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Dose Measurement in Veterinary Radiology Using Thermoluminescent Dosimeter

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Abstract : Radiological protection for plants and animals is an area of regulatory importance. Acute doses of 0.1 Gy/d (10 rad/d) or below are highly unlikely to produce permanent, measurable negative effects on populations or communities of plants or animals. The advancement of radio diagnostics for domestic animals, particularly dogs and cats, has gained popularity in veterinary medicine. As pets are considered to be members of the family worldwide, they are entitled to the same care and protection. It is important to have a system of radiological protection for nonhuman organisms that complies with the focus on human health as outlined in ICRP publication 19. The present study attempts to assess surface-skin entrance doses in small pets undergoing abdominal radio diagnostic procedures utilizing a direct measurements technique with a thermoluminescent dosimeter. These measurements allow the determination of the entrance skin dose (ESD) by calculating the amount of radiation absorbed by the skin during exposure. A group of Thirty TLD-100 dosimeters produced by Harshaw Company, each with a repeatability greater than 95% and calibration using ^{137}Cs gamma source, were utilized to measure doses to ten small pets, including cats and dogs in the radiological department in a veterinary clinic in Shiraz, Iran. Radiological procedures were performed using a portable imaging unit (Philips Super M100, Philips Medical System, Germany) to acquire images of the abdomen; ten exams of abdomen images of different pets were monitored, measuring the thicknesses of the two projections (lateral and ventrodorsal) and the distance of the X-ray source from the surface of each pet during the exams. A group of two dosimeters was used for each pet which has been stacked on their skin on the abdomen region. The outcome of this study involved medical procedures with the same kVp, mAs, and nearly identical positions for different diagnostic X-ray procedures executed over a period of two months. The result showed the mean ESD value was 260.34±50.06 µGy due to the approximate size of pets. Based on the results, the ESD value is associated with animal size, and larger animals have higher values. If a procedure doesn't require repetition, the dose can be optimized. For smaller animals, the main challenge in veterinary radiology is the dose increase caused by repetitions, which is most noticeable in the ventro-dorsal position due to the difficulty in immobilizing the animal.

Keywords : direct dose measuring, dosimetry, radiation protection, veterinary medicine
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