



A Survey of Animal Use and Alternatives in Higher Education in Europe

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Summary

A questionnaire, delivered online using the UK Bristol Online Survey service during 2010, was used to determine the extent to which animals were still being used or had been replaced by computer-based alternatives across a selection of universities from 10 European countries.

Response rates varied between 73.1% (UK) and 26.3% (Romania) thus making valid comparisons difficult. Universities in the UK, Spain, and France had the highest average levels of animal usage with the highest total use in the UK. Of the four eastern European countries surveyed Romania had the highest use of animals in teaching.

Computer-based alternatives were used to some extent by all countries. Major barriers to the introduction of alternatives were “resources not available in local languages,” “difficulty finding resources,” and “lack of money.” Major factors that would persuade academic staff to introduce alternatives were: “published evidence of effectiveness,” “colleague’s recommendation,” and “students’ objections.”

Keywords: survey, animal use, teaching, European universities

1 Introduction

Accurate figures for the number of animals used for teaching across the European Union are not available, but compared to the number used for research it is less than 1% (Casati and Hartung, 2003; Grindon, 2005; Sauer et al., 2005). Typically, most of the animals used are small rodents in university laboratory practical classes in pharmacology and physiology (Grindon, 2005).

The reported animal use for education and training across Western Europe is declining, even against a background of a large increase in student numbers in disciplines that traditionally use animals for teaching (Casati and Hartung, 2003; Grindon, 2005). There are probably several reasons for this decline: the costs of running these classes are high: they require specialized facilities, technical support, expensive consumables (e.g., drugs), and often the same class will need to be repeated to address large class sizes (Gruber and Dewhurst, 2004); they are very demanding on academic staff time (Ruksenas, 2006); increasingly students object to what they perceive as unnecessary use of animals; and now there is widespread availability of high-quality, low-cost alternatives, including computer simulations or virtual animal labs with proven educational effectiveness (Gruber and Dewhurst, 2004).

Information about animal use in teaching in universities across Eastern Europe is not as available or reliable as it is for universities in the West (Ruksenas, 2006; Cervinka and Cervinkova, 2006). Anecdotally, animal use in teaching is much higher in universities in Eastern Europe (Sladowski and Halder, 2002; Jukes, 2008; Kojic and Dewhurst, 2009). Two recent surveys of universities in Balkan countries and other eastern European countries revealed substantial animal use for teaching and demonstrated that providing faculty with computer-based replacements for animal

laboratories could reduce this number significantly (Kojic and Dewhurst, 2009; Dewhurst and Kojic, 2011; Knight, 2007).

This study was undertaken during 2010 to obtain some insights into the use of animals and alternatives in the teaching of physiology and pharmacology in institutions of higher education in selected countries in Europe. The main research questions the study attempted to address were:

- How many animals (and which species) are used for purposes of higher education in those European countries surveyed?
- In which curricula subjects are animals being used, e.g., pharmacology, physiology, and at which educational level (undergraduate, postgraduate)?
- What use is being made of non-animal teaching methods (alternatives), particularly those that are computer-based, and in which disciplines are alternatives most used?
- What are the key drivers and barriers to introducing computer-based alternatives?
- Are the IT infrastructure and pedagogical approaches of the surveyed countries supportive of the introduction of alternatives?

2 Methods

Universities in 10 European countries were surveyed using a standardized questionnaire translated into each country’s language and delivered online using the Bristol Online Survey tool (<http://www.survey.bris.ac.uk/>). The target groups were university faculties/schools/departments that provide physiology/pharmacology courses with laboratory practical classes in the UK, Germany, Spain, Italy, Holland, France, Poland, Czech Republic, Romania, and Republic of Macedonia. These countries



gave us a mix of southern, northern, eastern, and western European countries, developed vs. developing countries, and Latin, Anglo-Saxon and Slavic languages.

Initially, a web-based search was conducted to identify relevant universities (those whose curricula contained significant pharmacology/physiology content and included practical classes) and named contacts in each country.

Survey design

A questionnaire was designed and piloted with groups of physiology/pharmacology academics internationally and subsequently was modified. Questions were optimized for online delivery and ease of completion. Questions relating to animal use were embedded in a more extensive survey requesting information about innovative teaching in physiology and pharmacology (not reported here). Some personal questions including names and e-mail addresses were set as optional to protect the anonymity of the participants. In addition, the questionnaire was designed to be as short as possible so as not to discourage the participants from completing it.

Questionnaires were translated into different European languages using a professional translation service specializing in the life sciences (Tongue-Tied Ltd, UK: <http://www.tongue-tied.co.uk/>).

The surveys were delivered online or via e-mail with a deadline for return of the completed survey. Reminder e-mails, with an automatic acknowledgement function (so that notifications were received when the messages were opened and read) and individually addressed to those staff on the contact list, were sent out according to a planned time schedule.

Data collection and analysis

Data collection for animal use was simplified by using drop-down menus so that respondents could select between ranges (e.g., 1-10, 11-20, etc.) when reporting number of animals used. This method of data collection does not allow reporting of actual numbers but provides minimum and maximum numbers from which calculated estimates can be made. For the purposes of this report

estimates were calculated by taking the average of the minimum and maximum reported numbers for each species.

Data sets for the 10 European countries were created, and visual representations were created and cross-tabular analysis was conducted to identify and illustrate underlying patterns.

3 Results

Response rates

The response rates were (number of institutions surveyed: %): UK (52: 73%); Germany (46: 41%); Spain (42: 52%); Italy (42: 36%); Holland (14: 71%); France (45: 31%); Poland (17: 18%); Czech Rep. (14: 57%); Romania (19: 26%); Macedonia (3: 100%).

An in-depth analysis of the questionnaires from each country was carried out and these data are summarized below.

The use of animals

Estimated numbers of animals used in teaching physiology and pharmacology in each of the surveyed countries are shown in Table 1.

Of the western European Universities the UK, Spain, and France form a distinct group among the institutions surveyed, with the highest average levels of animal usage. The UK has the highest estimated total animal use in this group. Spanish universities use the most mammals, and the UK the most amphibians and guinea pigs for teaching.

Of the eastern European universities, Romania uses the most animals for teaching and has the highest institutional average of all 10 countries surveyed. However, the very low number of responses for the eastern European countries, and to a lesser extent France and Germany, make valid comparisons difficult.

The use of alternatives (particularly those that are computer-based)

There was significant use of human subjects for laboratory practical classes, particularly in physiology, in most of the countries

Tab. 1: Estimated number of animals used in teaching Physiology and Pharmacology in surveyed European countries

	Rat	Mouse	Guinea Pig	Rabbit	Dog	Total Mammals	Frog/Toad	Fish	Total non-mammals	Total animals	Aver. # of animals per institution
UK	354.5	192	417.5	11	0	975	434	41	475	1,450	38.2
Germany	106.5	56.5	0	0	0	163	5.5	166.5	172	335	17.6
France	565.5	0	11	0	0	576.5	383.5	0	383.5	960	68.6
Spain	380	616.5	5.5	21	5.5	1,028.5	15.5	15.5	31	1,059.5	48.2
Italy	0	5.5	0	0	0	5.5	0	15.5	15.5	21	1.4
Holland	55.5	16.5	0	0	0	72	5.5	0	5.5	77.5	7.8
Poland	5.5	0	0	0	0	5.5	0	0	0	5.5	1.8
Czech	53	0	0	11	0	64	0	35.5	35.5	99.5	12.4
Romania	0	253	0	0	0	253	301	0	301	554	110.8
Macedonia	0	0	0	0	11	11	0	0	0	11	3.7

surveyed. Demonstrations by tutors of experiments using animals, rather than students performing individual experiments, were also widely used. Both of these, presumably, have resulted in the use of fewer animals overall for teaching.

Computer-based alternatives were used to some extent by the majority of countries, with Romania, Spain, and Poland reporting the highest use of alternatives and Macedonia, Italy, and France the lowest. Most made use of commercially available software, particularly from suppliers such as: Thieme – mainly in Germany and Czech Republic, and Sheffield BioScience Programs, PCCAL and the British Pharmacological Society (pharma-CAL-ogy) – mainly in the UK. Free software (unspecified) was used by Holland and Italy, and in-house developed resources featured prominently in Germany and Holland.

Barriers/drivers to the use of computer-based alternatives

An analysis of the reported barriers for all ten countries showed that “difficulty in finding suitable resources” and “lack of money to purchase resources” were the major factors. For many countries, lack of local language resources was also an issue, particularly in Spain (75%), Czech Republic (67%), and France (50%).

Similarly, analysis of the reported drivers showed that “published evidence of effectiveness” and “recommendation from a colleague” were the major factors. In western European institutions “student objections to the use of animals” was important, and in eastern European countries “saving money” was important, with “students objections” lower in the list.

In Germany and Spain the “lack of capacity to create resources in-house,” and in Italy “the lack of support from their institutions and/or colleagues” were issues. In Eastern Europe, all (except Poland) cited “cost of computer-based alternatives” as a barrier.

4 Discussion

Response Rates

Overall, the response rates were disappointing. It had been anticipated that by identifying accurate, named contact information good response rates would be achieved. All individuals (names or position titles, e.g., course leader) were contacted by e-mail, and if they did not respond within one month they were contacted again. For most countries this process was repeated at least twice and sometimes 3-4 times. It was possible to monitor whether the recipient had actually opened the e-mail or deleted it without reading, and it was clear from this monitoring process that the frequency with which later reminders were deleted without being read increased.

It was evident that some respondents chose to remain anonymous and did not even provide the names of their institutions. Sometimes it was not possible to identify which institution a particular survey came from, so it is possible that some data has been duplicated. Even when the names of institutions and schools/departments were provided some respondents chose not to provide details of the types or the numbers of animals used in teaching. The study is exploring a topic sensitive to the respondents and, anecdotally some, particularly those engaged in research using animals, see this as “the thin end of the wedge.”

Although it may be difficult to obtain complete data sets, the study has made a significant first step in this area and possibly represents the most comprehensive survey carried out to date.

Use of animals

Of the western European Universities, the UK, Spain, and France form a distinct group, with the highest average levels of animal usage. Animal use in the UK is the highest in this group, with Spain using the highest number of mammals and the UK the highest number of amphibians and guinea pigs for teaching.

Of the eastern European universities, Romania uses the most animals for teaching and the institutional average for Romania is the highest of all of the 10 countries surveyed. However, the very low number of responses for eastern European countries, and to a lesser extent France and Germany, make valid comparisons difficult.

Rats and mice were the most common mammalian species used for teaching. Macedonia and Spain were the only countries to report the use of dogs.

Amphibians were the most frequent non-mammal species used, probably as the frog nerve-skeletal muscle preparation is used commonly in physiology teaching. There was some use of fish, particularly in Germany, though how they are used in teaching is unknown. As far as the authors are aware there are no commercially available simulations of experiments on fish (contrast the number of simulations of amphibian nerve/muscle experiments (Gruber and Dewhurst, 2004; Knight, 2007)). Fish, e.g., zebra fish are now frequently used for bio-medical research, and it may be that this has led to an increased use of fish for teaching.

Use of alternatives

The reported replacement of animal labs with computer-based alternatives was highest in Spain (73%), whereas in France and Italy it is very low. The response rates for eastern European countries were probably too low to make any definitive statements, but Poland, Czech Republic, and Romania reported a relatively high level of use of computer-based alternatives. The reported use of alternatives in UK universities (35%) is disappointing considering the number of available resources and the fact that significant UK government funding (Teaching and Learning Technology Programme: http://www.hefce.ac.uk/pubs/hefce/1999/99_39.htm) has gone into supporting the development and use of computer-based learning packages in the biosciences over the last 20 years. These data might also suggest that computer simulations are being used as replacements for some, but not all, laboratory classes, or that they are being used as supplementary resources, perhaps to prepare students in advance of the “real” experiment, or to collect additional data after the experiment. It is worth noting that the UK has seen an unprecedented rise in the number of students entering higher education, so it is possible that without the introduction of computer-based alternatives a much larger number of animals would be being used for teaching.

Italy (64%) and Holland (67%) make the greatest use of free-of-charge computer-based resources, with Spain (27%) report-



ing the lowest use. Germany (41%) and Holland (22%) make the greatest use of in-house developed computer-based resources. Universities in Holland, where there is a low barrier to the use of English, do not appear to purchase computer-based programs in English. Spanish universities obtain computer-based resources from varied sources.

In the UK, universities use commercially available programs from several sources. The computer simulation of Guinea Pig Ileum (PCCAL) is the most often cited alternative in this survey, and this fits with the data indicating that the guinea pig ileum preparation is the most frequently used preparation in teaching undergraduate pharmacology. There is also significant in-house development of computer-based learning programs with relatively little use of free software.

In Germany, universities cite Thieme products most frequently with almost no use of English language versions. In France pharma-CAL-ogy and Thieme are the most widely used. In Spain there was relatively little reported use of commercially available software with most use being made of free software. In Italy only 28% reported use of computer-based alternatives, with Sheffield BioScience Programs most often cited.

The eastern European universities provided little detailed information about which computer-based alternatives they used. Polish universities cited Thieme products most frequently.

Key drivers/barriers to the use of alternatives in teaching

For both western and eastern European countries the most persuasive factor is good empirical evidence of educational effectiveness with “cost” the least important in Western Europe, whereas in Eastern Europe “cost” is more highly ranked. Objections from students to the use of animals is highly ranked for western European institutions but is the lowest ranked factor for Eastern Europe.

There was little difference across all 10 universities in the ranking of the important barriers to the introduction of computer-based alternatives, with “difficulty in finding suitable resources” being the most important. This could possibly be related to the lack of resources written in local languages. Interestingly, poor IT infrastructure did not figure in the top five barriers.

Lack of local language resources was a major factor for many countries. While both staff and students in most of the countries read, write, and speak English reasonably well, it is clear that students are much more comfortable learning in their local language, and academics are more comfortable introducing local language resources into their teaching. It is possible that making current English-language alternatives available in these languages may increase adoption of replacement methods, particularly if they are low cost, there is published evidence of educational effectiveness, and published successful use-cases. Although Germany and Holland reported that language was not a barrier, it is interesting that the most commonly used alternatives in Germany (Thieme: Sim series) were developed in a German university and written in German.

As expected, universities in Eastern Europe make much less use of technology to support teaching and learning than their

western European counterparts. This probably is a reflection of the low level of IT infrastructure rather than an unwillingness to embrace new technologies. A lack of IT readiness in eastern European and some western European countries (France and Italy) may have significant implications for the introduction of computer-based alternatives.

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