RADIATION SAFETY, I WILL BEAM IT INTO YOU

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The amount of exposure received during radiographic procedures depends on many factors.

- Are the personnel hand-holding every study?
- Are they wearing protective devices?
- Are they collimating to cut down on scatter radiation?

One of the basic facts is: the higher the mAs the more exposure to personnel. The X-ray machine generates approximately 23 mR per 1 mAs. Therefore, the lower the mA and the shorter the exposure time, the less the patient/operator’s radiation dose. High kVp with a thicker or larger body part can lead to secondary scatter radiation. The one most pro-active step you can take is to COLLIMATE.

COLLIMATING DOES TWO THINGS:

[1] Cuts down on secondary scatter coming off the patient which affects film quality.

a. Scatter coming off the patient will artificially darken the radiograph, this is called film fog. To reduce this will give you a better radiograph.

[2] Collimating cuts the scatter to the personnel.

a. This is a major rule of Radiology. You must show collimation on two opposing sides. (A Federal and State Guideline).

b. The American Animal Hospital Association guidelines states you must show collimations on all four sides.

c. Digital Detectors are very sensitive to scatter radiation. Whatever is outside the primary radiation field will show up on the image. If people are holding the patient on the table their hands will show up if they are not wearing protective gloves. This is when collimating is even more important. These detectors are BIG tattletales.

d. Using sandbags and other restraining devices help keep the hands off the patients.

HOW MUCH EXPOSURE IS TOO MUCH?

The Federal mandated maximum exposure allowed per year is 5,000 mR, whole body and lens of the eye. This allows for a rate of a little less than 100 mR per week. It would be extremely rare that any Veterinary Technician could ever receive this amount of exposure using modern equipment. The use of appropriate collimation, rare earth screens, proper protective apparel and good techniques greatly reduces personnel exposure to X-rays.

MONITORING DEVICES

Any person capable of receiving or exceeding 500 mR per year in an occupation is required by Environment Health and Safety to be monitored for radiation exposure. This means the person making the exposure as well as everyone in the room. If your X-ray machine is in the general treatment area this is considered your radiology room.

When monitoring personnel there are several devices you can use.

FILM BADGE

- A film badge is a piece of film wrapped in protective paper placed in a holder with different filters in it.
- The badge is read once a month to monitor your exposure to X-rays.
- The badge will separate out exposure to your whole body (deep), eyes and hands (shallow). Each body part will be given a reading (hopefully it is Zero).
- These badges give you a monthly, year-to-date, and lifetime readings.
- If you leave one practice and go to another then you should take your information with you so your new employer can give it to your new dosimeter company.

T.L.D (THERMO-LUMINESCENT-DOSIMETER)

- It does the same thing as a Film Badge.
- T.L.D. is made up of a crystal that absorbs the energy of X-rays. The crystals are heated up and the light they give off is proportional to the X-rays it was exposed to.

Both devices should be worn at your collar level outside the lead apron and thyroid shield.
- Never wash your badges
- Do not leave them on the dash of your car, the heat will artificially fog the film
- Do not share your badge
- Never leave it in the X-ray room or close to the X-ray machine

THE GOLDEN RULE

Time, Distance and Shielding are the spoken and unspoken rules. Besides collimating, these three factors are major in controlling exposure to X-rays.

TIME IS HOW MUCH TIME YOU ARE IN THE ROOM OR HAND-HOLDING THE PATIENTS.

- Limit the amount of time you are in the room by using sandbags and other restraining devices.
- Rotate the personnel so that one person is not taking all the radiographic studies.

DISTANCE IS HOW MUCH LESS EXPOSURE YOU GET BY STEPPING AWAY FROM THE TABLE.

- The Inverse Square Law of physics stipulates that every time the distance from the source doubles, the exposure factor decreases by a factor of four. An example would be: if there are 100 mR of scatter radiation 1 inch from the patient and you double that distance to 2 inches away from the patient you have reduced your exposure to 25 mR, at 4 inches it is reduced to 6.25 mR, and at 8 inches it is only 1.56 mR.
- You can see that we have lowered...
the personnel exposure from 100 mR to less than 2 mR by moving 8 inches from the patient which is the source of secondary scatter radiation.

**Shielding is limiting the exposure to X-rays.**

- Use of lead-lined gloves and aprons to protect you from secondary scatter.
- Thyroid shields are highly recommended. The thyroid is your most sensitive blood producing organ that is exposed to X-rays. Mess with your thyroid and you are really messing up your body.
- It is important to remember gloves and aprons are not thick enough to stop primary radiation. Gloves with your hand in them or any other body part should never be in the primary beam!

**Rules and Regulations**

The rules and regulations are set by the Nuclear Regulatory Agency and must be adopted by each state. The states may make these rules tougher or stricter but they may not decrease these standards. The A.L.A.R.A. regulation mandates that you must make every attempt to keep X-ray exposure as low as reasonably achievable. Part of the A.L.A.R.A. standard requires that you have available restraint and positioning devices that allow the operator and other personnel to step away from the table when the exposure is being produced.

**Hard Fast Rules**

**Age**

Be Careful, this one that can get your practice in big trouble. No one under the age of 18 years old may be in the room or helping hold the patients while the exposure is being produced.

**Pregnant Women**

There is no law or rule that says pregnant women cannot take radiographic studies. What they do say is that a woman must declare her pregnancy and state the due date. This then changes her status as how much exposure she can accumulate during her pregnancy. Currently it is 500 mR for the nine-month period. Common Sense says to stay out of the room. The most sensitive time is the first three months when the cells are rapidly dividing. Damage one cell and generations to follow can be affected.

**Radiology is a great diagnostic tool. Basic understanding and common-sense help keep those radiographs looking like they should with good safety skills in mind.**

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