27 Veterinary Diagnostic X-ray Equipment

Scope

1. This chapter describes the requirements for keeping and using veterinary diagnostic X-ray sets.

Statutory Requirements

2. In addition to the general requirements of the Health and Safety at Work etc. Act 1974 and the Management of Health and Safety at Work Regulations 1999, the following specific legislation applies directly: Ionising Radiations Regulations 2017 (IRR17).

Duties

3. Duties as detailed in Chapter 39 apply. In addition, the following duties also apply.

Radiation Protection Supervisor (RPS)

4. The RPS is to ensure that X-ray equipment is correctly used in accordance with local orders for radiation safety including instructions and procedures. The RPS is also to ensure that reporting procedures for any incidents are followed (see Chapter 14). The RPS is normally the veterinary nurse or veterinary officer within the unit and should be appropriately trained for the role. This training should be refreshed at least every five years.

Hazard

5. X-ray sets generate a significant in beam exposure hazard. In addition, radiation from X-ray head leakage and scatter from the beam may affect areas around the X-ray head and beam.

Radiation Safety Assessment for New or Refurbished Facilities

6. For new or refurbished X-ray facilities the RPA is to be consulted at the design stage to ensure that the design of the facility, including any shielding required, is sufficient to keep doses to personnel as low as reasonably practicable.

Acceptance Testing of New X-Ray Equipment

7. Acceptance tests are to be carried out as advised by the RPA on all newly installed veterinary X-ray equipment and when an X-ray tube is replaced to ensure that radiological functions are satisfactory and to specification.

8. Guidance on design, construction and installation of veterinary X-ray equipment is available at Reference A and from the RPA.

Critical Examination and Design of New X-Ray Facilities

9. A critical radiation safety examination including an assessment of the adequacy of room shielding is to be carried out as advised by the RPA on all new or structurally modified X-ray rooms prior to being brought into routine use.

Controlled and Supervised Areas

10. General requirements relating to controlled and supervised areas are provided in Chapter 4.

11. A dedicated X-ray room containing installed X-ray equipment is designated as a controlled radiation area during exposures.

12. For mobile X-ray sets, the controlled radiation area extends in the direction of the X-ray beam until the beam is sufficiently attenuated by distance (approximately 8 m) or shielding (e.g. solid floor or wall) and out to 3 m from the X-ray tube head and in all other directions.

13. For radiography outside an X-ray room, a controlled radiation area must be demarcated using cones, tapes or cordons displaying 'X-Ray Controlled Area: Do Not Enter' signs in appropriate languages. The whole of the controlled area is to be visible to the radiographer. The X-ray set operator is to ensure that nobody is in the line of the useful beam taking into account the increasing spread of the beam with distance from the collimator. Special care is to be taken when the useful beam is horizontal. The X-ray beam is to be directed at an adequately shielded wall, e.g. solidly constructed of brick or concrete or at a suitable beam stop, such as a 2 mm thickness of lead sheet.

Radiographic Examination Considerations

14. Animal radiography is to be conducted only on the instructions of a Veterinary Officer, who will ensure that the radiographic examination is justified, be fully aware of radiation protection aspects, the radiographic procedures and techniques to be employed and that the radiation dose received by personnel present is minimised.

Operation of Veterinary X-Ray Equipment

15. Only suitably trained persons are to operate X-ray sets under the direction of a Veterinary Officer.

16. The person operating the X-ray set is responsible for ensuring the radiation safety of persons present. Non-essential personnel are to be excluded from the radiography room or demarcated controlled radiation area during such examinations. The operator is to be fully aware of the radiation protection requirements and the radiographic techniques to be employed.

17. After use, X-ray sets are to be switched off at the mains, or on the tube head for battery operated devices, and are to be secured against unauthorised use.

Training and Instruction

18. Where veterinary assistants or other persons restrain animals, they are to be provided with appropriate protective clothing and properly instructed by the Veterinary Officer in the actions to be taken during radiographic examinations before the commencement of such examinations.

Personal Protective Equipment

19. X-ray personal protective equipment (PPE) for staff includes aprons, gloves and

thyroid shields incorporating lead to reduce radiation exposure during X-ray examinations. This PPE is not designed to provide protection from the primary beam, but only from scattered radiation and that transmitted through the patient. Guidance on specific requirements for the use and storage of PPE is given in Reference A.

20. Unless positioned behind protective screens, all person's present are to wear protective aprons and stand at least 2 m from the X-ray tube. No animal is to be manually restrained for radiographic examination unless there is a clinical reason for avoidance of sedation or anaesthesia. In such circumstances the individual restraining the animal is to ensure that no part of their body is in the primary beam. Where it is necessary for a person to place their hands close to the X-ray beam for manipulation, support or restraint of an animal, protective gloves together with lead rubber hand and forearm drapes/gauntlets are to be worn. Dosemeters issued by the Approved Dosimetry Service (ADS) are to be attached to each hand inside the glove to assess the radiation dose received.

21. Each piece of X-ray PPE is to have its own identifying number. Gloves and aprons are to be visually examined at 3-monthly intervals and radiographically examined at least every 12 months for the determination of deterioration or reduction in shielding effectiveness. Records of examinations are to be kept for 2 years.

Ancillary Equipment

22. For fixed installations, a protective screen incorporating a lead-glass window and having a lead equivalence of not less than 1 mm is to be provided at the control console.

23. For work without a purpose-built table, a 1 mm thick sheet of lead larger than the maximum beam size employed is to be placed under the cassette or film in order to reduce scatter and protect feet and legs of anyone standing close to the table.

24. Special free standing or long handled cassette holders are to be available when it is necessary to support cassettes such as during horizontal beam radiography.

25. Suitable positioning aids, such as hoof blocks and lead-shot bags are to be available to assist patient positioning.

X-Ray Equipment Records

26. All units and establishments are to maintain the following records for X-ray equipment:

a. an inventory of equipment including the name of manufacturer, model number, serial number or other unique identifier, year of manufacture and year of installation; and

b. a record of all equipment defects, maintenance and QA tests.

Maintenance of Veterinary X-Ray Equipment

27. Veterinary X-ray sets are to be maintained in accordance with manufacturer's instructions, or as laid down by service maintenance departments. Servicing is to be carried out at least once a year. A record of defects and maintenance carried out on these units is to be kept by the establishment. The scattered radiation, leakage and radiation output of veterinary X-ray sets are to be examined during visits by the RPA.

28. Safety checks on the correct functioning of X-ray warning lights and automatic termination of X-ray exposures are to be carried out routinely.

Quality Assurance Performance Tests

29. The following QA tests are to be carried out:

a. accuracy of alignment of the light beam delineator with the X-ray beam;

b. check of radiographic image quality using TOR CDR or similar. If this is not available, a step wedge test tool may be used instead; and

c. analysis of undiagnostic radiographs.

X-Ray Cassettes and Processing Requirements

30. The most appropriate CR or DR cassette, compatible with a satisfactory radiograph is to be used.

31. Routine checks are to be made on the processing system to detect any deterioration in the quality of radiographs. In the event of any deterioration in the image quality a review of the equipment is to be undertaken. If such a review does not resolve the problem, then the X-ray set must be checked.

Reference

32. Reference A - Guidance Notes for the Safe Use of Ionising Radiations in Veterinary Practice, British Veterinary Association, July 2019