ALTERNATIVE TO USE OF LIVE ANIMAL IN TEACHING PHARMACOLOGY AND PHYSIOLOGY IN PHARMACY UNDERGRADUATE CURRICULUM: AN ASSESSMENT OF 120 STUDENTS' VIEWS

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ABSTRACT

This study was conducted to ascertain the attitudes of undergraduate pharmacy students to animal experimentation after they had completed experiments on frog abdominal rectus muscle, goat intestine, studied the effect of various drug like analgesic, anti-inflammatory, diuretics etc on mice and rats and on computer programme in academic year 2008-09. Barely sixty five percent of the students agreed with to use alternative of life animals like mice and rats for experimentation purpose in education, an overwhelming majority (seventy four percent) felt that the animal experiments involved needless pain and suffering to the animals. A large majority of students felt the need to reduce the number of animals by demonstrating the practical, to explore alternatives to the animal experiments, and to restrict animal experiments for research on life threatening diseases. More than half of the students were unaware of the government regulations on animal experiments. Students considered, understanding physiological processes as the main objective of animal experiments. The results of this study indicate that there is a need to modify the curriculum taking into account the development and availability of the new technology. The students also need to be made aware of the Government regulations on animal experiments particularly the role of the CPCSEA and the institutional animal ethics committee.

Key words: Animal experiments, Physiology, medical education, undergraduate, ethics.

INTRODUCTION

Pharmaceutical Undergraduate curriculum in India continues to follow an archaic syllabus set up decades ago, which has not kept pace with the technological progress. The Animal Physiology syllabus does not reflect the constraints imposed by the Prevention of Cruelty to Animals act of 1960 in the transport, care and experimentation. The CPCSEA (Committee for the Purpose of Control and Supervision of Experiments on Animals) was established under Prevention of Cruelty to Animals act of 1960. The Experiments on Animals (Control and Supervision) Amendment Rules (1998) and the Breeding of and Experiments on Animals (Control and Supervision) Rules (1998) gave powers to the CPCSEA, to make rules in relation to the conduct of experiments on

animals, the power to authorize any of its officers to inspect any place (at any time) and the power to prohibit a person or an institution from carrying out experiments on animals[1].

In the pharmaceutical undergraduate curriculum especially in experimental pharmacology a lot of stress is laid on pithing. It is usually performed by inserting a sharp probe into the living animal's spinal cord or brain, through the nape of the neck, moving the probe vigorously to destroy the brain. It is a common site to see a hapless frog jumping in the lab with a needle passing through its eye or other parts to the shrieks of second and third year students of pharmacy. It is difficult to see the rationale of such rituals in making a good pharmacist.

In the decade since, several states of USA have passed "choice-in-dissection" laws, which affirm a student's right to use alternatives to dissection without penalty. In the past, the use of live animals has been routine practice in the pharmacy undergraduate training curriculum. However, recent trends indicate that animal use is declining. According to the Physicians Committee for Responsible Medicine (PCRM), which for the past decade has been pressuring medical schools to replace animal labs with non-animal alternatives, about half of all 126 U.S. medical schools-including prestigious institutions as Mayo, Harvard, Columbia, and Yale-now have no live-animal laboratories. One clear conclusion that can be drawn from this information is that live-animal use is not indispensable for pharmacy training also[2].

Keiser and Hamm argue that when dissection is not part of the school curriculum, students may miss the opportunity to prepare for vocations and become valuable contributors in medicine and other health-related professions. However, many students switch career plans away from the life sciences when they learned that they were required to dissect animals[3]. There are small number of studies have been conducted in alternative to use of animal in undergraduate training curriculum for saving the live of animals. The study can be also performing on goat intestine which can be explained by our previous results on goat intestine[4-6]. Bennett conducted study on 110 U.S. Medical students. 78 percent of the surveyed medical students supported a student's right to choose not to participate in required terminal dog labs, and 32 percent felt that, given a choice, they would not participate in such labs[7]. Bowd conducted 191 Canadian Undergraduates In a retrospective survey, 27 percent of the surveyed students reported having exclusively negative reactions to dissection, and 38 percent reported both negative and positive reactions[8]. Many studies in the West have captured the pitiable conditions in which the lab animals are kept. Gibbs et al. conducted an in-depth

study to document the conditions of the capture and warehousing of frogs bound primarily for dissection. "As many as 100 frogs were kept in each sack for up to a week or more, the only care being intermittent spraying with water. Eventually, the frogs were put into large tubs of water where they were kept for periods ranging from days to months depending on the season and the demand for shipments. During this period, the frogs were provided no food. Frogs shipped during the summer likely had gone without food for a week or more between capture and arrival at a school; in the early spring, frogs may not have eaten for more than six months. In the summer months, most frogs were "hot," meaning that they were overheated and hyperactive often to the point of convulsion[9]."

Schrock's argument for dissection is that it provides the learner with "real material" and "real experience". Schrock points out, that no model is complete, and that no simulation can replicate an actual organ or organism. Also, media such as pictures, models, and computer simulations fail to provide the full sensory experience-sound, smell, and touch-that dissection Provides and, dissection is "the only way to provide meaning to communications about anatomy, physiology, and health[10]". A 1994 survey by Ammons, to which 125 of the total 126 U.S. medical schools responded, showed further declines in live-animal use for all three sub disciplines, to 39 percent, 10 percent, and 17 percent[11].

MATERIALS AND METHODS

The survey was conducted among the undergraduate second and third year pharmacy students at S.N.Institute of Pharmacy, Pusad during academic year 2008-09. The 120 students had been exposed to various animal experiments e.g. experimentations on frog abdominal rectus muscle, goat intestine for absorption and bioassays studies, effect of various drugs like analgesic, anti-inflammatory, diuretics etc and various surgical techniques like adrenoctomy and ovarectomy in mice, rats, while undergoing a practical syllabus of pharmacology subject of Pharmacy second and third year. All the experiments were performed by taking a permission of Institutional Animal Ethical Committee of S.N.Institute of Pharmacy, Pusad. The study was conducted using a questionnaire. The questionnaire was filled anonymously, and voluntarily. Opinion was sought on the following aspects, the need to use animals, alternatives to animal experiments, awareness of government regulations and the objectives of animal experiments.

RESULTS AND DISCUSSION

The CPCSEA (Committee for the Purpose of Control and Supervision of Experiments on Animals) was established under Prevention of Cruelty to Animals act of 1960. The Experiments on Animals (Control and Supervision) Amendment Rules (1998)

and established 4 R's i.e. reduction, refinement, replacement and rehabilitation in relation to the conduct of experiments on animals[1, 12].

Reduction: to constantly work to reduce the number of animals used in research.

Refinement: to improve the lives and living conditions of animals used in research, to make their lives comfortable.

Replacement: to constantly try to find new and better ways to do research that do not require animals.

Table1: Students views toward the use of animals in their practical curriculum

Values given in parenthesis are present in the form of percentage.

Points	Views of students		
	Agree	**Disagree**	**Don't know**
Do you agree there is importance of frog in pharmacology experimentation in undergraduate level?	32(26)	76(64)	12(10)
Do you agree there is alternative to use of goat intestine instead of frog abdominal muscle in pharmacology experimentation in undergraduate level?	93(78)	07(6)	20(16)
Do you agree there is need of animals (Mice/Rats), in Pharmacology experimentation?	35(29)	67(56)	18(15)
Do you think animal experiments like Frog, rats and mice involve needless pain and suffering to the animals?	89(74)	10(8)	21(18)
Facts can be learnt by demonstrations by the teacher and using computer programmers instead of performing experiments.	78(65)	36 (30)	06(5)
I am unaware of CPCSEA regulations on animal experiments.	63(52)	39(33)	18(15)
Animal experimentation should only be conducted for research on life threatening diseases	59(49)	36(30)	26(21)
What do you think the objectives of pharmacological experiments on frog, mice and rats			
To understand Physiological of processes	90(75)	13(11)	17(14)
To improve dissection skills	21(18)	87(72)	12(10)
To pass university examination	43(36)	56(46)	21(18)
Do not serve any purpose	30(26)	64(53)	26(21)

There is a global trend towards reduction in animal experiments medical undergraduate training similarly there is needs to follow such trend in pharmacy undergraduate training. The results of this study indicate that there is a need to modify the curriculum taking into account the development and availability of the new technology to use of alternative to live animals[13].

In present study 120 undergraduate pharmacy students responded to the questionnaire. The results are summarized in Table 1. Barely sixty four percent of the students disagreed with to use of frog for studying bioassays and other pharmacology experiments in pharmacy curriculum while seventy eight percent of students felt alternative use of goat intestine for bioassay and for other experiments in pharmacology practicals.

An overwhelming majority sixty five percent students felt alternative to use of live animals like computer programs, video films, demonstration by teacher for teaching pharmacology and physiological experiments. A majority of students (forty nine) felt to reduce the number of animals by demonstrating the practical, to explore alternatives to the animal experiments, and to restrict animal experiments for research on life threatening diseases; seventy four percent of students felt the animal experiments involved needless pain and suffering to the animals and these are might be reasons for the sixty five student's views toward alternative to use of live animals in teaching. While twenty nine percent of students felt to use of live animals in teaching and this was might be due to thinking the use of animals for better understanding of physiology, improving dissection skill and for passing the university examination.

More than fifty percent of the students were unaware of the government regulations on animal experiments. Students considered, understanding physiological processes as the main objective of animal experiments. Thus students need to make aware of the Government regulations on animal experiments particularly the role of the CPCSEA and the institutional animal ethics committee. There are many alternatives to teach the pharmacological experiments. Computer simulations allow students to view many levels of complexity unavailable to the dissector.

Programs' currently being used

The CD-ROMs on the human body produced by ADAM (Animated Dissection of Anatomy for Medicine) software, for example, show not only gross structural anatomy in high detail, but also contain histology images, animations, and video clips of body processes unobservable during gross dissection of a living or dead organism. Digital Frog by Digital Frog International. 3-D Body Adventure, by Knowledge Adventure displays "fly-

through" of the skeletal and circulatory systems of the human, in which the viewer tours these systems in three-dimensional space as if piloting a miniature airplane. Physiology is one of the heaviest users of animals. A survey by the Association of Chairmen of Departments of Physiology reported that most physiology faculty believed that no alternative could fully replace live-animal use in education[14]. The Virtual Physiology Series (five CD-ROMs), produced at the University of Marburg, Germany, covers the entire field of nerve-muscle physiology and simulates all of the classic experiments[15].

The SimBioSys Physiology Labs use animations, simulations, exercises, and quizzes, and cover general, cardiovascular, respiratory, and renal physiology; over 1,000 physiological parameters can be reproduced; by altering parameters, students gain understanding of how the body works[16]. Dyna Pulse Systems allows students to monitor their own cardiovascular profiles; also includes a "patient management" system that allows long-term tracking and statistical analyses of students' cardiovascular status[17]. Intelitool's software series allows students to study respiratory physiology (Spriocomp), muscle contraction (Physiogrip, Flexicomp), and cardiac physiology (Cardiocomp); students generate their own original data from their own bodies, making them both the investigators and the experimental subjects[18]. To sum up there is no dearth of alternatives.

CONCLUSION

The results of this study indicate that there is a need to modify the curriculum taking into account the development and availability of the new technology. The students also need to be made aware of the Government regulations on animal experiments particularly the role of the CPCSEA and the institutional animal ethics committee.

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