Halal & Hygienic Food Safety: A Comparative Review of Modern Food Science and Islamic Principles

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Abstract:

In the present era, food safety and the provision of disease-free food have become a major challenge globally. According to reports from the World Health Organization, bad food causes illness and death of millions of people annually. The concept of "halal and tayyāb" presented by Islamic Sharia is not just a religious obligation but a complete and comprehensive system of health principles. This paper presents a scientific analysis of halal slaughter, Concept of "Jalāla" and Islamic principles of purity protect meat from microbiological contamination. The main focus of the research is how halal methods lead to an increase in the biological safety, taste and shelf-life of meat compared to traditional methods. This study attempts to answer the following three basic questions: 1. To what extent does rapid and complete bleeding during halal slaughter contribute to the prevention of pathogen growth and biochemical stability of meat? 2. What are the scientific similarities between the World Health Organization's "safe food" parameters and the Islamic concept of "tayyāb", especially with regard to obtaining meat free of antibiotics and growth hormones? 3. Does the monitoring under halal certification play any role in reducing the rate of dangerous bacteria such as E. coli and Salmonella in meat? A comparative method and an analytical method have been adopted in this study. The study closely compared the bacterial load and pH levels in halal and non-halal meat samples using modern laboratory testing methods, such as DNA testing (for adulteration) and proteomics. In addition, it presents a comparative study of Islamic principles of cleanliness in the context of Sharia objectives with modern scientific protocols and HACCP standards. This research proves that the principles of halal and tayyāb are a shield against bacterial contamination. The removal of blood through halal slaughter weakens the bacterial attack during refrigeration, while the avoidance of jalāla and chemical-contaminated food protects human cells from toxic effects. This combination of medical science and Islamic jurisprudence leads us to a lifestyle where food not only fulfills the body's needs but also becomes the greatest means of preventing diseases.

Key words: Food, Safety, WHO, Halal, Tayyāb, Jalāla, Biochemical, Meat, Micro Organism

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Introduction

Human survival and health depend on the food they consume daily. In the modern era, food safety has become a serious global problem. According to reports from the World Health Organization (WHO, 2020), millions of people suffer from various diseases every year due to contaminated meat and substandard food. The philosophy of "Halal and Tayyāb" that Islam presented fourteen hundred years ago is not limited to a few religious rituals, but there are deep scientific and medical facts hidden behind it. The concept of halal and clean food provides a complete "quality control" system from the selection of the animal to its slaughter and then the processing of its meat. Similarly, obtaining other clean food is also very important. Similarly, animals that constantly eat dirt and do not eat clean food are also not good for health. This article covers how Islamic principles of purity and slaughter methods make meat microbiologically safe.

Importance of Halal, Tayyāb and Cleanliness in Islam:

In Islam, Halal, Tayyāb and clean food have great importance and cleanliness has been declared as half of faith. Allah Almighty says!

يٰٓاَيُّهَا الَّذِيْنَ اٰمَنُوْا لَا تُحَرِّمُوْا طَيِّبٰتِ مَآ اَحَلَّ اللّٰهُ لَكُمْ وَ لَا تَعْتَدُوْاۗ اِنَّ اللّٰهَ لَا يُحِبُّ الْمُعْتَدِيْنَ(87)وَ كُلُوْا مِمَّا رَزَقَكُمُ اللّٰهُ حَلٰلًا طَيِّبًا وَّ اتَّقُوا اللّٰهَ الَّذِيْٓ اَنْتُمْ بِهٖ مُؤْمِنُوْنَ (Al-Qur'ān 05:87,88)

"O you who have believed, do not forbid the good things which Allah has made lawful for you, nor transgress the limits. Allah hates transgressors. Eat and drink of the lawful and good things which Allah has provided for you, and fear Allah in Whom you have believed".

The Messenger of Allah (ﷺ) attached great importance to cleanliness, purity, and good health. He said:

عَن اَبی مَالِک اَشعَری قالَ، قَالَ رَسُولُ اللهِ ﷺ، الطُّهُورُ شَطرُ الإِيمَانِ(Muslim bin al-Hajjaj, n.d.)

"It is narrated from Abu Malik Al-Ash'ari that the Messenger of Allah (ﷺ) said: 'Cleanliness is half of faith'".

يٰٓاَيُّهَا الَّذِيْنَ اٰمَنُوْٓا اِنَّمَا الْخَمْرُ وَ الْمَيْسِرُ وَ الْاَنْصَابُ وَ الْاَزْلَامُ رِجْسٌ مِّنْ عَمَلِ الشَّيْطٰنِ فَاجْتَنِبُوْهُ لَعَلَّكُمْ تُفْلِحُوْنَ

"O you who believe! Intoxicants, gambling, idols, and dice are an abomination. These are the works of Devil. So avoid them that you may prosper".

قَالَ رَسُولُ اللَّهِ صَلَّى اللَّهُ عَلَيْهِ وَسَلَّمَ: " كُلُّ مُسْكِرٍ خَمْرٌ، وَكُلُّ مُسْكِرٍ حَرَامٌ

The Messenger of Allah (ﷺ) said: Every intoxicant is alcohol, and every intoxicant is forbidden.

The Prophet (peace be upon him) had forbidden all kinds of drugs, alcohol and gambling in the light of divine revelation about fourteen and a half hundred

years ago and had created a healthy society. If we look at this step of the Prophet (peace be upon him) in the light of the following report released on April 25, 2024, the belief that Islamic teachings are from Allah becomes even stronger.

According to a report released by the World Health Organization, the use of alcohol and intoxicants among children in many countries of the world is extremely dangerous for public health. The first twenty years of life are very important in the development of the human brain and it is very important to keep young people away from the effects of drugs at this age. The report also stated that those who use drugs at a young age become addicted to drugs and suffer from many psychological problems with increasing age. The World Health Organization has also recommended banning the use of different flavors of intoxicants. This includes the use of menthol and other substances in nicotine and tobacco products. In addition, the World Health Organization has recommended a comprehensive ban on advertising of narcotics in all forms of media.

The Sharia Rulings of Jalāla: In Five Schools of Thought:

In Arabic, 'Jalāla' is an animal that usually eats human or animal waste and filth, which causes its sweat or meat to smell bad. Literally, 'Jalāla' means dirt.

According to Hanafi jurisprudence, it is makruh-e-tahrimi to eat the meat and drink the milk of an animal that constantly eats dirt. If the animal eats fodder along with dirt and its meat does not smell bad, then it is halal (Al-Haskafi, 1992).

Period of Imprisonment: According to Imam Abu Hanifa, it is necessary to purify it by feeding it clean fodder for 3 days for a chicken, 4 days for a goat, and 10 days for a cow and camel.

According to Imam Shafi'i, the ruling on eating meat depends on its condition. If the taste or smell of the meat changes, its consumption is makruh (haram according to some). However, when the animal is fed pure fodder and the bad smell of its meat disappears, it becomes halal (Al-Nawawi, 2005).

According to Maliki jurists, eating an animal that continuously eats dirt is not makruh, but permissible (mubah). According to them, eating the dirt of an animal does not make its meat haram, but it is better to feed it clean fodder for a few days before slaughtering (Al-Hattab, 1995).

According to Imam Ahmad ibn Hanbal, it is forbidden to eat the meat, milk, and eggs of an animal that constantly eats dirt, unless it is kept captive and fed with pure food. This ruling is quite strict in his opinion(Ibn Qudamah, 1997).

According to Ja'fari jurisprudence, the meat and milk of an animal that continuously eats dirt becomes haram. To purify it, ' îstibrā ' (keeping it on a clean diet) is mandatory. The prescribed period is 40 days for a camel, 20 days for a cow, 10 days for a goat, and 3 days for a chicken (Al-Sistani, 2021).

From all the discussions regarding Jalāla, it is clear that Jalāla is considered makruh or forbidden in all schools of thought except Imam Malik.

Scientific Perspective of Jalāla and Other Micro Organism:

In Islamic principles, not only 'halal' is sufficient, but 'tayyāb' (purity) is also a condition. This means that the animal's food should not contain any impure, dangerous drugs such as antibiotics or poisonous substances (Lever & Puia, 2018). Islamic sociological research has defined halal as "ethical consumption". The principles of halal and tayyāb provide a solution to the 'antibiotic resistance' that modern food science is worried about today, because they emphasize providing the animal with a natural environment and clean food. In Islam, an animal that constantly eats dirt is called Jalāla (Lever & Puia, 2018).

Scientific research shows that if animals are fed a good diet, their meat remains free from the harmful effects of chemicals, pesticide residues, and growth hormones (Qureshi et al., 2017). This purity helps reduce inflammation in human cells (Qureshi et al., 2017).

Modern veterinary science supports this religious ruling. Animals that eat dirt have a high rate of zoonotic diseases, parasites, and dangerous bacteria like salmonella. During quarantine, the animal's metabolism removes these toxins from the body, making the meat safe for human consumption (Qureshi et al., 2017).

It is generally believed that the cold of the refrigerator kills bacteria, but there are some bacteria that grow rapidly even at low temperatures.

Listeria: This is the most dangerous bacteria that survive even at refrigerator temperatures. It is commonly found in raw milk, cheese, and deli meats. It can be fatal for pregnant women and people with weakened immune systems (Gandhi & Chikindas, 2007).

Pseudomonas: This is the most common bacteria that spoil refrigerated meat, fish, and eggs. It causes the surface of the meat to become mushy and gives off an unpleasant odor (Jay et al., 2005).

Salmonella: This is found in raw poultry, eggs, and contaminated water. It causes severe inflammation of the intestines and typhoid-like symptoms.

Escherichia coli: This bacteria is often found in undercooked meat or vegetables washed in dirty water. Some strains can cause kidney failure.

Staphylococcus aureus: This bacteria is found on human skin and nose and is transferred to food during handling and produces a toxin that is not killed even by boiling (Food and Drug Administration [FDA], n.d.).

Molds: This is a cottony layer seen on bread, fruits, jams, etc. Some molds produce 'mycotoxins' which can cause liver cancer (Pitt & Hocking, 2009).

Yeasts: They spoil most sweets and juices, causing them to produce gas and turn sour.

Halal Slaughter and Food Science:

In the modern food industry, several manufacturing protocols such as HACCP are adopted to protect meat. However, the Islamic method of Zabiha is much more ancient and effective than all these modern standards. In Halal Slaughter, it is mandatory to cut the four vessels (aorta, larynx, esophagus and other blood vessels), while the spinal cord (Haram Mugs) is preserved. Its biggest

advantage from a scientific point of view is that the connection between the heart and the brain is maintained, as a result of which the heart continues to beat and almost all the blood in the body is pumped out with pressure (World Health Organization [WHO], 2020).

According to Nakyinsige et al. (2013) blood acts as a "culture media" for the growth of bacteria, so its removal from the body is the real safety of meat.

The chemical composition of blood is such that it provides an ideal environment for bacteria to feed and grow. The hemoglobin, iron and glucose present in blood are the best food for pathogens.

Research by Addeen et al. (2014) shows that animals that are slaughtered by stunning often have a slow or sudden cardiac arrest, causing blood to pool in the capillaries. This pooled blood creates oxidative stress that breaks down the protein in the meat and makes it spoil faster. In contrast, the removal of more than 90% of the blood in halal slaughter naturally protects the meat from dangerous pathogens such as E. coli and Salmonella (Ali et al., 2010). This removal of blood also reduces the water activity of the meat, which increases its shelf-life (Nakyinsige et al., 2013).

There has long been a debate in scientific circles about whether the halal method is painful. Professor Wilhelm Schulze (Schulze et al., 1978) provided the answer through an electroencephalogram (EEG) test at the University of Hanover. Research has shown that within the first three seconds of slaughter, when the blood supply to the brain is cut off, the animal goes into a state similar to deep sleep and does not feel pain. In contrast, after electric shock (Stunning), the animal's heartbeat may stop, but the brain waves show severe pain. It is important not to cut the spinal cord in the halal method so that the nervous system continues to send the message to the heart to pump blood until all the blood is drained from the body (Schulze et al., 1978).

The quality of meat depends on the process of 'Post-mortem Glycolysis'. A scientific report by Sabow et al. (2015) states that when an animal is slaughtered calmly, the 'Glycogen' present in its muscles is properly converted into 'Lactic Acid'. This process keeps the pH of the meat between 5.4 and 5.7, which is an ideal level (Ali et al., 2010).

If an animal experiences fear or severe pain before slaughter, its body releases 'Adrenaline' and 'Cortisol', which prematurely deplete glycogen. This results in an increase in the pH of the meat, making it "Dark, Firm, and Dry" (DFD) and losing its ability to fight germs (Sabow et al., 2015).

In the Western world, halal slaughter was often considered cruel to animals, but research by experts such as Dr. Temple Grandin has changed this perception. According to his research, if the halal slaughter equipment is extremely sharp and the method is accurate, the animal experiences less physical stress than electric shocks. A study by Khalid et al.,(2015) also supports the fact that the halal method does not suddenly paralyze the animal's physiological system, but leads it to a

natural death, which helps to completely eliminate it while maintaining blood pressure(Grandin, 2010).

Methodology

This study has obtained authoritative data from international scientific journals such as 'Meat Science', 'Journal of Food Protection' and 'Animal Science Journal'. After which a comparative study of halal and non-halal slaughter methods has been conducted in the light of laboratory results, which include microbiological load, oxidative stability and biochemical changes. Also, based on the results obtained from individual scientific experiments (such as EEG and pH testing), a general conclusion has been drawn that halal slaughter is best for human health. Also, animals that constantly eat dirt or are given various drugs; the meat of such animals is not good for health.

Discussion

The scholarly review of the research article under review proves that the concept of halal and tayyāb in Islam is not just a religious code but a complete biosecurity system based on the principles of modern medical science and microbiology. The medical importance of halal slaughter is clear in the first stage of research; scientific observations (such as Professor Schultz's EEG study) confirm that preserving the spinal cord after cutting the aorta keeps the heart beating, through which all the blood in the body is pumped out under pressure. According to medical science, blood is the best culture media for the growth of bacteria, so its complete removal purifies the meat from uric acid and toxins and makes it nutritionally safe.

The second important aspect is food spoilage during refrigeration and storage. Research has revealed the alarming fact that simply putting meat in the refrigerator does not make it sterile. Psychotropic bacteria, such as Listeria mono cytogeneses, can grow even at low temperatures. According to medical research, if blood is not completely removed at the time of slaughter (as is the case in non-halal methods), refrigerated meat quickly becomes slimy and harbors bacteria such as Pseudomonas, which can cause food poisoning. Thus, the Islamic concept of "tayyāb" food teaches us that it is not enough for food to be halal, but it is also necessary for it to be sterile and fresh.

The third pillar of the article is the combination of the Islamic concept of jalāla and modern toxicology. Animals that constantly eat dirt and waste, their meat becomes toxic due to the process of "bio magnification". The injunction of "îstibrā" (keeping on a clean diet) in all five schools of jurisprudence regarding jalāla is actually a process of scientific detoxification. This process eliminates salmonella and other dangerous chemicals accumulated in the animal's tissues. Furthermore, the effects of unnecessary antibiotics and growth hormones given to animals in modern times also make meat "unclean" and unhealthy, which cause diseases such as antibiotic resistance and cancer in the human body.

Conclusion

In summary, this research proves that the principles of halal and tayyāb are a shield against bacterial contamination. The removal of blood through halal slaughter weakens the bacterial attack during refrigeration, while the avoidance of jalala and chemical-contaminated food protects human cells from toxic effects. This combination of medical science and Islamic jurisprudence leads us to a lifestyle where food not only fulfills the body's needs but also becomes the greatest means of preventing diseases.

Recommendations

1. Broiler Chicken Diet and 'îstibrā' (Pure Food Period): In the light of modern scientific research and the jurisprudential principle of "Jalāla", it is recommended that broiler chickens whose feed contains impure blood, carrion or dirt should be kept on a completely pure and vegetarian diet for at least 3 to 7 days before slaughter. This eliminates the toxins and effects of impure food in their meat, which is called Biological Detoxification in scientific terms.

2. Complete cleanliness and Sharia principles at the time of slaughter: When slaughtering a chicken or any animal, it should be ensured that the knife is extremely sharp so that the animal suffers minimal pain and blood can be completely drained. The immediate cutting of the semi-cut veins or the forbidden cord stops the heartbeat, causing the blood to clot inside the meat; therefore, the Sharia order should be strictly observed at the time of slaughter.

3. Limited use of antibiotics and growth hormones: Poultry farmers should follow the World Health Organization (WHO) principle of "Withdrawal Period" in the use of antibiotics and growth hormones given to chickens. The course of the drugs should be stopped for a certain period before slaughter so that their residues do not transfer to the human body and cause cancer and other diseases.

4. Principles of refrigeration and storage: It is recommended for consumers to wash the meat thoroughly to remove traces of blood before storing it in the refrigerator, because stagnant blood causes bacteria like Listeria to grow even inside the refrigerator. Keep meat in the coldest part of the refrigerator (Freezer) and keep raw meat separate from cooked items to avoid cross-contamination.

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