



Veterinary loss prevention program: Radiation exposure in the veterinary setting

Radiation exposure in the veterinary setting

Trainer's overview

To help your employees get the most out of their training sessions, trainers should:

- Conduct the training sessions in a relatively quiet and uninterrupted environment.
- Keep the sessions for the same time and day of the month (e.g., 12:30 p.m. on the first Tuesday).
- Give out employee handouts along with pencils/pens.
- Review the trainer's guide, employee handout, and any references.
- Keep the sessions to a maximum of 20 minutes.
- Give personal examples of incidents or prevention techniques that worked for them.
- Ensure all employees who attend sign the Safety Training Sign-in Sheet for documentation purposes.
- Conduct a second training session for the employees who could not attend the first session.

Regulations

In California, there are a variety of regulations designed to track the location, installation, and safe use of X-ray machines. These include:

- California Code of Regulations (CCR) [Title 17, Division 1, Chapter 5 Subchapter 4](#). The installation subsection is [17-30314, Veterinary Medicine Radiographic Installation](#).
- U.S. Nuclear Regulatory Commission Code of Federal Regulations 10 CFR [Part 19](#) and [Part 20](#).

Postings

- RHB 2364 poster, **Notice to Employees**, from the Radiologic Health Branch of the California Department of Public Health, needs to be posted per the posting requirements. You can download the notice from <http://www.cdph.ca.gov/pubsforms/forms/CtrlForms/rhb2364.pdf>. CCR Title 17 Section 30255.

Trainer's guide

- **Caution X-Ray** sign(s) must be posted in areas or rooms that contain permanently installed X-ray machines as the only source of radiation. CCR Title 17 Section 30305.
- Post a current copy of CCR [Title 17, Chapter 5, Subchapter 4 \(Radiation\)](#), a copy of applicable licenses for radioactive material, and a copy of operating and emergency procedures applicable to work with sources of radiation. If this is not practical, then post a notice that describes the documents and the location of these documents for examination. CCR Title 17 Section 30255.

References

- **Radiation Safety Relating to Veterinary Medicine and Animal Health Technology in California 2012** — This booklet is on the website of the California Veterinary Medical Board. It includes a radiation safety examination that unregistered assistants can use for documentation of training and knowledge. As stated in the exam, **“You may not operate radiographic equipment until you have successfully passed this examination or can provide other proof of Radiation Safety Training.”** http://www.vmb.ca.gov/forms_pubs/radguide.pdf
- U.S. Nuclear Regulatory Commission — Regulatory Guide 8.13, **Instruction Concerning Prenatal Radiation Exposure**. <http://pbadupws.nrc.gov/docs/ML0037/ML003739505.pdf>

Background

Radiographic machines are important in the treatment process of animals.

Wilhelm Röntgen developed X-rays in 1895. A major advantage of utilizing X-rays is the fact that they consist of ionizing radiation, produced mainly by artificial means, rather than by naturally occurring radioactive substances.

Exposure from X-ray machines poses a potential occupational hazard, so personnel need to be protected from excessive exposure to radiation at work. The undesirable biological risk, at the occupational dose limit of 5 rem per year for the whole body,

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Trainer's guide (continued)

is believed to be very low.

As specified in 10 CFR 20.1208, the dose equivalent limit of 0.5 rem to the embryo/fetus during the entire pregnancy, should not be exceeded. Therefore, it is highly recommended that individuals avoid any radiation exposure during pregnancy. If necessary, as an extra precaution, they should wear a “baby badge” in addition to a regular dosimeter.

Three primary means to protect from radiation are:

- **Time.** The shorter the period of exposure to radiation, the less radiation will be absorbed.
- **Distance.** The intensity of ionizing radiation rapidly decreases with distance according to the inverse square law: an object of the same size twice as far away receives only one-fourth of the energy.
- **Shielding.** People working near radiation sources are protected by barriers, including protective clothing.

Safety tips

- Only trained personnel should use radiographic equipment.
- Minors under 18 are not allowed to perform or assist in radiographic examinations. <http://www.dir.ca.gov/dlse/dlse-cl.htm>
- Pregnant women should voluntarily inform their employer, in writing, that they are pregnant, as the total dose limit to an embryo/fetus is 0.5 rem during the entire pregnancy.
- Unless required, no individuals other than the operator should be in the X-ray room while exposures are being made.
- To reduce exposure, patient-restraint devices, sedation, and/or anesthesia should be used, instead of an employee holding a patient during X-rays.
- No individual should be regularly employed to hold or support animals during radiation exposures.
- In any application in which the operator is not located behind a protective barrier during an exposure, the operator and other individuals in the room should wear clothing consisting of a protective apron with a lead equivalent of not less than 0.25 millimeters.

- Lead aprons and other personal protective equipment (lead gloves and thyroid shields) must be in good condition.

Note: Lead aprons or other personal protective equipment are not designed to protect against the primary beam.

- Dosimeter badges should be worn at the thyroid level on the outside of aprons.
- To minimize scatter radiation, the primary beam should be collimated as small as possible.
- A dead-man-type exposure switch, coupled with an electric cord of sufficient length, should be provided. This ensures that the operator is standing out of the useful beam and is at least six feet away from the animal.



Questions for discussion

In what units is the biological effect of radiation measured?

Rem. The occupational dose limit for the whole body is 5 rem per year. The dose equivalent limit of 0.5 rem to the embryo/fetus during the entire pregnancy should not be exceeded.

A dead-man type of exposure switch, together with an electrical cord of sufficient length, is required so that the operator can stand out of the useful beam. How far should the operator be from the animal during X-ray exposures?

Six feet.

Please complete the sign-in sheet. Please complete the sign-in sheet.

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Employee handout

Overview

X-rays are a form of radiation produced mainly by artificial means rather than by naturally occurring radioactive substances.

The undesirable biological risk, at the occupational dose limit of 5 rem per year for the whole body, is believed to be very low.

- Only trained personnel should use radiographic equipment.
- Minors under 18 are not allowed to perform or assist in radiographic examinations.
- Pregnant women should voluntarily inform their employer, in writing, that they are pregnant, as the total dose limit to an embryo/fetus is 0.5 rem during the entire pregnancy.
- Unless required, no individuals, other than the operator, should be in the X-ray room while exposures are being made.
- To reduce exposure, patient-restraint devices or sedation should be used, instead of an employee holding a patient during X-rays.
- No individual should be regularly employed to hold or support animals during radiation exposures.
- In any application in which the operator is not located behind a protective barrier during an exposure, the operator and other individuals in the room should wear clothing consisting of a protective apron with a lead equivalent of not less than 0.25 millimeters.
- Lead aprons and other personal protective equipment (lead gloves and thyroid shields) must be in good condition.

Note: Lead aprons or other personal protective equipment are not designed to protect against the primary beam.

- On the outside of aprons, dosimeter badges, at the thyroid level, should be worn.
- To minimize scatter radiation, the primary beam should be collimated as small as possible.
- A dead-man-type exposure switch, coupled with an electric cord of sufficient length, should be provided. This ensures that the operator is standing out of the useful beam and is at least six feet away from the animal.
- The three primary ways to protect from radiation are:
 - Time
 - Distance
 - Shielding



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