

# Effects of Laboratory Animal Science Training on Scientists' Attitudes and Practice in Egypt

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The implementation of principles and guidelines that govern the various areas of research in an educational institution is one of the key factors in international recognition of its research integrity and value. The privilege of conducting research using animal subjects requires adherence to international regulations and standards governing the humane care and use of laboratory animals. The IACUC at our university deemed it critical to have an animal care and use training program to raise researchers' understanding and knowledge. Our IACUC recently designed a training program in the principles of laboratory animal science and the ethical issues involved in animal use. The present study aimed to measure the effect of such training on scientists' attitudes and practice. During 4 successive training courses, the participants (n = 100; 72% women and 28% men) were surveyed twice through self-administered questionnaire—before starting and after completing the course. Questions focused on ethical consideration for care and use of animals in research, ethical committees, international guidelines for humane care of animals, and 3Rs concepts and their interpretation. The results revealed that the scientists' knowledge and awareness increased effectively after the completion of the training courses. They understood the 3Rs concepts of replacement, reduction, and refinement; recognized the importance of standardization of animal handling on scientific results; and were able to distinguish between different ethical committees and their roles. Overall, training leads to standardization of animal care and use practices that are vital for the reproducibility of results fundamental to quality scientific research.

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The guidelines for research known as the OIE Terrestrial Animal Health Code (Terrestrial Code)<sup>12</sup> have been compiled to help researchers and the research community to be aware of their ethical views and attitudes. The implementation of principles and guidelines that govern the various areas of research in an educational institution is a key factor in international recognition of its research integrity and value. Animals in biomedical research play a vital and integral role in the advancement of science. Their use is a privilege that requires great responsibility and compassion. According to the EU Directive, researchers must undertake specific training to be licensed to work with animals.<sup>4</sup> In its *Terrestrial Animal Health Code*, the World Organization for Animal Health stresses that training is essential for all staff, researchers, and personnel involved in any animal activity.<sup>12</sup> Training leads to standardization of animal care and use practices that are vital for reproducibility and statistical validity of results fundamental to quality research.<sup>1</sup> Currently Egypt lacks animal welfare laws that governs the use and care of experimental animals for research and teaching purposes.

Cairo University was the first educational institution in Egypt that recognized the importance of the implementation of ethical principles and guidelines of animal care and use. In 2012, the Faculty of Science at Cairo University established its first IACUC. In 2013, the activity of the committee spread to encompass all the faculties and institutions under the Cairo University umbrella. An Animal Care and Use Program is crucial to ensure that animal research is consistent and comply with the ethical considerations internationally acknowledged. International

regulations<sup>12</sup> require assurance that persons involved in the care and use of animals in research, teaching, and testing are qualified to perform their duties. Animal Care and Use Programs must provide appropriate training and instruction to all persons working with animals. As part of the protocol review process, the IACUC must ensure that personnel are qualified to perform the proposed animal procedures. Training requirements must be fulfilled before persons are granted the privilege of working with and caring for animals through their activities or employment within Egyptian universities.

In 2015, the IACUC at Cairo University decided to implement the international guidelines of animal care and use in research to standardize the researcher's practices and ensure the validity of preclinical scientific research in Cairo University. The IACUC developed an animal care and use training course to provide basic training for researchers in the multiple basic skills and theoretical knowledge needed to become fully autonomous in planning and conducting animal experiments. The course includes a number of topics, such as the history of research ethics, laws and regulations regarding animal welfare in Egypt, IACUC composition and the roles of members, 3Rs principles,<sup>9</sup> humane methods of animal killing (euthanasia), humane endpoints, and animal use protocol review. The course is set up to deliver resources, training, and supervision to a wide range of personnel involved with animals, including principal investigators, research staff, student volunteers, graduate students, postdoctoral fellows, visitors, and undergraduate students taking part in research projects.

The present study was designed to assess the effect of the Cairo University basic animal care and use training course that was developed adherent to international training standards on the practice and attitudes of the Egyptian researchers who participated.

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## Materials and Methods

The IACUC of Cairo University, Egypt, mandates that all research staff members and students who are using animals in research, testing, or training as well as IACUC members must complete a basic course regarding ethical issues concerning animal care and use. The course addresses a number of topics, including the history of research ethics, laws and regulations regarding animal welfare in Egypt, IACUC composition and the roles of members, 3Rs principles,<sup>9</sup> humane methods of animal killing (euthanasia), humane endpoints, and animal use protocol review. Each 2-d course involves 25 participants and is held for 6 h each day at the Cairo University Faculty and Leader Development Center.

In 4 successive training courses held during March through June 2017, the participants ( $n = 100$ , 72 women and 28 men) were surveyed through a self-administered questionnaire before the start of the course and then again after its completion. Questions were focused on ethical consideration for care and use of animals in research, ethics committees, international guidelines for humane care of animals, and 3Rs principles and their interpretation. The questionnaire was divided into sections—the first section addressed the respondent's basic information and background; the second assessed participants' views regarding 3Rs principles and the need for animal use in biomedical research; and the third section asked about the protocol approval application and the roles of IACUC members and protocol application form. The last section included some important questions regarding ethical guidelines for animal care and use in biomedical research.

## Results

**Basic information regarding participants.** During 4 successive training courses (25 participants per course), 72 of the total 100 participants were women; 28 were men. The participants were 25 to 40 y old, and all participants had previous experience with laboratory animal research.

**Awareness of ethical issues regarding research animal use.** Before attending the course, participants' responses regarding the difference between animal welfare and animal rights showed that the difference between 2 expressions is not well discerned in Egypt, because the word 'welfare' is misleading and 'rights' is meant usually. After the course, participants were aware of the difference between animal welfare and animal rights. In addition, the results revealed that none of the participants had membership in animal welfare or animal right organizations. In addition, none of the participants were aware of any national laws and regulations that govern animal welfare in Egypt before attending the course. However, after course completion, all participants indicated awareness of animal welfare regulations, stating the presence of the 1902 Khedawi Decree, 1966 Agriculture Decrees, and Article 45 of the 2014 Egyptian Constitution.

At the start of training, when participants were asked about the justification for using animals in the biomedical research, 85% selected "Because animals are cheap and easy to handle," whereas 5% chose the opinion "There is no alternative to animals in biomedical research," and 10% marked "Because animals are usually used to discover new drugs." After the course, all 100 participants agreed that animals can be used only when no alternative is available.

**Knowledge of 3Rs principles.** Prior to course attendance, 75% of respondents were completely unaware of 3Rs principles, 15% claimed to know about the 3Rs but failed to name them correctly, and the remaining 10% correctly named these principles. At

the end of the course, 95% of the respondents from all courses defined the 3Rs correctly.

Before the course, all 100 participants agreed that use of animals is very important in scientific research. When asked "Can current experiments based on animals be replaced with an alternative?," 80% of respondents believed that no suitable replacement for animals in biomedical research are available; the remaining 20% answered that animals can be replaced with various alternatives. After completion of the course, all participants understood that there are numerous alternatives to animals. Answers to the follow-up question "Do you prefer to apply reduction or refinement in your animal studies?" indicated that 90% of respondents prefer refinement, with the remaining 10% choosing reduction.

**Views about animal ethical committees.** When asked "Do you know what the term IACUC stands for?" before beginning the training course, approximately 85% of respondents stated they were completely unaware of the IACUC term, 5% claimed to know the term but failed to define it correctly, and 10% correctly defined it. At the end of the course, the percentage of respondents that correctly defined IACUC rose to 100%.

When the participants were asked to clarify the importance of the IACUC in their field of study, 60% considered it to be "very important; without it international publishing would be compromised, 35% believed it to be "important for standardization of scientific results," and 5% thought that the IACUC is "very important for animal welfare." The proportion of respondents stating that IACUC is very important for standardization of scientific results increased to 85% after the completion of the course.

When participants were asked whether they had ever requested approval for animal care and use from the IACUC, 90% of them had not, whereas 10% had submitted an application. These 10 respondents then were asked why they sought IACUC approval: 80% indicated that they did so "due to international journals' requirements regarding publication of research animal use," 10% marked the option "Due to higher studies body's requirements," and 10% selected "To follow guidelines of animal care and use."

## Discussion

Training in laboratory animal science has developed as the field has progressed. The complexity in the regulatory and scientific features of the animal research environment necessitates a strong training program on diverse topics according to staff duties. The training course in the present study was designed to train researchers to be more competent in conducting animal research and to promote their responsible use of animals. Many Egyptian scientists have not received training to work with a particular animal species used in research. However, many resources (for example, AALAS training manuals and online courses) are available to support their training, and once trained, these persons readily apply the newly acquired knowledge and skills. The present study represents the first attempt to assess the influence of Cairo University IACUC training modules on researchers' attitudes regarding the ethical issues, international guidelines, and 3Rs interpretation concerning their animal use studies. At the start of the course, all of the participants were unaware of national laws and regulations concerning animal welfare in Egypt; this situation may reflect the absence of enforced and obligatory regulations in many Egyptian institutions regarding animal care and use. In response, the developed training course succeeded in exposing participants to the most important regulations concerned with animal welfare from

1902 (Khedawi Decree) until 2014 (Egyptian Constitution).<sup>10</sup> The training course also conveyed the importance of providing clear justification for animal use in scientific research, and the attendees learned that animals must be used only when no suitable alternative is available.

It was unsurprising that most attendees were unaware of 3Rs concepts, given the lack of undergraduate-level laboratory animal science courses in Egypt. The few participants (10%) that correctly defined the 3Rs principles were veterinarians, who acquired their knowledge from courses in veterinary medical school. However, training courses appear to be effective in correcting this situation, with almost every participant able to correctly name the 3Rs after attending. The training courses also explained the availability of several alternatives to animal use in research and stressed the importance of implementing this concept, which may help to decrease the number of animals used in Egyptian biomedical research in the future. The high importance of animal use in biomedical research reflected by the participants is in accordance with data from surveys performed in other countries.<sup>6-8</sup> The present IACUC training evaluation at Cairo University revealed that refinement conflicts with the goal of reduction.<sup>3,11</sup> Most participants believed that refinement of the use of animals is easier to achieve than reduction. The present assessment showed the low level of participants' awareness regarding both concepts.

The IACUC at Cairo University has been established since 2014 and was constituted to ensure 1) competent review of the ethical aspects of research and 2) independence from influences that could affect the performance of unbiased reviews.<sup>2</sup> The present survey showed the lack of specialized institutional animal ethics committees in Egypt, which became apparent from the inability of the participants to define the term IACUC. The lack of such committees may be due to the absence of mandatory regulations that enforce their establishment in Egyptian institutions. Thereby, that all participants have no knowledge of the importance and roles of such committees is expected. The developed training courses succeeded in explaining the role of the IACUC in the standardization and harmonization of experimental results.

The present survey revealed the importance of the IACUC training course for researchers working with laboratory animals at Cairo University, Egypt. The recorded results showed that such training courses must be mandatory for all animal users at Cairo University and at all other Egyptian universities and research centers because it is a valuable means of educating and raising awareness regarding animal welfare. The obtained results mandated the inclusion of additional training courses

focused on experimental design in animal experimentation and sample size, to implement the concept of animal reduction. In addition, the current survey emphasized that continuous training for those responsible for designing and performing animal experiments is mandatory for standardization and harmonization of scientific results.

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