.

Beta (β) Beta particles are small and quicker than alpha particles and can be likened to a tennis ball. Using this analogy, the particles will pass straight through a sheet of paper, but would be stopped by something like a sheet of aluminium.

Gamma / X-ray (γ/X) Gamma radiation is a ray, travels quickly and can be likened to a light beam. This would mean the ray will quite easily travel through the human body but would be stopped by something like lead.



Neutron (n) Exposure to free neutrons can be hazardous, since the interaction of neutrons with molecules in the body can cause disruption to molecules and atoms and can also cause reactions that give rise to other forms of radiations (such as protons).

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Protection

The effect that exposure to radiation will have will be dependent on the type of radiation as well as following three straightforward steps;

- **Time** – The longer you are exposed to a source of radiation, the larger the dose you will receive.
- **Distance** – If you double your distance from the radioactive source, you will quarter the dose rate.
- **Shielding** – By using protection you can shield yourself from radiation, Alpha particles will be stopped by paper, Beta particles by substances such as aluminium and Gamma and X-rays can be stopped by lead.

Irradiation & Contamination

Where a casualty has been exposed to a form of radiation which has irradiated the body, for example an x-ray, then this person poses no risk to Ambulance crews or Hospital staff, as the radiation source has passed through their body, rather than contaminated particles resting on the body.

Radioactive Contamination is particulate radioactivity. It can be generated when radioactive materials are dispersed, disrupted and can be present on surfaces. Contamination can be spread inadvertently or by poor control procedures. EEAST specialist assets will use a RamGene detection device to monitor any contaminated casualties.

Decontamination

When decontaminating any casualties, follow the Initial Operational Response (IOR) procedures of Remove, Remove, Remove. Expert advice on how casualties can be decontaminated can be sought from the UK Health Security Agency (UKHSA) Radiation Protection Advisors. EEAST also have a cadre of Radiation Protection Supervisors within the Resilience and Specialist Operations department.

ALARP

It is important to keep doses **A**s **L**ow **A**s **R**easonably **P**racticable.

- If you don't need to be there, move away.
- Reasonably Practicable – Allows you to do the work you need to do.

A Radiation E-Learning Module can be found on Evolve by going to Continuing Professional Development, Clinical CPD Courses and choosing Emergency Preparedness eLearning.

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