From Lab to Table: Islamic Jurisprudential Analysis of Cultured Meat Production

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ABSTRACT

This article critically examines the production of cultured meat through the lens of Islamic jurisprudence, focusing on its halal status and the ethical implications of biotechnology in food production. Cultured meat, created by cultivating animal cells in vitro, has emerged as a promising and environmentally sustainable alternative to conventional meat, addressing concerns over food security and resource depletion projected by 2050. However, the adoption of cultured meat among Muslim consumers remains fraught with jurisprudential challenges, especially regarding the permissibility (halal status) of cell sources, the use of growth media (such as foetal bovine serum), and the compliance of the production process with established Shariah principles. This study comprehensively analyses classical and contemporary Islamic legal opinions, global fatwa guidelines, and scientific developments related to cultured meat. The findings reveal diverse scholarly views, with consensus emerging around key requirements for halal certification such as the origin of the starter cells, the purity of all ingredients, and the absence of najis (impure substances) or prohibited elements throughout the production chain. The article highlights the need for ongoing engagement between religious scholars, biotechnologists, and halal regulatory bodies to develop robust, context-sensitive guidelines for cultured meat production. Such collaboration is essential to ensure the product's acceptability within the Muslim community and to guide industry stakeholders and policymakers in addressing the rapidly evolving demands of the global halal food market.

Keywords: Cultured meat, Islamic law, halal status, biotechnology, implications

INTRODUCTION

Cultured meat, also known as lab-grown or cell-based meat, refers to meat that is produced by cultivating animal cells in a controlled laboratory environment through tissue engineering and biotechnology (Guo et al., 2022; Messmer, 2023). This process does not require the slaughter of animals. It is a promising innovation that addresses global challenges such as climate change, food insecurity, antibiotic resistance, and animal cruelty (Bryant & Barnett, 2018). The production of cultured meat is an innovation in food biotechnology (Hong, 2021).

Compared to conventional animal farming, which involves rearing and slaughtering animals, cultured meat is produced in laboratories and factories without the need for livestock (Hong et al., 2021). It develops from animal cells using modern biotechnological methods, rather than through natural processes (Lee et al., 2024). With the advancement of technology, the production of cultured meat has shifted from traditional methods to a more innovative approach. However, Muslim consumers remain cautious due to uncertainties surrounding its halal status. In Islam, the permissibility of food is determined not only by its composition but also by the processes involved in its preparation (Nakyinsige et al., 2012).

Therefore, this research explores issues such as halal compliance, sources of the cells and the production process, which have led to doubts and various fatwas and debates among Islamic legal bodies and relevant authorities (Kashim et al., 2022; Burhanuddin et al., 2023). As such, Muslim consumers generally seek clear assurance from recognised religious authorities before accepting such novel food technologies (Halim, 2022). This study aims to examine existing fatwas and Islamic rulings on cultured meat, focusing on the sources of animal cells

and the types of culture media used, to assess whether the process meets halal standards. Integrating biotechnology with Islamic legal analysis seeks to support the development of clear halal guidelines and build Muslim consumer confidence in adopting this new food technology.

LITERATURE REVIEW

Concept of Cultured Meat

Cultured meat is one of the products produced using the latest biotechnology methods in nutritional science. Cell culture is a common laboratory technique scientists use to propagate cells from either plant or animal sources under controlled physiological conditions (Baydoun, 2010). Scientists use various terms to describe cultured meat, such as cultured, lab-grown, artificial, and in vitro. Cultured meat is introduced to produce meat that resembles conventional meat through stem cells and tissue sources (Satari, 2024).

Generally, cultured meat is produced by culturing tissues and animal stem cells. These cells or tissues are placed in a nutrient-rich and suitable medium that allows them to multiply and develop into meat (Post, 2012). The difference between cultured meat and conventional meat is that cultured meat is produced in a laboratory, free from bacteria and contamination. In contrast, conventional meat is produced through traditional animal farming and slaughtering (Awang, 2024).

The halal status of cultured meat must be ensured based on the source from which it is derived. Fundamentally, several aspects of cultured meat must be considered, including the source, production process, medium, and final product. From an Islamic legal perspective, the source of cultured meat must come from halal animals to be consumed as prescribed by Shariah. Similarly, the tissue cells taken must not come from impure parts of the animal, such as blood and excrement (Mridul, 2025).

The issue of cultured meat, including its production, is very complex and requires in-depth study by the relevant authorities. The first question is whether cultured meat is intended for human or animal consumption. If it is for humans, it raises questions about halal and haram. The first thing to consider is the source of the meat, whether it is derived from plants or animals. Whether the animal is alive or dead must be determined if it is from an animal. If the animal is dead, it must be slaughtered according to Shariah law. Secondly, the medium used must be derived from halal sources and materials. Lastly, preservation must also be ensured (Ideris, 2022).

Biotechnological Advancements in Cultured Meat

Biotechnology comes from combining the words “bio” and “technology”. “Bio” means life, while “technology” refers to the methods or techniques used to achieve practical objectives (Steiner, 2020). As a branch of technology, biotechnology fulfils practical goals that can be applied to ease human tasks. Biotechnology generally refers to using biological systems, living organisms or their components to produce products or processes that benefit humans (Prasetyo & Sari, 2021).

One important application of biotechnology in the food sector is cell culture technology (Chandrababu & Puthumana, 2024). This technology enables the growth of plant or animal cells in a controlled laboratory environment. This approach has opened the door to producing alternatives to conventional meat, namely cultured or lab-grown (Mustafa, 2024). This technology relies on stem cells, which can multiply remarkably, a key factor in minimising the number of animals needed as cell donors (Hamdan et.al., 2021).

These stem cells can develop into muscle or fat cells, forming the primary components of meat. This method can produce meat from various species commonly used in livestock farming, including birds, mammals, and fish (Lee et al., 2024). Various techniques have been developed in producing cultured meat to ensure the resulting product's quality and effectiveness, including the scaffold structure technique, organ printing, and tissue culture (Handral et al., 2020).

These techniques generally begin with isolating stem cells from halal-permissible animals such as cows, goats,or fish. These cells are placed in a special medium containing suitable nutrients and cultured *in vitro*, outside the

original organism's body, but in conditions that mimic the body's natural environment (Zhao, 2023). Across these methods, the cells proliferate and differentiate into muscle and sometimes fat tissues over several weeks (Park et al., 2023). However, current technologies still struggle to replicate the complete three-dimensional structure of natural meat (Zou et al., 2023).

The cells are typically obtained through a biopsy, where only a few grams of tissue are extracted with minimal harm to the animal. It is also possible to perform multiple biopsies on a single animal (Dohmer et al., 2025). Alternatively, if the animal is slaughtered, its stem cells can be fully collected, although large-scale retrieval from entire animals has yet to be achieved (Hamdan et al., 2021). Myoblasts (embryonic progenitor cells), often obtained via biopsy while the animal remains alive, are a key part of the process (Shaikh et al., 2021).

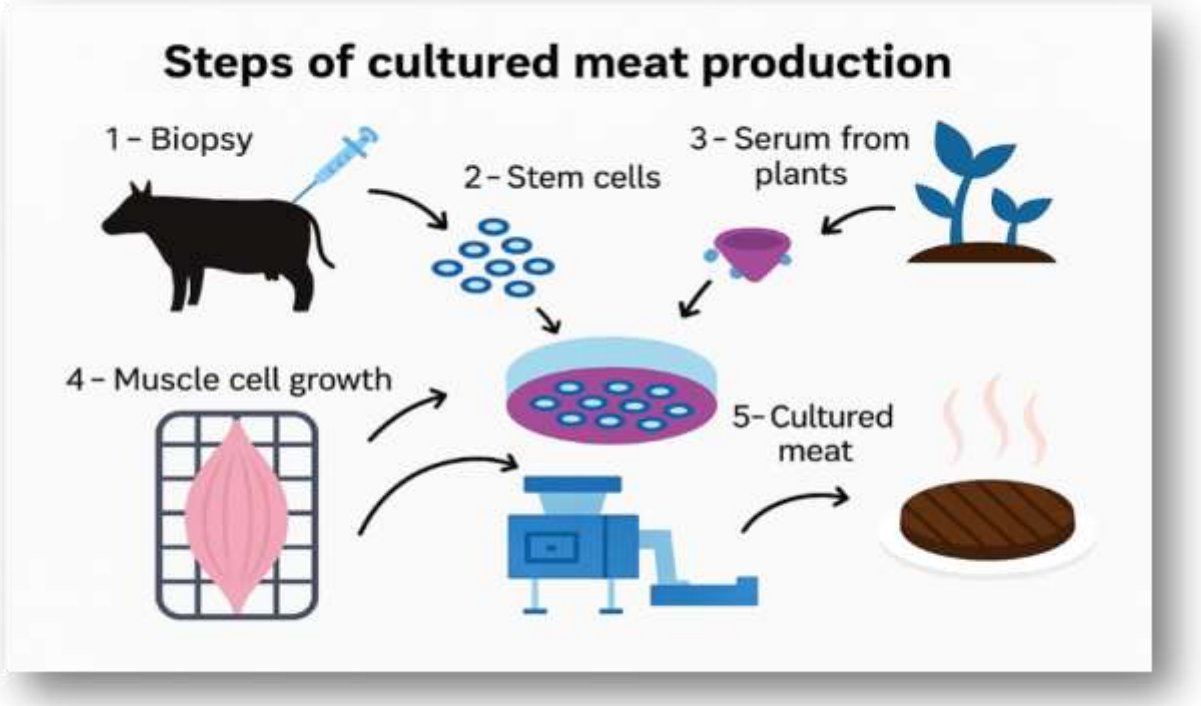

Figure 1: Shows the steps of producing cultured meat using technology

Source: Mustafa, 2024.

Challenges and Implications for the Muslims

Although the benefits of this technology can be seen in terms of scientific advancement and environmental conservation, it also raises significant concerns among Muslims. These include issues related to halal status, slaughtering procedures, and animal cell source (Haris et al., 2022). Therefore, further research from an Islamic perspective is crucial to assess the compatibility of this technology with Shariah principles and the objectives of Shariah (Maqasid Shariah), particularly in protecting life, intellect, lineage and property (Sahid et al., 2023; Rosidi et al., 2022).

In the context of a halal diet, Muslim consumers uphold the concept of *halalan tayyiban*, which combines two essential elements: halal (lawful) and *tayyib* (wholesome and pure) (Kurniasari et al., 2023). These principles are deeply rooted in the Qur'an and Hadith, and guide what is permissible for Muslim consumption. "Halal" refers to anything lawful under Islamic dietary laws, including the strict prohibition of pork and alcohol, the avoidance of cross-contamination, and the requirement that animals be slaughtered by Islamic teachings (Lubis & Muazzul, 2023).

In addition to religious concerns, the global expansion of the cultured meat industry presents economic and strategic implications for Muslim-majority countries (Lewisch et al., 2023). The global cultured meat market

was valued at RM791.87 million in 2022 and is projected to grow to RM1.443 billion by 2027, with an annual growth rate of 12.76% (Bioeconomy Corporation, 2023). Government investments in infrastructure, workforce development, and a comprehensive ecosystem support this growth. Malaysia's neighbour, Singapore, has taken the lead in this industry due to its limited natural resources, pushing the country to seek alternative solutions. Therefore, Malaysia must develop awareness campaigns, educational efforts, and strategic policies to avoid falling behind in regional competition (Matveeva et al., 2025).

METHODOLOGY

This study employs a qualitative approach using a library-based research design and document analysis to examine the issue of cultured meat production from the Islamic perspective. This approach is chosen as it enables the researcher to explore the principles of Islamic law through both primary and secondary sources and to comprehensively assess the compatibility of modern scientific innovations with the requirements of Shariah.

Data Collection

This study's data were obtained from two main categories of sources. Primary Islamic sources include the Qur'an, authentic hadiths and contemporary fatwas issued by institutions such as the Majma'al-Fiqh al-Islami, the National Fatwa Council of Malaysia and others. Secondary sources consist of scholarly journals, academic articles, research reports, and technical documents related to cultured meat technology, including references from biotechnology, bioethics and halal food studies.

Data Analysis

The data were analysed using content analysis and thematic analysis to identify key issues related to cultured meat production, such as the source of cells, culture media and cell cultivation methods. This analysis also involved applying Shariah principles related to the concepts of *halal* and *tayyib*, including *istihalah* (substance transformation) and *maqasid al-shariah* (the higher objectives of Islamic law). Additionally, discussions on contemporary fatwas, bioethics, and synthetic food production were examined to understand current approaches to issuing rulings on such innovations.

DISCUSSION

The issue surrounding cultured meat often makes consumers doubtful about their purchases. In brief, cultured meat is created in a laboratory using tissue derived from animal cells. Biotechnology cultivates tissue that grows from small fragments of animal muscle cells and places it on a special medium within a designated container (Shepherd, 2022).

The Halal or Prohibited Status

According to Muhammad Fathi Noordin (2001), Islam has established several guidelines to determine what halal (permissible) and haram (forbidden) are in food. Essentially, all food is considered halal except for what has been explicitly prohibited by Islamic law, such as animals not slaughtered according to Shariah, blood, pork, and others. This is based on the verse of Allah SWT:

حرِّمَتْ عَلَيْكُمُ الْمَيْتَةُ وَالدَّمُ وَلَحْمُ الْخِنزِيرِ وَمَا أُهِلَّ لِغَيْرِ اللَّهِ بِهِ وَالْمُنْخَنِقَةُ وَالْمَوْقُوذَةُ وَالْمُتَرَدِّيَةُ وَالنَّطِيحَةُ وَمَا أَكَلَ السَّبُعُ إِلَّا مَا ذَكَّيْتُمْ وَمَا ذُبِحَ عَلَى النُّصُبِ

"Prohibited to you are: dead animals (those not slaughtered), blood (that flows), the flesh of swine (including all of it), and animals sacrificed for others than Allah, and those killed by strangling, or by a violent blow, or by falling from a height, or by being gored and those partly eaten by wild beasts unless you can slaughter them (before death) and those sacrificed on stone altars (to idols)."

(Surah al-Ma'idah, 5:3)

This verse prohibits Muslims from consuming carrion, blood, pork, and animals that die without being

slaughtered by Islamic law. This prohibition can be related to the issue of cultured meat, particularly regarding the source of cells and the materials used. If animal cells are derived from carrion or animals not slaughtered Islamically, they are considered haram, as stated in the verse. Similarly, if the growth medium contains blood or impure substances, it also affects the halal status of the meat (Kashim et al., 2022). Therefore, to ensure that cultured meat is halal, it must originate from animals slaughtered according to Islamic principles, use pure materials, and be free from elements prohibited in Islamic law (Hossain, 2019).

Sources of Cells

In terms of the source of the initial cells (stem cells) used in the production of cultured meat, Islam emphasizes that they must be derived from animals that are halal and slaughtered according to Shariah. According to Halim (2022), if the cells are taken from an animal slaughtered by Islamic law, then the cultured meat produced from it may be considered halal, depending on the cleanliness and permissibility of other materials used. However, suppose the cells are obtained from animals that are not slaughtered according to Shariah or from animals that are inherently prohibited, such as pigs. In that case, the cultured meat is classified as haram or *syubhah* (doubtful) (Hossain, 2021).

This verse, Surah al-Ma'idah, verse 3, indicates that any food derived from animals that have died without proper Islamic slaughter, or that were slaughtered without invoking the name of Allah, is forbidden. In the context of cultured meat, if the original cells used are taken from an animal not slaughtered according to Islamic law, then those cells are considered to originate from carrion (dead flesh), which is prohibited in this verse. Although cultured meat does not directly cut meat from animals, using impermissible base materials such as carrion cells still raises the syubhah issue (doubt). It potentially renders the final product unlawful (*haram*) (Burhanuddin et al., 2023). Therefore, the selection of cell sources must come from halal and slaughtered animals, according to Islamic guidelines that align with the halal principles outlined in this verse.

This is in line with the principles outlined in the *Malaysian Halal Certification Procedure Manual* (JAKIM, 2020), which states that all basic ingredients used in food processing must originate from sources that are halal, pure and free from doubt. Therefore, selecting the initial cell source plays a crucial role in determining the final halal status of the cultured meat product.

The Production of Cultured Meat

Cultured meat is produced through cell cultivation in a culture medium that contains essential nutrients for cell growth. One commonly used substance is Fetal Bovine Serum (FBS), a serum extracted from the blood of unborn calves (Lee et al., 2022). However, the use of FBS raises critical Shariah concerns as most of the serum sources are obtained from cattle that were not slaughtered according to Islamic law. If the serum originates from non-halal sources, it may render the product impure (*najis*) and prohibited (*haram*) for consumption (Halim, 2022).

Furthermore, according to the *Malaysian Halal Certification Procedure Manual* (JAKIM, 2020), all ingredients used in food production must be pure, free from impurities, and derived from halal sources. If the substance remains in the final product and does not undergo a transformation in its essence (*istihalah*), its original ruling remains applicable. Therefore, selecting a halal and clean growth medium is crucial in ensuring the halal status of cultured meat from an Islamic perspective (Kashim et al., 2022).

In the production of cultured meat, the entire process from beginning to end must be ensured to be free from any impurities (*najis*), pure and uncontaminated by prohibited (haram) substances. Every stage of food production, including sourcing raw materials, processing methods, storage and handling, must comply with halal principles. Materials such as stem cells and growth media must be halal, and laboratory facilities and equipment must also be free from contamination by *najis* or prior to use with haram substances (JAKIM, 2020).

Furthermore, according to Yusuf Al-Qaradawi (1994) in his book *The Lawful and the Prohibited in Islam*, food is only considered halal if produced purely. It does not contain any element of *syubhah* (doubt). Therefore, comprehensive Shariah supervision at every stage of production is essential to ensure that the halal status of cultured meat is truly safeguarded.

Therefore, in determining the halal status of cultured meat, it must be ensured that the process of obtaining the tissue complies with the guidelines set by Shariah. Suppose the tissue is taken from a part of the animal's body. In that case, the animal must be classified as one that is permissible to eat, such as cattle, goats and the like and must be slaughtered by Islamic principles. Allah SWT said:

"On this day, all good and wholesome things have been lawful for you. Moreover, the food (slaughtered animals) of those who were given the Scripture is lawful for you, and your food is lawful for them (it is not wrong for you to offer them your food)."

(Surah al-Ma'idah, 5:5)

This verse states that all good and wholesome foods (*ṭayyibāt*) are lawful (*halal*) for Muslims as long as they meet the prescribed conditions. In this context, cultured meat may be considered halal if it originates from a halal animal slaughtered according to Islamic law and if the growth medium used is pure and non-harmful. This view is supported by the Islamic Fiqh Academy (Majma'al-Fiqh al-Islami, 2019), which affirms that the permissibility of cultured meat depends on the source of the cells and the materials used in its production. Furthermore, the concept of *ṭayyib* in food selection also encompasses cleanliness, health and consumer safety as muslim consumers place great emphasis on hygiene and the integrity of food sources (Supian & Rashid, 2018). Therefore, if cultured meat fulfils the criteria of *ḥalāl* and *ṭayyib*, it has the potential to be accepted within Islamic law (Rahman et al., 2024).

Another hadith narrated by Abu Waqid bin al-Laith, in which the Prophet Muhammad (SAW) said:

مَا قُطِعَ مِنَ الْبَهِيمَةِ وَهِيَ حَيَّةٌ فَهُوَ مَيْتَةٌ.

"Whatever is cut off from a living livestock animal is considered carrion (dead meat)."

Based on this hadith, the tissue used must come from animals that have been slaughtered by Islamic law. Therefore, the biopsy method commonly used to obtain muscle cells for cultured meat must be critically assessed. The resulting tissue would not be considered halal if the animal remains alive during the extraction (Hamdan et al., 2018). However, for sea creatures, tissue extraction is considered halal, as their carcasses are permissible to eat without the need for slaughter, according to the verse:

أُحِلَّ لَكُمْ صَيْدُ الْبَحْرِ وَطَعَامُهُ مَتَاعًا لَّكُمْ وَلِلسَّيَّارَةِ

"Lawful to you is the game from the sea and its food as provision for you and travellers."

(Surah al-Maidah, 5:96)

Nevertheless, the tissue must be taken from parts permitted by Islamic law, not from impure parts such as blood or faeces (Nordin, 2021).

Fatwa and Islamic Scholars' Views

An important question arises in the context of cultured meat: are animal cells taken before slaughter considered *carrion* (*bangkai*)? According to Halim (2022), scholars have differing opinions. Some scholars believe that cells extracted for scientific purposes do not constitute actual meat and therefore do not fall under the category of *carrion*, as they have not yet formed edible meat structures.

In Islam, *carrion* refers to animals that die without being slaughtered according to Shariah law and their meat is prohibited (haram) for consumption as stated in Surah Al-Baqarah, verse 173:

إِنَّمَا حَرَّمَ عَلَيْكُمُ الْمَيْتَةَ وَالدَّمَ وَلَحْمَ الْخِنْزِيرِ وَمَا أُهِلَّ بِهِ لِغَيْرِ اللَّهِ ۖ فَمَنِ اضْطُرَّ غَيْرَ بَاغٍ وَلَا عَادٍ فَلَا إِثْمَ عَلَيْهِ ۚ إِنَّ اللَّهَ غَفُورٌ رَحِيمٌ

"Indeed, Allah has only forbidden to you the dead animal, blood, the flesh of swine, and that which has been slaughtered in the name of anything other than Allah. However, whoever is compelled (by necessity), neither

desires it nor exceeds the limit (of necessity); there is no sin upon him. Truly, Allah is Most Forgiving, Most Merciful."

However, according to the view of the Fatwa of the Islamic Fiqh Academy (Majma' al-Fiqh al-Islami, 2018), the cells are still derived from animals that have not been slaughtered according to Shariah, making them *syubhah* (doubtful) in terms of permissibility, especially if no straightforward process of purification or *istihalah* (transformation) has occurred. Therefore, the issue of slaughter and the concept of *carrion* in the context of stem cells is highly significant and requires careful evaluation from both fiqh (Islamic jurisprudence) and scientific perspectives.

In Islam, cleanliness and purity (*taharah*) are fundamental in determining food's permissibility (halal). According to the *Malaysian Halal Certification Procedure Manual* (JAKIM, 2020), if food or any ingredient used in its production is contaminated with impurities (*najis*), it affects its purity and renders it impermissible for Muslim consumption. Therefore, every ingredient and piece of equipment must be ensured free from *najis* and processed by strict hygiene principles.

At the same time, the issue of industry transparency and the trust of Muslim consumers are crucial considerations. According to Halim (2022), Muslim consumers will only feel confident in using or consuming a product when there is clear assurance regarding the halal source of raw materials, a Shariah-compliant production process and valid, recognised halal certification. This aligns with Islamic principles, which emphasise halal compliance in legal terms and uphold integrity, transparency and social responsibility within the food industry (Ali et al., 2025). Ultimately, all parties producing food such as cultured meat must ensure complete transparency throughout the supply chain to maintain Muslim consumer confidence and adhere to Shariah requirements.

Islam places great emphasis on the halal status of every food consumed by a Muslim. As Muslims, we must be vigilant about what is halal and haram and avoid doubtful (*syubhah*) matters. Allah S.W.T. commands Muslims to eat from what is lawful and reasonable (*halalan tayyibah)* and forbids following the footsteps of Satan, who incites humans to consume unlawful food, as stated by Allah S.W.T. in Surah Al-Baqarah, verse 168:

يٰٓاَيُّهَا النَّاسُ كُلُوْا مِمَّا فِى الْاَرْضِ حَلٰلًا طَيِّبًا وَّلَا تَتَّبِعُوْا خُطُوٰتِ الشَّيْطٰنِ اِنَّه لَكُمْ عَدُوٌّ مُّبِيْنٌ

"O humanity! Eat from what is lawful and good on the earth, and do not follow the footsteps of Satan. Indeed, he is a clear enemy to you."

Several characteristics of food are halal and suitable for consumption, including having halal ingredients, slaughtering processes conducted according to Islamic law, being free from impurities and contamination, and the source must be obtained through lawful means (Noor et al., 2023).

The use of cultured meat has been approved by Singapore, making it the first country to market cultured meat commercially (Umaina, 2024). However, the acceptance of cultured meat in Malaysia is still in its early stages and remains relatively unknown due to several challenges, such as its halal status. The Muftis and fatwa committees in Malaysia and several other fatwa institutions have expressed cautious views regarding the ruling on cultured meat (Mansoor, 2025). Islamic legal opinions emphasise several key conditions for cultured meat to be considered halal according to Shariah, namely:

Sources of Basic Cells

For cultured meat to be halal, the cells must be taken from animals that are halal and have been slaughtered lawfully according to Islamic Shariah. Taking cells from animals that are still alive and have not been slaughtered, or from impure parts such as blood and faeces, is prohibited (haram) because it is considered carrion, based on the Prophet's hadith and Surah Al-Ma'idah, verse 3.

حُرِّمَتْ عَلَيْكُمُ الْمَيْتَةُ وَالدَّمُ وَلَحْمُ الْخِنزِيرِ وَمَا أُهِلَّ لِغَيْرِ اللَّهِ بِهِ وَالْمُنْخَنِقَةُ وَالْمَوْقُوذَةُ وَالْمُتَرَدِّيَةُ وَالنَّطِيحَةُ وَمَا أَكَلَ السَّبُعُ إِلَّا مَا ذَكَّيْتُمْ وَمَا ذُبِحَ عَلَى النُّصُبِ

"Prohibited to you are dead animals, blood, the flesh of swine, and that which has been slaughtered in the name of other than Allah, and those animals killed by strangling, or by a violent blow, or by falling, or by the goring of horns, and those eaten by wild beasts except what you can slaughter (before death) and those sacrificed on stone altars (to idols).".

1. Medium and Process: The cell growth medium and other materials used in the production process of cultured meat must be halal and not contain haram substances such as pig-derived serum or alcohol.
2. Safety and No Harm: Cultured meat must be safe for consumption and should not cause any harm. If there are health risks, then it is considered haram based on the Shariah principle that prohibits harm (la darar wa la dirar).

The Fatwa Committee of the State of Penang emphasizes that a ruling on the consumption of cultured meat should not be issued hastily (Hamdan et al., 2024). They await further confirmation regarding the source of the cells, additives, and potential health impacts before issuing a definitive fatwa. This cautious approach aligns with the fatwa the Majlis Ugama Islam Singapura (MUIS) issued, which allows meat cultivation only if it meets strict halal conditions (MUIS, 2024).

Meanwhile, the Fatwa Committee of the State of Pahang issued a declaration in September 2023 declaring cultured meat as haram (forbidden) for Muslims because it is currently produced using animal serum or blood plasma as a growth medium, and the consumption of blood plasma is considered haram according to Islamic law. (Portal Rasmi Jabatan Mufti Negeri Pahang, 2023)

In conclusion, Malaysia's Muftis and fatwa committees emphasized that cultured meat can be considered halal if it meets the Shariah requirements regarding its source, additives, and safety. However, the official fatwa is still under evaluation and further study before a final ruling is issued (Shaharudin et al., 2025; Rosidi, 2024).

CONCLUSION

Cultured meat is a food biotechnology innovation with great potential in addressing the global shortage of animal protein supply (Post et al., 2020; Li et al., 2020). This is particularly relevant as the world population is projected to increase by 2050, along with a significant demand for meat products (Wageningen University & Research, 2021). Singapore has become the first country in the world to approve the commercial sale of cultured meat (Lavars, 2020), opening opportunities for Malaysia to develop new cell-based food products. However, the use and production of cultured meat in Malaysia have not yet been widely emphasised, as the current supply of conventional meat remains sufficient and there is no urgent need to seek alternative sources (Erwan, 2024).

Islam stipulates that food must be derived from halal, pure sources, free from impurities and not harmful (Tsani et al., 2021). Therefore, cultured meat production must be based on halal sources, including the cells used, the growth medium and the equipment involved (Rahmawati, 2023). All of these must be clean, free from any prohibited substances, and maintained in a state of purity throughout the process from beginning to end. The Fatwa Committee also emphasises that cultured meat can only be considered halal if the entire production process fully complies with Shariah principles and safeguards consumers from any elements of doubt (*syubhah*). However, there is currently no definitive fatwa that permits or prohibits the use of cultured meat.

The development of global food technology requires Malaysia to be better prepared, particularly in understanding Islamic rulings on the production of cultured meat. This study explores issues related to its halal status, the source of cells, the biotechnology processes involved and the implications for the Muslim community. By providing an early guideline based on Shariah principles and scientific approaches, this study is hoped to benefit policymakers, halal food producers and Muslim consumers in formulating appropriate strategies should this technology be widely adopted.

Overall, the issue of halal compliance in the production of cultured meat is an aspect that requires serious attention, particularly regarding the use of serum that may be derived from animals not slaughtered according to Islamic law. Efforts to replace animal-derived serum with plant-based alternatives represent a proactive step towards ensuring the product is suitable for Muslim consumers. Therefore, local research is greatly needed to

support the development of cultured meat that is innovative and aligns with Shariah principles (Adnan et al., 2021).

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