



Ethics of Animal Use in Research: Perspectives of Islamic Education and Science

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Abstract

The use of animals as research objects in the world of science, such as biology and health, is common practice. However, the problem that often arises is the lack of knowledge of researchers regarding ethics or the correct procedure for using animals as research samples. This article precisely discusses how to use animals in research without violating the ethics that have been regulated by Islam and the provisions of science. This article was written using a qualitative method with a content analysis approach. Data was taken from the framework of Islamic and scientific theoretical concepts, scientific articles related to the issue of animal use, organizational provisions, and international law regarding animal protection as research samples. All data collected is carried out by analysis interactive model Milles & Hubberman assisted by NVIVO 12.0 Software. This finding resulted in seven ethical uses of animals in research; i) reciting tauhid sentence, ii) not using sick animals, iii) using sharp surgical tools, iv) hiding from the eyes of animals, v) minimizing the quantity of animal use, vi) using the euthanasia method, vii) handling post-surgical management. These seven ethics can be used as a reference for researchers in the use of animals in a study, to guarantee and ensure that animals are treated with proper and good ethics.

INTRODUCTION

Islam is a religion that supports the advancement of science. It is evident that the greatest discoveries in the history of world science were born from Islamic researchers, such as Al-Khwarizmi (mathematics), Al-Battani (astronomy and trigonometry), Al-Haitsam (optics), Al-Jazari (robotics), Ar-Razi (medicine), Al-Asma'i (zoology and botany), Al-Muqaddasi (geography) and other Islamic scientists. In fact, all the findings of Islamic thinkers above are still the main source of reading for world researchers in conducting research until now (Abdullah, 2017; Afriyansyah et al., 2016). In its development, all new findings in science originate from observations and tests which sometimes involve living things such as animals as samples or research objects. For example, in medicine and biology, the use of animals is prevalent in various practices carried out in schools, universities, government laboratories, and independent research centers. In the following, the author will discuss the ethics of using animals according to Islamic and scientific views.

Islam is a very concerned religion and guarantees the rights and benefits of living beings, including the safety of animals. It is not surprising if some surahs in the Quran are taken from the names of animals such as surahs Al-Ankabut (ants and spiders), Al-Fil (elephant), Al-An'am (goats, cows, and buffaloes) and An-Nahl (bee).

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The naming of surahs from the names of animals in the holy Quran is not a coincidence but rather shows that Islam considers animals to be noble creatures just like humans, and can even be used as examples of their various characteristics for humans (Li et al., 2023).

Regarding the ethical interaction between a Muslim and an animal in Islam, Islam has regulated the ethics and attitude of a Muslim when interacting with animals as fellow creatures of Allah SWT (Efendy, 2016; Nurulloh, 2019). Referring to the Quran, Sunnah, and various opinions of scholars (ulama), there are ten obligations of a Muslim towards animals, namely i) pay attention to the sources of animal water, ii) availability of sufficient food, iii) proper shelter, iv) living conditions, v) mental, iv) good health and avoiding pain, vii) prohibiting torture, viii) keeping away from distress and ix) unnecessary termination of animal life (Anam et al., 2021; Rahman, 2017). Meanwhile, according to Imam Sadiq, there are four rights to animals that must be considered by their owners, namely i) not to burden animals, ii) not to burden their backs as a place for conversation, iii) to feed them after using them, and iv) not to whip their faces.

The ethics of slaughtering animals are also regulated explicitly in Islam such as i) providing a sharp surgical tool to avoid long-term pain, ii) removing hair at the location of the body to be slaughtered, iii) uttering the sentence of monotheism, iv) facing a good direction (*qiblat*), v) hiding slaughtered animals the other animal's view (Naitboho, 2021). In several hadiths of the Prophet Muhammad (peace be upon him), Muslim ethics towards animals are also found, such as the following hadith.

وَلَهُ: مِنْ حَدِيثِ عَائِشَةَ رَضِيَ اللَّهُ عَنْهَا; أَمَرَ بِكَشِّ أَقْرَنَ، يَطَأُ فِي سَوَادٍ، وَيَبْرُكُ فِي سَوَادٍ، وَيَنْظُرُ فِي سَوَادٍ؛ لِيُضَحِّيَ بِهِ، فَقَالَ: "إِشْحَذِي الْمُدْيَةَ"، ثُمَّ أَخَذَهَا، فَأَضْجَعَهُ، ثُمَّ ذَبَحَهُ، وَقَالَ: "بِسْمِ اللَّهِ، اللَّهُمَّ تَقَبَّلْ مِنْ مُحَمَّدٍ وَآلِ مُحَمَّدٍ، وَمِنْ أُمَّةِ مُحَمَّدٍ" (صحيح. رواه مسلم)

Meaning: "And to him: from the hadith of Aishah (radhiyallahu 'anha): "That the Messenger of Allah, may God bless him and grant him peace, ordered to bring two goats with horns that were (white in color) but their legs, belly, and around their eyes were black. So bring the animal to him. He said to Aisyah: "O Aisyah, take a knife and sharpen it with a stone". After that he took a knife and laid the goat down, and slaughtered it while praying: "In the name of God. O Allah, accept (this sacrifice) from Muhammad, his family, and his people". (Muslim)

In Islam, uttering the *tauhid* sentence especially *bismillah* before slaughtering animals is very important. The Prophet Muhammad (peace be upon him) said in the hadith narrated by Bukhari that during the process of slaughtering animals, one should say the name of Allah and read the *takbir* as the following hadith reads:

حَدَّثَنَا آدَمُ بْنُ أَبِي إِيَاسٍ، حَدَّثَنَا شُعْبَةُ، حَدَّثَنَا قَتَادَةُ، عَنْ أَنَسٍ، قَالَ ضَحَّى النَّبِيُّ صَلَّى اللَّهُ عَلَيْهِ وَسَلَّمَ بِكَشْبَيْنِ أَمْلَحَيْنِ، فَرَأَيْتُهُ وَاضِعًا قَدَمَهُ عَلَى صَفَاحِهِمَا يُسَمِّي وَيُكَبِّرُ، فَذَبَحَهُمَا بِيَدِهِ. (رواه البخاري)

Meaning: "Adam bin abu Iyaas has narrated to us, Shu'bah has narrated to us, Qatadah has narrated to us, from Anas, the Prophet (peace be upon him) slaughtered an animal (sacrifice) with two sheep. I saw him put his foot on the neck of the animal, then read *basmallah* and *takbir*, then he slaughtered the two sheep himself." (Bukhari: 5558).

Referring to the opinions and hadiths above, it can be understood that Islam has properly and completely regulated the ethics and attitudes of a Muslim when interacting with animals. The use of animals for maintenance purposes, slaughter for food dishes and research objects is permissible on condition that humans continue to pay attention to the ethics that have been set so that the rights of animals are still fulfilled as living things.

Furthermore, when viewed from a scientific perspective, in principle the use of animals in a research is permissible if it applies established ethics (Husna et al., 2019a; Lloyd et al., 2020). Russell and Burch in 1959 introduced the 3R concept as a code of ethics for the use of animals in a study, namely i) replacement, replacing experimental animals should be attempted, ii) reduction, reducing the number of experimental animals used to the limit of the amount that can still be analyzed statistically, iii) refinement, improved handling of animals used to reduce the effects that can cause pain and stress (Lund et al., 2016; McCulloch & Reiss, 2018; Mutiarahmi et al., 2021; Nasution, 2022). Meanwhile, according to Institutional Animal Care and Use Committee (IACUC), the use of animals in research must fulfill ten ways which are i) minimize pain and distress in animals it is assumed that animals experience pain similar to humans, ii) prevent unacceptable study endpoints (death) or procedures must be designed to produce as few animal deaths as possible, iii) avoid repeated use of animals, iv) minimize the duration of the experiment, v) use euthanasia methods (avoid harm, be reliable and speed up the painless loss of consciousness until death), vi) Preoperative examinations to identify problems potential animals because sick animals may not be used as research material, vii) surgical procedures performed under anesthesia, viii) postoperative care, ix) proposals to manipulate genetic material, germ cells, or embryos must be submitted to IACUC for approval, x) experimental tumor induction (Nugroho et al., 2022; Olsson et al., 2022; Putri, 2018). In general, all the ethics above are aimed to respect the rights of animals as living things when they are used as research objects.

As a researcher, there are also at least three ethics that must be obeyed in conducting research activities, namely, i) *respect for animal* that is every researcher who uses experimental animals must respect these animals, ii) *beneficence* that is beneficial to humans and other creatures, iii) *justice* that is being fair and making use of experimental animals (Mutiarahmi et al., 2021; Reed, 2017; Wahywardani et al., 2020). In other words, humans as actors must also maintain ethics in using animals as objects or tools in their research.

Although the use of animals as research samples is commonly carried out by researchers in developing science, the problem that often arises is the lack of knowledge and understanding of a researcher, especially among university, college, and high school students regarding the ethics of using animals in research (Amin et al., 2011; Andersen & Winter, 2019; Schobin et al., 2022; Suryanti, 2019). The findings of the researchers above coincide with the results of the author's survey of 119 students from 14 universities in Indonesia, the survey was carried out related to the stage of student knowledge of the ethics of using animals for research practicum in biology lectures, the results of the analysis showed 55.9% of students stated they did not understand, 28.81% did not understand at all, 11.86% quite understood, and only 3.38% understood the ethics well.

The low knowledge of researchers regarding the ethics of using animals in research is also due to the small amount of literature that addresses this issue. Based on SCOPUS data search using keywords ethics, use of animals, research, Islam, and science there are 157 articles discussing the use of animals. However, no documents have been found that discuss it from an Islamic perspective as shown in Figure 1 below.

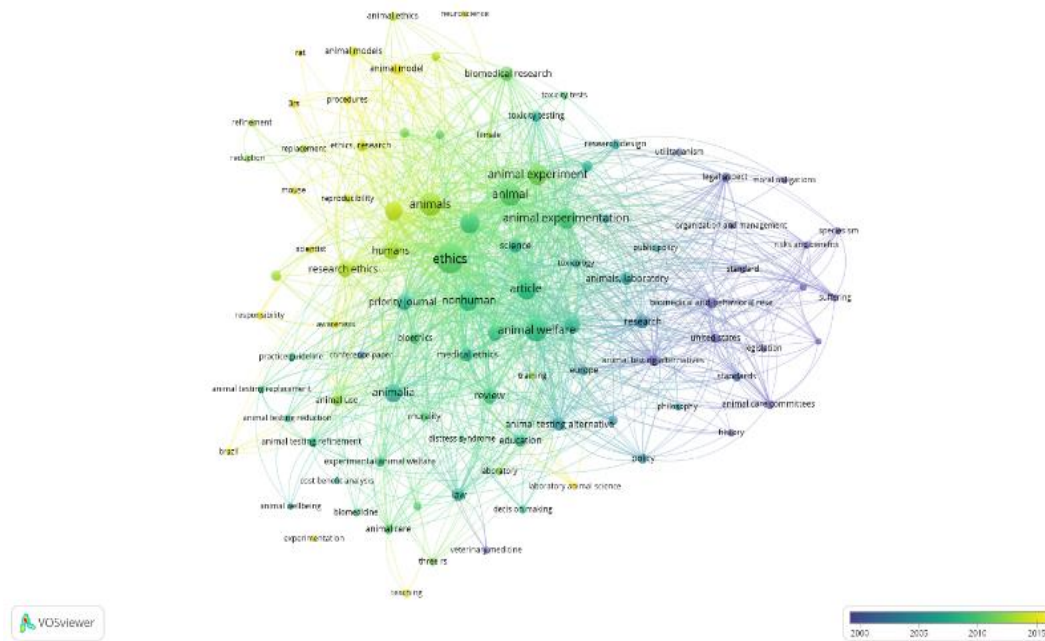


Fig 1. A number of keywords refers to ethics, use of animals, research, Islam, and science by world researchers (Scopus database)

Furthermore, in the same literature based on country search, 67 articles are found which are dominated by America, India, Netherlands, England, Australia, Denmark and followed by Germany and Portugal. There is no single document that has been found from Indonesia as shown in figure 2 below.

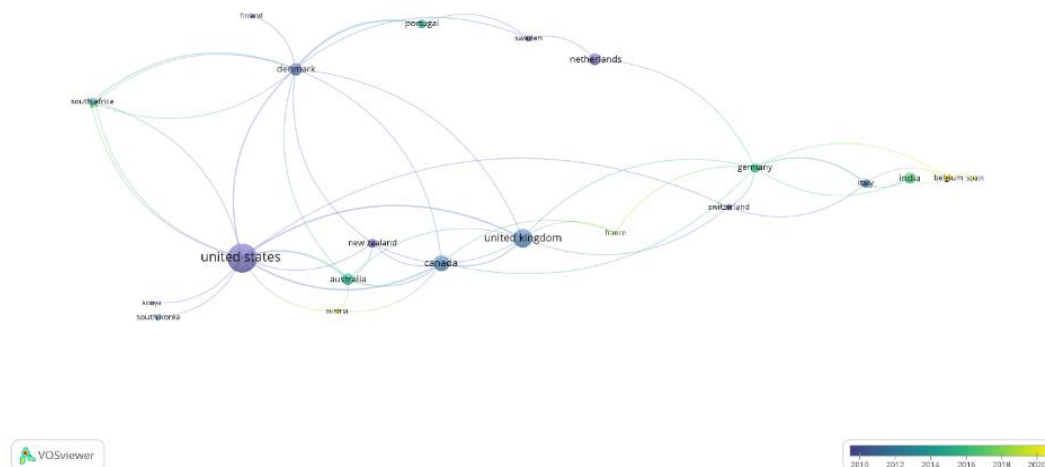


Fig 2. Research in several countries related to keywords ethics, use of animals, research, Islam and science by world researchers (Scopus database)

In fact, this article is important to discuss how animals should be used in research according to an Islamic and scientific perspective comprehensively and specifically. Besides that, this article can be a reference for all researchers, especially university, college, and high school students regarding the importance of understanding and maintaining ethics and animal rights when used as samples for research purposes.

METHODS

This research was conducted using a qualitative method with a content analysis approach. Data was taken from the Islamic and scientific framework, theoretical concepts, pertinent scientific articles, organizational provisions, and pertinent

international law. This research approach can be carried out to discuss certain problems, issues, or topics from various theoretical frameworks, and literature. Finally, the result will be served as some appropriate themes with the required data (Anthony & De Paula Vieira, 2022; Tannenbaum, 2017). After collecting the data, the next step is to select the necessary data according to the issues raised in this article (Kasim et al., 2021; Zamawe, 2015). The next step is to discuss the collected data to be used as discussion themes. Themes are some related topics to the ethics of using animals as research samples which is the focus of the results and discussion (Bourque & Bourdon, 2017; Snelson, 2016). All collected data were analyzed by using the interactive model Milles & Hubberman and NVIVO 12.0 Software (Asril et al., 2023; Engkizar et al., 2025; Jaafar et al., 2023). The results will be discussed using a content analysis approach. It uses some themes or main reviews according to the issues and problems (Marshall et al., 2020). This article was written using the methods and steps the author described above.

RESULT AND DISCUSSION

Referring to the conceptual framework of Islamic theory and modern science, as well as scientific articles and literature related to the use of animals as research samples, seven ethical principles for animal use in research were identified. Four of these principles are derived from an Islamic perspective: i) reciting the *tauhid* sentence, ii) avoiding the use of sick animals, iii) using sharp surgical instruments, and iv) concealing the process from the sight of other animals. The remaining three are based on a scientific perspective: i) minimizing the number of animals used, ii) applying euthanasia methods, and iii) ensuring proper post-operative management. These principles are illustrated in Figure 3 below.

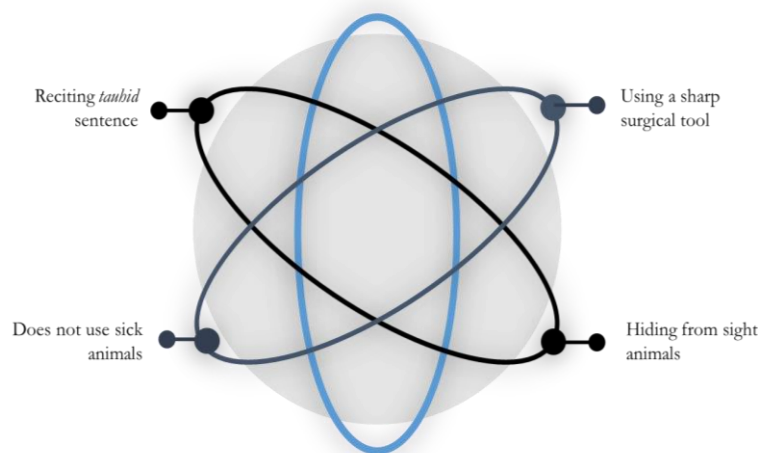


Fig 3. Ethics of animal use from an Islamic perspective

First, reciting *tauhid* sentence. Islam regulates its adherents to recite the sentence of *tauhid* when slaughtering animals. *Jumhur Ulama* agreed that reciting *tauhid* sentence is important especially *basmallah* while the process of cutting or slaughtering animals including valid (*sah*) requirements. A valid requirement is something that is done in accordance with the provisions of the basic conditions. A thing is said to be valid if it meets the conditions of the existing pillars in Islam. On the contrary, it is invalid or void of Islamic pillars if the condition does not meet the rules. The importance of reading *basmallah* before slaughtering animals is one of the sharia (Islamic law) as found in the Qur'an Surah Al-An'am verse 121:

لَمْ يَذْكُرِ اسْمُ اللَّهِ عَلَيْهِ وَإِنَّهُ لَفِسْقٌ وَإِنَّ الشَّيَاطِينَ لَيُوحُونَ إِلَى أَوْلِيَائِهِمْ لِيُجَادِلُوكُمْ وَإِنْ أَطَعْتُمُوهُمْ إِنَّكُمْ لَمُشْرِكُونَ وَلَا تَأْكُلُوا مِمَّا

Meaning: *Do not eat of what is not slaughtered in Allah's Name. For that would certainly be 'an act of' disobedience. Surely the devils whisper to their 'human' associates to argue with you.1 If you were to obey them, then you 'too' would be polytheist.*

In Islam, reciting *taubid* sentence especially *basmallah* before slaughtering animals is very important. Apart from the Quran, the suggestion to start slaughtering animals by pronouncing the name of Allah was also taught by the Prophet Muhammad (peace be upon him) as a role model for Muslims. The Prophet Muhammad (peace be upon him) said in the hadith of Rafi 'bin Khudaij which means: *"everything that can bleed in Allah's name when slaughtering it, please eat it"*. (Bukhari)

Even though the explanation of the hadith refers to food, the mention of *taubid* is still important for slaughtering animals for research purposes. The importance of reading *bismillah* is based on the Hadith of Al Khatib which means: *"every important thing that does not start with bismillah, then the practice is cut off (less) blessed"* (Al Khatib). The research is conducted to provide knowledge to humans. This activity is considered very noble in Islam. Apart from being controversial about the use of animals in research, slaughtering animals for research needs is highly recommended to achieve blessings. All good things will be more perfect if it starts with *basmallah*.

Second, does not use sick animals. Animals with sick condition are strictly prohibited from being used, especially in research. Sick animals are disturbed some metabolisms. One of the test animals that is often used to study the function of human genes is the mouse. Most of the biological processes in mice are very similar to those that occur in humans (Hall et al., 2021; Syafril et al., 2021). It is important to ensure the health conditions of test animals before using. If the research uses healthy animals, it could reduce errors in animal testing or experiment, especially in pathophysiological research, treatment mechanisms, and drug side effects of a disease. In addition, the discovery of sick test animals includes negligence in the use of test animals. Negligence can be caused by not being careful in determining animals that are suitable to be used as test animals (Li et al., 2023; Pranayasa et al., 2021). The practice of using animals is also highly considered in Islam. All religious recommendations for using animals are strict to animal health requirements. For example, in the practice of *Qurban* and *Aqiqah*, the animal used must not be sick, disabled, lame, or thin. This is determined to avoid the transmission of certain diseases from animals to humans. Therefore, it is proven the awareness of using animals in Islam.

Third, using a sharp surgical tool. Animal slaughter must use a sharp surgical tool. This tool can be used to drain blood and sever the animal's jugular vein. Some recommended sharp objects are knives and machetes. Before using it, the tool must be sharpened first. Objects that appear to be sharp such as teeth, bones and glass are not recommended because they can torture the animal. This will not affect animal pain for a long time before they die. Islamic direction to slaughter animals in a direct way will be beneficial to the heart pumping blood out of the body optimally. This affects the quality of the meat which is more suitable for human consumption and in accordance with the principles Good Manufacturing Practice (GMP) and *halal* term. The guidelines were taught by the Prophet Muhammad (peace be upon him) in a hadith which means: *"Indeed, Allah makes it obligatory to do good towards everything. If you kill, then do it well. And when you slaughter, then do it well. And let one of you sharpen the knife and wear (not torture) the animal at the time of slaughter"* (Muslim).

In scientific research, the use of tools is highly considered in research procedures. Scalpels and razor blades were often used to dissect the animal for

research. Both tools will guarantee the sharpness and sterility of the tool. In addition, the size of the scalpel and razor blade is adjusted to the size of the animal as a research sample. Thus, the organ function of animal is maintained to success the experiment.

Fourth, hiding from sight animals. When dissecting one of the test animals, this process should be kept away from the view of the living test animals. Then, the alive animal will not feel tortured by watching the dissection process. Several studies on the behavior and nervous system of rodents have shown that rodents have empathy for their communities. When seeing their fellow sufferers trapped in a trap cage, rodents are able to show their social desire to help (Husna et al., 2019b; Nelson, 2016; Weidner et al., 2016). The results of this study support that animals can experience stress when they see each other being dissected. In Islamic values, protecting animal feelings from stress and fear is remarkable. Islam concerns the animal slaughtering process from the very beginning until the end. This is in accordance with the example from the Prophet Muhammad narrated by Ahmad and Ibn Majah which means: "*Rasulullah SAW ordered the sharpening of the knife, without showing it to the animals.*" (Ahmad and Ibnu Majah).

The four principles above illustrate the Islamic ethical perspective, which emphasizes compassion, respect, and moral responsibility toward living beings. These values form the foundation for the humane treatment of animals, rooted in the concept of *ihsan* and inspired by the example of the Prophet Muhammad. Meanwhile, the subsequent principles represent the scientific dimension of animal ethics. Although grounded in empirical reasoning rather than revelation, scientific ethics shares a similar moral orientation ensuring that animals are treated properly, their suffering minimized, and their use conducted responsibly. Thus, the convergence of Islamic and scientific perspectives suggests that the two can complement each other in promoting more ethical and humane research practices. To illustrate this relationship, Figure 4 below shows the connection between these ethical perspectives.

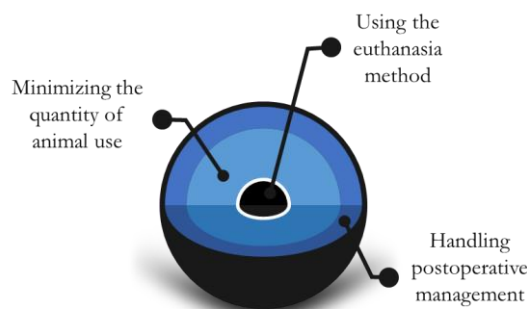


Fig 4. Ethics of animal use from an Islamic perspective

First, minimizing the quantity of animal use. Along with the need for research, the use of animals in research must be estimated in a measurable manner. In preparation for the study, the number of animals must be calculated and determined according to research purposes in accordance with the 3R principles, namely reduce, refine, and replace (Bartal, 2012). Reducing the number of animals can be done by reducing the number of repetitions in the experiment. However, the research objectives must be achieved with the minimum quantity of samples. In addition, research procedures need to be thoroughly studied to reduce the possibility of error and fewer animals are needed. The researcher can also modify the procedure or methodology to reduce the level of stress that is experienced by animals. Furthermore, laboratory experiments or *in vivo* tests could be replaced with available

alternatives in the advancement of technology. Several countries have already stopped using animals in the testing of drugs and chemicals by alternatively conducting *in vitro* (Sivaselvachandran et al., 2018) and *in silico* (Hachiga et al., 2018). For example, *in vitro* and *in silico* approaches can be conducted. *In vitro* is carried out by utilizing cell cultures isolated in the laboratory. Whereas *in silico* utilize a developed database through a computational approach to filter the best candidates without testing all the potential compounds using animals. Both approaches will reduce the number of animals (Sistare et al., 2016).

Second, using the euthanasia method. A euthanasia method is an act of sacrificing the lives of experimental animals through certain procedures that cause the animals to experience a decrease in consciousness so that the animals die without feeling pain or stress (Stenberg et al., 2019). The euthanasia method is carried out as a means of alleviating the suffering of sick or injured animals that have little chance of recovery (Ford, 2016). In the research process, the euthanasia method is carried out in the process of rearing animals before conducting experiments. Euthanasia can be performed using chloroform, ether, halothane, methoxyflurane, nitrous oxide, CO, CO₂, N, and cyanide (Emami et al., 2019). When carrying out the euthanasia method on mice, CO₂ compounds are usually exposed to the respiratory tract of mice, causing a sudden loss of consciousness and death without pain and stress. Before carrying out the euthanasia method, the researcher must determine how much is needed to minimize the animal's pain or distress. In addition, this method can be equipped with knowledge of applicable guidelines and laws so that errors and illegal practices do not occur in research (Andersen & Winter, 2019). For technical understanding, researchers who involve in euthanasia practices must prepare themselves mentally, emotionally, and physically. This can reduce feelings that will arise after ending an animal's life such as feelings of anger, sadness, fear, guilt, and depression (Mullins et al., 2017). Although the legality of this method is quite controversial, several states in America have legalized euthanasia on pets, but the process can only be carried out by licensed doctors according to the provisions of the American Veterinary Medical Association (AVMA) (Nugroho et al., 2022; Shomer et al., 2020).

Third, handling postoperative management. Handling experimental animals is very important from the beginning to post-surgery to achieve a sustainable environment. However, some researchers are rarely concerned and aware of the processing of experimental animal waste. This issue happened due to several reasons such as the small number of samples, the irregular time of use, and the risks posed are considered small. The use of experimental animals in research can be adjusted to the research objectives. In pharmacological research, treatment in experimental animals begins with giving certain drugs periodically. These drugs are usually given oral, intraperitoneal, subcutaneous, intramuscular, intravenous, intrathecal, and intra cerebrospinal. After the drug administration period is over, the experimental animals will be dissected to harvest their organs. The majority of organs are useful to test the effectiveness of drugs such as the liver, kidneys, spleen, heart, lungs, and others. These organs are sampled to test the effectiveness of the drugs given over a certain period. After completing all the research procedures, the researcher is responsible for cleaning the experimental animals that have been dissected and their organs removed. Experimental animal waste can be packaged and given to the waste manager in order to manage the postoperative animal. Experimental animal waste is included in the category of B3 waste in Indonesia. B3 waste contains hazardous or toxic materials which can pollute the environment or endanger human health directly

or indirectly. By handling the management of B3 waste, ethics towards the use of experimental animals is maintained (Cadmus & Daramola, 2020; Edwards-Callaway et al., 2020; Kirkwood, 2013).

CONCLUSION

The use of animals as research objects is permissible for the sake of scientific development, human needs, and the animal itself. This article has discussed seven ethics of using animals according to Islam and science to serve as guidelines for students, teachers, lecturers, and researchers in carrying out their research activities. They also fulfill and protect the rights of animals that are used as objects of the experiment. These seven ethics obviously show the similar perceptions and principles between Islamic and scientific ethics. Animals are also God's creatures that must be cared for, protected, and loved to preserve their existence. Every human activity that involves animals must avoid cruel behavior, oppression, pain, and permanent trauma for animals. Therefore, it is important to understand consciously and properly the seven ethics that have been established both from an Islamic and scientific perspective as discussed in this article.

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DECLARATIONS

Author Contribution

Tareq Alsokari: Writing-Preparation of original manuscript, Conceptualization, **Ahmad Hamed:** Investigation, Methodology, Improve Content, **Muhammad Fahim Ahmad:** Data accuracy, Visualization, Improve Language.

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The data and language usage in this article have been validated and verified by English language experts and no AI-generated sentences are included in this article.

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Conflict of Interest

The authors declare that this research was conducted without any conflict of interest in the research.

Ethical Clearance

The place or location studied has agreed to conduct research and is willing if the results of this study are published.

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