THE 3 PRINCIPLES OF RADIATION SAFETY

X-rays are a form of electromagnetic radiation that has high-energy, high-frequency, and short-wavelength rays. These rays are classified as ionizing because they can create atomic ions or charged atoms, specifically in biological tissues (ie, animal and human tissue).

Three basic principles should be adhered to when dealing with radiation and making radiographs:
- Time
- Distance
- Shielding.

These principles form the basis of a broader radiation safety concept called ALARA (As Low As Reasonably Achievable).

TIME
Time refers to the time the patient or the technician/veterinarian is exposed to primary (x-rays in the collimated beam directed toward the patient) or secondary (x-rays scattered away from the patient and outside the collimated field) radiation from the x-ray tube. Time can be minimized by:
- Keeping the time station of the x-ray machine to the lowest possible number(s) and the highest mA station, in order to obtain the desired mAs when making the exposure.
- Minimizing your time in the room during the exposure.

DISTANCE
The principle of distance means that there needs to be physical distance between the technician/veterinarian and the patient/x-ray tube at the time of exposure.
- Use of positioning devices allows everyone to physically exit the room at time of exposure.
- If there are staff in the room at time of exposure (if allowed by state law), make sure there are 2 individuals holding the patient, which allows each person to further distance themselves from the x-ray tube and area of collimation.
- Holding the patient at time of exposure provides the greatest chance of secondary or scatter radiation exposure.
- Never stand directly in front of the x-ray tube at the time of the exposure.

The x-ray intensity will exponentially decrease as one doubles the distance from the primary source of radiation; in this case, the area of the collimated patient that is being imaged. If you can move from 2 to 4 feet away, you will have decreased the intensity of the scatter radiation by 25%.

SHIELDING
Shielding is required if you are staying in the room at time of exposure or within the walls of the room.
- Shielding involves wearing lead aprons, gloves, and thyroid shields (0.5 mm lead equivalent).
- In addition, every radiation worker must be over 18 years of age, have appropriate dosimetry to record any radiation exposure, and declare pregnancy (there are strict rules and guidelines specific to pregnant radiation workers).
- Lead shielding never protects the individual from primary radiation exposure (area inside the collimated light), only secondary or scatter radiation exposure.

Radiation Regulations
Radiation safety requirements are specific to state regulations, so that a copy of the specific state radiation safety requirement for workers in veterinary medicine should be given to every staff member at the clinic as well as posted in the x-ray area. These regulations should be thoroughly reviewed with all employees on an annual basis.

ALARA = as low as reasonably achievable; mA = milliampere; mAs = milliampere × second

The information on this page can be downloaded at todaysveterinarypractice.com and printed for use in your clinic.