



# Challenges of Using Alternatives to Animals in Laboratory Classes in Physiology: the Spanish Experience

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## Summary

*We have examined the use of animals, and alternatives for educational purposes in Spain. We looked at the efforts to change teaching approaches and to learn about students' opinions on this issue. Among the various degree courses that include the study of physiology we have focused on pharmacy, but other degrees have been considered as well. Although some progress has been made, additional effort is still required to introduce students to the ethical concerns surrounding the use of laboratory animals.*

*Keywords: laboratory animals, alternatives, education*

## 1 Introduction

Physiology is taught in all the life sciences, including medicine, pharmacy, biology, veterinary medicine, and biochemistry. Teaching physiology entails both lectures and practical classes; traditionally, the latter have involved the use of animals (Ra'anana, 2005). Nevertheless, there has been a progressive decline in the use of animals in many countries over the last few years (Barnard et al., 1988; Cervinka and Cervinkova, 2003). There are still some faculties in which this transformation is very slow, however, due to reluctance of teachers to change or to the difficulties associated with language in the alternative resources (Ruksenas, 2005).

We have examined the use of animals for educational purposes in Spain, looking at the efforts to change teaching approaches and to learn about students' opinions on this issue. We have focused on pharmacy, among various degree courses that include the study of physiology, but other degrees have been considered as well.

## 2 Current situation

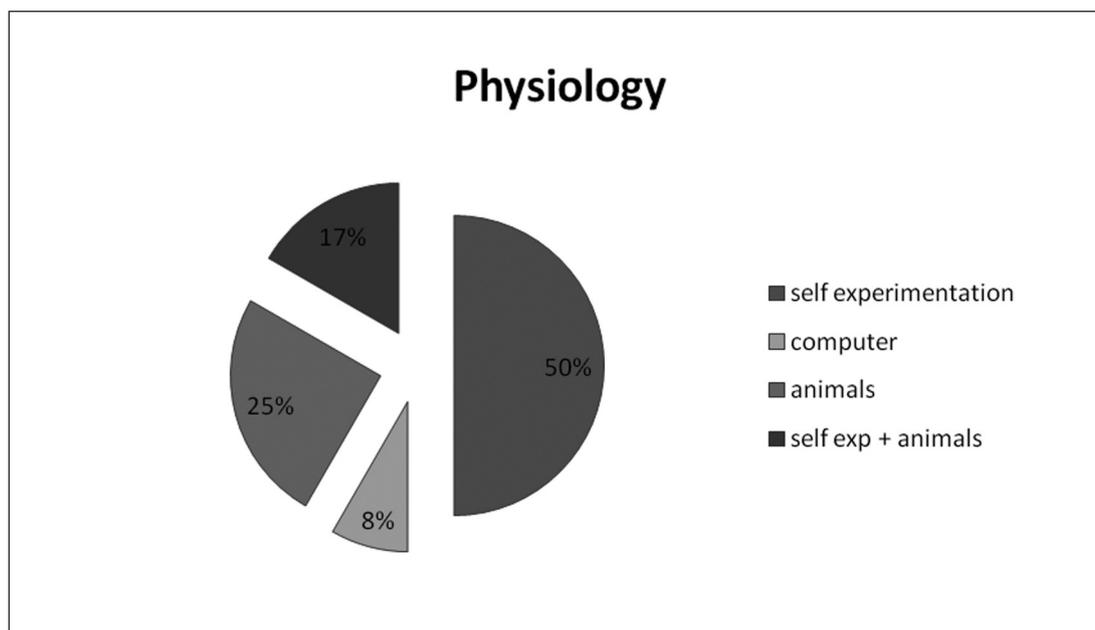
The number of public and private universities teaching pharmacy in Spain is determined by the Spanish state; currently there are ten public and five private universities teaching pharmacy. In many of these faculties, animal dissection constitutes a traditional practice that has been followed for many years. The animal most commonly used for this purpose is the rat. Other practical classes involve the administration and handling of laboratory animals, especially rats and mice. The classes also include muscle-nerve preparation of frogs or rats, studies of intestinal absorption in rats by perfusion *in vivo* or with *ex vivo* techniques such as everted sacs, studies of the effect of hormones on sex glands in rats, the induction of diabetes in rats, and studies using isolated frog hearts, etc.

In an attempt to promote the use of alternatives in teaching activities and, in particular, to foster the work developed by EURCA (European Resource Centre for Alternatives in Higher Education), I have participated in several Spanish congresses on a range of subjects, including physiology, toxicology, pharmacology, and laboratory animals (Vinardell, 2003). These presentations served both to introduce teachers to the newly available alternative models now used by various teachers in Europe and to highlight the advantages of these models over traditional practical classes.

In recent years, many faculties have implemented new methods that do not use animals, such as models, mannequins, computer programs, and especially self-experimentation, in their practical programs (Samsel et al., 1994). A search for different practical approaches reveals that the principal changes have been achieved through the use of human models instead of rat dissection. This is important when we consider that in the faculties of pharmacy, students need to learn human rather than animal anatomy because they are studying human physiology. Other changes include the use of self-experimentation with electromyography instead of neuromuscular preparations, and the study of human blood pressure rather than rat blood pressure.

A study of the type of physiology laboratory classes given in Spanish pharmacy faculties found that half the faculties now used self-experimentation. Nevertheless, 42% of the faculties are still using animals alone or in combination with self-experimentation; only one faculty relies entirely on computer simulation programs (Fig. 1).

The political organization of Spain means that each autonomous community has its own laws on certain issues. This is also the case in the protection of animals used for scientific purposes, based on Directive 2010/63/EU of the European Parliament. Consequently, local regulations on the use of animals in practical classes vary. Thus, in the autonomous community of Andalusia (*Andalucía*), in the south of Spain, the authorities have forbidden the direct use of animals by students; teachers must



**Fig. 1: Distribution of the type of physiology laboratory classes in Spanish pharmacy faculties**

prepare all animal materials (for instance, the intestines or other organs) before the beginning of class, and students work with this material without direct contact with laboratory animals.

The European Directive clearly states: “The use of animals for scientific or educational purposes should therefore only be considered where a non-animal alternative is unavailable.” Based on this statement, however, some faculties still use animals in practical classes, arguing that non-animal alternatives are not available and that the use of animals is important for teaching purposes.

The study of intestinal absorption in the rat is one practical class that is still used in many faculties, due to the teachers’ reluctance to change. This is the case in my own department, where some teachers have made a film showing all the steps involved in performing the experiment. In theory, this film constitutes a good alternative to conducting the experiment; nevertheless, after viewing the film, students are still required to perform the entire procedure – killing a rat and studying the absorption of sugars.

My recent experience of promoting alternative methods has been positive in many faculties. I have been unable to convince colleagues from my own department to change their approach, however. “Nobody is a prophet in their own land.”

### **3 Students’ acceptance of laboratory animal classes**

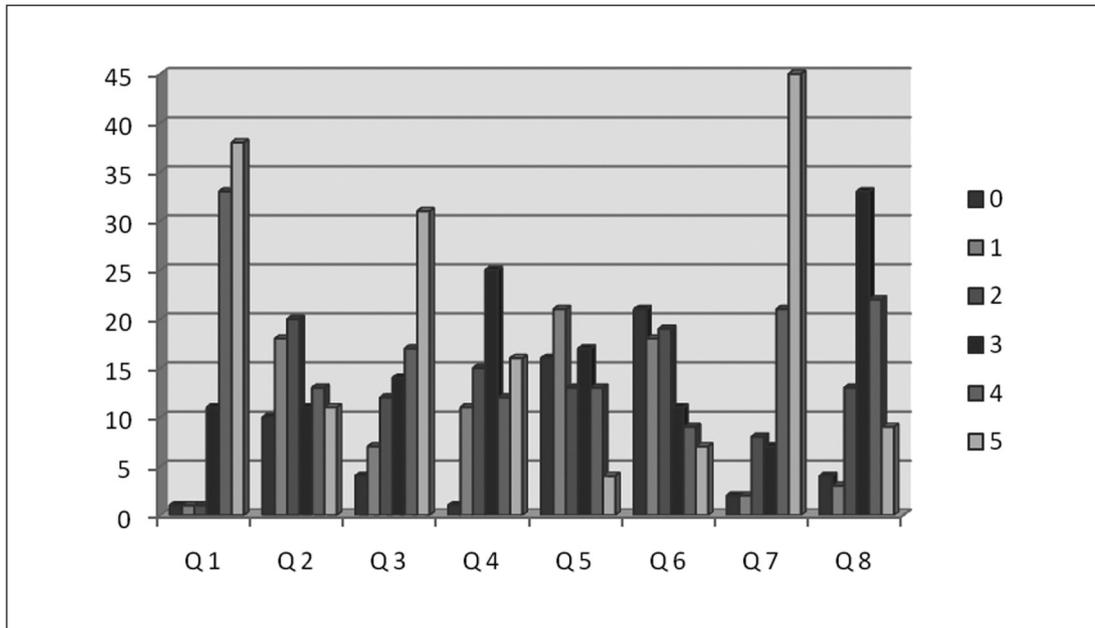
In order to measure our own students’ degree of acceptance of the practice on intestinal absorption, a student survey was conducted, consisting of eight questions with six possible answers graded according to degree of satisfaction. The questions were as follows:

Do you think intestinal absorption is useful for your physiology learning? Do you think it is possible to study the mechanism of intestinal absorption without killing a rat? If there was a good method to study intestinal absorption without animals, would you prefer this? Do you think there are ethical considerations in the use of animals in practical classes? Do you think it is possible to learn about physiology through computer simulations? If you had a computer simulation program, would you prefer that to the use of animals? Do you like self-experimentation in practical physiology classes? Do you think the use of animals is justified in practical classes?

The answers to this survey are shown in Figure 2. I would like to emphasize that the students’ answers indicated that, in general, they like practical classes using animals and consider them important for their study of physiology. Few students have ethical concerns regarding the use of animals in practical classes, which is rather worrisome. These findings suggest that students are poorly informed by their teachers about the ethical aspects of animal experimentation and that this issue requires reinforcement. These results, which were obtained with students of pharmacy, contrast with those pursuing other degrees, such as biology. In the latter, students began to question the use of animals in laboratory classes. As a result, the use of animals for teaching physiology has been replaced by self-experimentation in many cases.

Another interesting result is that students, in general, disagree with the use of computer programs. In some cases this is because they do not know enough English to take full advantage of the programs. In other cases, students prefer to learn skills in the laboratory, with an eye on their future professions, and they do not consider this possible using computer programs.

In contrast, a high percentage of students like self-experimentation and consider it a good way to understand the physiological mechanisms taught in earlier lectures.



**Fig. 2: Answers of students to the survey about their opinion on laboratory practices with animals**  
0 totally disagree, 5 totally agree.

- Q1 Do you think intestinal absorption is useful for your physiology learning?  
 Q2 Do you think it is possible to study the mechanism of intestinal absorption without killing a rat?  
 Q3 If there was a good method to study intestinal absorption without animals, would you prefer this?  
 Q4 Do you think there are ethical considerations in the use of animals in practical classes?  
 Q5 Do you think it is possible to learn about physiology through computer simulations?  
 Q6 If you had a computer simulation program, would you prefer that to the use of animals?  
 Q7 Do you like self-experimentation in practical physiology classes?  
 Q8 Do you think the use of animals is justified in practical classes?

#### 4 Conclusions

In conclusion, despite the efforts made to encourage members of the educational community to adopt alternative methods and to replace traditional practical classes using animals, some teachers are still reluctant to do this. They believe that students, especially those studying biology and veterinary sciences, should learn to handle laboratory animals. In addition, further efforts are required to introduce students to the ethical concerns surrounding the use of laboratory animals.

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