Estimated Operator Exposure for Hand Holding X-Ray Units During Imaging of the Equine Distal Extremity

Reid Tyson, DVM, Diplomate ACVR; Douglas C. Smiley, BS; R. Scott Pleasant, DVM, MS, Diplomate ACVS*; and Gregory B. Daniel, DVM, MS, Diplomate ACVR

Exposure data from this study indicate that it would necessitate an extremely high workload to reach occupational radiation dose limits for a person wearing appropriate shielding. However, as low as reasonably achievable (ALARA) exposure limits for whole body exposure could be reached after a modest number of exposures for operators not wearing a lead apron. Authors’ addresses: Department of Small Animal Clinical Sciences (Tyson, Daniel) and Department of Large Animal Clinical Sciences (Pleasant), Virginia–Maryland Regional College of Veterinary Medicine, Virginia Tech, Blacksburg, Virginia 24061; and Department of Environmental Health and Safety (Smiley), Virginia Tech, Blacksburg, Virginia 24061; e-mail: rpleasan@vt.edu. *Presenting and corresponding author. © 2010 AAEP.

1. Introduction
Many state regulations prohibit hand holding X-ray machines when imaging veterinary patients. However, purpose-made X-ray machine stands decrease the efficiency of acquiring views and may represent a physical hazard when imaging equine patients. For these reasons, many equine practitioners do not use X-ray stands.

2. Materials and Methods
Radiation exposure associated with commonly performed radiographic views was determined. Radiation measurements were obtained at simulated finger and collar locations. To estimate the effect of personnel shielding, radiation exposure was measured within the primary beam at 40-in film focal distance (FFD). Measurements were obtained behind a 0.5-mm lead equivalent apron and within a >0.5-mm lead equivalent glove at 40-in FFD. Radiation attenuation estimates for the apron and glove were used to estimate hand and collar dose with shielding.

3. Results
The estimated number of exposures needed per year before reaching occupational exposure limits, based on the average exposure obtained in this study, was 209,196 (collar with lead apron) and 19,113,150 (hand with lead gloves).

4. Discussion
Exposure data from this study indicate that it would take an extremely high workload for an operator wearing lead gloves and a lead apron to reach occupational dose limits for hand and/or whole body exposures.