Radiation Basics Made Simple

Segment 5: Radiation Protection

There are three basic principles in radiation safety. These are time, distance, and shielding. Time simply refers to the amount of time you spend near the radioactive source. But naturally you want to minimize that. So, if I'm working in a radiation area, where radiation levels are elevated, I want to get my work done as quickly as I can, and I want to leave the area. There's no more reason for me to stay there longer.

Imagine a day at the beach. If you're out in the sun the entire day, you may get sunburned. But if you're there only for a brief period of time, you won't. So, the amount of time you're out there makes a difference.

Distance refers to the distance between you and the radioactive source, the radioactive area. And you want to maximize that to the extent you can. So, let's say that if I'm working here and making a demonstration – these are radioactive sources here. When I'm done, I'm either going to put the sources away or move myself away and increase my distance.

And you can imagine maybe sitting next to a fireplace. You sit next to a fireplace, close to it, and you feel the heat, and you're uncomfortable. So, you move to the other side of the room. So, as you move, the heat intensity decreases. And that works exactly the same way; radiation intensity decreases as you move away.

The third principle is shielding. And shielding means putting a barrier, some shield, between yourself and radioactive source. In a previous segment, we demonstrated how we used different material, plastic or a piece of paper or lead, between the source and the detector to shield it. Now, it's not always that easy, because radioactive sources may not be that small to be easily shielded.

For example, first responders may report to a scene where there's been an accident and there's radioactive material, but they can't easily shield the scene. So, they would deploy the principle of time, and try to decrease their time they spend on the scene. But let's say for people, when they have widespread contamination in the environment they can seek shelter inside a building. That would offer them protection.

Or let's say a surgeon who's operating on an injured individual and the surgeon removes a piece of shrapnel and it happens to be radioactive. They can put it in a lead container and shield the staff from the source. That's shielding.

There's one acronym that I'd like you to remember, and that's ALARA; stands for As Low as Reasonably Achievable. That's the guiding principle for controlling exposures to ionizing radiation. And what that means is that even if the dose is small, if receiving that dose doesn't offer you or anybody else any direct benefits, you should avoid it.

To give you an example, these sources that I have here to make demonstrations, I don't keep them in my office right next to me where I sit. Even though they're very small doses, and even if I did that it didn't amount to much; but there is no reason for me to do that. So, when I'm not using them, I'm not sitting right next to them. That's the philosophy of radiation protection, as low as reasonably achievable.

And in case of radiation emergency, you can take action based on these principles, of time, distance, and shielding, to protect yourself and your family. In a radiation emergency listen to instructions from emergency officials on what to do. In many cases one of the best things you can do is to stay inside until it's safe to leave. This is called sheltering in place. Now, how long you stay inside depends on the incident, the amount of damage to infrastructure like bridges and roads, and the nature of the incident itself.

If you're sheltering in place and you're in a multi-story building, move to a center floor. If you're in a single-story building, move to the center, away from the doors and windows and exterior walls. And if you're in a building that has a basement, go there. That offers you protection. But it's important always to stay tuned for instructions and information from emergency officials.

If you're a first responder or radiation worker, you have personal protective equipment that can help minimize your exposure to radiation. Respirators would help protect against inhalation hazard. Protective clothing would keep contamination off your skin and hair. Alarming dosimeters can help you manage stay time and track your dose. These devices provide real-time measurements that allows responders to gauge the hazard and work within the principle of ALARA.

Anyone who's expected to respond to a radiation emergency should work with their safety officers and radiation safety professionals to determine what personal protective equipment and what instrument they need to stay safe on the job.