

Unique Aspects of Radiological Protection in Veterinary Practice

Presented by

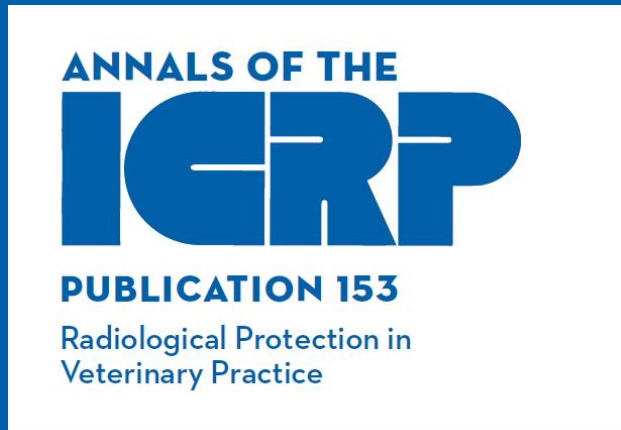
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Radiological Protection in Veterinary Practice



- Why this publication?
- Introduction
- Basic concepts of radiological protection
- **Ethics and values**
- **Unique aspects of veterinary practice**
- **Application of the system of radiological protection to veterinary practice**
- Summary of recommendations and considerations
- Annex A. Roles and responsibilities
- Annex B. Ethical issues associated with the protection of animals and the environment

Key Takeaways

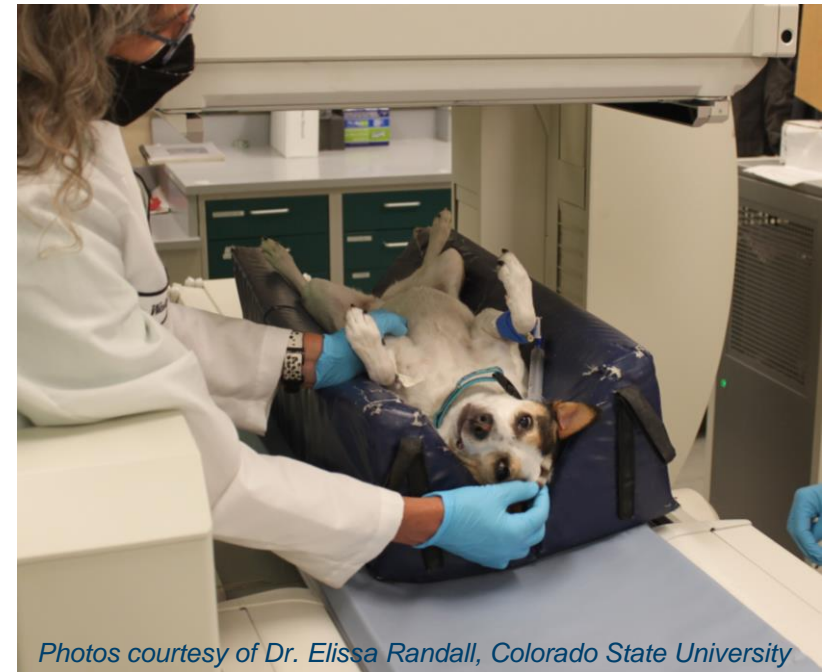
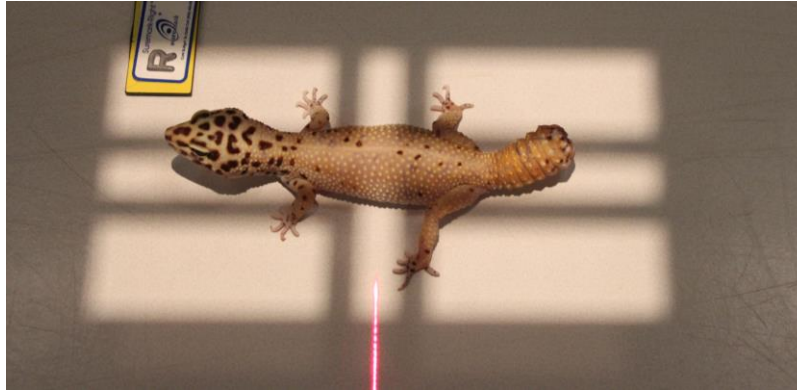
RP of workers/public surrounding veterinary practice has **always been included** in the system of RP but is now explicitly addressed due to modern advances in the practice.



Veterinary patients come in all shapes and sizes and available technologies are consistent with human medicine



Pentreath et al (2019)

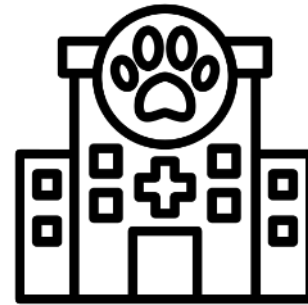


Photos courtesy of Dr. Elissa Randall, Colorado State University

Key Takeaways

RP of workers/public surrounding veterinary practice has **always been included** in the system of RP but is now explicitly addressed due to modern advances in the practice.

Unique RP challenges arise from the different **combinations** of personnel and members of the public who may be involved, and from **operational environments** required when dealing with **animals**.



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RP of workers/public surrounding veterinary practice has **always been included** in the system of RP but is now explicitly addressed due to modern advances in the practice.

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Ethics of the RP system can be applied across veterinary, environmental, and other applications of RP although interpretation may differ slightly.



Ethical Values

Core ethical and procedural values with additional interpretation



**Beneficence/
Non-maleficence**



Animal
welfare

Promotion of
**health and
welfare** along
with **minimization
of suffering** in
animal care



Justice



Solidarity

Employing the **co-
expertise** process
such that
outcomes are as
**fair, equitable,
and balanced** as
possible



Prudence



Sustainable
development

Acting with
precaution
particularly when
decisions might
affect **future
generations**



Dignity



Reverence
for life

Recognition
that both
humans and
**other living
things** have
value and
importance



Accountability



Stewardship

Responsible use or
management of
things **entrusted to
one's care**,
whether pets,
livestock, land,
resources, or even
personal
information



Transparency



Respect for
Autonomy

**Open and honest
communication**
in support of the
right of
individuals to
know relevant
risks/benefits to
**make informed
decisions**



Inclusiveness



Empathy

Meaningful
engagement with
others and
**appreciation of
needs, challenges,
and values** for
mutually agreeable
outcomes

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Ethics of the RP system can be applied across veterinary, environmental, and other applications of RP although interpretation may differ slightly.

The **priority** of radiological protection in veterinary practice is **that of the humans involved**, but the exposure of **animals** should also be the object of **explicit attention** noting that RP should be approached with a holistic perspective and **graded approach**.



Justification

Doing more good than harm

Level	Human medicine	Recommended for veterinary practice
Level 1 General use	Proper use of radiation in medicine is accepted as doing more good than harm to society. Now taken as a given.	Proper use of radiation in veterinary medicine is accepted as doing more good than harm to society. Now taken as a given.
Level 2 Specific procedure and objective	A specified procedure with a specified objective is justified if it will improve the diagnosis or treatment or if it will provide necessary information about exposed individuals .	A specified procedure with a specified objective is justified if it will improve diagnosis or treatment of a defined group of animal patients or if it will provide necessary information about exposed animals .
Level 3 Particular procedure for the patient	The application of a radiological procedure is justified if it is judged, in advance, to do more good than harm to the individual patient .	The application of a radiological procedure is justified if it is judged, in advance, to do more good than harm in the management of the individual animal patient

Some Unique Challenges

- There is currently a lack of decision support tools
- Different than in humans, non-medical investigations are common
- Of note is that research animals are beyond the scope of the current work

Optimisation of protection (Holistically) as low as reasonably achievable

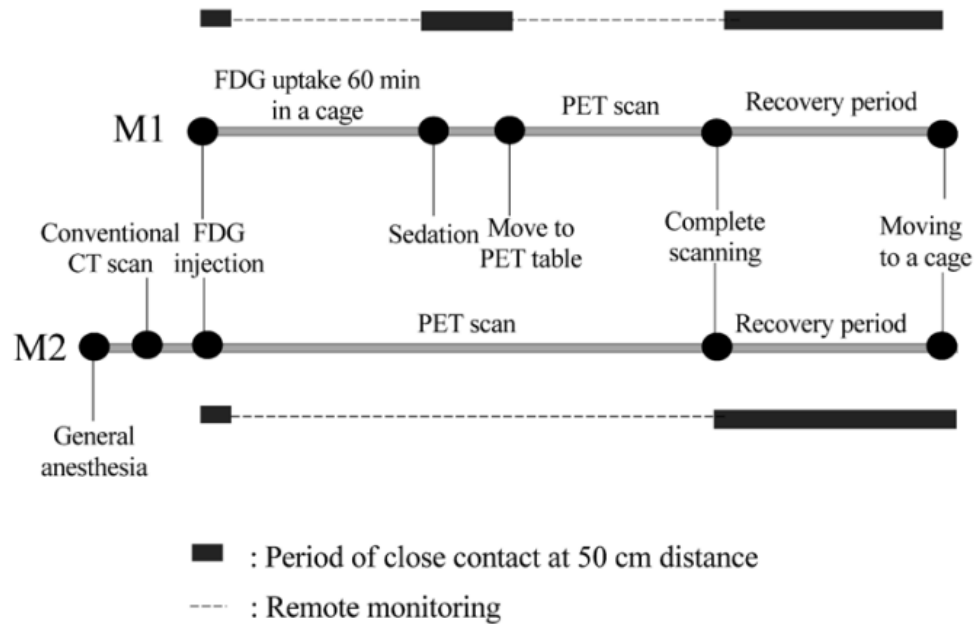
- **Protection and safety of humans may be considered the priority** of optimisation efforts, but this can be largely achieved by limiting the exposure of the animal to what is necessary for **achieving the (clinical) objective**
- Encompasses **animal welfare**, whether the motivation for veterinary services is economic (e.g., performance horse) or societal (e.g., companion animals)
- Needs to be **tailored to best fit the circumstances**, within the boundaries of what is prudent and reasonable, considering clinical needs and the whole environment in which the procedure takes place

Some Unique Challenges

- Currently a lack of imaging guidance parameters or systematic reporting of dose descriptors; development of schema like DRL may be challenging
- Dosimetric data for patients limited but emerging
- Sedation and anaesthesia frequently advocated from RP standpoint, but can be a detriment to the animal's health (use of prudence important)

Two different methods for performing veterinary positron emission tomography (PET)

(Suwannasaeng et al 2022)

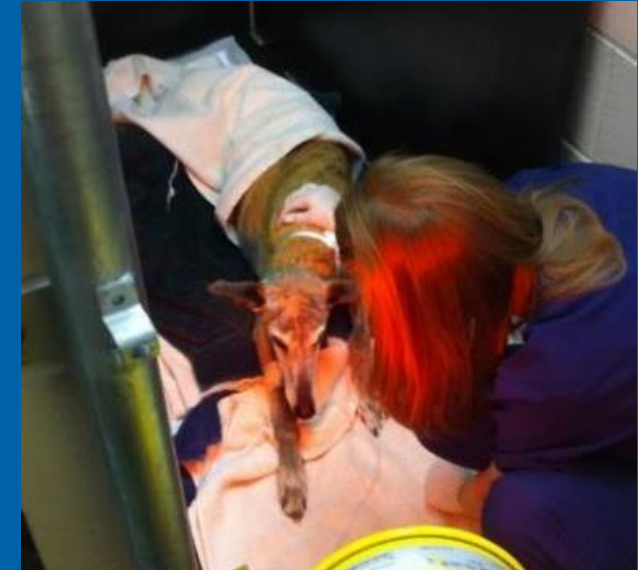


Advantage: streamlines patient handling, shortens anesthesia time

Disadvantage: increased dose to staff, potential challenge to keep patient still during uptake

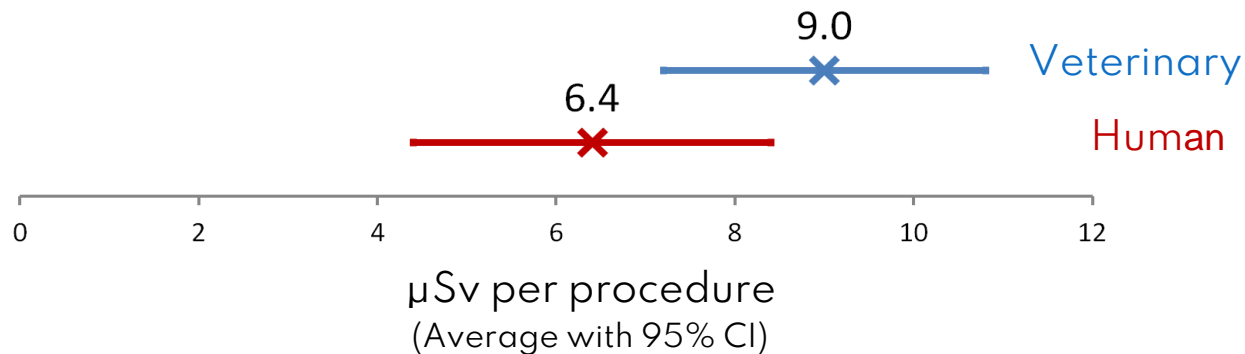
Advantage: reduced radiation dose to staff

Disadvantage: additional anesthesia, increased procedural cost, increased equipment and room use



Occupational dose associated with veterinary PET

(Martinez et al 2012)



Anesthesia recovery following PET/CT at CSU Vet Teaching Hospital. Courtesy N. Martinez.

Caring for animal patients



- A **carer** is an individual who may be (knowingly) exposed to radiation as a **voluntary helper** providing support or care for a patient (not part of their job)
- Animals generally not legally recognised as “patients,” but there is often a **direct benefit both to the animal patient and the owner from the relationship**
- The concepts of patient and carer ideally should be **tailored to be applicable within reason in veterinary practice** (i.e., “animal patient” and “owner/handler”)
 - For example, when considering length of hospital stay
- If exposure of an owner/handler is deemed justified, dose constraints should be used to guide optimisation of protection in a proportionate, practical way

Bottom line

- Despite some differences, RP concerns in veterinary practice are largely comparable to human medicine applications and non-medically-indicated human imaging; veterinary applications should be treated in a comparable, proportionate way (including consideration of equipment and education/training).

“The Commission hopes that highlighting radiological protection concerns and related knowledge gaps will inspire **additional research and development** related to the evidence-based use of ionising radiation in veterinary practice in support of the justification process; **dedicated facilities and equipment**; improved **understanding** of the radiosensitivity of different types of animals; and **practice guidelines** in support of exposure management and other relevant areas to **promote health and safety** of personnel, the general public, and the environment, while further **improving the quality of care** for the patients and healthy animals submitted to radiological procedures.”

Future considerations?

- Decontamination of livestock following an emergency
- Service/comfort animals present for a human procedure (e.g., at a children's hospital) or following a nuclear medicine study; the animal is the comforter in this case
- Other working animals (e.g., search and rescue)
- Research animals



Animal assisted therapy, Langley Air Force Base



Split Creek Farms baby goats (N. Martinez)



Toronto Police Service dog

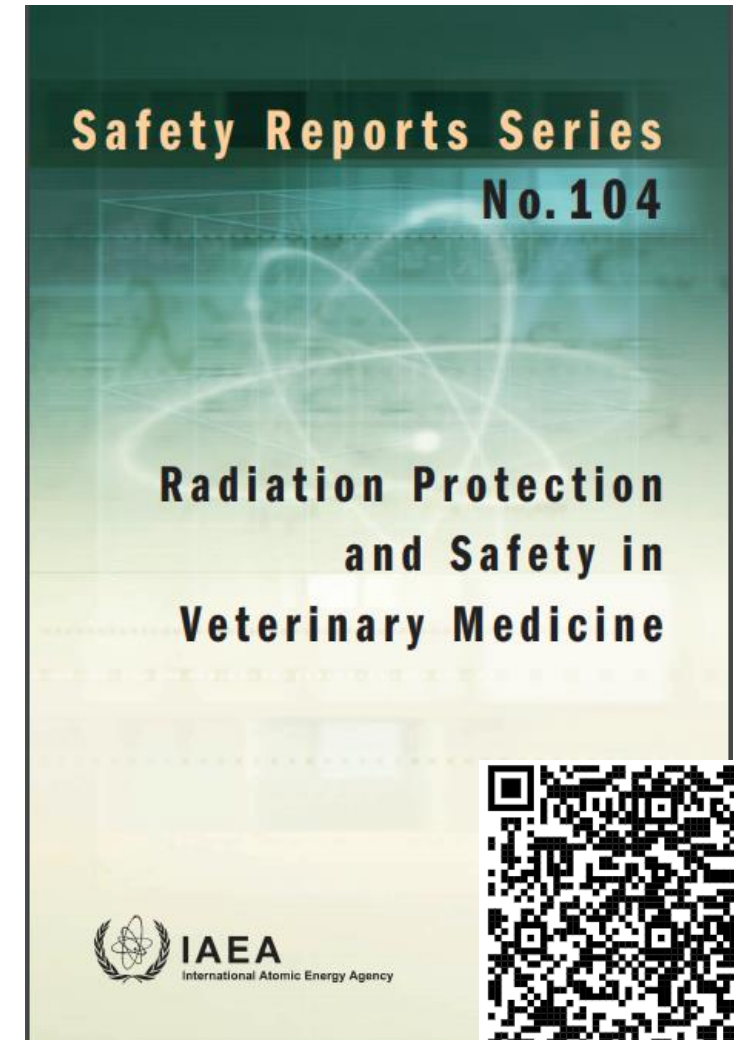
Example resources of interest

Example review papers/books

- Haley, B., Wang, Q., Wanzer, B., et al., 2011. Past and future work on radiobiology mega-studies: a case study at Argonne National Laboratory. *Health Phys.* 100(6), 613-21.
- Spatola, G.J., Ostrander, E.A., Mousseau, T.A., 2021. The effects of ionizing radiation on domestic dogs: a review of the atomic bomb testing era. *Biol Rev Camb Philos Soc.* 96(5):1799-1815.
- von Zallinger, C., Tempel, K., 1998. The physiologic response of domestic animals to ionizing radiation: a review. *Vet Radiol Ultrasound* 39(6), 495-503.
- Zaidi, H. (ed), 2018. *Computational Anatomical Animal Models: Methodological developments and research applications*. IOP Publishing.



FREDERICA Radiation Effects Database



Thank you for your attention!

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