Letter to the Editor

Faculty outlook toward animal experiments in post-graduate medical education

Animal Experiments (AE) are fundamental in the training of almost all pharmacology-related post-graduate courses.[1] However, research studies have questioned their human applicability, toxicological utility, and validity. Other limitations like their exorbitant costs, difficulty in procurement of animals, strict regulations, and reservations about animal ethics by animal rights organizations and students have also been observed.[2] Moreover, newer opportunities and requirements in the pharmaceutical industry and clinical research organizations[3] and recent trends in areas like pharmacoepidemiology, pharmacoeconomics, pharmacovigilance, rational pharmacotherapeutics[1] have thrown AE out of focus.

Faculty perceptions have a strong influence on the curriculum followed and help in improvising the diverse post-graduate curricula followed in different medical colleges of India.[1] Though studies have explored the students' and faculty perceptions of use of animals in undergraduate medical education,[4] the faculty perceptions regarding use of animals in post-graduate training have not been looked into. Thus, it was deemed essential to assess the perceptions of the medical faculty about various aspects of AE in post-graduate medical education (PGME).

A cross-sectional survey was carried out among the pharmacology faculty in South India following institutional ethical committee approval. Faculty members from medical colleges, selected by convenience sampling method in the four southern states of India (Tamil Nadu, Karnataka, Kerala, Andhra Pradesh), took part in the study. The questionnaires with explanations of the objectives and instructions for filling were sent through post to the consenting faculty maintaining full confidentiality.

A structured questionnaire with closed-ended statements, determined through multiple focus group discussions with six pharmacologists (who themselves used AE in their teaching) and review of literature, was used to collect the data. Two professors in the subject, a medical education expert, and a socio-psychologist validated the content of the questionnaire and ensured that the statements in the questionnaire addressed all the study objectives.

After pilot testing on a group of five pharmacology faculty members, the face-validated questionnaire finally contained 27 statements. Some negative statements were introduced into the questionnaire and the statements were jumbled up in their order to circumvent answering bias.

The questionnaire was divided into the following five domains:

1. **Advantages of AE in learning (ADV)**: seven statements about the usefulness, relevance, and worth of AE in learning.

2. **Disadvantages of AE in learning (DIS)**: five statements regarding the drawbacks of AE in PGME were included in this domain.

3. **Logistics of conducting AE (CON)**: the time duration, economics, and other details about the conduct of AE were elaborated in six statements.

4. **Faculty perceptions of student experiences with AE (PER):** four statements focused on students finding these experiments stimulating, having lower exam stress, and being aware of learning objectives.

5. **Alternatives to existing AE (ALT)**: five statements considered the knowledge about Government laws and characteristics of alternatives to existing AE.

Categorical data were described as frequencies and percentage and analyzed by SPSS 19 version (IBM, Illinois, Chicago, USA).

Fifty-two faculty members (82.5%) from eight private and seven state government institutions who responded to the questionnaire, had a mean age of 40.5 ± 9.5 years. The majority of the respondents were female, with less than 8 years of total teaching experience, holding an MD or a PhD degree and involved in post-graduate teaching.

At the time of the survey, the AE conducted in the participating colleges were: in vivo screening and toxicity in rat, mice, and rabbit (100%) and graded dose responses in isolated tissues like frog rectus (100%), rat colon (83%), guinea pig ileum (50%), frog heart (33.3%), and rabbit aorta (16.7%).

Around 75% of faculty members were in agreement with the advantages and logistics for conducting AE. However, opinions were divided on statements relating to disadvantages and other domains (Table 1). Majority of the faculty members perceived AE as a good learning experience by the students but disagreed that AE helped to lower student's stress. The faculty members were in favor of utilizing alternative for practical training but nearly half (52%) of them were not willing to totally discontinue the AE in PG training.

AE contribute significantly in the training of post-graduates in the discipline of pharmacology.[1] However, national legislations, student objections, animal right activists concerns, global awareness of three R's concepts (Replace, Reduce and Refine),[5] and the attraction for the pharmaceutical industry/clinical research organizations[1,3] have made the use of animals in PGME debatable. The results of our study revealed that the majority of the participants support AE in PGME despite several shortcomings. A plausible reason for this may be that they perceive the need for post-graduates' training in AE for biomedical research and compliance with

Table 1
Faculty members' perceptions regarding animal experiments in post-graduate medical education ($n = 52$).

Domain	S. No.	Statement	Agreement (%)	Disagreement (%)	Uncertainty (%)
ADV	2	AE leave a long lasting impression of your discipline on students	36 (69.2)	7 (13.5)	9 (17.3)
	5	AE help to encourage student centered education	37 (71.2)	9 (17.3)	6 (11.5)
	6	AE improve dissection skills	38 (73.1)	7 (13.5)	7 (13.5)
	7	AE encourage development of scientific research outlook	44 (84.6)	3 (5.8)	5 (9.6)
	15	Students learn to handle live tissues through AE	35 (67.3)	10 (19.2)	7 (13.5)
	24	AE provide an opportunity for deep learning rather than surface learning	39 (75)	5 (9.6)	8 (15.4)
	27	AE seem relevant to a career in biomedical research	43 (82.7)	2 (3.8)	7 (13.5)
DIS	4	*AE give too much of importance to factual learning (a method of learning which concentrates on memorizing information)*	26 (50)	18 (34.6)	8 (25.4)
	14	*AE cause unnecessary distress to animals*	39 (75)	9 (17.3)	4 (7.7)
	16	*The same understanding of concepts of your discipline can be achieved without these experiments*	21 (40.4)	22 (42.3)	9 (17.3)
	18	*The main objective of students to do AE is to pass University examinations*	17 (32.7)	28 (53.8)	7 (13.5)
	26	*Students resist performing AE*	16 (30.8)	24 (46.2)	12 (23.1)
CON	1	AE should be conducted in the program	46 (88.5)	4 (7.7)	2 (3.8)
	8	The current use of animals for teaching purpose is ethically justified	38 (73.1)	10 (19.2)	4 (7.7)
	17	*The duration of time spent in AE is too much*	23 (44.2)	24 (46.2)	5 (9.6)
	19	AE allow enhanced potential for repeatability of learning exercises compared with other alternatives	14 (26.9)	29 (55.8)	9 (17.3)
	20	AE are economically viable	19 (36.5)	21 (40.4)	12 (23.1)
	23	AE offer flexibility as to when and where experiments are conducted	15 (28.8)	23 (44.2)	14 (26.9)
PER	3	Students find AE stimulating	30 (57.7)	11 (21.2)	11 (21.2)
	9	Students are aware of the learning objectives for AE prior to the practical	47 (90.4)	3 (5.8)	2 (3.8)
	21	AE result in lower student stress during exams	12 (23.1)	31 (59.6)	9 (17.3)
	22	*Demonstrations (of AE in batches) are preferred rather than experiments done by students individually*	15 (28.8)	34 (65.4)	3 (5.8)
ALT	10	*There are alternatives to AE for practical teaching*	36 (69.2)	8 (15.4)	8 (15.4)
	11	*Alternatives to AE can achieve equivalent learning outcomes compared to AE*	26 (50)	16 (30.8)	10 (19.2)
	12	*If alternatives (like computer assisted learning experiments, models) are available, AE should be totally discontinued*	18 (34.6)	27 (51.9)	7 (13.5)
	13	*If alternatives are available AE should be continued with reduction in no. or refinement of use of animals*	40 (76.9)	8 (15.4)	4 (7.7)
	25	Government laws have been framed with regard to use of animals in education/research	49 (94.2)	0	3 (5.8)

ADV: advantages of animal experiments in learning, DIS: disadvantages of animal experiments in learning, CON: logistics of conducting animal experiments, PER: faculty members' perceptions of student experiences with animal experiments, ALT: alternatives to existing animal experiments, AE: animal experiments. *Negative statements are in italics.*

regulatory toxicology requirements in the new drug development by the pharmaceutical industry.

In our study, the general agreement of the faculty members with all the statements in advantage domain reveals that the teachers support AE in PGME despite being aware of its potential disadvantages. Disagreement with statements that "students resist performing AE" but still perform them "to pass University Examinations" reveals the faculty members' perceptions about positive opinions of post-graduates toward AE (maybe due to its relevance in the post-graduates' future professional career). Ethical justification, post-graduates performing AE individually, and agreement with statements such as "students finding AE stimulating" and being "aware of learning objectives" again divulges their substantial support for animal use. They all seem to be aware of the alternatives to AE and the concept of three R's (Reduce, Replace and Refine) must be implemented.

Practical sessions in PGME fulfill learning outcomes like preparation-specific skills, animal handling, animal behavior, observational and surgical skills, research methodology, developing responsible attitudes toward animals etc. The alternatives do meet some of these objectives at least as effectively as live AE. Thus, introducing alternatives into PGME training necessitates the availability and familiarity with efficient alternatives. We advocate faculty training in physio-chemical methods and techniques utilizing tissue culture, microbiological system, stem cells, deoxyribonucleotide DNA chips, micro fluidics, computer analysis models, epidemiological surveys, and plant tissue-based materials which would minimize the number of animals used and circumvent some of the accepted disadvantages of AE.[6] Furthermore, combinations of computer-aided learning techniques with

manikins and chemical sensors can evade some of the disadvantages of alternatives and be a training tool which can completely replace few AE in PGME.

The findings indicate that faculty members in South-Indian medical colleges support animal use in PGME in spite of being aware of their drawbacks and the availability of alternatives. In view of the global efforts to "Replace, Reduce and Refine" animal use, more awareness needs to be generated regarding the availability of alternatives to AE in PGME which will help our post-graduates to carry out scientifically valid animal-based research evading ethical issues.

We advocate the use of qualitative studies to evade the limitations of our questionnaire-based results. We also acknowledge the absence of randomization in our sampling procedure. Moreover, in view of the regional representativeness of the sample (from South India) and the small sample size, generalization of results to whole of the country may not be appropriate. Therefore, more studies on faculty perception from other parts of the country regarding AE should be performed before introducing the changes in post-graduate curriculum.

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