

Medical students' view on the use of animals in biomedical research

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Introduction

Animals continue to be essential in biomedical research and safety testing. This use of animals is much debated and criticised by so-called antivivisectionists. The various groups who want to forbid or at least dramatically limit the use of animals in research often appear as representatives for the general public because of extensive publicity in the media. This is unfortunate and there is a need for information on the attitudes of the general public to the use of animals in biomedical research. Cronholm (1992) stated that the views of the general public are often based on emotions, and not on facts. A majority may also lack both ability and interest to understand the often complex issues, that scientists bring forward in the debate. Something that further may limit the possibility to perform animal research in the future is thus not the animal-rights activists' contributions to the debate, but rather the lack of contributions from the researchers and the pharmaceutical industry. This results in a one sided message to politicians and legislators. An assumption often made in the debate concerning animal experimental research is that university teachers as well as students within the biomedical area automatically understand the need for use of animals in research, because they are well informed and because they have chosen this particular field (Pardes *et al.*, 1991). But is this true?

Previous surveys published in this area both in Sweden and abroad usually either describe the general public's or college students' (regardless what line of study they follow) views towards animals and animal research. Only a few surveys where the target group primarily consists of students, who have contact with laboratory animals during their education have been published, foremost by psychological journals.

The purpose of this survey was to elucidate the attitudes of medical students in Uppsala toward medical research ethics, specially to the use of

animals in research. Do they change their view on this issue during the course as a result of their teaching and training? Is it a gender issue or perhaps a generation issue, so that sex and age are more important concerning these issues than how long the students have studied medicine?

Materials and methods

Target group

The target group was medical students at Uppsala University. In total 140 individuals responded (75 women and 65 men). They were divided by three classes: 53, 41 and 46 students respectively per year: year 1 (term 1), year 3 (term 6) and year 6 (term 11). (The Swedish medical education consists of 11 terms.)

Questionnaire

Questions were phrased and put together to reflect attitudes toward animals and animal experimental research. Questions reflecting the attitudes to the use of nuclear power, the European Union and commitment to environmental issues were also included. The explaining variables used were gender, age and year of study. Some of the questions have been used in earlier reports, while others were constructed specifically for this survey. The questionnaire consisted of about 30 different questions (see Appendix 1). The questionnaire was distributed during lectures to students. Questionnaires were filled in anonymously during 10-15 minutes immediately after distribution. The population is defined as all who were part of the group and were present at the time of distribution. All students present returned completed questionnaires, but not all registered students were present at the times and places of distribution.

Statistical analysis

To measure differences between groups Pearson's chi-square-test was used, or where appropriate, Fisher's exact probability test was used. To mea-

sure relationships between variables the contingency coefficient was used (Aczel, 1993); p-values <0.05 were considered significant. For practical statistical reasons the two oldest classes were treated as one group, which means that the number of students in the class 27 years and older are 39, and this figure will be used later on in the tables. Since most students were between 20 to 40 years old, three classes seem to be an appropriate delimitation.

Results

The figures shown in the tables have been converted into percent figures. About half of the students had regular contact with animals and about 90% had conventional omnivorous eating habits. The others were vegetarians or semi-vegetarians (consume meat, fish, poultry and/or seafood occasionally). No respondent described herself/himself as a vegan (Table 1).

Table 1. The age distribution of the respondents. Frequencies. N=140

Age	F	M	Year 1	Year 3	Year 6	Sum
-21	24	12	31	5		36
22-26	39	24	11	26	26	63
27-37	11	25	10	10	16	36
38-		3			3	3
No response	1	1	1		1	2

There were more young female students than young male students but more older male students than older female students in the material (p<0.003). The students were as expected older, the longer they had studied medicine (p<0.0001) (Table 1). One feasible reason for the fact that the male students were a bit older, is probably that most of them had completed their national service prior to medical school.

Approximately 85% of the students were brought up in Sweden. More than 15% considered themselves being religiously active. Here the middle class "22-26 years old" was over represented compared to the other two (χ^2 (N=138)=9.207,

p<0.027). Less than 20% of the respondents were brought up in the countryside, about 30% in a small town (population <30 000) and more than 50% in a city with more than 30 000 people. The youngest age class had an over representation of students brought up in small towns, whereas the oldest age class was over represented in the city category (χ^2 (N=115)=17.295, p<0.044).

The students in years 3 and 6 had experience of animal experimental research, through teaching or own research, while the 1st year students had no experience (χ^2 (N=140)=55.51, p<0.0001) (C=0.533).

Table 2. Do you believe animals have rights or not? Percent. N=140

	F	M	-21	22-26	27-	Year 1	Year 3	Year 6
Yes	97	94	96	97	95	96	100	91
No	3	6	4	3	5	4	0	9

More than 95% of the medical students believed that animals have rights (Table 2). These students answered the follow up question, "if they considered animal rights above, equal to or below those of human rights"; the answers are shown in Table 3.

There seemed to be disproportionately more female students (χ^2 (N=134)=3.794, p<0.051) (C=0.166) who believed that animal rights are equal to human rights, than male students (Table 3).

Table 3. Do you consider animal rights above, equal to or below those of human rights? Percent. N=134

	F	M	-21	22-26	27-	Year 1	Year 3	Year 6
Above	0	0	0	0	0	0	0	0
Equal to	33	18	37	22	24	35	22	17
Below	67	82	63	78	76	65	78	83

There was no relationship between those who value animal rights above or equal to those of humans and vegetarianism. A higher proportion of the female students who considered themselves

pacifists believed that animal rights are equal to human rights compared with the other female students. This relationship was not present for male pacifist students.

Table 4 a-e. Comparisons between the groups attitudes toward animal rights activism and the use of animals in research. Percent.

<i>a. Do you consider yourself being an animal rights activist? N=139</i>								
	F	M	-21	22-26	27-	Year 1	Year 3	Year 6
Yes	7	3	3	8	3	11	2	4
No	93	97	97	92	97	89	98	96
<i>b. Is it morally acceptable to break the law in order to disrupt animal research? N=137</i>								
	F	M	-21	22-26	27-	Year 1	Year 3	Year 6
Yes	31,5	14	37	18	18	34	10	24
No	68,5	86	63	82	82	66	90	76
<i>c. Have you ever actively been part of any action, organisation and/or name collection against animal research? N=140</i>								
	F	M	-21	22-26	27-	Year 1	Year 3	Year 6
Yes	24	9	27	17	13	26	10	9
No	76	91	73	83	87	74	90	91
<i>d. Do you believe animal research is immoral regardless of the benefits? N=140</i>								
	F	M	-21	22-26	27-	Year 1	Year 3	Year 6
Yes	3	1,5	8	0	0	4	2	0
No	97	98,5	92	100	100	96	98	100
<i>e. Do you believe animal research plays a significant role in treating humans? N=140</i>								
	F	M	-21	22-26	27-	Year 1	Year 3	Year 6
Yes	90,5	97	89	93,5	97,5	96	93	100
No	9,5	3	11	6,5	2,5	4	7	0

Table 4a shows that students who were animal rights activists had more regular contact with animals, valued animal rights equal to those of humans to a larger extent, were vegetarians and were more against the use of nuclear power and the EU compared to non animal rights activists. Many of those who considered themselves as

animal rights activists were also active religious persons. Since there were only a few respondents who were animal rights activists, one should however not overstate these relationships. Only a quarter of those individuals who believe that animals and humans have equal rights considered themselves animal rights activists. A surprisingly

high number of students considered it morally acceptable to break Swedish Law in order to disrupt animal research (Table 4b). Female students (χ^2 (N=137)=6.013, $p<0.049$) and students in year one (χ^2 (N=137)=12.420, $p<0.014$) were more likely to answer yes to this question compared to other categories. About a quarter of the 6th year students considered it morally acceptable to break the law. Those who considered it morally acceptable to break the law to disrupt animal research, did not consider it morally acceptable to cheat on their income tax form or drive a car under the influence of alcohol (if nobody finds out) more than any other group. So they were not more anarchistic in general. When it comes to Table 4c, "if the students have actively been part of any action, organisation and/or name collection against animal research", those who answered yes were more likely to be female students (χ^2 (N=140)=5.347, $p<0.021$) and/or students of the first year (χ^2 (N=140)=7.496, $p<0.024$) than belonging to the other categories. Those who had actively been part of some action, organisation and/or name collecti-

on against animal research had also been active in some environmental issue. Those who believed animal research is immoral regardless of the benefits (Table 4d), were also animal rights activists. The youngest students were more likely to answer yes than the older students (χ^2 (N=140)=8.534, $p<0.036$). Those who considered themselves animal rights activists also tended to answer no to the last question 4e: "Do you believe animal research plays a significant role in treating humans?" There was no significant difference between the different categories (age, sex and year of study) regarding this question. These figures show that more than 95% of the respondents were positive toward the possibility to use laboratory animals for scientific purposes (Table 4d-e). Nine out of ten respondents agreed with the statement: "The typical animal researcher cares about laboratory animals but feels that research is needed" (Table 5). Most students ticked alternative two, and there was no significant difference between the different groups.

Table 5. Which statement do you agree with the most? Percent. N=140

1. "The typical animal researcher does not care about laboratory animals; they view animals as expendable supplies."								
2. "The typical animal researcher cares about laboratory animals but feels that research is needed."								
3. Cannot choose between 1 and 2								
	F	M	-21	22-26	27-	Year 1	Year 3	Year 6
Alt 1	1	8	5	3	5	9	0	4
Alt 2	92	86	92	87	90	87	98	85
Alt 3	7	6	3	10	5	4	2	11

Table 6 shows that close to half of the respondents believed there is a moral difference between using various categories of animals in animal research. In Table 7, the answers to the question: "If you were faced with the choice of rescuing your drowning dog or an unknown derelict, whom would you rescue?" are shown. You are supposed to be emotionally attached to the dog, but not to the unknown derelict. Almost 20% of the respondents would not choose to rescue the stranger if they were faced with a choice between their own dog and a stranger. The students in the class aged between 22-26 years (χ^2 (N=137)=17.291,

$p<0.008$) were more likely to choose the unknown derelict, compared to the other two age classes. Those who chose the dog had more regular contact with animals and valued animal rights equal to those of humans to a larger extent compared to those who chose the unknown derelict. Female students and 1st year students who had a positive attitude toward the use of euthanasia also chose the dog more frequently than other categories did. Those who chose the unknown derelict did not consider themselves being either vegetarians or animal rights activists. They also had a more negative attitude towards euthanasia.

Table 6. Difference between using different categories of animals. Percent. N=139

<i>Is there any moral difference between using various categories of animals in animal research?</i>								
	F	M	-21	22-26	27-	Year 1	Year 3	Year 6
Yes	51	40,5	65	43,5	34	53	46	40
No	49	59,5	35	56,5	66	47	54	60

Table 7. Dog versus stranger. Percent. N=137

	F	M	-21	22-26	27-	Year 1	Year 3	Year 6
Dog	19	12,5	21,5	11	23	23	12	12
Stranger	78,5	87,5	78,5	85,5	72	75	85	88
Don't know	2,5	0	0	3,5	5	2	3	0

Discussion

Several articles and opinion surveys have been published concerning issues on attitudes toward animals and the use of animals in research. It is difficult to make useful comparisons between most of these surveys, due to the fact that identical questions only have been used in a few of them.

A few Swedish surveys have been published. Jeffner published in 1986 a project called Livsåskådningar i Sverige (Life views in Sweden). On the question if one should show more respect towards humans than towards animals 37% answered no, 44% yes and 17% were undecided. Follow ups to this report have further results and comments in Människor och människovärdering (Humans and value of humans) in 1988 and Djur och människor (Animals and humans) in 1992. According to the first one 66% believed that animals and humans have equal value, while 27% considered that humans have a higher value than all other beings and 7% were undecided. The view that humans hold a unique position seems not to be obvious for the general public in Sweden.

Cronholm published a survey concerning the general public's view toward the use of animal testing in medical research in 1992. In the Cronholm survey, 88% of the general public had no knowledge on how many animals, that are used yearly for research purposes in Sweden. On the other hand most of them (84%) knew that rats and mice were the most common used species in research. Sixty percent believed that animal testing within medical research should be allowed, but

more than half of those believed that one should not allow any testing without any reservation. One fifth of the respondents believed that all animal testing should be stopped. Those, who without any reservation wanted to forbid medical animal testing could to some extent accept veterinary medical animal research use. Those who were against animal research more often had a reservation focusing on the research purpose rather than what kind of species is used or how the laboratory animals are treated.

Women tend to be more against animal experimental research than men (Gallup & Beckstead, 1988; Herzog et al, 1991; Broida et al, 1993; Pifer et al, 1994). According to a survey by Plous (1991), more women than men seem to be animal rights activists. People who are older or less educated seem to regard animals more as resources, whereas younger people and those who have more education look at animals with more empathy (Kellert & Berry, 1987). Furnham & Pinder (1990) reported similar results: the general education level is correlated to a more negative view of animal research, rather than a more positive one. A study by Compton et al (1995) compared teachers with college students, high school students and the general public. Both college and high school students seemed to value animal rights higher and be more restricted in their view of animal research, compared to the other two groups.

Scientists have suggested that scientific knowledge and education is the answer against the animal rights movements' impact on the attitude of the

general public to the use of animals in biomedical research. Even if education has an effect on the attitudes toward animal research, is the effect general for the entire population? Previous studies suggest it is not (Culliton, 1991; Birke & Michael, 1992). Another suggestion is that researchers should have a leading role when it comes to influencing the general public about the necessity of animal research in medicine and other sciences (Pardes et al. 1991; Birke & Michael, 1992).

Biology students seem to have a more positive attitude toward the use of animals, and they seem to be more certain of the benefits from biomedical research, compared to those who have little or no scientific education (Bowd & Boylan, 1986; Gallup & Beckstead, 1988). However, these results were contradicted by Broida et al (1993), who reported that students facing animal experiments in their education (psychology or biology) seem to be more against animal research compared to other students.

The relationship between commitment to environmental issues and attitudes toward animal research may be explained by a number of theories. Interest for the environment and for the animals' welfare can be part of a broader attitude orientation, but the balance between the two interests may differ from one person to another. In some countries the animal rights movement as well as the environmental movement are joint movements under the headline left-oriented political parties, since it is only there they fit into the political system. It may also be that the animal rights movement has tied itself to the environmental movement in order to increase its own power base. Several reports show a relationship between a commitment to environmental issues and to defend animal rights (Greenville, 1989; Collard, 1990).

It is obvious that the present survey design constitutes a limitation as to which conclusions it is possible to achieve. The survey only questioned the general position of the respondent on animal and animal research issues but did not provide a basis to explore the underlying reasons for the respondents' positions. Since the total number of respondents was 140, one should not put too much weight on the reported frequencies. What is more important is to see whether there are any significant relationships between groups and questions.

The question whether animals have rights or not, is a controversial philosophical and logical issue. In the debate that has been running the last decades, contradictory views have been presented. The philosophy used by animal rights activists is generally based on utilitarian arguments, for example that animals as well as humans have an interest to avoid pain and suffering, and therefore animals shall not be used in experiments that may cause pain or distress (Baldwin, 1993). One example of this view is the following quotation from a group called The Vegan Society:

"All animal (including human) species share similar characteristics - such as the ability to experience pain, fear and hunger. Humankind practices speciesism - that is, discriminating against animals solely because they are not of the same species. Speciesism, like racism is irrational and perpetuated by ignorance and subtle coercion."

The Vegan Society's home page
(<http://www.vegansociety.com/why/whyanimals.html>)

The philosophers Peter Singer, Tom Regan and others use the term "animal rights", and argue that every animal (including humans) have a value and therefore have the right to avoid exploitation. The philosophers who refute Singer and Regan generally point out morally relevant criteria that separate humans from animals. Raymond G. Frey has written that animals cannot have interests, because they cannot have desires, because they cannot have beliefs, because they do not have a language. Carl Cohen argues that rights are not inherent: they arise from implicit contracts among members of the society, and they imply duties. When humans accept rights they automatically have the duty not to violate the rights of other people. Because animals cannot logically have such duties, they cannot have rights. Others argue that nature itself is cruel: lions kill zebras, cats hunt mice and so forth. Another view is that the evolution has placed humans on top, so it is only natural for us to use other creatures (Mukerjee, 1997).

The present survey showed that about 95% of the students believed that animals have rights. This result must be considered as a surprisingly high figure. One reasonable explanation may be that the

term *rights* have been used by the media during a relatively long time span, which means that the expression has been subjected to inflation and the students believe the term is legitimate to use, and they do not consider what "to have rights" really infers, as well as the different interpretations one can make of this term.

A natural consequence for those respondents who believe that animals have rights above or equal to those humans have, would be that they also considered themselves animal rights activists and/or vegetarians. But this survey only showed a relationship between animal rights activism and to value animal rights equal to those humans have.

Younger students and female students seem to value animals higher and have a more restricted view of animal research compared to other categories. This is in line with what has been reported earlier by Gallup & Beckstead (1988), Herzog et al (1991), Broida et al (1993), Pifer et al (1994) and Compton et al (1995). It is also relevant to emphasize that 95% of the students were positive toward the possibility to use research animals for scientific purposes. One surprising finding was that about a quarter of them found it morally acceptable to break the law in order to disrupt animal research. It is also surprising to find that even though a quarter of the respondents considered animal rights equal to those of human rights, only five percent were against the use of animals in research. But the reasons behind these contradictions are beyond the scope of this survey, so one can only speculate.

This survey also shows that there is a relationship between commitment to environmental issues and concern for animal rights, which is in agreement with the results of Greanville (1989) and Collard (1990).

When it comes to the choice between rescuing the drowning dog and the unknown derelict, a survey by Glick (1995) showed a similar result among medical students in Israel, as those reported in Table 7.

The students in years 3 and 6 had experience of animal experimental research, through teaching or own research, while the 1st year students had no experience. This may be a reason why the older students in general were more positive to the use of animals in research than younger students. On the other hand, younger students were more likely

to have a history of actions against animal research than older ones. This may indicate a generation difference. The fact that students in the later stages of the education seem to find it more acceptable to use animals in research, might be a result of the possibility that students opposed to the use of animals in research choose to leave medical school before they get their degree. But before such a conclusion can be drawn, the students now in their first year must reach the sixth year, and this calls for a follow up study in five years.

Which practical consequences should these conclusions lead to? One consequence of this survey is a suggestion that more objective information should be made available to both students and the general public. This material should include the progress that has been made possible by using laboratory animals and the necessity of using animals in biomedical research, as well as the increased use of more powerful research designs to reduce the number of animals. In addition, possible alternative methods to animal research and the limitations of those alternatives should be described. The current legislation and terms like purpose breeding, animal welfare and the relation between humans and animals should be discussed. The information should also specifically stress that this use of animals is strictly regulated and that an ethical committee on animal experiments must perform an ethical examination of the research project before the researchers are allowed to initiate an experiment.

The present survey represents the medical students' attitudes toward animals and animal research at Uppsala University. This study reflects the societal values and the educational climate that currently prevails among students in Uppsala in the Spring of 1997. Can the results described here be compared to equivalent studies conducted in other Western countries? This question is beyond the scope of this study, but needs further attention.

Summary

The purpose of this survey was to describe medical students' views of animals and the use of animals in biomedical research. The three explanation variables used were gender, age and year of study. A vast majority (95%) of the respondents considered that animals have rights. Possible explanations to this result could be that the term

has been used by the media during a relatively long period, which has made the expression common, and the students do not consider what it philosophically and logically infers to have rights. Younger students and female students seemed to value animals higher and had a more restricted view on animals and animal research compared to other groups. More than 95% of the respondents were positive toward the possibility to use animals for scientific purposes. There was a relationship between commitment to environmental issues and caring about animal rights. A conclusion of the present study, is that more information about laboratory animals and biomedical research should be made available to the students, as well as to the general public.

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Appendix 1 The questionnaire's design

1. Gender: *M F*
2. Age: *-21 22-26 26-37 38-*
3. a. Course of study:
b. Year *1 2 3 4 5 Other*
4. Upbringing:
a. *Sweden Abroad*
b. *Countryside Small town (<30 000 cit.) Big city (>30 000 cit.)*
5. a. Are you an active religious person?
Yes No
b. If Yes, state which: *Protestant Catholic Muslim Other*
6. Do you have any regular contact with animals? *Yes No*
7. Are you a pacifist? *Yes No*
8. Do you have a positive or negative attitude towards euthanasia?
Positive Negative Don't know
9. Do you think gene manipulated food should be allowed? *Yes No Don't know*
10. Do you think Sweden should remain in the EU?
Yes No Don't know
11. a. Do you have an organ donation card?
Yes No
b. Would you accept that an organ taken from an animal should be transplanted into your body?
Yes No
12. Do you believe animals have rights or not?
Yes, they have No, they haven't
b. If Yes, do you consider animal rights Above, Equal to or Below those of human rights?
Above Equal to Below
13. Do you consider yourself an animal-rights activist? *Yes No*
b. Have you ever actively been part of any action, organisation and/or name collection against animal research? *Yes No*
c. Is it morally acceptable to break the law in order to disrupt animal research? *Yes No*
d. Do you believe animal research is immoral regardless of the benefits? *Yes No*
e. Do you believe animal research plays a significant role in treating humans? *Yes No*
14. a. Do you consider yourself being an environmental activist? *Yes No*
b. Have you ever actively been part of any action, organisation and/or name collection concerning environmental issues? *Yes No*
c. Do you have a positive or negative attitude towards the use of nuclear power?
Positive Negative Don't know
15. Is it acceptable to drive a car under the influence of alcohol if you feel sober and nobody finds out? *Yes No Don't know*
16. Should wolf hunting be allowed or forbidden in Sweden?
Allowed Forbidden Don't know
17. a. Do you have any experience of animal research?
Yes, own research and through teaching Yes, through teaching only No
b. If experience, have your view of animal research changed compared to the one you had previously? *Yes No*
c. If Yes, in what way
18. How capable do you consider various animals are of feeling pain on a scale from 1 - 5, in which a 1 indicates "feel no pain" and a 5 indicates "as much as humans"?
1 2 3 4 5
Nonhuman primates Nonprimate mammals Birds Reptiles Fish Invertebrates
19. Which statement do you agree with the most?
1 "Humans deserve a different treatment than animals because of 'sanctity' of human life." 2 "One should not discriminate between humans and animals." 3 Can't choose between 1 and 2
20. Which statement do you agree with the most?
1 "The typical animal researcher doesn't care about laboratory animals; they view animals as expendable supplies." 2 "The typical animal researcher cares about laboratory animals but feels that research is needed." 3 Can't choose between 1 and 2
21. If you were faced with the choice of rescuing your drowning dog or an unknown derelict, whom would you rescue?
Your dog Stranger
22. Do you have a positive or negative attitude towards clinical testing, involving a risk, of medicine on humans?
Positive Negative Don't know

23. Do you have a positive or negative attitude towards using living foetuses who shall be aborted later, in medical research?
Positive Negative Don't know
24. Do you have a positive or negative attitude towards using cloning of humans in research?
Positive Negative Don't know
25. Is it acceptable to cheat on your income tax form if nobody finds out?
Yes No Don't know
26. How do you feel about cheating in research?
Should lead to a lifetime disqualification
Should only lead to a warning
Should not have any consequences
Should be encouraged if you're confident the results are trustworthy
27. a. Is there any moral difference between using various categories of animals in animal research?
Yes No
b. If Yes, where is the limit for what animals should be allowed?
Nonhuman primates
- Nonprimate mammals*
Birds
Reptiles
Fish
Invertebrates
28. Should early abortion be allowed or not?
Should be allowed on any ground
Should be allowed on medical or crime related ground
Should not be allowed
Don't know
29. Why did you choose to study medicine? (Tick the alternative you agree with the most)
Social prestige
Financial reasons
You're parents made the decision
Genuine interest (idealist)
Want to improve human life (altruist)
30. Which of the following categories do you belong to?
Vegan Vegetarian Semi-vegetarian Regular