ORIGINAL ARTICLE

Animal Experiments and Pharmacology Teaching at Medical Schools in India: A Student’s Eye View

Mandeep Singh Dhingra, Amandeep Singh and Jatinder Singh

Department of Pharmacology, Government Medical College, Amritsar, Punjab, India

Abstract

Animal experiments are an integral part of the pharmacology teaching at medical schools in India. Various medical schools in India, and rest of the world, have either introduced alternatives to these experiments or are debating the issue. There have been very few studies that have tried to define the relevance of these experiments and report the attitude of the medical students towards them. This survey aims to assess the attitude of undergraduate medical students towards animal experiments and alternatives to these experiments, in the process trying to explore the issues pertaining to their relevance.

A questionnaire based survey was conducted amongst second professional medical students at Government Medical College, Amritsar, India. Questions explored various aspects of animal experiments in pharmacology teaching and provided a platform for expressing views on alternatives to animal experiments.

Majority of the students understood the importance of animal experiments in pharmacology but did not favour the use of animals in medical education. There was a strong opinion against the sacrifice of animals for these experiments. There was a strong wave in favour of reducing the number of animals involved in experiments apart from the various other alternatives suggested.

Key words: Pharmacology, Education, Animal Experiments, Alternatives

Introduction

It has been a general perception, in spite of the paucity of data available, that health care professionals favour the use of animals in the teaching and research associated with medicine. Very few attempts have been made to see truth in this line of thinking. (Glick 1995) Adequate efforts have not been made to ascertain the views of medical professionals on this aspect. In the process, the opinions of people closely related to the teaching guidelines and methodologies have largely been overlooked.

In the present day scenario of animal rights and strict animal handling guidelines, not only have the ethical issues cropped up but cost effectiveness of the animal experiments has also been questioned. (Gitanjali 2001) Apart from these factors strong objections continue to be raised on the relevance of these experiments especially in medical education. On the other hand, one cannot turn a blind eye to the relevance of these experiments in the field of pharmacokinetic studies and in the process of ‘New Drug Development’. It is hard to imagine the process of drug research without the use of animals. Though there has been progress in the development of alternatives for animal use in pharmacokinetic studies we still cannot claim to have found the perfect answer. (Keller 1995)
Medical education in India is imparted mostly in state run medical schools. The first two Professional years involve the study of Basic and Para Clinical subjects like Anatomy, Physiology, Biochemistry, Pathology, Microbiology, Pharmacology, Forensic Medicine and Community Medicine. The Final Professional year, spread over a span of two calendar years, includes the study of subjects like Ophthalmology, ENT, Community Medicine, Pediatrics, Obstetrics and Gynecology, Internal Medicine, General Surgery, Orthopedics, Psychiatry, Dermatology, Radiology and Radio Diagnosis, and Anesthesia. Pharmacology teaching is undertaken from the second year of medical education with the emphasis being on animal experiments, pharmacy exercises and prescription writing exercises in practical classes coupled with the detailed theoretical study of various drugs. This curriculum is followed in a majority of the medical schools in India. The Medical Council of India (MCI) governs the teaching in the medical schools, both state run and private, and is responsible for the development and amendment of the teaching guidelines and the syllabus.

Teaching of undergraduate pharmacology in India still relies a lot on animal experiments both for research, and undergraduate and postgraduate teaching. According to a recent study, which analyzed publications in the Indian Journal of Pharmacology in the past two years and presentations at the previous two conferences of Indian Pharmacological Society, 68.21% of the studies were based on animal experiments with the contribution of medical schools towards these studies being 54.01%. (Rai and Singh, in press) At the undergraduate level, animal experiments take up a major portion of the total teaching hours of experimental pharmacology.

In most of the medical schools three of the commonly undertaken animal experiments involve the study of the nature and site of action of drugs on 1) isolated rabbit’s small intestine, 2) isolated frog’s heart, and 3) rabbit’s eye.

Experiments conducted on isolated rabbit’s small intestine and isolated frog’s heart involve the sacrifice of animals during the conduct of the experiment. The students are required to isolate the required organ, set up the experiment and record the response of the tissue, on a drum connected to a kymograph, to the various drugs administered and draw various conclusions depending upon the exercise.

The issue of the place of animal experiments in medical education becomes relevant in this context. There has hardly been any refinement in the teaching methodologies as far as these experiments are concerned. The need and the rationale of these experiments have always been questioned and these views have started to find their way into medical literature lately. (Tekur and Prabhu, 1995; Wang, 2001)

A fact that needs to be highlighted is that, both in India and the world over, if there are individuals who advocate the introduction of alternatives to animal experimentation, there are an equal proportion of individuals who feel that animal experiments are an integral part of medical research and absolutely essential for the evolution of medicine. This view is restricted not only to the teachers but certain groups of students have also discovered the place of these experiments in their curriculum. (Roy and Tekur, 2001; Hagelin et al., 2000; Welsford et al., 1995) Due to the existence of two groups, one in favour of animal experiments and the other favoring alternatives, both in India and the rest of the world a need was felt to know the thoughts and beliefs of a representative population of Indian medical students in order to evaluate the trends in the present times.

Materials and Methods
A survey was conducted amongst second professional students at Government Medical College, Amritsar during the last months of the teaching period in order to include those students who had already been exposed to the experiments during the course of pharmacology practical classes. The students participating in the survey were given the option of remaining anonymous and withdrawing from the study. They were also clearly informed that the survey was not in any way a part of their academic evaluation and that their responses to the various questions would not have any bearing on their final grade.

A total of 150 students participated in the survey. Each questionnaire comprised of nine questions. (Table 1) The questions sought to obtain the opinion of the students on various aspects of animal experiments namely: relevance of the use of animals in medical education; role of animal experiments in the understanding of pharmacology; the comfort level of the students while performing these experiments; aspects of these experiments that troubled students the most; knowledge about the alternatives to animal experiments. Apart from responding as Yes/No to the questions,
students were also encouraged to give individual opinions on various aspects wherever possible. The Faculty from the Department of Pharmacology designed the questionnaire.

Since the present study analyzed qualitative data and the results were mostly in the form of Yes/No, the results are being presented in the form of percentages for the sake of understanding and ease of comparison with the published studies on related issues.

### Results

Contrary to the popular belief, there was a very strong opinion against the use of animals in medical education with nearly 60.66% of the students being against this use. (Figure 1) There was a 50:50 male to female ratio in response to this aspect of medical education.

In stark contrast, on being asked about the relevance of animal experiments in the teaching of the subject of pharmacology, 85.33% of the students were of the opinion that the experiments were indeed helpful in reinforcing the facts that

<table>
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<th>Table 1 Survey Questionnaire</th>
<th>Male/Female</th>
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<tr>
<td>1. Do you approve of the use of animals in medical education?</td>
<td>Yes/No</td>
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<td>2. Do you think that animal experiments have any relevance as far as the clinical subjects are concerned?</td>
<td>Yes/No</td>
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<tr>
<td>3. In your opinion do the animal experiments have any role in pharmacology teaching?</td>
<td>Yes/No</td>
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<td>4. Are you comfortable while performing animal experiments in the class?</td>
<td>Yes/No</td>
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<tr>
<td>5. Do you think that the sacrifice of the animals involved in the experiments has any bearing on your reaction towards these experiments?</td>
<td>Yes/No</td>
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<tr>
<td>6. Given a choice between experiments on isolated rabbit’s small intestine and isolated frog’s heart would you choose to perform an experiment on isolated rabbit’s small intestine and why?</td>
<td>Yes/No</td>
</tr>
<tr>
<td>7. Given a choice between experiments on isolated rabbit’s small intestine and isolated frog’s heart would you choose to perform an experiment on isolated frog’s heart and why?</td>
<td>Yes/No</td>
</tr>
<tr>
<td>8. Do you think it would be relevant to introduce alternatives to animals in experiments and why?</td>
<td>Yes/No</td>
</tr>
<tr>
<td>9. What could serve as an alternative(s) to animals in experiments or to the problems associated with animal experimentation?</td>
<td>Yes/No</td>
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they had studied theoretically where as 14.66% of the respondents felt that these experiments served no purpose in the teaching of pharmacology as they only repeated the facts which have been well documented, and that the drugs which are mostly used in the conduct of these experiments are not used clinically. (Figure 2) Moreover around 61.33% students felt that these experiments were in no way helpful as far as their understanding of the clinical subjects was concerned.

In response to the questions designed to evaluate the specific aspect of these animal experiments which generated such negative feelings, it was observed that 71.33% of the students were not at ease while performing these experiments, with the female students comprising 54% of this group. Furthermore the process of pithing/sacrifice of the animals was perceived to be the problematic area wherein 79.33% of the students responded that they would have no problems with the animal experiments if the processes of pithing/sacrifice of the animals were done away with. Interestingly 2.5% of the students (all females) were of the opinion that such a change in the procedure of animal experimentation would have no effect on their opinion about animal experiments. Coincidentally all these female students had opinionated against the use of animals in medical education.

66.66% of the students said that if given a choice they would prefer performing an experiment on the isolated rabbit’s small intestine than on the isolated frog’s heart, for the primary reason that the animal was not sacrificed by one’s own self and also that the number of animals sacrificed in the process was less. The respondents who preferred frog’s heart experiment to rabbit’s small intestine experiment did so because they thought that this experiment was easier to perform (64.7%); gave them an opportunity to handle live animals (29.4%); would help in developing surgical skills for the future (2.94%), and produced comparatively better results (2.94%).

When questioned about the aspect of introducing alternatives to animal experiments in medical teaching, 78.66% students felt that it would be the next logical step. Interestingly 21.34% of the individuals were of the opinion that there was no alternative to animal experiments in medical education. (Figure 3) Various alternatives suggested by the 78.66% students who were in favour of introducing alternatives are shown in Table 2.
Discussion
The debate about the place of alternatives in animal experiments is neither an isolated event nor a recent entity and involves a sizeable section of the medical and non medical personnel who have been trying to create awareness about a methodology. At the core of the alternatives methodology are the three R’s. These seek to either a) refine the study design to cause less distress to the animals, b) reduce the number of animals used, or c) replace the use of animals all together. These three are commonly referred to as the ‘3R’s of animal alternatives’. (Hakkinen and Green, 2002; Jukes and Chiuia, 2003) Many countries in the European Union (EU) and USA require the scientists involved in research to perform a ‘comprehensive search of the available alternative methodologies to animal experiments and not to conduct a particular experiment if a scientifically satisfactory method is available’. Failure to do so is considered a violation of the animal welfare legislation. (Grune et al., 2004)

Theoretical teaching of core subjects in medical sciences has always gone hand in hand

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**Table 2** Various alternatives suggested by the students

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<th>S.no</th>
<th>Alternative suggested</th>
<th>Percentage</th>
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<tbody>
<tr>
<td>1</td>
<td>Not aware of any specific alternative but change needed</td>
<td>30.5%</td>
</tr>
<tr>
<td>2</td>
<td>Reduce the number of animals involved</td>
<td>29.7%</td>
</tr>
<tr>
<td>3</td>
<td>Computer software/ simulation</td>
<td>12.8%</td>
</tr>
<tr>
<td>4</td>
<td>Models/ Slides/ Charts/ Graphs</td>
<td>11.9%</td>
</tr>
<tr>
<td>5</td>
<td>Human volunteers</td>
<td>6.7%</td>
</tr>
<tr>
<td>6</td>
<td>In-vitro tests</td>
<td>3.4%</td>
</tr>
<tr>
<td>7</td>
<td>Terminally ill patients</td>
<td>3.4%</td>
</tr>
<tr>
<td>8</td>
<td>Use Pre- dissected animals</td>
<td>1.7%</td>
</tr>
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with experiments involving animals. The Indian medical education system gives due importance and value to these experiments and they occupy a sizeable proportion of the total academic hours allotted to a subject. Since the advent of animal rights a lot has been said and discussed about the feasibility of replacing animals with alternative methodologies. In the present day scenario, the difference in cost between the experiments and the alternatives has added a new arsenal into the armory of people in favour of introducing alternatives. In the midst of all these discussions very few organizations or academic institutions have sought the views of the people who really have to work with the animals while performing the experiments. (Tekur and Prabhu, 1995; Roy and Tekur, 2001)

The primary finding of this study, which seeks to bring forward the opinion of the students, is that even though majority of the students feel that animal experiments are an important aspect of undergraduate pharmacology teaching, the rationale behind using these experiments to demonstrate well established facts eludes most of them. As a consequence of this, most of the students were of the opinion that animal experiments should be discontinued. There was a very strong opinion in the favour of introducing alternative methods to these animal experiments with only very few students being of the opinion that there was no alternative to animal experiments in medical education. Of the definite alternatives suggested, an effort to reduce the number of animals involved in experiments was the forerunner.

Sacrifice of the animals involved in the experiments or the pithing of the frogs during experiments on isolated frog’s heart were perceived to be the areas with greatest need for change. According to the students, the negative feelings attributed to the experiments would be dampened to a great extent if the animals were not sacrificed by one’s own self. A fact that merits attention is that a sizeable proportion of the students felt that working with live animals was essential to develop skills needed for the future.

Some institutions both in India and abroad have taken a step towards introduction of alternatives in the field of experimental teaching at undergraduate levels. (Wang, 2001; Bhavsar et al., 1999) In our department the animal experiments have recently been partially replaced with rational prescribing exercises based on the WHO model of ‘Guide to Good Prescribing’. Under this initiative an effort has been made to reduce the number of animals involved in the experiments. The main stress under this methodology has been to correlate the study of pharmacology with prescribing practices and introduce a rational therapeutic practice into student behavior. However a lot of issues need to be addressed before alternatives can replace the existing animal experiments in the Indian scenario. The issues relating to cost, widespread acceptance and change in teaching guidelines by MCI have to be taken into account when debates regarding the introduction of alternatives are being conducted. (Gitanjali, 2001)

The ultimate aim of this effort is the hope that we are able to mold our methodologies in a direction which would help create a more rational and need oriented curriculum. This curriculum would be the one which addresses the issues of higher education in India from an Indian point of view, taking into account our resources and needs. A consensus needs to be developed about the curriculum of the experiments in medical education taking into consideration all the prevalent views. The fact that needs to be understood is that animal experiments in pharmacology, in their present form, are neither able to live up to the expectations of the students nor able to serve the complete purpose for which they were introduced.

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**Corresponding author:**
Dr. Mandeep Singh Dhingra,
Department of Pharmacology,
Government Medical College,
Amritsar, Punjab, India.
PIN-143001
Tel: +919872248404
E-Mail:drmdhingra@yahoo.co.in