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The importance of dosimetry in occupationally exposed workers and auxiliaries in veterinary radiology

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Abstract

This work aims to evaluate the doses involved in veterinary diagnostic, emphasize the importance of radiation protection in veterinary medicine and the need to use protective equipment, aiming to satisfy the ALARA principle. The results of X-ray room area dosimetry showed that areas closer to the X-ray equipment are safe, with doses lower than the local background except at position (2) behind the x-ray tube. The individual doses evaluated indicate that is important to use a reliable dosimetry method for occupationally exposed workers and auxiliaries who assist the exams.

1- Introduction

The current economic moment of Brazil has enabled the advancement of areas that were not fully explored before, such as veterinary radiology. This development also revealed the importance of radiation protection in hospitals and veterinary clinics. In 2012 spending on pets (PET market) moved 4 billion dollars only in the city of Sao Paulo (Veja Magazine, October 2012). In this market **are** include expenses for food, exams and treatment. Currently the pets are considered true members of the family. In the United States it is estimated that there are 172 million domestic animals, of which 35% are considered geriatric patients. This fact opened a new front in the American Veterinary Medicine: palliative care and curative.

The reasons for using radiation in veterinary medicine are to either obtain optimum diagnostic information or to achieve a specific therapeutic effect while maintaining the radiation dose to the radiological workers and the individuals of the general public as low as reasonably achievable (the ALARA principle). Similarly, it is also important to avoid all unnecessary irradiation of the animal patient (NCRP, 148). Veneziani et al. performed works for evaluate the entrance surface skin doses received by dogs submitted to chest X-ray using thermoluminescent dosimeters (Veneziani et al., 2010). In this work the authors concluded that is extremely important the assessment of radiation doses involved in veterinary diagnostic radiology procedures, to evaluate the delivered doses to the animals, to be used as a parameter in the individual monitoring of pet's owners, who assist the animal positioning and to protect occupationally exposed workers at the Veterinary Radiology Clinics (Veneziani et al.,

2010). Seifert, H.,2008/L. Hermandez et al.,2012 show that workers receive a dose within the limits of the ICRP, with a slight variation between the type dosimeter used.

The primary goal in veterinary radiography is to produce radiographs of diagnostic quality on the first attempt. This goal serves three purposes: (1) to decrease radiation exposure to the animal patient and veterinary staff; (2) to decrease the cost of the procedure; and (3) to produce diagnostic data for rapid interpretation and treatment of the patient (Lavin, 2007).

2- Objectives and Methodology

This work aims to evaluate the doses involved in veterinary diagnostic, emphasize the importance of radiation protection in veterinary medicine and the need to use protective equipment, aiming to satisfy the ALARA principle. The work evaluated area doses at different points in the X-ray room and individual doses of occupationally exposed workers and auxiliaries who assist the exams in Hospital Veterinário Dr. Halim Atique of Centro Universitário de Rio Preto (UNIRP). In this study were used thermoluminescent dosimeters (TLDs) of calcium sulphate doped with dysprosium ($CaSO_4$:Dy) produced at Instituto de Pesquisas Energéticas e Nucleares (IPEN-CNEN).

The materials and methodology applied are described following:

2.1- Dosimetric material

- 30 TLDs of calcium sulphate doped with dysprosium ($CaSO_4$:Dy):
  - 12 TLDs used to X-ray room area monitoring;
  - 18 TLDs used to individual doses monitoring of occupationally exposed workers and auxiliaries;
- 8 plastic badges containing three filters (plastic – 3 mm thick, lead – 1 mm thick and lead 0.8 mm with a central hole 2 mm) used to X-ray room and individual doses and energy evaluation.
- 2 bracelet containing three filters (plastic – 3 mm thick, lead – 1 mm thick and lead 0.8 mm with a central hole 2 mm) used to individual doses and energy evaluation.

2.2- The X-ray room

Four dosimeters were distributed at strategic points in the X-ray room, such as the entrance door, emergency exit, control panel and behind the X-ray tube, according to figure 1.

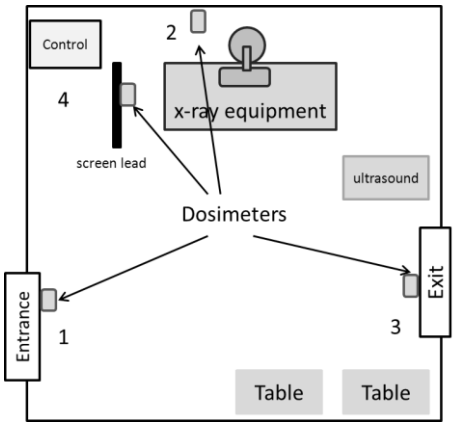

Figure 1: The X-ray room with Tl dosimeters placed in strategic points.

2.3- Occupationally exposed workers and auxiliaries

Each worker occupationally exposed used a bracelet and a badge dosimeter for a period of a month. The auxiliaries have used only a badge dosimeter for a month.

3- Results

The area doses at X-ray room evaluated in points 1, 3 and 4 presented values lower than local background radiation (BG). However, the point 2 presented dose of 0.5 mSv after subtract the local BG (0.22mSv).

The individual doses of workers and auxiliaries are shown in figure 2. It can be observed that the workers 1 and 2 had higher doses than auxiliaries 3 and 4. This difference can be explained because the auxiliaries do not participate in all exams performed**.** The dose received by the worker 2 exceeded the limit for occupationally exposed workers.

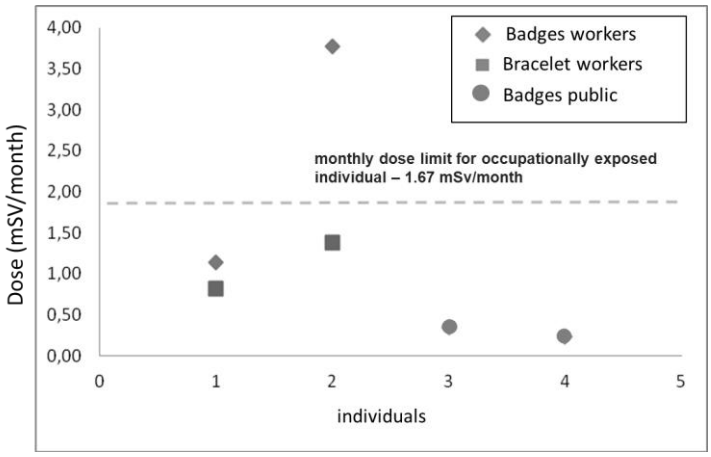

Figure 2: shows the monthly dose each individual receives during the month working on veterinary radiology, and the monthly limit established by Brazilian norms

4- Conclusion

The concern with Veterinary Radiology is the fact that most procedures are performed with the need of the animal immobilization. From this way the workers are exposed to primary X-ray beam.

The study evaluates the doses involved in veterinary diagnostic, emphasizes the importance of radiation protection in veterinary medicine and the need to use protective equipment, aiming to satisfy the ALARA principle.

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