



Radiation safety considerations and compliance within equine veterinary clinics: Results of an Australian survey



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ABSTRACT

Objective: To examine current knowledge and the level of compliance of radiation safety principles in equine veterinary clinics within Australia.

Method: Surveys were sent to equine veterinary surgeons working in Australia. The survey was delivered both online and in hardcopy format; it comprised 49 questions, 15 of these directly related to radiation safety. The participants were asked about their current and previous use of radiation-producing equipment. Information regarding their level of knowledge and application of radiation safety principles and practice standards was collected and analysed.

Results: The use of radiation-producing equipment was evident in 94% of responding clinics (a combination of X-ray, CT and/or Nuclear Medicine Cameras). Of those with radiation-producing equipment, 94% indicated that they hold a radiation licence, 78% had never completed a certified radiation safety course and 19% of participants did not use a personal radiation monitor. In 14% of cases, radiation safety manuals or protocols were not available within clinics.

Conclusions: The study has shown that knowledge and application of guidelines as provided by the Code of Practice for Radiation Protection in Veterinary Medicine (2009) is poorly adhered to. The importance of compliance with regulatory requirements is pivotal in minimising occupational exposure to ionising radiation in veterinary medicine, thus there is a need for increased education and training in the area.

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Introduction

Veterinary clinics are equipped with radiation-producing equipment to aid diagnosis of disease, identify relevant pathology, and also for treatment.¹ Radiation-producing equipment commonly used includes plain radiography (X-rays) units and computed tomography (CT) machines. Clinics also use radionuclides in brachytherapy and nuclear medicine.² With the use of such equipment comes responsibility to maintain rigid radiation safety standards and practice. There is some evidence, however, of variation in the application of regulated radiation safety standards within veterinary clinics.^{3,4}

Veterinary use of radiation in Australia is regulated by the Code of Practice for Radiation Protection in Veterinary Medicine (2009)

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as implemented by the Australian Radiation Protection and Nuclear Safety Agency (ARPANSA).² The code is a platform to increase uniformity of application and interpretation of the requirements of practice across Australia. It provides useful radiation protection information to the veterinary community and stipulates regulations to which practices must adhere. Specifically, the Code stipulates that a 'responsible person' is appointed within each practice; a person with overall management responsibility of the veterinary practice or radiation source. It is also a requirement of the Code that a 'Radiation Management Plan' is actioned within each practice. The plan must incorporate a comprehensive list of actions and procedures (Schedule A: Radiation Management Plan) including: the provision of protocols for procedures, methods to achieve the ALARA principle (As Low As Reasonably Achievable), quarantine provision, personnel monitoring and recording (for each occupational person likely to be exposed to ionising radiation above 1 millisieverts (mSv) annually), protective equipment and staff training and licensing, among other requirements.²

Occupational exposure to ionising radiation endures as a significant and widespread potential risk for veterinarians in view of their current uniqueness of practice.^{5,6} This may be partially attributed to the need for veterinarians to engage in a wide range of generalist clinical activities as opposed to a specialist activity.^{1,3,5} The requirement for veterinarians to be generalists may compete with their capacity for expert knowledge in areas such as radiation safety, hence impeding the application of crucial radiation safety principles. ARPANSA acknowledges that in veterinary radiography, positioning animals has the potential to increase the magnitude of radiation doses received by veterinary workers – for example, at times members of staff are required to hold the animal during exposures. In relation to horses and adding to the procedural complexities, exposures are usually performed in the field with horses in the standing position. The imaging detector (cassette) is often held by a member of staff whilst the radiograph is acquired, which increases the radiation exposure danger to primary and scattered radiation. The potential hazard in radiation therapy and nuclear medicine imaging with radionuclides is arguably even higher to the operator in view of the ongoing nature of exposure and the higher doses required.⁷ In consideration of the extenuating factors potentially contributing to veterinarian exposure to radiation, veterinarians should be aware of the hazards caused by ionising radiation and be compliant with mandatory radiation protection regulations.⁸ The practising veterinarian is responsible for the maintenance and correct use of protective clothing and radiation-producing equipment. With this responsibility comes the additional expectation that the veterinarian will be aware of the recommended radiation exposure limits and ways of limiting exposure.⁹ Regulated guidelines exist and are underwritten within the Code of Practice for Radiation Protection in Veterinary Medicine; compliance, however, is self-regulated.²

The detrimental side effects of radiation exposure have been well documented.^{5,10} Adverse effects highlight the need for compliance with radiation safety guidelines and the need for education with respect to the safe use of radiation. Although the precise risk of occupational exposure is unclear, biological effects of low-level exposure to ionising radiation remain a concern.¹¹ The potential for damaging health effects as a result of occupational radiation exposure in veterinary practice have been acknowledged.¹² The most commonly chronicled effects of radiation exposure include cancer, birth defects and other permanent mutations.^{5,8} Published studies in the area of veterinarian exposure to occupational radiation make comparisons to other professions and highlight the potential impact of the limited use of radiation protection equipment and principles. Results of a postal survey of women in veterinary practice found 64% ($n = 1384/2175$) of respondents had been exposed to radiation during pregnancy – an alarming statistic in view of the known dangers of in-utero exposure to ionising radiation and the increased radiosensitivity of the foetus.¹ A separate study reported 82% ($n = 375/457$) of females working in the veterinary field self-reported exposure to X-rays over a period of one year.¹² The maximum reported exposure for this study was in the vicinity of 1.2 mSv per month (14.4 mSv per annum). As a comparison, in Australia, the average dose to diagnostic radiographers and radiation therapists is 0.12 mSv per annum,¹³ with the annual limit for radiation workers in Australia being 20 mSv, as recommended by the International Commission on Radiobiological Protection (ICRP).¹⁴

To investigate and identify current radiation safety considerations and compliance within the equine veterinary field, data was collected on current work practices and compared to the existing Code of Practice for Radiation Protection in Veterinary Medicine (2009) by ARPANSA.² The endpoint of this study was to analyse the data and identify significant gaps in knowledge and practice to

inform the proposed development of a radiation safety training package designed specifically for veterinary use.

Materials and methods

Ethical approval for this survey was granted by the University of Newcastle Ethics Committee (H-2009-0136).

The survey

This paper reports on data from a survey of equine veterinary surgeons in Australia. The 15 questions on radiation safety included both open and closed questions. The questions aimed at eliciting responses from participants in relation to the requirements stipulated within the Code of Practice for Radiation Protection in Veterinary Medicine.² Particular focus was placed on the adherence and knowledge around the 'Radiation Management Plan' requirements including: the provision of protocols, methods to achieve the ALARA principle, quarantine provision, personnel monitoring, protective equipment and staff training and licensing.

The survey was designed using the web-based program Survey Monkey (www.surveymonkey.com, California Office: 640 Oak Grove Avenue, Menlo Park, CA 94025, USA). Details of the survey including a participant information sheet and the link to a web-based survey was sent through the Australian Equine Veterinary Association fortnightly e-mail newsletter followed by a 3-monthly reminder. Details were also sent directly to a group of practitioners identified through the internet and Yellow Pages[®]. Participants had the option of completing the survey online or hardcopy. A single survey response was requested for each practice.

Results

Data analyses

Data from the online responses were exported into an Excel spreadsheet and combined with the paper-based responses before analysis was undertaken. Data analysis included frequencies and counts. The small number of responses prohibited in-depth statistical analysis to be performed. It must be noted that participants were given the opportunity to choose more than one option in many of the survey questions. This resulted in occasions where the total percentage was more than 100%.

Participants

Veterinarians who work with horses were identified through records accessed via the Australian Equine Veterinary Association (AEVA) public website, through internet searches, and the Yellow Pages[®]. However rigorous the process of identifying all veterinarians working with horses, it cannot be confirmed that all Australian equine veterinarians were invited to participate.

The radiation safety section was completed by 82 participants, however, results are reported on to reflect the participant sample group that owned radiation-producing equipment; this equated to 77 participants. A wide cross-section of Australia was represented, with responding veterinarians practising throughout all states and territories and some practising in more than one state or territory. Of the 77 responses to the demographics portion of the survey, 39% (30) worked in New South Wales; 22% (17) in Victoria; 19% (15) in Queensland; 9% (7) in Western Australia; 6% (5) in South Australia; 3% (2) in Tasmania; and 1% (1) in the Northern Territory. Additionally, four participants noted they ran clinics in more than one state/territory; these included NSW and Victoria (1), Victoria and Australian Capital Territory (2), and Tasmania and Victoria (1).

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