



**Australian Government**

**Australian Radiation Protection and Nuclear Safety Agency**

---

## **Regulatory Impact Statement Public Consultation Draft**

### **Code of Practice**

### **Safe Use of Radiation in Veterinary Science**

Comment on the Regulatory Impact Statement should be forwarded by **7 October 2005** to:

Mr Alan Melbourne  
Manager, Standards Development & Committee Support Section  
ARPANSA  
Lower Plenty Road  
YALLAMBIE VIC 3085

Tel: (03) 9433 2355

Fax: (03) 9433 2353

Email: [secretariat@arpansa.gov.au](mailto:secretariat@arpansa.gov.au)

**(Electronic submissions preferred)**

---

## Table of Contents

<b>Background .....</b>	<b>1</b>
Radiation and veterinary science.....	1
Jurisdiction .....	1
Risk of Radiation Injury in Veterinary Science .....	2
Current legal position .....	2
<b>Problem.....</b>	<b>3</b>
Outdated information.....	3
Externalities.....	4
<b>Desired Objective .....</b>	<b>4</b>
<b>Possible Options .....</b>	<b>5</b>
<b>Impact Analysis.....</b>	<b>5</b>
Affected Parties .....	5
Cost benefit analysis for each alternative .....	6
<b>Status quo .....</b>	<b>6</b>
Costs.....	6
Benefits.....	7
<b>Self-Regulation Model .....</b>	<b>9</b>
Costs.....	9
Benefits.....	11
<b>Proposed code of practice.....</b>	<b>12</b>
Costs.....	12
Benefits.....	15
<b>Summary of cost benefit analysis .....</b>	<b>16</b>
<b>Consultation .....</b>	<b>19</b>
<b>Implementation and Review .....</b>	<b>20</b>
<b>References.....</b>	<b>20</b>

## Background

### Radiation and veterinary science

- 1 X-rays and radioactive nuclides are an essential part of the diagnosis and treatment of animals, and in research in veterinary science. The X-ray equipment used ranges from small low-powered portable equipment used for field radiography, to large high-powered fixed radiography equipment and the use of X-rays to aid in diagnosis and treatment must be managed with the knowledge of the impact that ionizing radiation can have on the health and safety of veterinary surgeons, staff and the general public.
- 2 Radioactive materials used in veterinary practice include diagnostic radionuclides such as technetium-99 and therapeutic radionuclides such as iodine-131, used for the treatment of hyperthyroidism in cats.
- 3 Laser radiation is also used in veterinary science overseas and is expected to be used increasingly in Australia in future. Laser radiation is potentially hazardous to the eyes and skin and needs to be used safely to avoid burns, or eye injuries including blindness, both temporary and permanent.
- 4 The following table lists the current numbers of licensed veterinary surgeons and, where applicable, veterinary nurses, veterinary X-ray units, nuclear medicine practices, veterinary sources in each jurisdiction in Australia.

Jurisdiction	No. of portable Vet X-ray units	No. of fixed Vet X-ray units	No. of Vet Dental X-ray units	No. of licensed Vets	No. of Vet nurses (licensed)	No. Practices licensed for Nuclear Medicine	No./Type of Sealed Therapy Sources
ACT	20 (includes 13 CD mobiles)	4	0	22 (only licence 1 vet/practice)	0 (Not eligible)	0	0
ARPANSA	1						
NSW	390	188	3	824	N/A	12*	12*
NT	10	6	0	12	Not Registered in NT	0	0
QLD	62	271	10	642	17	2	0
SA	24	Fixed=7 Mobile=35	1	235	0		4 × Sr-90
TAS	65	2	1	98	0	0	0
VIC	322	76	10	672 <sup>(a)</sup>	—	8 <sup>(b)</sup>	6 × Sr-90
WA	193	55	5	474	0	1	1 × Sr-90
<b>TOTALS</b>	<b>1087</b>	<b>644</b>	<b>30</b>	<b>2979</b>	<b>17</b>	<b>23</b>	<b>23</b>

(a) This number includes all types of licences.

The break-up is: X-ray only: 648, X-ray & sealed: 13, X-ray & unsealed: 10 and X-ray, sealed & unsealed: 1.

(b) The eight practices licensed to use unsealed sources use the following:

(1) Tc-99m, P-32, P-33, S-35 & I-125;

(2) H-3, C-14, P-32, P-33, S-35, I-125, Cr-51 & Ca-45;

(3) I-125 & Co-57;

(4) Tc-99m;

(5) I-125;

(6)-(8) I-131.

(NOTE: Tc-99m & I-131 would be used in nuclear medicine while the other isotopes would be used in biochemistry or molecular biology.

#### Details and numbers of any other Veterinary Uses/equipment or classes of authorised users:

- (1) Victoria has had a request for a CT scanner to be used at a veterinary institution. It should be noted that this is only at the request stage and no response has been prepared to this stage.
- (2) Victoria: An application was recently made by two vets to use Au-198 but to this stage they have not pursued it further.
- (3) Victoria: The cobalt-60 pads are registered but are no longer being used.
- (4) Victoria: Of the total number of X-ray units we think this includes at least four fluoroscopy units, there may be more.

- 5 There are two categories of exposed persons, namely, persons occupationally exposed to radiation and members of the public. Occupationally exposed persons include all members of a department or practice, and temporary or visiting staff whose duties are likely to require their presence during radiographic, radiotherapeutic or nuclear medicine procedures.

Veterinary students may also have some exposure to radiation. Members of the public include all other persons, for example, owners of animals, observers, and family of staff members living adjacent to the premises where radiation is used.

### **Risk of Radiation Injury in Veterinary Science**

- 6 All persons involved in the diagnosis and treatment of animals may be exposed to radiation hazards from the sources of radiation used in veterinary science.
- 7 In radiography, the principal hazard arises from the possibility of exposure to the primary X-ray beam. Scattered radiation and radiation leaking from the X-ray tube assembly, which are always present during an exposure, may also contribute further significant doses given the proximity of persons who may be required to hold animals in position for radiography.
- 8 Positioning animals for radiography is one of the areas of difficulty. Animals may be anaesthetised or sedated, however this is not always the case and there may be a need for an animal to be held in position for radiography. Hence, a member of the veterinary staff or the owner of the animal may need to be close to the X-ray tube and the primary beam during the exposure.
- 9 Radiography of large animals, eg horses, is often done in the field with the horse standing. There is the consequent need for the film cassette to be held in position for radiography. While handling tools and protective aprons and gloves should be used, again someone is of necessity close to the primary beam during the exposure. It is also true that in outdoor lighting it is much more difficult to see the light beam that indicates the X-ray beam location, hence the beam position is not as well located as would be the case indoors, and there is consequently a greater chance of an assistant having part of their body in the primary beam.
- 10 In radiotherapy, the radiation dose delivered to the patient is very much greater than in diagnostic procedures and thus the potential hazard may be much greater to the operator. Sealed radioactive sources, eg strontium-90 and cobalt-60, are also used for some veterinary treatments, mainly on large animals, raising further issues of possible damage to or loss of the sources.
- 11 In nuclear medicine or radiotherapy using liquid solutions, gases or aerosols there is an additional hazard of radioactive contamination from potential inhalation or ingestion risks.

### **Current legal position**

- 12 Currently, all jurisdictions regulate the use of ionizing radiation, including both the operation of X-ray equipment and the use of diagnostic and therapeutic sealed and unsealed radioactive sources.
- 13 Within the regulatory frameworks, the safe use of radiation in veterinary science is also controlled by two Codes issued by the National Health and Medical Research Council (NHMRC) within its Radiation Health Series (RHS). These are:
  - (a) *Code of Practice for the Safe Use of Ionizing Radiation in Veterinary Radiology: Parts 1 and 2* (1982) (RHS No. 3)
  - (b) *Code of Practice for Safe Use of Ionizing Radiation in Veterinary Radiology: Part 3 – Radiotherapy* (1984) (RHS No. 10).

- 14 At present all jurisdictions, apart from the Australian Capital Territory, have adopted RHS No.3 as part of their requirements, licensing or registration conditions. Only three jurisdictions however, have adopted the RHS No.10 Code — New South Wales, Victoria and ARPANSA. In jurisdictions where the Codes have not been adopted into the regulatory or licensing system, they are still used as guidance by the regulators and profession.

## **Problem**

### **Outdated information**

- 15 The radioactive sources used in veterinary science could, if used or transported improperly or if involved in a serious incident, result in radiation exposure that would lead to radiation injury. Further, personnel assisting in work near veterinary radiation sources, both X-ray and radioactive, might not necessarily be fully trained in their use nor would they necessarily be familiar with the properties and potential hazards associated with radiation. The need for appropriate warning signage is also an important consideration, particularly for work away from the surgery situation.
- 16 The dose rates associated with some of the more ‘powerful’ X-ray equipment and radioactive sources can be quite significant. A high degree of safety needs to be engineered into the design of X-ray equipment and radioactive source containers and handling equipment to ensure that exposure is kept to a minimum and that, in the event of an incident, the likelihood of exposure is minimal. Consequently, any person who might be required to work with veterinary radiation sources or assist the veterinary surgeon in their use needs to be aware of the potential risks involved to ensure that doses received are kept to a minimum.
- 17 The 1982 and 1984 NHMRC Codes (RHS 3 and 10 respectively) do not have expiry dates but it is over 20 years since they were both published. The NHMRC does not wish to continue the RHS publications and has handed the responsibility for the review of these publications to ARPANSA. ARPANSA needs to review these two NHMRC Codes to ensure that workers and the public are able to obtain reliable information on the measures to take to avoid radiation exposure that might exceed permissible levels.
- 18 Since the establishment of RHS 3 and 10, there have been significant advances in the use of radiation in the treatment of animals. Radiotherapy using X-ray equipment and radioactive sources, nuclear medicine, veterinary dental, computerised tomography (CT), fluoroscopy and the use of laser treatment have evolved and their use increased in that time. While the two earlier Codes covered the use of some of these modalities to varying degrees, time has necessitated an increase in safety awareness to ensure that operators, assistants and the owners of the animals are not exposed to significant radiation levels. This is particularly important for procedures that were not considered in the earlier Codes such as nuclear medicine, CT and laser work.
- 19 The two NHMRC veterinary Codes were based on radiation protection limits specified in the International Committee for Radiation Protection (ICRP) Publication No. 26 in 1977. The ICRP publication has been significantly revised since the two NHMRC veterinary Codes were published. As such, the both NHMRC veterinary Codes need to be reviewed to ensure that veterinary procedures are conducted in a manner that the dose limits specified by the ICRP in its 1990 recommendations are not exceeded.
- 20 Further, the transport requirements in the 1984 NHMRC Code were based on the 1973 edition (revised and amended in 1979) of the International Atomic Energy Agency (IAEA)

Regulations for the safe transport of radioactive material. The IAEA has also significantly revised its transport regulations since the 1984 NHMRC veterinary Code was published. An Australian Code of Practice that covered transport of radioactive material has been introduced (originally in 1982) and replaced in 1990 and 2001 to reflect the changes to the IAEA requirements. As the 1984 NHMRC veterinary Code (RHS 10) covers the use of radioactive materials in veterinary science, it also needs to be reviewed to ensure that the current requirements of the IAEA transport regulations and the Code of Practice for the Safe Transport of Radioactive Material 2001 are met.

- 21 This variation in the requirements of the two NHMRC veterinary Codes from the current international recommendations could result in a lack of uniformity across Australia. This could cause confusion for users, manufacturers and suppliers, and a lack of clarity as to which provisions apply to radiation sources used in veterinary science if some regulators were to still use the 1982 and 1984 Codes as their provisions are inconsistent with the 2001 Australian Transport Code and Radiation Protection Series No. 1 (RPS1). Increased costs could be experienced as each stakeholder group attempts to find out the requirements that they must comply with in each jurisdiction.

### **Externalities**

- 22 The uncontrolled use of the radiation sources used in veterinary science represents a risk of radiation exposure and injury to users of the devices, workers at the premises, persons assisting in the veterinary procedure, the public, and represents a risk of contamination of the environment. The social costs that can result from uncontrolled exposure to radiation, eg. from a lost radioactive source, could be serious. Relying on market mechanisms for affected parties to directly negotiate with the veterinary practitioner that causes these externalities would involve transaction costs that may not be reasonable for users and members of the public to bear.
- 23 The Australian Radiation Incidents Register (ARIR) lists only 1 incident involving veterinary radiation sources. This incident involved the loss of a radioactive source and resulted in two regulatory officers attempting to retrieve it over a period of several days. The cost of such a search would be in the order of thousands of dollars in wages alone.
- 24 It is also known, mostly from regulatory inspections of veterinary practices, that other incidents involving veterinary equipment and personnel have occurred in the past that remain unreported to the ARIR. These include the loss of veterinary radioactive sources, inadvertent exposure during the use of radioactive sources, failure to use protective equipment when holding animals in position for radiography and evidence on veterinary radiographs of primary X-ray beam exposure of human limbs. Any improvement to current work practices would be expected to decrease the frequency of such events and increase the reporting of same. Work practices and equipment design requirements for veterinary radiation sources must continue to be stringent to reduce the risk of radiation exposure incidents.

### **Desired Objective**

- 25 To cost-effectively protect persons, property and the environment from the adverse effects of radiation during, and as a result of, the use of X-ray equipment, radioactive sources and lasers in veterinary science.

## Possible Options

26 Three regulatory options have been identified by ARPANSA:

- *status quo* — this entails doing nothing and leaving two Codes from the National Health and Medical Research Council's — RHS No.3 Code of Practice for the Safe Use of Ionizing Radiation in Veterinary Radiology: Parts 1 and 2 (1982) and RHS No.10, Code of Practice for Safe Use of Ionizing Radiation in Veterinary Radiology: Part 3 – Radiotherapy (1984) — in place;
- *self-regulation* — this option would allow industry to set its own radiation safety requirements, subject to other occupational health and safety (OH&S) obligations; and
- *update the current Codes* — this option entails re-writing both Codes and updating them with the current radiation protection requirements and philosophies. It would consist of combining both Codes as well as expanding to give guidance on veterinary nuclear medicine and the use of lasers in veterinary science. The proposed Code would provide a set of requirements to be adopted by State/Territory regulators as part of their regulatory frameworks.

## Impact Analysis

### Affected Parties

27 The parties who are likely to be affected by the use of veterinary radiation sources include:

- (a) Veterinary surgeons who use X-ray equipment, radioactive sources and lasers including those employed in research centres and private practitioners (there are approximately 2800 veterinary surgeons licensed to use radiation sources);
- (b) employees of veterinary surgeons such as veterinary nurses and ancillary staff;
- (c) assistants to veterinary surgeons, including otherwise untrained animal owners;
- (d) suppliers of the equipment and sources;
- (e) Government regulators (State, Territory and Commonwealth); and
- (f) the community.

Veterinary surgeons using radiation sources need to know correct procedures to ensure the safety of their employees and assistants who may be required to work near radiation sources during the procedure. Companies also need to ensure a duty of care to the wider community. Employees of veterinary surgeons or in veterinary research centres need to be protected from potential harmful effects of exposure to radiation while at the same time not perform any act that might compromise the safety of radiation source or its installation.

Suppliers of the veterinary radiation equipment and sources need to ensure that all equipment and sources supplied to users is consistent with international standards and is safe to use.

Governments and the public are stakeholders insofar as any incident involving the use of veterinary radiation sources impacts on public perception of radiation safety generally.

28 The NHMRC does not intend to continue publishing its RHS publications. It has handed the responsibility for the review of RHS publications to ARPANSA. Unless ARPANSA reviews

the Code and republishes it, the industry will be left without a code of practice on the safe use of ionising radiation in veterinary radiology and radiotherapy.

### **Cost benefit analysis for each alternative**

29 The aim of this assessment is to provide a clear exposition of the nature of the costs and benefits associated with each option, and to quantify these impacts where possible.<sup>1</sup>

### **Status quo**

30 Under the status quo option, the RHS No.3 and No.10 Codes would continue to remain the prime regulatory tool for ensuring radiation protection in veterinary science. Keeping the status quo would involve no new costs; however, there are a number of indirect costs potentially incurred by stakeholders, which are discussed below and quantified where possible.

### **Costs**

#### ***Compliance***

31 There are ongoing compliance costs associated with both Codes, which place a burden on a range of stakeholders. In this regard, it is noted that:

- veterinary surgeons and others in the industry are already subject to a range of general and specific occupational health and safety duties of care and requirements, many of which would effectively impose similar (but more general) requirements on vets using x-ray equipment; and
- regulatory compliance costs tend to be borne disproportionately by small businesses and given a large number of veterinary practices are small businesses — in fact, only 13 per cent of veterinary practices have more than five vets<sup>2</sup> — then the compliance costs of radiation protection legislation may be higher than other areas of radiation protection such as mining.

32 In the main, the veterinary industry has been subject to the requirements of both Codes for many years now; there is an expectation therefore that compliance is strong (enforced by State and Territory regulators), with ongoing costs reflecting the marginal or day-to-day costs. There is no expectation that under the *status quo* option vets will need to implement new systems or incur new compliance costs. The *status quo* option does however — as with any regulatory option — create opportunity costs — this issue is considered below.

#### ***Administration***

33 Relative to a perfectly streamlined co-ordinated national regulatory system for radiation protection, the *status quo* involves an opportunity cost for vets. Currently the regulations differ across jurisdictions thus resulting in different costs depending on location and reducing

---

<sup>1</sup> While cost-benefit analysis requires all costs and benefits associated with the options to be measured quantitatively in common units (either in monetary units or physical units) to the fullest extent possible, to the extent that quantification is not possible, a comprehensive list of the costs and benefits together with a strong qualitative analysis can often provide a simple but still compelling case. Indeed, this approach is preferable to one where unreasonably broad assumptions are made to generate quantified impacts which provide a false sense of accuracy.

<sup>2</sup> ABS (Australian Bureau of Statistics) 2001, *Veterinary Services, Australia, 2000*, cat. no. 8564.0, AusInfo, Canberra.

the scope for nation-wide efficiencies. For vets that operate in multiple jurisdiction then clearly this adds costs.

- 34 For each jurisdiction the *status quo* results in administration costs associated with monitoring and enforcing both Codes. Individually identifying these costs is somewhat difficult, as they often tend to be absorbed within the entire budget for regulatory agencies rather than reported separately. Further, the administration and enforcement costs may well be incurred regardless of the *status quo* as regulatory agencies are likely to carry out other occupational health and safety and radiation protection related activities — that is, it is extremely hard to separate out the avoidable costs associated with the *status quo*.

### ***Dynamic efficiency***

- 35 The NHMRC has rescinded all of its health based Codes that are over 10-years old and has no mechanism for renewing or updating them.
- 36 At the same time, jurisdictions are implementing the National Directory and have adopted (since 1995) the exposure limits set out in RPS1.
- 37 If the *status quo* option were to be maintained — that is to remake the Codes as they currently stand — then this would result in different radiation protection standards and exposure limits for vets relative to other industries or sectors that use radiation. The health and safety implications of this are discussed later but in essence this could lead to a weakening of the ALARA principle, which states that radiation exposures should be kept as low as reasonably achievable while taking into account economic and social factors.

## **Benefits**

### ***Health and safety outcomes***

- 38 It is generally accepted that the *status quo* has provided health benefits for those working in the veterinary profession — including, veterinary surgeons, assistants, staff, and others. In terms of measuring those benefits, it is usual to consider the impact of radiation exposure in terms of average or collective annual effective dose.<sup>3</sup> For the *status quo* there are two relevant effective dose measures.
- The average annual effective dose measured for *occupational exposure* to radiation — that is, the exposure by veterinary surgeons and others working directly in the veterinary sector. In fact this is the type of exposure the Code is designed to directly influence. Based on the latest available information — material published by the United Nations Scientific Committee on the Effects of Atomic Radiation (UNSCEAR)<sup>4</sup> — the average annual effective dose for all occupational exposure is 0.24 mSv per year.<sup>5</sup> For veterinary surgeons however, the doses are significantly lower — 0.015 mSv per year.<sup>6</sup> The average effective doses of vets in education

---

<sup>3</sup> N. Morris 1996, *Personal Radiation Monitoring and Assessment of Doses Received by Radiation Workers (1996)*, report prepared for Australian Radiation Laboratory, Department of Health and Family Services, Commonwealth of Australia, Yallambie.

<sup>4</sup> United Nations Scientific Committee on the Effects of Atomic Radiation 2000, *Sources and Effects of Ionising Radiation: UNSCEAR 2000 Report to the General Assembly, with Scientific Annexes*, United Nations, New York.

<sup>5</sup> This is based on a weighted average of the average effective dose and the number of workers monitored over the period 1975 to 1994.

<sup>6</sup> The doses for occupationally exposed personnel such as assistants and receptionists are significantly lower, with each group recording an average dose of 0.007 mSv in veterinary practices. *Source: ARPANSA.*

departments and research centres are 0.046 mSv and 0.023 mSv respectively. Despite these small variations, exposure levels in the veterinary field are significantly below the exposure limits in the Code and RPS1.

- The average annual effective dose to the general public — that is, those that are directly exposed to radiation (such as x-rays) as a result of taking their pets and animals to a veterinary surgery or hospital, and other members of the public in areas close to where radiation is used. Based on the latest available information — material published by the United Nations Scientific Committee on the Effects of Atomic Radiation (UNSCEAR) — the average annual effective dose for the population is 0.002 mSv.<sup>7</sup>

39 In terms of occupational exposure, the average annual effective dose is significantly lower than exposure limits specified in the Code. As such factors other than merely specifying a maximum limit must be influencing the caution with which vets view and act in relation to radiation protection. The most likely explanation is the promotion and adherence to the ALARA principle.<sup>8</sup>

40 Keeping the extremely low levels of occupational exposure in mind, it is reasonable to conclude that the *status quo* — including several occupational health and safety obligations — generates significant benefits (for vets and workers in the veterinary industry) by avoiding the potential increase in risk of illness associated with unnecessary exposure.

41 Despite this relatively good performance of the *status quo*, there have still been circumstances where vets have been inappropriately exposed to radiation, particularly for vets who undertake radiographic assessments of horses for yearling sales.<sup>9</sup>

The Radiation Health Committee is concerned that ‘the accumulated dose to those performing the radiography could be significant and possibly above the radiation dose limits in radiation safety regulations and standards...exacerbated by the fact that only a small number of persons are performing the radiography for the yearling sales...’.<sup>10</sup>

42 There are currently 20 vets and other personnel undertaking equine radiological assessments or in close proximity to those assessments. Significant benefits could be generated if the *status quo* — or any regulatory approach for that matter — that could avoid any severe adverse consequences from exposure to radiation for this high-risk group. For example, as a rough guide, a human capital model of workplace costs suggests that the major categories of indirect costs associated with workplace-related disease-induced death — i.e. consequential overtime, loss of productivity, staff turnover costs, retraining costs; lost future earnings, legal costs, pain and suffering, loss of income, health and medical costs, loss of gross domestic product (i.e. human capital), and loss of tax and revenue — are worth in excess of \$500 000 per work-place related death.<sup>11</sup>

---

<sup>7</sup> This is estimated using UK data contained from UNSCEAR as a proxy for Australia — see UNSCEAR 2000, op. cit, p 387.

<sup>8</sup> The ALARA principle encourages users of radiation to ensure that radiation exposure is kept as low as reasonably achievable (ALARA) after taking into account economic and social factors.

<sup>9</sup> ARPANSA 2004, *Statement on Veterinary Investigations for Yearling Sales*, Press Release, July.

<sup>10</sup> Ibid.

<sup>11</sup> Derived from Industry Commission 1995, *Work, Health and Safety*, AGPS, Canberra. Collins and Lapsley note that ‘The human capital approach is necessarily always adopted in benefit-cost analysis (BCA) where the nature of the task is to compare, on a common basis, time streams of costs and benefits.’ — D. Collins and H. Lapsley 2002, *Counting the Cost: Estimates of the Social Costs of Drug Abuse in Australia in 1998-99*, Monograph Series No. 49, Commonwealth Department of Health and Ageing, Canberra, p. 14.

## Self-Regulation Model

- 43 Industry self-regulation describes a regulatory system whereby it is industry participants who primarily determine the type of actions or procedures that constitute appropriate conduct. But to develop some concept as to what are the costs and benefits of a self-regulatory regime it is necessary to make a judgement as to what the self-regulatory arrangements would look like.
- 44 One possible approach for veterinary — and perhaps the most likely self-regulatory regime — is what Priest<sup>12</sup> calls ‘voluntary codes of conduct’ where a peak industry body develops an industry standard on behalf of all veterinary surgeons. Another possible model is the ‘firm-defined regulation’. While these options are contrasted in table 1.1, the cost benefit analysis that follows is relevant for either option.

MODELS OF SELF-REGULATION

Characteristic	The ‘voluntary codes of conduct’ model	The ‘firm-defined’ regulation model
Government involvement	Often little or none, but may be required or encouraged by legislation.	Government requires private industry to establish regulatory structure at firm level.
Source of power	Voluntarily established by contract.	Firm's control their own processes and employees.
Involvement of the public	Usually very little. May have public representative on committee developing code.	Depends. The structure may remove rulemaking from public consultation process.
Accountability	Usually no independent audit of compliance, no accountability to government. Accountability is all internal.	Government monitoring of private rule enforcement. Employee accountability to firm; firm to shareholders.
Rulemaking	Consensual. Approved by those who adopt code.	Rules made at firm or industry level specific to firm or industry requirements. May be approved by government regulator.
Adjudication	May be no provision; otherwise peer review committee, industry ombudsman or other dispute settlement mechanism.	Initial stage of firm discipline labour relations. Secondly through courts or tribunals.
Sanctions	Often none or involve dismissal from industry organization or right to use logo or other identifier of compliance. Penal sanctions not available.	At first instance at firm level — e.g. fines, employment sanctions, dismissals. Second instance, fines or regulatory sanctions by government.
Offences	Non compliance with code is usually not an offence in law; may have due diligence implications.	Offences in regulatory legislation continue to exist. Adjudication in civil courts continues. First step is private enforcement.
Membership or coverage	Usually adherence to code is voluntary. Free rider issues can be a problem.	The overall legislation covers an industry, the tailored rules cover a firm or smaller industry group.

Source: M. Priest (1997-98), ‘The privatization of regulation: Five models of self-regulation’, *Ottawa Law Review*, Vol. 29, p. 233.

## Costs

### Compliance

- 45 Nationally, there are around 2 800 licensed vets and assistants<sup>13</sup> comprising around 1 800 veterinary practices.<sup>14</sup> Under self-regulation therefore, there is the potential for hundreds of

<sup>12</sup> See M. Priest (1997-98), ‘The privatization of regulation: Five models of self-regulation’, *Ottawa Law Review*, Vol. 29, p. 233.

<sup>13</sup> Figures from ARPANSA.

alternative radiation protection approaches. This could result in confusion and uncertainty as to appropriate radiation protection practices, it will certainly add compliance costs to the industry, and it will make it difficult for regulatory agencies to assure themselves that radiation protection was being appropriately undertaken.

46 Furthermore, given that the majority of veterinary practices are small businesses the compliance burdens associated with self-regulation are likely to be significantly higher than for other industries where small businesses are a much smaller proportion of industry participants.

47 Under self-regulation:

- decision making about exposure to ionising radiation would be delegated and hence decisions on radiation exposure would be made by people who may not have expertise in radiation use and protection;
- the setting of standards could be influenced by commercial interests and could be subject to change without a rigorous assessment — potentially increasing the risk of over exposure for vets, veterinary staff, the general public and animals (pets); and
- radiation protection will rely on a vets' ability to organise efficiently and effectively suitable processes, schemes or approaches to manage radiation risks; however, without legal compulsion there may be only limited incentives to do so.

48 These factors lead to a conclusion that vets will need to incur most costs and dedicate more time to radiation protection under self regulation than under the *status quo*. This could cost up to \$450 000 per year in compliance costs, assuming that it requires each veterinary practice to devote 1 full day to radiation protection per year.<sup>15</sup>

### **Administration**

49 Self-regulation could involve some transitional administrative costs for government if jurisdictions are required to amend legislation or regulatory controls. Presuming a move to self-regulation is acceptable, then legislative amendments are likely to be seen as 'machinery of government' and hence the administrative costs would be small. If however, legislative changes require considerable effort then a move to a self-regulatory approach could involve a one-off cost of up to \$400 000.<sup>16</sup>

### **Health and Safety**

50 Self-regulation is likely to result in a degree of radiation protection — in terms of both occupational and medical effective dose levels. However, self-regulation may result in increases in average annual effective dose levels, as some veterinary surgeons or assistants in

---

<sup>14</sup> Australian Veterinary Association, *2003 Annual Report*, Accessed 10 November at <http://www.ava.com.au/>, p.7.

<sup>15</sup> This estimate is based ABS data which states that per practitioner income was \$70 000 per year in 2001—ABS 2001 Cat 8564.0 — and an estimated number of working days of 280 in a year. The cost to veterinary practices is the value of the lost day due to self-regulation (as measured in terms of lost income), which is \$250 per veterinary practice per year (based on \$70,000/280) and multiplied by the number of veterinary practices (ie 1800).

<sup>16</sup> The basis for this cost estimate is set out in the section on the "Proposed Code of Practice".

the veterinary industry may be inadvertently exposed due to less strict adherence to the ALARA principle<sup>17</sup> or due to less effective alternative compliance approaches. For example:

- veterinary surgeons and/or assistants using x-ray equipment while positioning an animal for a diagnostic treatment; or
- veterinary surgeons during radiotherapy treatments, where the radiation dose delivered to the patient is very much greater than in diagnostic procedures.

- 51 If self-regulation increased the average annual effective dose for vets to the current average occupational exposure of 0.24 mSv per year — then this would result in a cost of around \$44 730 per year for veterinary surgeons and those employed in veterinary sciences.<sup>18</sup>
- 52 Like the exposure level of vets, the average occupational dose for all industries is still significantly below the proposed exposure limits. In this light, if self-regulation resulted in exposure levels of around 1 mSv per year then the cost would increase to just under \$200 000 per year and if the exposure level increased to the proposed exposure limit of 20 mSv per year then the cost would be just under \$4 million per year.
- 53 Anything that increases the average annual effective dose will lead to a cost to vets, assistants, researchers and potentially others in the community. While the size of such a change cannot be predicted in advance, it is reasonable to expect that self-regulation is likely to result in some increased exposure given the nature of ionising radiation — i.e. human senses (sight, taste, smell, etc) cannot detect the level of exposure.

## Benefits

### *Flexibility*

- 54 Sometimes a one-size fits all regulatory approach limits innovation and stifles more efficient compliance mechanisms. This is particularly true where there are easily identifiable alternative compliance approaches which are cheap and effective to implement.
- 55 Self-regulation promotes efficiency in providing the opportunity to pursue those alternatives and hence would provide for flexibility for the veterinary profession to manage radiation protection in a manner they determine appropriate rather than the manner imposed by regulators. This has the potential to lower compliance costs; however, as was noted earlier other regulatory obligations and occupational health and safety requirements may limit the extent of this potential benefit (if it exists at all).

---

<sup>17</sup> It is acknowledged that this is an assertion for which there is no supporting research.

<sup>18</sup> This is based on:

- an assumed increase in average annual effective dose of 0.22 mSv per year (i.e. going from the current occupational exposure of 0.015 mSv to the average occupational exposure of 0.24 mSv per year) (taken from UNSCEAR 2000, op. cit.);
- a total of 2 800 vets in Australia; and
- an estimated cost per person sievert of \$71 000 — which is an inflation adjusted and exchange rate converted estimate taken from United Kingdom National Radiological Protection Board 1986, *Board advice on cost-benefit analysis*, Chilton, UK, p10.

## Proposed code of practice

- 56 The third option involves the revision of the two Codes issued by the National Health and Medical Research Council within its Radiation Health Series, to bring it into line with current radiation protection regulations.
- 57 ARPANSA has prepared a draft Code of Practice to provide guidance on uses of radiation in veterinary science. If implemented, the ARPANSA Code will replace 1982 and 1984 NHMRC Codes and will be published as part of the new ARPANSA Radiation Protection Series. In addition to updating the guidance provided in the NHMRC Codes, the proposed ARPANSA Code has been expanded to include guidance on veterinary nuclear medicine and the use of lasers in veterinary science.
- 58 It will supplement the radiation control legislation of the Commonwealth, States and Territories and will be implemented by the appropriate regulatory authorities in each of these jurisdictions.
- 59 The proposed ARPANSA Code applies to the use of radiation in the practice of veterinary science, teaching and research and embraces diagnostic radiology, radiotherapy and nuclear medicine. It lays down detailed requirements for the following protective measures:
- (a) allocation of responsibility for all safety procedures and radiation surveillance,
  - (b) provision of appropriate premises and installations,
  - (c) provision of appropriate radiation and ancillary equipment, and
  - (d) provision of appropriate maintenance and safety checking of equipment.
- 60 The revised ARPANSA Code of Practice would differ from the RHS No. 3 and 10 Codes of Practice in that it will:
- update the guidance provided in these two Codes into a single Code;
  - expand on the guidance on veterinary nuclear medicine;
  - expand on the guidance on the use of lasers in veterinary science;
  - incorporate ICRP Publication 60 [1991] and the scheduled dose limit, consistent with RPS1 and the National Directory;
  - introduce the *Code of Practice for the Safe Transport of Radioactive Material (2001)*;
  - require better practices for holding X-ray units or film cassettes during diagnostic, therapeutic or radiography cases; and
  - require the appointment of radiation safety officers in some jurisdictions.

## Costs

### *Compliance*

- 61 The proposed Code will impact on vets that use x-ray equipment in a number of ways.
- All vets (who operate radiation equipment) will be required to appoint a radiation safety officer. In the majority of the States and Territories, the appointment of a radiation safety officer is a

mandatory requirement as part of the veterinary licensing conditions.<sup>19</sup> As such, most jurisdictions require no further changes with the adoption of the proposed Code.

For New South Wales though, radiation safety officers are not currently required to be appointed. Estimating that there are 900 licensed vets in New South Wales, and that half a day will be needed to familiarise radiation safety officers with the new role (4 hours), and at an average rate of \$250 per day per radiation safety officer, then this provision would involve a cost of \$112 500. This is a one-off cost, as ongoing familiarisation costs would be marginal once vets became familiar with the role of the radiation safety officer as part of their licensing conditions.

- The proposed Code introduces a number of requirements for ensuring safe practices for staff and visitors, such as requiring:
  - warning signs;
  - irradiation indicators; and
  - X-ray tube shielding.

These requirements are unlikely to result in additional costs for vets as they should already be familiar with and have implemented systems consistent with standard practices and safety procedures under the Australian Standards.

- The proposed Code requires the responsible person to ensure that radiation safety assessments be carried out when the X-ray high voltage generator is replaced or otherwise modified. This could cost the industry around \$225 000, if up to half a day is needed per premise to carry out the assessment.<sup>20</sup>

62 The proposed Code includes guidance on the use of lasers in veterinary science. At present only the Commonwealth, Western Australia and Tasmania regulate the use of dealing with (particular classes of) non-ionising radiation apparatus or equipment. These jurisdictions, however, currently do not regulate particular classes of lasers likely to be used in veterinary practices and therefore the guidance material will not impact on vets in those jurisdictions. For the other States and the Northern Territory, vets will not be impacted unless these jurisdictions regulate non-ionising radiation.<sup>21</sup>

63 Under the proposed Code, guidance has been expanded to include advice on the use of nuclear medicine in veterinary practices. This involves both the procedures and facilities relevant for using unsealed radioactive sources for either diagnostic or therapeutic purposes. Nationally, there are 23 veterinary practices licensed for nuclear medicine.<sup>22</sup> The proposed Code requires:

- special dedicated facilities for storing, safe handling, manipulating and dispensing of unsealed radioactive sources;
- approval of the design and the facilities by the relevant authority;

---

<sup>19</sup> The RSO is required to have sufficient professional expertise on all aspects of radiation safety, including advising staff on safe work practices, ensuring that regulatory matters are duly processed, and arranging for records to be provided and kept.

<sup>20</sup> The inputs used here were discussed earlier in footnote 16, namely the value per day for a vets time is \$250.

<sup>21</sup> The Australian Capital Territory cannot regulate non-ionising radiation, as non-ionising radiation is not defined in its Act.

<sup>22</sup> These practices are in New South Wales, Victoria, Queensland and Western Australia.

- protective aprons and gloves;
- dedicated facilities used for nuclear medicine procedures for housing of animals;
- completing records.

Stakeholders are invited to submit details on the initial and ongoing costs of these requirements.

- 64 The proposed Code will require familiarisation with the *Code of Practice for the Safe Transport of Radioactive Material (2001)* which sets out the internationally accepted standards for packaging, loading and transporting of radioactive substances. The *Code of Practice for the Safe Transport of Radioactive Material (2001)* has been adopted by all jurisdictions (except Victoria, which is in the process of adoption) and should not therefore result in additional time or resources for veterinary industry members or regulators.
- 65 Manufacturers, suppliers and others who deal with veterinary X-ray equipment will need to update their knowledge of the proposed Code of Practice. The costs of this are expected to be small however as the safety requirements incorporated into the proposed Code are already familiar to them as equipment aspects are incorporated in particular Australian Standards. Many of these suppliers also provide similar equipment to the medical profession where the standards are higher due to consideration of the dose received by human patients. As their equipment would already meet the more stringent standards required for medical X-ray equipment, the requirements of the proposed Code would have minimal costs for these suppliers.

### **Administration**

- 66 With the introduction of any new code, the regulators themselves require some retraining and familiarisation with the Code. It is expected that this will involve only a small cost for certain jurisdictions — New South Wales, Victoria, and ARPANSA — as they have adopted both existing Codes as part of their licensing and registration conditions.<sup>23</sup>
- 67 For the remaining jurisdictions — Queensland, Western Australia, South Australia, Tasmania, the Australian Capital Territory and Northern Territory who have not directly adopted the RHS 10 Code (nor the RHS 3 Code in the case of the Australian Capital Territory) — it has been suggested that there would be a small cost associated with familiarisation with the Code.
- 68 For these jurisdictions, it is estimated that the number of hours associated with familiarisation with a new code may be of the order of 40 person-hours. Using an average figure of approximately \$25 to \$30 per hour per staff member and an on-cost multiplication factor of 2.2, the cost to a regulatory body for retraining/familiarisation would be between \$2 200 and \$2 700. Nationally, this equates to between \$13 200 and \$16 200.
- 69 The introduction of the proposed Code would also mean that each jurisdiction may need to amend regulations. As discussed earlier, changing regulations requires resources and costs on behalf of government, including seeking policy approvals, draft changes, and making regulations.
- 70 These costs will be one-off and will have no further impact on the way in which jurisdictions regulate radiation protection issues nor will they have any impact on industry, consumers of products that use radioactive substances, nor the public more generally. While such

---

<sup>23</sup> National Directory for Radiation Protection, Annex 3, p.48.

administrative costs are rarely costed in regulatory impact analysis, it should be acknowledged that even machinery of government legislative changes impose costs.

- 71 By way of example of what this might entail, in Western Australia, the average cost of legislative amendments that was directly attributable to a department was estimated to be around \$45 000 — although it was acknowledged that this was an underestimate.<sup>24</sup>
- 72 Using these estimates as a guide to the administrative cost of implementing the proposed Code, then the total administrative cost of amending legislation nationally could be around \$405 000. This assumes that all jurisdictions need to pass some legislative amendments. The actual cost could be much lower as these amendments are relatively non-controversial, would have been subject to considerable debate, and some of the jurisdictions have already adopted both Codes in their legislative frameworks — hence it should not consume significant parliamentary or departmental resources.

## Benefits

### *Health and safety*

- 73 There are several health benefits associated with the adoption of the proposed code. There should be increased health outcomes because of several factors:
- better practices for holding X-ray units or film cassettes during diagnostic, therapeutic or radiography cases;
  - procedures being adopted to take into account radiation protection (including radiation safety officers in some jurisdictions); and
  - the tightening of the occupational dose limits.
- 74 Since occupational radiation exposure in the veterinary sciences and public exposure is already extremely low — as discussed earlier — then the move to the proposed Code is unlikely to produce significant additional health and safety benefits for vets, for those who work in the veterinary industry and the general public.
- 75 The proposed Code may however, result in improved health and safety outcomes for the community if, as was discussed earlier in terms of dynamic inefficiencies in the *status quo* option or increased exposure under self-regulation, the proposed regulations facilitates the avoidance of increased exposure. That is, while not contributing to a reduction in exposure in the veterinary industry, the proposed Code is expected to help maintain the importance and commitment to ALARA. The proposed Code will result in cost savings due to costs avoided.
- 76 In terms of over-exposure to radiation, particularly for equine veterinary personnel, it will not take many avoided radiation exposure incidents to generate significant savings. For example, and as was discussed earlier, the human capital model of workplace costs suggests that the indirect costs associated with workplace-related disease-induced death — i.e. consequential overtime, loss of productivity, staff turnover costs, retraining costs; lost future earnings, legal costs, pain and suffering, loss of income, health and medical costs, loss of gross domestic

---

<sup>24</sup> Department of Local Government and Regional Development 2003, *Annual Report 2002-2003*, Perth, p. 21.

product (i.e. human capital), and loss of tax and revenue — are worth in excess of \$500 000 per work-place related death.<sup>25</sup>

- 77 Overall, while the direct health benefits for vets, assistants, and staff may not be all that large since radiation exposure is already extremely low, there is reason to believe that there will be considerable benefits to the industry and the broader community resulting from reduced exposure to radiation as part of veterinary treatment and diagnosis.

### **Uniformity**

- 78 In addition to health benefits — and in fact a contributing factor to those health benefits — the proposed Code is likely to result in benefits associated with better coordination and uniformity of radiation protection regulation, for example:
- the material being published in the single proposed Code — will give clear up-to-date national guidance on safety obligations for all who deal with veterinary x-ray equipment; and
  - regulatory obligations can be better promoted through a consistent message from all jurisdictions regardless of location.

### **Summary of cost benefit analysis**

- 79 The costs and benefits for each of the options are not necessarily spread evenly among the community. Relative to the *status quo*, the major distributional impacts associated with:
- self-regulation include:
    - there will be a greater onus on vets, staff and the general public to protect themselves by being knowledgeable of risks, and enforcing their rights under other regulatory obligations. Given that employees and the general public are not usually in the best position to protect themselves, largely because of information asymmetries, they will likely bear the burdens associated with reduced health and safety outcomes;
    - government regulators may in principle ‘save’ administration costs associated with both Codes, but administration and enforcement costs will not change significantly as those resources are likely to be transferred and needed to enforce general occupational health and safety regulatory requirements;
  - the introduction of the new code includes:
    - one-off costs associated with appointing radiation safety officers;
    - direct health benefits to the veterinary industry and the broader community;
    - increased costs for regulators as they come up to speed on the Code; and
    - greater clarity in the Code.

---

<sup>25</sup> Derived from Industry Commission 1995, *Work, Health and Safety*, AGPS, Canberra. Collins and Lapsley note that ‘The human capital approach is necessarily always adopted in benefit-cost analysis (BCA) where the nature of the task is to compare, on a common basis, time streams of costs and benefits.’ — D. Collins and H. Lapsley 2002, *Counting the Cost: Estimates of the Social Costs of Drug Abuse in Australia in 1998-99*, Monograph Series No. 49, Commonwealth Department of Health and Ageing, Canberra, p. 14. It is noted that the observation that the human capital approach “is used most often” in cost-benefit and cost-effectiveness analyses is due to the availability of reliable statistics, the relative simplicity of calculations and the consistency of results, which permit comparison between diagnostic categories or with other cost-of-illness studies using this approach. For further information please see [http://www.phac-aspc.gc.ca/publicat/ebic-femc93/burd2\\_e.html](http://www.phac-aspc.gc.ca/publicat/ebic-femc93/burd2_e.html).

80 In summary:

- the *status quo* has the benefit of familiarity (and hence attendant low compliance and administrative costs), but will promote an inconsistent approach to radiation protection more broadly;
- self-regulation is constrained by the fact that to be successful:
  - there must be common understanding of the risks associated with radiation safety and procedures amongst all practitioners;
  - there must be sufficient power and commonality of interest within an industry to deter non-compliance; and
  - the cost of non-compliance must be small.

81 These issues are not satisfied with respect to the use of radiation in veterinary science.

- The proposed code entails higher administration and compliance costs than the *status quo*, but there are likely to be offsetting health and safety benefits.

82 The costs and benefits of the self-regulation model and proposed code have been assessed according to whether the impacts are minimal, higher or significantly higher compared with the status quo and these impacts (with the *status quo* being used as the base comparator). This assessment is summarised in table 2.2.

#### NATURE OF THE IMPACTS COMPARED TO THE *STATUS QUO*

Impact	Self-regulation	Proposed Code
<b>Costs</b>		
Compliance	<p><i>Minimal additional compliance costs</i></p> <p>Up to \$450 000 incurred in order to keep up to date on radiation protection requirements and to implement new systems for compliance.</p>	<p><i>Higher costs</i></p> <p>Appointing radiation safety officers will cost an additional \$112 500, offset by health benefits from better radiation safety practices.</p> <p>The responsible person must ensure that radiation safety assessments be carried out when the X-ray high voltage generator is replaced or otherwise modified. This could cost the industry around \$225 000 per year, if up to half a day is needed per premise to carry out the assessment.</p> <p>Costs for veterinary practices to establish nuclear medicine services as a result of upgrading procedures and facilities. These costs are not expected to be high as there are few veterinary practices providing these services and the Code is similar to existing regulatory requirements.</p>
Administration	<p><i>Minimal changes to administration costs</i></p> <p>Increased costs associated with legislative amendments.</p>	<p><i>Higher costs</i></p> <p>Up to around \$16 000 in one-off staff training costs for regulators.</p> <p>Ongoing additional costs are not considered significant.</p> <p>May need to amend regulations to accommodate a new code may incur one-off administrative costs of up to \$405 000.</p>

Impact	Self-regulation	Proposed Code
Health and Safety	<p><i>Minimal costs</i></p> <p>Reduced regulatory control is likely to lead to higher effective dose levels which could result in a cost of between \$44 730 to \$4 million per year.</p>	
<i>Cost sub-total</i>	<p><i>Minimal costs</i></p> <p>The likely increase in health and safety costs probably outweighs the costs associated with compliance</p>	
<b>Benefit</b>		
Flexibility	<p><i>Minimal benefits</i></p> <p>This option allows greater flexibility for industry to determine the appropriate levels and whether conditions are mandatory or not.</p>	
Uniformity		<p><i>Higher benefits</i></p> <p>There is likely to be greater clarity in the Code and Safety Guide procedures, for vets and veterinary staff.</p>
Health and safety		<p><i>Higher benefits</i></p> <p>Reduced exposure to radiation for the general community is estimated to have a nett benefit due to costs avoided.</p>
<i>Benefit sub-total</i>	<p><i>There is likely to be only limited benefits, if they exist, in terms of additional flexibility.</i></p>	<p><i>There are greater benefits associated with the proposed Code.</i></p>
<b>TOTAL</b>	<p><b><i>Moving to this option would result in minimal benefits and minimal costs.</i></b></p>	<p><b><i>Moving to this option would more than likely result in net benefits</i></b></p>

## Consultation

- 83 The proposed Code was developed by a working group of the Radiation Health Committee. The Radiation Health Committee includes representation of all Commonwealth, State and Territory radiation protection regulators.
- 84 The draft Code has initially been made available on the ARPANSA web site at [www.arpansa.gov.au](http://www.arpansa.gov.au) from [DATE] until 29 July 2005. This has been extended to allow comment on this Regulatory Impact Statement. The following organisations have been advised of the availability of the proposed ARPANSA Code and this Regulatory Impact Statement and their comments have been requested:

Australian Veterinary Association  
Australian Veterinary Association (Vic Division)  
Australian Veterinary Association (SA Division)  
Australian Veterinary Association (ACT Division)  
Australian Veterinary Association (Qld Division)  
Australian Veterinary Association (NT Division)  
Australian Veterinary Association (WA Division)  
Australian Veterinary Association (NSW Division)  
Australian Veterinary Association (Tas Division)  
Australian Equine Veterinary Association  
Animal Health Australia  
Australian Pesticides and Veterinary Medicines  
Commonwealth Veterinary Association, Dept of Primary Industries  
School of Veterinary Sciences, University of Queensland  
National Farmers' Federation  
Faculty of Veterinary Science, Camperdown Campus, University of Sydney  
School of Veterinary and Biomedical Sciences, Murdoch University  
Faculty of Veterinary Science, Camden Campus, University of Sydney  
Veterinary Nurses Council of Australia  
Australian College of Veterinary Scientists  
Director of International Programs (Health Sciences), Curtin University  
Faculty of Veterinary Science, The University of Melbourne  
Institute of Medical and Veterinary Science  
Post-graduate Foundation in Veterinary Science, University of Sydney  
Dr Max Zuber  
Veterinary Practitioners' Registration Board of Victoria  
Institute of Veterinary, Animal and Biomedical Sciences, Massey University, NZ  
Veterinary Health Research  
Ballarat Veterinary Practice  
Dr John Hamilton  
Veterinary Surgeons Board of WA  
Dept of Agriculture, Fisheries and Forestry (ACT)  
Veterinary Surgeons Board of Queensland  
Australasian Veterinary Boards Council  
The Veterinary Board of Tasmania  
Vet Surgeons Board of the ACT  
Veterinary Board of the NT  
ANZSNM Accreditation Board  
Veterinary Surgeons Board of NSW  
Veterinary Surgeons Board of SA  
Veterinary Surgeons Board of WA  
Mr Peter Collins, Royal Adelaide Hospital  
Dr Barry Chatterton, Dept of Nuc Med & Bone Densitometry, Royal Adelaide Hospital  
Australian Radiation Services P/L  
Radiation Safety Services

Radiation-Wise P/L  
Australian Diagnostic Imaging Association  
Australian Institute of Radiography  
Royal Australian and New Zealand College of Radiologists  
Australasian Association of Educators in Medical Radiation Sciences  
Radiation Safety Committee, Charles Sturt University  
Agriculture and Animal Science, NMIT  
Medical Radiation Science, University of Newcastle  
Australian Training Products  
Science and Technology Faculty, Canberra Institute of Technology  
Centre for Biotechnology and Animal Sciences, Box Hill Institute  
Rural Skills Australia  
RSPCA Australia Inc  
Australian Veterinary Practice Management Association  
Faculty of Science, Engineering and Technology, Victoria University  
Agricultural Colleges of Queensland  
Australasian Radiation Protection Society  
Radiation Advisory Council (Qld)  
Director-General, Queensland Health  
Rural Training Council of Australia  
Animal Industries Resource Centre  
Oakey Veterinary Hospital  
Animal Science Dept, Brisbane North Institute of TAFE0  
Radiation Protection Solutions  
Dr Christopher Reardon  
Magic Millions Sales P/L  
Montrose Veterinary Centre (Tas)  
CSIRO Occupational Health & Safety  
CSIRO Livestock Industries

## Implementation and Review

- 85 The proposed Code will be published by ARPANSA under its Radiation Protection Series. ARPANSA's Radiation Health Committee will review the Code within 10 years of its commencement to ensure it is still relevant to radiation protection needs. Earlier review would be undertaken if there are problems in the implementation of the Code, if international or national radiation protection objectives change or if there is new information from international research.
- 86 After publication, the Code will be proposed for incorporation into the National Directory for Radiation Protection, Edition 2 of which is now being prepared by ARPANSA. In August 1999, the Australian Health Ministers' Conference endorsed the National Directory as the mechanism for implementing national standards and codes of practice in radiation protection. When the Code is incorporated into the National Directory, all States and Territories must adopt it into their regulatory frameworks.
- 87 Once the Code is published, all organisations listed in paragraph 84, and other stakeholders made known to ARPANSA during the consultation period, will be advised of its publication. Regulatory authorities in each jurisdiction will, in turn, inform licensed veterinary practices within their jurisdiction of the promulgation of the Code.

## References

ABS (Australian Bureau of Statistics) 2001, *Veterinary Services, Australia, 2000*, cat. no. 8564.0, AusInfo, Canberra.

ARPANSA 2002, *Recommendations for limiting exposure to ionizing radiation* (1995), and National Occupational Health and Safety Commission 1995, National standard for limiting occupational exposure to ionizing radiation (1995), Radiation Protection Series No. 1, CEO of ARPANSA. [Republished in 2002]

ARPANSA, 2003, Draft National Directory for Radiation Protection Version 1.0. <http://www.arpansa.gov.au>.

Council of Australian Governments, November 1997 (Amended 2004), *Principles and Guidelines for National Standard Setting and Regulatory Action by Ministerial Councils and Standards-Setting Bodies*, COAG.

D. Collins and H. Lapsley 2002, *Counting the Cost: Estimates of the Social Costs of Drug Abuse in Australia in 1998-99*, Monograph Series No. 49, Commonwealth Department of Health and Ageing, Canberra.

Department of Local Government and Regional Development 2003, *Annual Report 2002-2003*, Perth.

Industry Commission 1995, *Work, Health and Safety*, AGPS, Canberra.

National Health and Medical Research Council 1982, *NHMRC Code of Practice for the Safe use of Ionising Radiation in Veterinary Radiology: Parts 1 and 2*, AGPS, Canberra.

National Health and Medical Research Council 1984, *NHMRC Code of Practice for the Safe use of Ionising Radiation in Veterinary Radiology: Part 3 — Radiotherapy*, AGPS, Canberra.

M. Priest (1997-98), 'The privatization of regulation: Five models of self-regulation', *Ottawa Law Review*, Vol. 29, p. 233.

United Kingdom National Radiological Protection Board 1986, *Board advice on cost-benefit analysis*, United Kingdom, Chilton.

United Nations Scientific Committee on the Effects of Atomic Radiation 2000, *Sources and Effects of Ionising Radiation: UNSCEAR 2000 Report to the General Assembly, with Scientific Annexes*, United Nations, New York.