Animal welfare studies in religious and Halal slaughter studies: A literature review

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Abstract Animal welfare in the process of slaughtering animals by the method of removal or without ingestion is still highly debatable. This study aims to systematically review and map the literature in publications on the theme of Animal Welfare in religious slaughter studies. This study used the PRISMA (Preferred Reporting Items for Systematic Review and Meta-Analyses) system in the process of screening articles that were the subject of research. From 375 halal research articles and slaughter rituals indexed by Scopus, 32 articles on animal welfare at the time of religious slaughter were selected and analyzed. The results showed the development of studies on Animal Welfare through the number of publications, authors, countries, fields of science, sources of publications, and articles cited. In this study, two classifications were found, namely, the method of slaughter using stunning and slaughter without prohibited stunning. The study with stunning examines the pain of slaughtered animals, the quality of meat produced at slaughter methods, and ethical considerations and practices of using animals in rituals. The study without stunning examines the effects that occur due to no stunning, the halal of the meat, the treatment of animals during preslaughter without stunning, and stunning after the incision of the Neck Vessels. This study explores some of the latest research development lines from both classifications. This study is expected to be a reference by researchers with the theme of animal welfare when conducting new research on the development of topics on animal welfare during the religious slaughter process.

Keywords: animal welfare, slaughter, stunning, Halal, religious slaughter, scopus

1. Introduction

Traditional ritual slaughter is an underlying practice of the Jewish religious community and is defined as a ritual activity following core beliefs (Zurek et al. 2023). Slaughter is precisely defined as the killing of meat in various ways (Al-Shammari, 2021b). In certain nations, traditional domestic slaughtering of animals is observed primarily by Muslim communities for religious slaughtering and by Christian communities for seasonal slaughtering (Kumalic 2018). One of the most critical aspects of this regulation is how the animal is slaughtered for food (Regenstein, 2017).

A complex problem related to religious ethics and rituals is responsible for slaughter according to Jewish and Islamic traditions. These two religions are two groups that perform ritual slaughter in the Western world (Rovinsky and Cohen 2018; Bruce 2019). The halal slaughter method is considered one of the causes of stress in cattle slaughter (Khan et al. 2018). The tension between respect for religious and cultural practices on the one hand and animal welfare on the other is genuine in regard to slaughter (Peters 2019).

During religious slaughter, animals are slaughtered with or without removal using a transverse incision in the neck (Velarde et al. 2014). When an animal is conscious at slaughter, the risk of suffering increases (Velarde and Dalmau 2017). The slaughter method affects the meat's pH and color (Anil et al. 2004). Muslim slaughter without stunning using captive bolts or electrical preslaughter stunning showed that stunning does not affect bleeding, and a neck cut without stunning does not improve bleeding (Anil et al. 2006). Therefore, the best method of slaughter is religious procedures practiced by Islam and Judaism.

With the world's Muslim population approaching two billion, providing halal meat to the Muslim community is ethically and economically significant (Nakyinsige et al. 2013). There are many concerns about the sustainability of increased meat production and consumption from various points of view, including human health, animal welfare, climate change, and environmental pollution (Miele and Rucinska 2015). Animal welfare is one of the main aspects of halal meat production. The issue of animal welfare violations is a sensitive situation for the world community because it impacts the results of the slaughter (Noor et al. 2023).

In some Western countries, slaughter has required animals to be knocked out before slaughter to prevent suffering (Zuolo 2015). However, there are exceptions for animals slaughtered for religious activities. Provided additional evidence that stunning is an effective method for enhancing the welfare of livestock and cattle at slaughter (Tetlow et al. 2022), Tetlow study. The most widely used cooling methods are mechanical clearance, electrical
clearance, and gas exposure (Velarde and Dalmau 2017). The method of slaughter stunning or not stunning to meet halal regulations is still a matter of debate. However, animal welfare standards have prompted concerns regarding halal slaughter without stunning, especially given uncomfortable restraint and unconsciousness latency (Nakynsige et al. 2013).

From the point of view of animal welfare standards, several issues have been raised regarding halal slaughter without stunning processes, particularly regarding stress control methods and animal conditions arising from unconsciousness (Nakynsige et al. 2013). Another problem is that many countries prohibit religious slaughter—ethical, political, and theological issues surrounding the prohibition of slaughter without electricity (Mittendorf 2017). However, Jewish tradition and many interpretations of Islamic tradition forbid anaesthesia before slaughter (Bruce 2019).

The stress level at which animals are slaughtered also affects the quality of the animal’s meat. Among the two slaughter methods, the halal slaughter method has advantages compared to slaughter by ingestion (Abd El-Rahim et al. 2023). The meat produced from slaughter by the no-scaling method will be tender and fresh (Zurek et al. 2023). At the same time, slaughter by ingestion has a destructive impact on the quality and cleanliness of the meat (Abd El-Rahim 2020).

Halal slaughter is one of the most discussed animal cruelty and animal welfare issues in the public sphere (Al-Shammari 2021). Animals slaughtered in front of a crowd can cause stress (Khan et al. 2018). In addition, the issue arises regarding halal labels on meat products with slaughter methods carried out by ingestion (Fuseini 2021). Therefore, the author wants to perform systematic literature on animal welfare in slaughtering with or without ingestion. This study aimed to reveal the development of animal welfare studies from several aspects, such as publications, the most active authors, fields of science, publication sources, and articles cited. This research is expected to add useful literature and provide an overview of future research on animal welfare issues.

2. Literature Review

Fuseini et al. (2016) reviewed how Islamic jurists interpret Shariah law differently for pre-slaughter and how halal stunning advocates select stunning methods. Because the number of Muslims in the globe is approaching two billion, it is both morally and commercially important to supply the Muslim community with halal meat (Nakynsige et al. 2013; Sterza et al. 2020; Junejo et al. 2023). The consumption of halal food is also gaining traction among Muslim visitors and residents (Indriastuti et al. 2022; Millatina et al. 2022; El Ashfahany et al. 2024). Human health, animal welfare, climate change, and environmental pollution raise questions about the sustainability of expanding meat production and consumption (Miele and Rucinska 2015).

The method of slaughtering animals also affects the quality of meat, such as in research conducted by (Abd El-Rahim et al. 2023) regarding the influence of slaughter methods on meat quality, with a systematic review of the literature supported by empirical data on the same topic. The review results indicate that the quality of meat produced from slaughter without ingestion is better because of the efficient bleeding process without obstacles arising from ingestion.

Tetlow et al. (2022) researched comparisons at slaughter with and without ingestion using the A search, which yielded 962 papers. Moreover, 16 journals were selected for this study. This study provides further evidence that ingestion is an effective method for improving the welfare of sheep and cattle when slaughtered.

Research conducted by Cui et al. (2023) regarding the widespread inaccessibility of farm animal welfare in China raises terrible assumptions. Therefore, a bibliometric analysis of the existing Chinese animal welfare literature was conducted. A total of 1,312 Chinese studies reviewed by the authors on farm animal welfare in 1992-2023 were drawn from the Web of Science (WoS) and China National Knowledge Infrastructure (CNKI) databases. CiteSpace software analyzes and visualizes the number, species, authors, institutions, journals, and keywords of papers. This bibliometric analysis confirmed that farm animal welfare is an area of interest in China. Farm animal welfare research in China tends to be pragmatic, emphasizing improving growth and production performance as product quality rather than concentrating solely on improving farm animal welfare.

Secinaro and Calandra (2021) researched halal food using a literature review method with a sample of 221 articles published from 1997 to 2020. This study resulted in five research groups on halal food and the role of halal food certification, awareness, production, quality, and the supply chain. This study differs from previous research (Rejeb et al. 2023) in that it used data from the Web of Science, which has 253 articles. The study’s findings represent halal food research, including halal food trust, certification, supply chain management, and attitudes toward halal food purchasing.

The halal supply chain, which includes the religious slaughter of animals, is an essential part of the halal literature (Secinaro and Calandra 2021; Rejeb et al. 2023). Unlike the literature that generally discusses halal food, this study is pioneering in discussing specific literature on religious or halal animal slaughter through bibliometric analysis and a systematic literature review. The urgency of the study of religious and halal slaughter is supported by research conducted by Zulfakar et al. (2012), which explains what factors affect the integrity of the halal supply chain that rotates between consumers.

In contrast to previous literature studies that focused on halal slaughter and rituals in general and several related to religious slaughter, this study fills in the gaps of specific literature reviews on animal welfare during slaughter by both stunning and nonstunning methods.
This study aims to discuss more specific literature with a systematic literature review. Given the importance of animal welfare factors during the slaughter process to meat product quality and halal labels, this study provides an overview and current direction for future studies.

3. Methods

This study used a systematic literature review method managed using PRISMA (Preferred Reporting Items for Systematic Review and Meta Analyses). The use of PRISMA in a systematic literature review is a structured process in which the scope of research is determined; then, the literature is searched using relevant keywords to identify appropriate research (Desti Kartikasari et al. 2023).

In addition, PRISMA is an evidence report of a stage in systematic reviews and meta-analyses (Alam et al. 2023). A guide to establishing the rationale, hypotheses, and methods of planned review can ensure that the study is transparent and complete (Alam et al. 2022).

Analysis with the systematic literature review (SLR) method aims to identify, review, and evaluate research relevant to the analyzed topic (Fitriani and Putra 2022). The research process is performed by analyzing the entire literature on the keywords being analyzed (Fauzi 2022).

The data used in this study were searched in the Scopus database under the topic analyzed (Alam et al. 2023). After the relevant articles were analyzed for suitability and met the criteria, the literature was summarized. There are three processes, namely, identification, screening, and inclusion of articles, in the PRISMA 2020 flowchart, as illustrated in Figure 1.

The documents in this study were obtained based on the research process described in Figure 1. As of August 7, 2023, statistics are taken from Scopus. Due to the limited number of religious slaughter studies, we are looking for slaughter study-related papers in the title, abstract, and keyword columns as of August 7, 2023. The following query is used to achieve this goal: TITLE-ABS-KEY ("halal slaught" OR "ritual slaught"). There were 375 documents found with the keywords religious slaughter, halal slaughter, or ritual slaughter. A total of 211 of the 375 documents were omitted because they were irrelevant to halal or ritual slaughter. Then, the remaining 164 documents were analyzed again for relevant topics related to the theme of animal welfare. There are 34 documents, which are then filtered back for journals that can be downloaded in full text, and 32 documents that will be used for further analysis.

4. Results

4.1. Publications on Animal Welfare by Year

Figure 2 shows graphs from research publications related to the theme of animal welfare from 2008–2023, which has undergone significant changes over the past 15 years. This research theme experienced a peak of publication in 2022, when four articles were published, and in the previous year, only the same number of articles, namely, 2-3 articles, were published. A low number of articles about animal welfare in religious slaughtering were published in 2008, with 1 article.

![Figure 1 Publication Trends by Year.](image1)

4.2. Publication Based on Citation Performance

The performance of published articles is determined based on the number of citations generated. Table 5 shows the publication articles with the highest number of citations obtained by the title "Animal welfare at markets and during transport and slaughter," with 125 citations and a percentage of 24.8%. This article was followed by "Stunning..."
and animal welfare from Islamic and scientific perspectives," which showed considerable differences, with 93 citations and a percentage of 18.4%. The third position is an article entitled "Industrial Halal Meat Production and Animal Welfare: A Review," which has 10.9% and 55 citations, respectively. The last position, in an article entitled "Evaluation of animal welfare during religious slaughtering," has 11 citations and a percentage of 2.2%.

Figure 2 Flow diagram of the search strategy.
Table 1 Publications by Citation Performance.

<table>
<thead>
<tr>
<th>Article Title</th>
<th>Quotation</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Animal welfare at markets and during transport and slaughter</td>
<td>125</td>
<td>24.8%</td>
</tr>
<tr>
<td>Stunning and Animal Welfare from Islamic and scientific perspectives</td>
<td>93</td>
<td>18.4%</td>
</tr>
<tr>
<td>Industrial halal meat production and animal welfare: A review</td>
<td>55</td>
<td>10.9%</td>
</tr>
<tr>
<td>Efficient halal bleeding, animal handling, and welfare: A holistic approach for meat quality</td>
<td>44</td>
<td>8.7%</td>
</tr>
<tr>
<td>Influence of gas Stunning and halal slaughter (no Stunning) on rabbits welfare indicators and meat quality</td>
<td>39</td>
<td>7.7%</td>
</tr>
<tr>
<td>Religious slaughter: A current controversial animal welfare issue</td>
<td>36</td>
<td>7.1%</td>
</tr>
<tr>
<td>Attitudes of the public toward halal food and associated animal welfare issues in two countries with predominantly Muslim and non-Muslim populations</td>
<td>24</td>
<td>4.8%</td>
</tr>
<tr>
<td>A note comparing the welfare of Zebu cattle following three stunning slaughter methods</td>
<td>12</td>
<td>2.4%</td>
</tr>
<tr>
<td>Animal welfare: A complex international public policy issue: Economic, policy, societal, cultural and other drivers and constraints. A 20-year international perspective</td>
<td>12</td>
<td>2.4%</td>
</tr>
<tr>
<td>Evaluation of animal welfare during religious slaughtering</td>
<td>11</td>
<td>2.2%</td>
</tr>
</tbody>
</table>

4.3. Tree Map Analysis in Animal Welfare Research

The analysis in the image below is a tree map, commonly called a tree map, one of the visual languages commonly used in concept maps or mind maps (Lestari et al. 2016). Using the NVivo 12 Plus application, a central concept can be obtained with appropriate terms (Valverde-Berrocoso et al. 2020). Then, these concepts are analyzed using word trees to show that a broad size characterizes the terms that appear most often, while the terms with a slight frequency of occurrence are small. Figure 3 shows that the most frequently used terms or words related to the research theme were "slaughter," "welfare," and "stunning." With a publication period from 2008 to 2023, the term appears frequently in publications on animal welfare at the time of slaughter.

![Figure 3 Visualization of TreeMap analysis in animal welfare publication journals.](image)

4.4. Classification of Research Publications on Animal Welfare at Slaughter

Research on animal welfare during slaughter is exciting. The discussion of animal welfare research can be divided into two categories: Slaughter with Stunning and Slaughter without Stunning.

4.4.1. Animal Welfare During Slaughter Through a Stunning Process

https://malque.pub/ojs/index.php/jabb
Slaughter methods, with or without Stunning, have a significant effect on the welfare of animals at the time of slaughter (Neves et al. 2016). Slaughter by stunning is an effective method for improving animal welfare because it avoids the pain experienced by animals (Nakyinsige et al. 2013; Tetlow et al. 2022). This stunning method can help meat farmers and producers meet consumer expectations and maintain the sustainability of the meat industry, as in Australia, provided that animals at slaughter are still alive (Barrasso et al. 2020; Buddle et al. 2023).

Concerns are currently being raised concerning religious slaughter centers on the stress that is caused by the handling of animals before slaughter by various methods, the pain and misery that may be experienced during and after neck cutting, and the length of time that may pass before the animal loses brain function and dies if stunning is not performed (Anil 2012). Efforts can be made to defuse the issue through communication between two parties, namely, the slaughter party with extermination and the party without extermination, to find a middle point acceptable to both parties (Bayvel et al. 2012; Miele 2013). Several countries have employed reversible electrical technologies for Halal slaughter for decades (Anil 2012). Halal meat is exported from animals stunned and slaughtered by Muslim slaughtermen for years in New Zealand (Anil 2012). The consequences of stunning are also mythical. These include stunning hurts, animal suffering, and insufficient blood loss compared to slaughter without stunning (Anil 2012).

<table>
<thead>
<tr>
<th>Table 2 Publications on Animal Welfare in Stunning Slaughter.</th>
</tr>
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<tbody>
<tr>
<td><strong>Animal Welfare Points Through a Stunning Process</strong></td>
</tr>
<tr>
<td>The pain of slaughtered animals is reduced.</td>
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<tr>
<td>The quality of the meat produced</td>
</tr>
<tr>
<td>Ethics and Practices of Using Animals in Rituals</td>
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The method of ingestion and the treatment of animals before slaughter will affect animal welfare (Al-Shammari 2021). The two countries that have different majorities also call for different opinions. According to Australia (Christianity), the method of stunning is not allowed because it affects the halal and quality of the meat. The welfare conditions of animals at the time of slaughter contribute to the quality of meat, so the handling of such animals must be observed before slaughter (Florek 2014). However, according to Nakyinsig (2014), differences in slaughter methods do not affect meat quality in some animals. The sharpness of the knife used as a slaughter tool also affects the welfare and quality of the meat (Kumar et al. 2023). Factors affecting animal welfare and meat quality during the slaughter process include environmental conditions, animal density, duration of transport, access to water and feed, and use of assistive devices such as sticks and electric drives (Gregory 2008).

### 4.4.2. Animal Welfare During Slaughter Without a Stunning Process

Several important conclusions can be drawn from the discussion results in the context of slaughtering animals without stunning. In this case, animal welfare policies and human rights in the context of slaughter require a balance because the two things have opposite provisions, where the practice of religious slaughter does not use ingestion, so it has an impact on animal welfare. However, the Court of Justice of the European Union (CJEU) stipulates that slaughter without extermination may occur during religious events (Peters 2019; Bozzo et al. 2021). The importance of animal welfare is also stated in the Quran (Fuseini 2022).

<table>
<thead>
<tr>
<th>Table 3 Publications on Animal Welfare in Slaughter without Prohibited Stunning.</th>
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<tbody>
<tr>
<td><strong>Animal Welfare Points Through a Stunning Process</strong></td>
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<tr>
<td>Impact that occurs as a result of stunning</td>
</tr>
<tr>
<td>Halal from slaughtered meat</td>
</tr>
<tr>
<td>Treatment of preslaughter animals</td>
</tr>
<tr>
<td>Stunning After Incision of the Neck Vessels</td>
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<tr>
<td>Stunning that does not cause death</td>
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The method of slaughter without removal results in stress to slaughter animals, thus affecting animal welfare. However, the efficiency of bleeding is more influential on the chosen method of religious slaughter, that is, without removal (Sterza et al. 2020). According to Khan (2018), slaughter methods, animal welfare, and empathy for farm animals need to be considered in depth because they affect the halal status and quality of meat produced after slaughter. In Malaysia Islamic, the method of ingestion is not allowed because it affects both halal and meat quality (Jalil et al. 2018).

Grandin (2020) conducted research on the behavioral principles and operation of low-stress restraint devices intended for religious slaughter. The mitigation of preslaughter tension contributes to the enhancement of meat quality and animal welfare (Grandin 2020). Cattle pose...
a more significant welfare concern than goats or sheep (Grandin 2020). This is because, in comparison to sheep, they are larger, more difficult to restrain, and require more time to lose consciousness after slaughter without stunning (Grandin 2020). The position of restraint on animals from being slaughtered is still an evaluation so that animals can avoid suffering, which can improve animal welfare (Grandin 2018). Aghwan et al. (2016) researched the effect of bleeding, containment, and welfare on animal meat quality. In conclusion, more research based on halal principles, welfare, and scientific evidence that will make meat healthy for consumers is needed (Neves et al. 2016).

The World Organization for Animal Health (WOAH) standards are based on the requirements of Islamic law, where animal cruelty is prohibited and animal welfare is protected (Aidaros 2014). In some countries that require removal, the method of slaughtering animals without stunning is an exception because it is intended for religious activities (Zuo 2015). Salamano et al. (2013) investigated methods of slaughter that satiate religious requirements through the use of exquisite incisions made after the neck (Salamano et al. 2013). A minimum of two operators are required for the operation; one operator is responsible for carrying out the slaughter, while the other operator promptly stuns the animal. The extent of animal suffering would be restricted to the neck incision alone, which would be minimal if stunning promptly followed the incision (Salamano et al. 2013).

There are worries about animal suffering during raising, transit, and slaughter, but the halal meat market is growing exponentially, attracting independent and mainstream stores (Fuseini et al. 2022). Fuseini et al. (2022) discussed Muslim-approved killing procedures for beef, lamb, goats, and poultry, including the stunning procedure, which did not kill animals before slaughter (Fuseini et al. 2022). Animal welfare must be considered in maintaining halal meat, as mentioned in the Quran about the prohibition of all forms of animal abuse (Fuseini et al. 2017a). In halal meat production, it is essential to ensure that animals are slaughtered humanely and in line with religious requirements and animal welfare regulations (Farouk et al. 2016).

According to ethics studies and practices of animal slaughtering in Caru rituals in Bali, this practice is associated with the application of welfare animal principles because it is likely to improve the welfare of animals before slaughter (Diarmita et al. 2019). The animals were housed in well-maintained enclosures, and food and water were supplied in the holding area prior to slaughter (Diarmita et al. 2019).

5. Conclusions

This study intends to reveal the development of animal welfare studies in the slaughter process with or without exposure to various factors. Studies on animal welfare from 2008-2023 were published in 34 journals. This study aimed to systematically review and map the literature from publications with the theme of animal welfare. Two major themes were identified from the journal: slaughter with stunning and slaughter without stunning. The results from this study show that stunning, allowable stunning and no stunning have different effects on animal welfare. The Stunning method is an effective way to improve animal welfare because it can reduce stress and prevent excessive animal suffering from being slaughtered. Before the slaughtering procedure, stunning helps to ensure that the animal is not immediately conscious, which in turn reduces the animal's perception of pain and fear. Some research suggests that stunning can help reduce animal suffering, but this perspective is still controversial in some cases, especially in religious matters. The impact of the two slaughter methods on meat quality is also different, according to some journals explaining that slaughter without stunning results in softer and fresher meat. However, there is debate about the impact of stunning slaughter methods on meat quality and hygiene because of the blockage of bleeding due to being knocked out first. The halal meat produced by the Stunning slaughter method is also a concern because at the time of slaughter, the animals are considered to have lost consciousness or died before slaughter. Future slaughter methods that prioritize animal welfare will continue to require significant development, taking into account religious aspects that remain unresolved. Stunning methods that conform to religious rules in Islam and other religions are still very important for finding a consensus between animal welfare and methods of religious slaughter.

6. Final considerations

Research on animal welfare over 15 years has been published in 34 journals, with the most publications occurring in 2022. This study has two major themes: slaughter with stunning and slaughter without stunning, which have different results and impacts on each method. Slaughter by sniffing is an effective method for improving animal welfare because it avoids the pain experienced by animals (Nakyinsige et al. 2013; Tetlow et al. 2022). The purpose of removal is to make the animal unconscious for a short time to reduce the risk of stress in the animal (Riadi Barkan 2014). The welfare conditions of animals at the time of slaughter contribute to the quality of meat, so the handling of such animals must be observed before slaughter (Florek 2014).

Some countries and religions have specific rules and conditions regarding stunning, such as type, method, and time of stunning (Kaol 2017). This study encourages new studies or innovations related to stunning the development of more efficient and safer slaughtering tools that follow halal standards. This study also highlighted the importance of research on the impact of stunning in terms of the welfare, physiology, and mortality of animals (Pisestyani et al. 2016). A study that describes the law of stunning or alternative methods using extermination following the provisions of halal slaughter is highly recommended (Tsaittsah 2022).
Slaughter by stunning still reaps pros and cons from a halal perspective due to the fear that animals will die during ingestion (Riaz et al. 2021). A factor that can affect the halal status of the meat is the frequency of electricity used in the cleaning device, as it is possible that the animal will be electrocuted prior to slaughter (Hayat et al. 2023).

Future research on animal welfare using the stunning slaughter method is expected to focus on several stunning methods that can minimize damage to the quality of meat resulting from slaughter. Ethics in animals before slaughter are expected to be given more attention to avoid causing stress.

Sterza et al. (2020) indicated that halal slaughter, both with and without stunning, induced stress, whereas animals subjected to traditional religious slaughter without stunning exhibited improved hemorrhage efficiency. This process is usually carried out by communities that follow specific religious rules, such as Islam and Judaism, which consider Stunning haram or not halal. However, this process also raises ethical, health, and animal welfare concerns, as animals that are not knocked out will experience more stress, pain, and bleeding. There are still many practices that do not consider animal welfare at the time of slaughter. Further research on animal welfare during slaughter without stunning is expected to focus on efforts to be able to carry out ingestion so that animals do not suffer at slaughter while maintaining the halal nature of the slaughtered meat. The treatment of animals to be slaughtered must also be considered, considering that in this method of slaughter, animals are slaughtered without any removal first.

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Ethical considerations

Not applicable

Conflict of interest

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