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5 **Animal welfare education; development and prospects**

6
7 Donald M. Broom

8
9 **Abstract**

10
11 Animal welfare has developed rapidly as a scientific discipline since the 1980s. Concepts
12 have been refined, methodologies for assessment developed and links made to other areas
13 of science. Changes in the subject and in its teaching are required. Since 1986, a series
14 of senior academic teaching posts in the subject have been created, especially in the last
15 ten years. Veterinary and animal science students should receive a specific course on
16 animal welfare, in addition to mention of the subject in other courses. In the future, more
17 allusion to developments in understanding of welfare in relation to disease and brain
18 measures of welfare are likely. The central role of animal welfare in veterinary and
19 animal science teaching will become more firmly established.

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21 **Animal welfare prior to 1986**

22
23 Animal welfare arose as a scientific discipline in the 1980's and has developed rapidly
24 since that time. However, some components of the science and much of the ethical basis
25 which encouraged its development existed long before that time. Health is an important
26 part of welfare (for discussion of concepts see Refs ¹⁻⁷), and both research and teaching
27 on how to treat disease and alleviate pain have long been central concepts of veterinary
28 education. Veterinary teachers vary in the extent to which they emphasise the importance
29 of minimizing disease for the animal itself, rather than for financial objectives or to limit
30 zoonoses. Whatever the motivation of the veterinary work, however, reduction of disease
31 improves welfare so veterinarians have long had a fundamental involvement with animal
32 welfare. Many farmers and others involved in keeping and caring for animals have also
33 tried to improve animal welfare. Other aspects of research and teaching relevant to
34 animal welfare were stress, physiology and animal behaviour work carried out by
35 zoologists and psychologists. A very small number of academic philosophers had an
36 interest in the ethics of animal usage.

37
38 The terms “animal welfare”, and more rarely “animal well-being”, were used extensively
39 by the general public in the 1950 – 1986 period. Animal protection societies campaigned
40 referring principally to the welfare of companion and laboratory animals. A significant
41 publication, which advocated concern about the welfare of farm animals, was Ruth
42 Harrison's book “Animal Machines”.⁸ Ruth Harrison was unusual amongst scientists
43 interested in animal welfare in that she regularly attended the more important scientific
44 meetings on the subject such as those of the Society for Veterinary Ethology, later called
45 International Society for Applied Ethology, and the World Poultry Science Association.
46 Her efforts were significant in that she reminded veterinarians and other animal welfare

1 scientists that there were many more farm animals than companion or laboratory animals
2 and some of them were kept in ways which resulted in very poor welfare. Her logical
3 arguments stimulated governments to fund animal welfare research.

4 The primary leaders in animal welfare research at this time are listed in Table 1. Funding
5 support for their work usually has a basis in production or disease objectives.

6 7 **Animal welfare teaching since 1986** 8

9 Since 1986 there has been a great increase in animal welfare research and in public
10 concern about animal welfare. Veterinarians have become much more aware of animal
11 welfare as a scientific discipline and of animal welfare courses as a necessary part of
12 veterinary education. Although such progress occurred first in the UK, Switzerland,
13 Scandinavian countries and the Netherlands, it is now Europe-wide and is significant in
14 Australia, New Zealand, Canada, Mexico, Brazil and the United States. In 1986, the
15 author was appointed as the world's first Professor of Animal Welfare at Cambridge
16 Veterinary School. Since that time eighteen other Professorships of Animal Welfare have
17 been set up (Table 2). Of the nineteen professors of animal welfare in the world twelve
18 are in veterinary schools and four are veterinarians by training. There are many
19 professors who do not have the name animal welfare in their title but who teach it and
20 include it as a major part of their research. These include John Webster, Bristol, UK;
21 Francisco Galindo, UNAM, Mexico City, Mexico; Temple Grandin, University of
22 Colorado, USA; Ray Stricklin, University of Maryland, USA; Mateus Paranhos da Costa,
23 UNESP, Jaboticabal, Brazil; Frank Ödberg, Gent, Belgium; Leopoldo Estol, University
24 of Salvador, Buenos Aires, Argentina; Luis-Carlos Pinheiro Machado, University Santa
25 Catarina, Florianopolis, Brazil; Joy Mench, University of California, Davis, USA; Jörg
26 Hartung, Hannover, Germany; Bert van Zutphen, Leiden, Netherlands; and Adroaldo
27 Zanella, Michigan State University, East Lansing, USA. There are at least thirty other
28 active scientists who teach and carry out research on animal welfare and many
29 philosophers who teach courses on ethics of animal usage, particularly in the USA.

30
31 This development of animal welfare as a subject taught to veterinary, agriculture and
32 biology students occurred slowly at first, with only ten of the thirty one professors
33 mentioned above appointed before 1995 and the other twenty one appointed since then.
34 Sixty percent of these professors are in veterinary departments but only twenty nine
35 percent of the professors and probably twenty percent of animal welfare research workers
36 are veterinarians. This is, in part, because the proportion of the cleverest veterinarians
37 who go into teaching and research is not large. Many of those who are in the forefront of
38 animal welfare research originated as ethologists but have acquired other expertise in
39 order to be aware of all aspects of the subject.

40
41 The dramatic change in the teaching of animal welfare courses to veterinary and
42 agriculture students from only two substantial courses in 1986 to over a hundred in 2005
43 has followed changes in public opinion in many countries around the world. It has been
44 part of a more general effect. In recent years, public pressure has grown for codes of
45 practice and laws concerning the impact of agriculture and other commercial activity on
46 human welfare, especially health, animal welfare and the environment. Underlying this

1 has been the view that it is uncivilised to allow people to become sick, animals to be
2 treated badly or the environment to be damaged. The concept of sustainability has been
3 taken into account more and more. A system or procedure is sustainable if it is
4 acceptable now and if its expected future effects are acceptable, in particular in relation to
5 resource availability, consequences of functioning and morality of action.⁹ Animal
6 welfare is one of the criteria used by the public when deciding whether a procedure or
7 system is acceptable so is a necessary consideration for sustainability. Evidence for
8 increased concern about animal welfare includes letters from the public to politicians,
9 media coverage, parliamentary discussions, government statements and laws, requests for
10 scientific evidence, activity of advisory committees, funding of scientific research and
11 extent of teaching and conference activity. An example of such evidence is that members
12 of the European Parliament receive more letters about animal welfare than about any
13 other topic. The impact of scientists on government decisions about animal welfare
14 issues has been substantial. In the EU, in many individual countries and in international
15 organisations like the OIE, veterinary staff now take the advice of animal welfare
16 scientists about the results of animal welfare research when formulating guidelines and
17 laws. Similarly, food retailing and producing companies use similar information and
18 advice when formulating policy with regard to which animal production systems and
19 procedures are allowable.

21 **How should animal welfare be taught?**

23 Any veterinary course and many courses for agriculture and biology students may
24 incorporate references to the impact of the core topic on animal welfare. However, it is
25 necessary, especially for veterinary and animal science courses for there to be specific
26 courses on animal welfare. In many cases, many of the members of a curriculum
27 committee will not have received such a course and may not be fully aware of the rapid
28 development of animal welfare science so will require persuasion on this point. The two
29 major reasons why a specific course is needed are, firstly that the interdisciplinary nature
30 of the scientific assessment of animal welfare means students are not able to acquire and
31 understand the relevant information without receiving integrated lectures and other
32 material on the subject. The second reason is that students need guidance on the inter-
33 relations between the underlying ethics issues and the science. Veterinary and agriculture
34 students do not usually realise that there are differences between deontological and
35 utilitarian approaches and need a logical explanation of such ethical approaches to
36 questions about animal usage. Given such approaches, they can decide or themselves
37 what their own position is. They can be told how the scientific evidence can be utilised
38 in decision-making.

40 Veterinary and science students will obtain a general background in basic science and it
41 is better if the animal welfare course is taught after this. An introductory lecture on
42 animal welfare at the beginning of their program is useful to introduce the issues but
43 animal welfare courses require knowledge of regulatory physiology, animal behaviour
44 and basic function of the immune systems and the brain. Hence these must either precede
45 the animal welfare course or elements must be incorporated in it.

1 The ethics part of a course on animal welfare is best taught by a small amount of
2 lecturing on basic philosophical concepts and a large amount of discussion of examples
3 of real situations. Seminars at which ethical problems in veterinary medicine and animal
4 science are discussed by the students themselves are useful. The subject of animal
5 welfare, being relatively new, includes concepts which are used in general conversation
6 but which must be used in a precise way in animal welfare science. Hence the key terms
7 should be defined and their inter-relationships explained.

8
9 Since the quantification of poor welfare, including pain, fear and other negative feelings,
10 involves an array of measures of behaviour, physiology, immune systems, brain function
11 and evaluation of pathology, each of these should be explained to students in an animal
12 welfare course. It is also important to explain how good welfare can be assessed. A key
13 concept in animal welfare is the needs of the animal and these require explanation with
14 reference to motivation.^{4,10} Information from psychology, animal behaviour and micro-
15 economics is needed to understand how we find out what is important to animals of a
16 particular species. The section on scientific evaluation of welfare should be the largest
17 part of the course.

18
19 Both evidence concerning attitudes to animals and a discussion of laws are useful in an
20 animal welfare course. All of these general issues can then be followed by lectures on
21 specific animal usage topics. Various farm animal housing systems, transport of animals,
22 operations on animals, humane slaughter, disease effects on welfare, housing and
23 management of companion animals, laboratory animal housing and management, zoo
24 animal housing and management, human activity in relation to wild animal welfare and
25 genetic selection and modification in relation to welfare are all good topics to include in a
26 course. The particular topics can be selected as appropriate to the interests of the
27 audience.

28 29 **Future animal welfare teaching**

30
31 As animal welfare research has progressed, more areas of biology have been incorporated
32 and there has been a slow improvement in links to research on human welfare.¹¹
33 Behavioural work in relation to animal welfare has become more sophisticated, both in
34 understanding abnormal behaviours and in evaluating what is important to animals.
35 Links between behaviour, animal physiology, brain function and immunology responses
36 have been worked out. However, with further links among the various mechanisms,
37 especially with brain function, there are likely to be rapid developments in animal welfare
38 science. This new knowledge will need to be incorporated into teaching.

39
40 The range of animal subjects considered in animal welfare courses has been extending.
41 Fifteen years ago, much of the public concern was about laboratory animals and most of
42 the scientific evidence concerned farm animals. The fact that animal welfare science is
43 general to all animals, including man, has resulted in demands for work on a wide variety
44 of ethical studies of human impact on animals. Research on companion animals and
45 laboratory animal welfare has increased and a little work on zoo animals and wild
46 animals has occurred. It is likely that there will be scientific study of more problems and

1 more species so that evidence will become available which can be incorporated in
2 courses. Work on animals other than birds and mammals is increasing with considerable
3 interest in fish and on invertebrate animals. This trend is likely to continue as the
4 question of how animals cope with the more difficult aspects of their environment is of
5 fundamental importance in biology. The link between veterinary practice and animal
6 welfare has always been strong but should become better underpinned by research. The
7 effects of diseases and of treatments on welfare will be studied further and can then be
8 discussed in a more scientific way in animal welfare courses as well as elsewhere in the
9 veterinary course. The central role of animal welfare in veterinary and animal science
10 teaching will become more firmly established.

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Table 1: The Pre-1986 Leaders in Animal Welfare Science

Edinburgh, Scotland	David Wood-Gush & Ian Duncan
Bristol, England	Graham Perry & John Webster
Reading, England	Donald Broom
Oxford, England	Marian Dawkins
Liverpool, England	Roger Ewbank
Zeist, Holland, ,	G.C.Brantas & Gerrit van Putten
Wageningen, Holland	Piet Wiepkema & Jos Metz
Skara, Sweden	Ingvar Ekesbo
Copenhagen, Denmark	Klaus Vestergaard & Henrik Simonsen
Munich Germany	Hans Sambraus
Mariensee, Germany	Diedrich Schmit & Jürgen Unshelm
Bordeaux, France	Robert Dantzer
Bern, Switzerland	Beat Tschanz
St Johns, Canada	Andrew Fraser
Ottawa Canada	David Fraser
Guelph, Canada	Frank Hurnik
Ruakura, New Zealand	Ron Kilgour

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Table 2 Appointed Professors of Animal Welfare

Cambridge, UK	Donald Broom
Guelph, Canada,	Ian Duncan
Copenhagen, Denmark	Jan Ladewig
Saskatoon, Canada	Joe Stookey
Massey, New Zealand,	Neville Gregory and then David Mellor
Prince Edward Island Canada,	Caroline Hewson
Pennsylvania, USA	James Serpell
U.B.C. Vancouver, Canada	David Fraser
Utrecht, Netherlands,	Berry Spruijt
Washington State, USA,	Ruth Newberry
Purdue USA,	Ed Pajor
Skara, Sweden	Linda Keeling
Bern, Switzerland	Andreas Steiger
Liverpool, UK	Jane Hurst
Bristol, UK	Christine Nicol, Mike Mendl
Queensland, Australia	Clive Phillips
RVC, London, UK,	Neville Gregory
Technical University Auckland, New Zealand	Natalie Waran
