ISLĀMIYYĀT 46(1) 2024: 165 - 172
(https://doi.org/10.17576/islamiyyat-2024-4601-13)

Application of the Principles of Ruling Determination in the Prohibition of Blood Plasma in Food

Aplikasi Prinsip Penentuan Larangan Plasma Darah dalam Makanan

Mohd Izhar Ariff Bin Mohd Kashim[1,2], Nur Asmadayana Hasim[3,*], Nurul Hafizah Mohd Nor[2], Farah Ayuni Mohd Hatta[2] & Ahmed Abdel Rahman Abdel Aziz Al-Shiha[4]

[1]Research Centre of Sharia, Faculty of Islamic Studies, Universiti Kebangsaan Malaysia, 43600 Bangi, Selangor.

[2]Institute of Islam Hadhari, Universiti Kebangsaan Malaysia, 43600, Bangi, Selangor.

[3]Pusat Pengajian Citra Universiti (School of Liberal Studies), Universiti Kebangsaan Malaysia, 43600 Bangi, Selangor

[4]Amman Arab University, Jordan Street, 11953, Jordan

*Corresponding Author; email: asmadayana@ukm.edu.my

Received : 20 July 2023/Revised: 4 August 2023/Accepted: 26 December 2023/

Publish : 1 June 2024

ABSTRACT

Blood plasma is one of the constituents of blood. It is used in food products today due to its rich protein content. Its purpose is to increase the chewiness and improve the texture of food products, especially in producing processed products such as meatballs and surimi. There needs to be clarity regarding the determination of blood plasma ruling, whether it follows the ruling principles established in Islam or not. Thus, this paper intended to apply the principle of determining the ruling of blood plasma in food products according to Islam. This qualitative study used expert interviews and literature review methods by referring to books and journals related to blood plasma. This study established four application principles in determining blood plasma ruling: the principle of halal and haram food, the principle of istihalah, the principle of maslahah, and the principle of darurah. The use of blood plasma is haram because it contradicts the requirements of Islamic sharia and thus opposes the principles of determining the ruling of food based on blood plasma. This study is relevant for authorities such as JAKIM's Halal Hub to improve the existing system. Further, it benefits the manufacturers and the general public in preparing and choosing food according to the ruling principles set by Islam. Analyses related to the use of blood plasma in food products involving laboratory studies and fiqh research can also be carried out in the future.

Keywords: Blood plasma; principle; food; halal; istihalah

ABSTRAK

Plasma darah merupakan salah satu juzuk dari darah. Dewasa ini, ia digunakan dalam produk makanan disebabkan kandungannya yang kaya dengan protein. Tujuannya, adalah bagi menambahkan kekenyalan serta membaiki tekstrur produk makanan terutama dalam penghasilan produk makanan proses seperti bebola daging dan surimi. Terdapat kekeliruan terhadap penentuan hukum plasma darah samada ia mengikuti prinsip-prinsip hukum yang telah ditetapkan di dalam Islam atau sebaliknya. Oleh itu, artikel ini bertujuan untuk mengaplikasi prinsip penentuan hukum plasma darah dalam produk makanan menurut Islam. Kajian ini merupakan kajian kualitataif menggunaan kaedah temubual pakar dan kaedah literasi pustakaan dengan merujuk buku-buku serta jurnal berkaitan plasma darah. Kajian ini mendapati bahawa terdapat empat aplikasi prinsip dalam penentuan hukum plasma darah iaitu prinsip halal dan haram makanan, prinsip istihalah, prinsip maslahah, dan prinsip darurah. Penggunaan plasma darah adalah haram kerana ianya bercanggah dengan keperluan yang ditetapkan dalam Syariah Islam dan ianya bertentangan dengan prinsip penentuan makanan berasaskan plasma darah. Kajian ini amat signifikan kepada pihak berkuasa seperti Hab Halal JAKIM bagi menambah baik sistem sedia ada manakala bagi para pengilang dan masyarakat awam umumnya

dalam menyediakan dan memilih makanan mengikut kepada prinsip hukum yang ditetapkan oleh agama Islam. Kajian berkaitan penggunaan plasma darah dalam produk makanan yang melibatkan kajian makmal dan digandingkan dengan penyelidikan fiqh juga boleh dilaksanakan pada masa akan datang.

Kata kunci: Plasma darah; prinsip; makanan; halal; istihalah

INTRODUCTION

Food is a human physiological need. Food produces energy, which is critical in human reproduction, learning and survival. In the Islamic religion, food does not only influence physiological development; it also impacts the spiritual aspects of the human being. This has been mentioned by Allah SWT in the al-Quran:

Translation:

O believers! Eat from the good things We have provided for you. And give thanks to Allah if you ˹truly˺ worship Him ˹alone˺.

(al-Quran, al-Baqarah, 2:172).

In line with the prompt development of technology, many foods contain *haram* (impermissible) elements. An alarming situation arose when a recent examination showed that researchers from the Universiti Sains Islam Malaysia surveyed twelve surimi samples taken from supermarkets around Nilai and Putrajaya and found the results of ELISA analysis. Five of them contained bovine (cow) blood protein plasma, two of which were from avian (chicken) and the other two from porcine (pig) (Afiqah Salahuddin et al. 2015). Senior Assistant Director of the Halal Relations Division of the Malaysian Islamic Development Department (JAKIM), Mohd Amri Abdullah, explained in the Utusan Malaysia newspaper that animal blood plasma consists of chicken, cow and pig to beautify and boost the quality of the fish balls to be chewier (Utusan Malaysia 2015).

The commercial name for artificial foods such as fish balls, fish cakes, artificial crabs and shrimps and similar products is surimi. Surimi is produced from fish fillets, but the fish fillet cannot thicken due to its low quality. To overcome this deficiency, manufacturers mix it with thickening agents such as blood plasma protein powder (Penang Consumer Association 2006). Aminah Abdullah (2000) also commented on research results that animal blood protein plasma is used to improve and maintain surimi-based food products

APPLICATION OF THE USE OF BLOOD PLASMA IN FOOD PRODUCTS

Blood is divided into two main fractions, cellular and non-cellular. The cellular contains red blood cells, white blood cells, and platelets. In comparison, the non-cellular fraction consists of plasma. In line with that, Rhoades (2003) defined plasma as the whole human blood separated from the elements that make up blood cells and platelets. In addition, blood plasma is a pale-yellow liquid component (Rhoades et al. 2003) produced due to a pigment, bile, and covers 60% of the total blood volume (Shepro et al., n.d.).

In addition to that, blood plasma also comprises dissolved gases such as oxygen, carbon dioxide, hormones, enzymes, vitamins and minerals. Other constituents include various waste materials, such as urea and uric acid (Rodney 2003). The protein plasma fraction can be divided into several main fractional components: albumin, globulin, and fibrinogen. This makes serum albumin the most abundant and essential commercially (Terte 2011). When dried, serum protein albumin, globulin and fibrinogen become a white blood plasma powder with slight pigmentation (Terte 2011).

Ultimately, modern technology nowadays has impacted the production of food products (Wan Zakaria 2019). Furthermore, blood has traditionally been a high-protein ingredient in human food and animal feed (Hseih 2014). Bovine blood contains 80.9% water, 17.3% protein, 0.23% lipids, 0.07% carbohydrates, and 0.62% minerals (Duarte 1999) is widely utilised in the food processing and production industry because it has a natural taste and a dark colour that is produced due to the existence of red blood cells (Ofori 2012).

In addition, plasma proteins obtained from blood are also used in food products. Plasma protein in food can increase the quality of food products. Plasma proteins function as emulsifiers, thickeners, and food texture improvers and become added protein to food (Hurtado et al. 2011). This is because the plasma containing protein molecules, such as globulin, albumin, is beneficial in the thickening process of a

food product. Blood-based products are widely used not only in the processing of food products but also in meat and other industries. For instance, blood plasma that has been dried and sprayed is used instead of eggs in the cake and bakery industry (Bah 2013).

Blood plasma products in food have advantages and disadvantages, which should be given due attention to ensure that a food product satisfies the needs and wants of consumers. Among the benefits of using blood plasma are:

COST SAVINGS

One benefit of using cow's blood in food is that it contributes to economic savings. This is because it has a low cost but high quality as a protein source and provides human nutrients (Ofori 2014).

This is appropriate in helping developing countries where most suffer from protein-sourced nutritional deficiencies. It is a significant problem because most of the population needs help to buy food products sourced from meat or livestock because of the high cost. Hence, the continuous use and availability of blood for human food and animal nutrition can help economic growth (Ofori 2014).

ENVIRONMENTAL CONSERVATION

In addition to losing the primary source of valuable protein obtained from blood, blood plasma used as a waste material will cause air pollution problems. (Ofori 2012). This year, based on statistics from the Department of Veterinary Services (JPV), 39,000 thousand cattle and 40,000 goats can be used in Eid al-Adha (Metro Daily 2016). While in China, about 1,500,000 tons of pig blood was produced earlier this year and had a protein content equivalent to 2,000,000 tons of meat and 2,500,000 tons of eggs (Ofori 2012).

When one looks closely, this abundant source of protein will be lost if animal blood is used as waste material. The country will also experience a severe air pollution problem and pollute the earth's ecological system (Hseih 2014). Consequently, the initiative to reuse blood is economical and suitable for the ecology (Hurtado 2011).

FAT SUBSTITUTE

Fat is a vital ingredient in processed meat products, and it plays a very significant role in binding the product, maintaining softness, freshness and emphasising the attractive appearance of processed meat products. Nevertheless, excessive fat and cholesterol content in food products can lead users to experience obesity and hypercholesterolaemia. The disease leads to individuals who share various chronic diseases related to the blood vein system (Viana et al. 2005). Therefore, blood plasma is used as a substitute for fat.

The outcomes of a study attended by Viana et al. (2005) on pete ham mixed with blood plasma demonstrated increased product moisture and protein content, in addition to not changing the product's smell or aroma and taste.

It should be noted that although the use of protein plasma delivers advantages, there are also some disadvantages to the use of blood plasma, and they exist due to several factors:

HEALTH

Health factors are one of the motivations why consumers avoid eating food products that contain blood. This happens because some users are allergic to blood proteins. This will harm the user. Beef allergy is the most common allergy among children, reaching 1.5% to 6.5% among children suffering from atopic dermatitis or food allergy (Hseih 2014). Atopic dermatitis or eczema is a condition that makes the skin red and itchy. It is typical in children but can occur at any age. It can also induce asthma and fever.

Besides, a more worrying situation arose when a study was made, and analysis found two cases of Bovine Serum Albumin (BSA) allergy. The first involved a female laboratory technician who had a history of bronchial asthma due to cat allergy and was found to have a bronchial symptom disorder due to inhaling BSA powder at work. The second case concerned a woman who experienced stomach pain and diarrhoea immediately after eating cooked pork. Also, she had the same reaction after eating mutton and goat cheese and the same after eating beef. Both analysed patients were susceptible and allergic to BSA and other mammalian serum albumins. Both cases established that BSA is the leading cause of food allergy in children; nevertheless, it can also trigger food allergy in adults (Voltolini 2013).

THE SPREAD OF BSE

The use of blood in food causes consumers to concern if the blood used in it will lead to BSE (bovine spongiform encephalopathy) or mad cow disease (Hseih 2012).

BSE disease is Bovine Spongiform Encephalopathy (BSE), or "Mad Cow Disease," which infects the brain and can cause death in adult cattle. It can also infect humans and cause "Variant Creutzfeldt JacobDisease". This disease spreads through food containing "Meat and Bone Meal" (MBM) from livestock that BSE has infected. Meanwhile, the causative agent of this disease is a type of protein from livestock called prion. Livestock affected by this disease will show signs of the disease nerves, which are aggressive, difficult to stand and walk properly, have no appetite, emaciation and cause death (Hseih 2012).

There is still no incident of BSE in Malaysia, and it is free from this disease. However, the government has taken measures to prevent this disease early by banning the importation of live cattle and beef products from European Union countries and the United Kingdom (Pahang Veterinary Department 2016).

BLOOD PLASMA COLLECTION METHOD

Animal blood plasma taken from the slaughterhouse undergoes detailed methods before being mixed. Blood that has been mixed with and used in food. The most crucial method is related to the slaughter system.

Two typical slaughter systems are operated to collect blood and blood plasma - the open and closed slaughter systems. The open system delivers blood from the slaughtered animal into an exposed container. Therefore, this system is at a higher risk of blood and blood plasma due to unhygienic factors during slaughter (Knipe 1988; Langhoff 2003; Bah et al. 2013).

While the second system is a closed slaughter system. This system allows blood flow from the slaughtered animals in a more hygienic way because it is in a closed channel, and then it is blocked from the carcasses of the slaughtered animals (Bah et al. 2013; Ribot 2006).

The following collection method is to mix the blood with an anticoagulant, an anti-clotting substance. Since the blood freezes quickly, an anticoagulant mixture such as sodium citrate will prevent the blood from freezing (Bah et al. 2013). The anticoagulant mixture can be placed on the slaughter knife or in the blood collection container (Knipe 1988).

The anticoagulant mixture is separated into plasma and haemoglobin fractions. The separation process uses two methods, either centrifugation or filtration. (Knipe 1988). After the isolation, the blood plasma will be stored as solid ice blocks (Knipe 1988) or dried using the spray-dried method (Gorbotov 1988).

In general, the istinbat approach in decision making of hukm (Islamic law) based on al-Quran and Sunnah argument can be used to determine the application of blood plasma in food. The scholars from the Hanafi, Maliki, Syafie and Hanbali schools have agreed that the ruling of flowing blood is haram to eat. It is based on al-Quran:

Translation:

Say, ˹O Prophet,˺ "I do not find in what has been revealed to me anything forbidden to eat except carrion, running blood, swine—which is impure—or a sinful offering in the name of any other than Allah. But if someone is compelled by necessity—neither driven by desire nor exceeding immediate need—then surely your Lord is All-Forgiving, Most Merciful."

(Al-Quran, al-Ancam, 6:145).

Al-Qurtubi (2004) stated that the blood mentioned in this verse is the blood that flows, and it is haram, while other than that, it is acceptable. In other words, this verse only focuses on prohibiting the flowing blood, but other blood can be used.

Next, there is disagreement among scholars about the ruling of blood that does not flow. This prohibition does not include the blood of fish, the blood that does not flow found in the liver, heart and spleen, or the blood that is still left in the nerves of animal meat after slaughter. (al-Bahuti n.d.) According to the opinion of Abu Yusuf and Imam Shafie, the blood found in fish is considered impure because of the prohibition of blood in general (al-Kasani 2000). It is also supported by one of Imam Malik's opinions in al-Mudawwanah (al-Qurtubi 1996).

Whereas Abu Hanifah and Muhammad, and other thoughts from the Maliki school of thought, declared that the blood of fish is pure because the scholars have agreed that it is necessary to eat fish together with the blood left on the fish (al-Kasani 2000). They also believe that the fluid found in fish is not blood but moisture (al-Dusuqi n.d).

APPLICATION OF THE PRINCIPLE OF DETERMINATION OF BLOOD PLASMA RULING IN FOOD

The discussion about the ruling of blood plasma-based food products needs to be done more carefully and in-depth by studying the views of jurists

regarding the ruling of specific foods. The research shows four principles of determining food products based on blood plasma. Through these principles, scholars, scientists and researchers can use them as the primary guideline in deciding a ruling on food products containing blood plasma.

PRINCIPLES OF HALAL AND HARAM

Any food eaten must comply with the principles of halal and haram outlined by Islam. In discussing the issue of food products containing blood plasma, the general view forbids the use of blood, whether a little or a lot, and it is still considered impure (Ibn Rusyd 1996).

However, al-Qardawi (2002) mentioned that it is mubah (neutral) to use part of the blood elements such as plasma, platelets, red blood cells, or white blood cells because it is not the whole blood as intended by al-Quran and al-sunnah (Mohd Izhar Ariff 2015). In addition, Dr Nazih Hammad (2004) stated that blood plasma is a molecule that has been separated from blood and maintains no properties and characteristics of blood in blood plasma. However, public opinion is more potent and accepted. This is also based on the fiqh method:

Translation:

The haram prevails when halal and haram come together

(al-Suyuti 1998).

Hence, one can understand that through this method, if there is a mixture of halal and haram elements in food products containing plasma, the ruling will be haram. Halal in this context does not mean obligatory halal, but what is meant here is mubah halal. Whereas haram is a general sense that an act, when done, one will sin and when one leaves it, one will be rewarded (Mohd Izhar Ariff 2015).

ISTIHALAH PRINCIPLE

In determining the ruling of food, the principle of istihalah should be emphasised because it is related to the cleanliness and purity of a product. The essence of this process in food products containing blood plasma is relevant as it is a method in food processing. The istihalah process, whether through human intervention or not, can convert substances that were initially impure into halal and pure. (Mohd Izhar Ariff & Sharif Mohd Tahir 2015).

Istihalah can be categorised into two types: istihalah sahihah and fasidah. Istihalah sahihah is a process of change that happens entirely. For example, alcohol that was originally impermissible (haram) changed its kind to vinegar, and the ruling changed to pure and halal (Ibn Nujaym 1997; al-Nawawi 1996; al-Sharbaini 1994). Furthermore, when the impure characteristics of alcohol, such as its smell, taste, colour and its identity, can no longer be detected or identified in vinegar because there has been a change from one state to another (Al-Haskafi 2000), then vinegar is permitted to be consumed and utilised in all matters.

Aizat and Wan Jasimah (2009) maintained that istihalah fasidah involves halal and haram ingredients, producing a haram final product. This process occurs using the enzyme transglutaminase, sourced from blood plasma in food. Halal ingredients are mixed with haram transglutaminase enzyme, which acts as an agent of change to improve food quality (Khader et al. 2016). Nevertheless, after being analysed with laboratory technology, the final material mixed with blood can still be proven and exists in the material.

Therefore, it can be concluded that the istihalah that occurs in the processing of food products based on blood plasma is istihalah fasidah and is categorised as impure and haram.

Figure 1.0 shows the *istihalah fasidah* process that occurs in the processing of food products containing blood plasma.

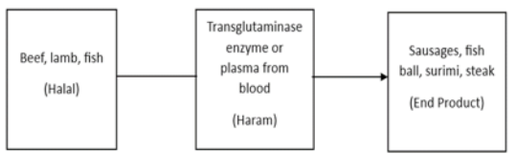

FIGURE 1. Shows the process of mixing food with blood plasma to produce a food product (Mohd Izhar Ariff et al. 2015).

MASLAHAH PRINCIPLE

Maslahah is a development attempting to better all aspects, while mafsadah is any bad element that does not develop or better custom and society (al-Shatibi 2004). This meaning is taken from the aspect of maslahah and mafsadah, which is worldly.

Whereas, when maslahah or mafsadah is related to the question of sharia law, it must be studied in parallel with the drives and guidelines based on evidence from the al-Quran, hadith, ijmak and qiyas that have been agreed upon by sharia.

Accordingly, the discussion about the maslahah and mafsadah of this blood-based food product must be examined through the lens of sharia because it involves the food consumed (Mohd Izhar Ariff et al. 2020a). Therefore, it is closely related to the relationship between worship and spirituality. Islam protects its followers holistically, covering all areas of life (Hasim et al. 2021), including food containing blood plasma.

Although animal blood plasma benefits humans and the environment, it does not align with Islamic regulations prohibiting blood in food (Mohd Izhar Ariff et al. 2020b). Allah SWT orders His servants to find halal food and avoid haram things so that they do not harm humans and to maintain public interest. This coincides with the true essence of the purpose of sharia or maqasid sharia. The outlined issues need to meet the requirements of Islamic law so that they are not misapplied (Mohd Izhar Ariff 2015).

DARURAH PRINCIPLE

When an individual is in a forced or darurah (necessity) situation, he is compelled to eat impure and forbidden foods, such as blood, pork, and carcasses. This is based on the al-Quran:

Translation:

He has only forbidden you ˹to eat˺ carrion, blood, swine, and what is slaughtered in the name of any other than Allah. But if someone is compelled by necessity—neither driven by desire nor exceeding immediate need—they will not be sinful. Surely Allah is All-Forgiving, Most Merciful.

(al-Quran, al-Baqarah, 2:173).

In addition, Ibn Qudamah (n.d.) stated that consuming impure food in an emergency is necessary to protect oneself from destruction or death because it is a more significant harm than avoiding forbidden things.

Nevertheless, currently, the processing of food products containing blood plasma is not an emergency situation that compels it to be declared halal because there are other alternatives to replace animal blood plasma. For example, plant proteins or recombinant transglutaminase enzymes can be used for binding purposes or as a protein source for food (Mohd Izhar Ariff et al. 2015; Mohd Izhar Ariff et al.2021).

However, if the situation creates a necessity, food products containing blood plasma can be consumed based on the following guidelines.

1. It is essential to note that necessity happens based on conviction rather than guessing.
2. There is no other mubah solution in a necessity situation. Once confirmed, then it is allowed to eat food containing blood plasma.
3. The definition of a necessity should be consulted by experts who have credibility, not just motivated by lust.

CONCLUSION

Islam is a religion that takes care of all aspects of human life. Everything comes with its ruling to ease people. Islam has also outlined guidelines for determining *halal* and *tayyib* food for humans. Therefore, as Muslims, one should be concerned about this and follow all the guidelines that have been established and the principles that have been set. Based on the discussion above, the principles are produced to help the community, consumers, and manufacturers process and choose pure and *halal* food products. Ergo, the use of blood plasma is *haram* because it contradicts the requirements of Islamic sharia and thus opposes the principles of determining the ruling of food based on blood plasma.

ACKNOWLEDGEMENT

The authors would like to thanks Universiti Kebangsaan Malaysia, DIP-2021-015.

AUTHORS' CONTRIBUTIONS

Conceptualization, M.I.A.M and A.A.R.A.A.A; writing—original draft preparation, M.I.A.M.; writing—review and editing, N.A.H., N.H.M.N. and F.A.M.H..; visualization, N.A.H.; supervision, M.I.A.M.; project administration, N.H.M.N.; funding acquisition, M.I.A.M. All authors have read and agreed to the published version of the manuscript.

REFERENCE

Afiqah Salahuddin, Mohammad Naqib Hamdan, Mohd Anuar Ramli. 2015. Penggunaan Teknologi Pengesanan Halal Terhadap Produk Makanan: Kajian Menurut Perspektif Hukum Islam. Prosiding Konvensyen Kebangsaan Pengurusan Islam.

Anon. 2016. Jabatan Veterinar Pahang. Pahang.

Al-Bahuti, Mansur bin Yunus. t.th. Kassyaaf Al-Qinac an Matni Al-Iqnac.t.tp. Maktabah Al-Nasru Al-Hadisah.

Clara, S.F., Bah, Alaa El-Din A.Bekhit, Alan Carne, Michelle A.Mcconnel. 2013. Slaughterhouse blood: An emerging source of bioactive compounds. *Journal Of Comprehensive Reviews in Food Science and Safety*. 12(3): 314-331.

David, S., Frank, B., Charles, L. n.d. Human Anatomy and Physiology a Cellular Approach. United States of America: Boston Universiti. Holt, Rinegart and Winston, Inc.

Al-Dusuqi, Syamsuddin Muhammad. t.t.h. Hasyiah ad-Dusuqi ala Syarah al-Kabir. Jil 1. t.tp: Ihya' Al-Kutub Al-Arabiyyah. Ms 48

Fabiana, R.V., V.D.M. Silva, F.M. Delvivo, C.S. Bizzotto, M.P.C. Silvestre. 2005. Quality of ham paˆte' containing bovine globin and plasma as fat replacers. *Meat Science* (70):153–160.

Gorbatov, V.M Gorbatov. 1988. Collection and Utilisation of Blood and Blood Proteins for Edible Purposese in the USSR. Dlm. A.M.Pearson & T.R.Dutson (pnyt). Edible Meat By-Products Advances in Meat Research Vol 5. Editor. England: Elsevire Science Publishers Ltd. Essex.

Harian Metro. 2016. *Plasma Darah dalam Makanan.* 6 September 2023.

Hasim, N.A., Amin, L. Mahadi, Z., Yusof, N.A.M., Yaacob, M. 2021. Indikator bagi prinsip etika sensitiviti agama, budaya dan maruah dalam bioteknologi moden. *Jurnal Islamiyyat* 43(1): 61-72

Hurtado, I., Daga, E., Espigule, D., Pares, E. Saguer, M. Toldra, C. Carretero .2011. Use of Porcine Blood Plasma in "Phosphate-Free Frankfurters". Procedia Food Science. Elsevier B.V. 11th International Congress on Engineering and Food (ICEF11).

Ibn Nujaym, Zainuddin bin Ibrahim. 1997. al-Bahru al-Raiq Sharah Kanzu al-Daqai'q. Beirut: Darul Kutub al-Ilmiyyah.

Ibnu Qudamah, Abi Al-Faraj Abdurrahman. 1984. Al-Mughni. Shamsuddin. Jil 1. Beirut: Dar Al-Fikr. Ibnu Rusyd, Muhammad bin Ahmad bin Muhammad. 1996. Bidayatul Mujtahid Wa Nihayatul Muqtasid. Beirut: Darul Ilmiyyah.

Jack Appiah Ofori and Yun-Hwa Peggy Hsieh. 2012. The use of blood and derived products as food additives. *Agriculture And Food Additives* 6: 229-256.

Jack Appiah Ofori & Yun-Hwa Peggy Hsieh. 2014. Issues Related to the Blood on Food and Animal Feed. *Critical Reviews in Food Science and nutrition*. 54: 687-697.

Al-Kasani, Abi Bakar Suud. 2000. Badaic Sanaic fi Tartib as-Syaraaic. Beirut: Dar Ihya' Turath al-Arabi.

Khader A., Md Ariffin, M.F., Mohd Yusoff, A.Z.S. 2016. Polemik masyarakat Muslim di Malaysia dalam memahami *medicine* pascamodenisme. *Islamiyyat* 38(2): 121-130

Knipe, C. Lynn Knipe. 1988. Animal blood and blood proteins as food. Dlm. A.M. Pearson & T.R. Dutson (pnyt). Edible Meat By-Products Advances in Meat Research Vol 5. England: Elsevire Science Publishers LTD. Essex. 147-163.

Lars Langhoff. 2003. Processing of sterile animal blood protein for human consumption. t.pt. t.tp

Mohammad Aizat Jamaluddin & Che Wan Jasimah Wan Mohamed Radzi. 2009. Teori Istihalah Menurut Perspektif Islam dan Sains: Aplikasi terhadap Beberapa Penghasilan Produk Makanan. *Jurnal Syariah* 17(1):169-194. Kashim, M.IA.M., Hasim, N.A., Othaman, R., Khalid, R., Samsudin, M.A., Yahaya, M.Z., Abdul Manaf, Z., Amin, L. & Mat Zin, D.M. 2018. Najis (Tinja) manusia daripada perspektif sains dan Islam serta amalan pemakanan sunnah. Sains Malaysiana, 47(6), 1227-1234.

Mohd Izhar Ariff Mohd Kashim, Ab Rahman, Z., Mohd Noor, A.Y., Md Sham, F. Hasim, N.A., Safiai, M.H., Mokhtar, M.H. & Hamjah, S.H. 2020a. Principles regarding the use of haram sources in modern food products: An Islamic perspective. Journal of Critical Reviews 7(6): 1017-1024

Mohd Izhar Ariff Mohd Kashim, Mohd Noor, A.Y., Ab Rahman, Z., Muhd Adnan, N.I., Abdul Mutalib, S., Zakaria, M.B., Hasim, N.A., Mokhtar, M.H. 2020b. Animal DNA and halal status of chocolate products in Malaysia. Journal of Critical Reviews 7(6): 1009-1016

Mohd Izhar Ariff Mohd Kashim, Hasim, N.A., Mat Zin, D.M., Amin, L.A., Mokhtar, M.H., Shahimi, S. Abd. Mutalib, S. 2021. Animal cloning and consumption of its by-products: A scientific and Islamic perspectives. *Saudi Journal of Biological Sciences* 28: 2995-300

Mohd Izhar Ariff Mohd Kashim, Muhammad Adib Samsudin, Wan Kamal Mujani. 2015. Penentuan Hukum Plasma Darah dalam Makanan Moden. *International Journal of Social Policy and Society* 11 (6): 83-101

Mohd Izhar Ariff Mohd Kashim & Sharif Mohd Tahir. 2015. Modul penentuan hukum makanan ubah suai genetik (GMF) dan kepentingannya di Malaysia. *Jurnal Islamiyyat* 37(2): 133-145. Mohd Sukri, S.J., Ahmad Fadzillah, N. Mat Jubri, M., Abdul Rohman. 2022. Development of a framework on prohibition of adulterating surimi products with animal plasma: A qualitative research approach. *Islamiyyat*. 44(2): 3-27

al-Nawawi, Abi Zakariyya Muhyiddin. 1996. al-Majmuc Sharah al-Mihazzab. Beirut: Darul Fikr.

Nazih Hammad. 2004. Al-Mawad Al-Muharramah Wa al-Najasah Fi Al-Ghiza' Wa Ad-Dawa'baina Nazoriyyah Wa At-Tatbiq. Beirut: Darul Qalam.

Persatuan Pengguna Pulau Pinang. 2006. Halal haram. Pulau Pinang.

Al-Qurtubi, Abu Jaafar Muhammad Bin Jarir. Tafsir Al-Tabari. Jil 4. Kaherah: Dar Al-Salam

Ribot, Eduard Davila Ribot. 2006. Advances in Animal Blood Processing: Development of Biopreservation System and Insights on the Functional Properties of plasma. Thesis Ph.D. Institute of Food and Agricultural Technology and the Deparment of Chemical Agricultural Engineering and Food Technology. Spain: University de Girona.

Rodney Rhoades, Richard Pflanzer. 2003. Human physiology USA: Thomson Brook Cole.

al-Sharbaini, Shamsuddin Muhhamad Ahmad al-Khotib. 1994. Mughni al-Muhtaj Ila Marcrifah maacni Alfaz wa al Minhaj. Beirut: Dar kutub al-Ilmiyyah.

al-Syatibi. Abi Ishaq. 2004. Al-muwafaqat fi usul al-syariah. Jil 2. Beirut: Darul Makrifah.

al-Suyuti, Jalaluddin Abdul Rahman. 1998. Al-Asybah Wa An-Nazair Fi Qawaid Wa Furu As-Syafieiyyah. Kaherah: Darul Salam.

Tarté, Kraft Foods Inc. 2011. Meat protein ingredients. In. G.O Philips and Williams (pnyt). Handbook of Food Proteins. hlm 56-83. Cambridge: Woodhead Publishing Limited.

Utusan Malaysia. 2015. 12 Februari. Malaysia: Kuala Lumpur.

Voltolini, F. Spignol, A. Cioè1, P. Cagnati, D.Bignardi, P.Minale. 2013. Bovine Serum Albumin: a Double Allergy Risk. *European Annals of Allergy and Clinical Immunology* 45(4):144-147

Wan Zakaria, W.F.A. 2019. Epistemologi dan metodologi Sains Islam di Era Revolusi Industri 4.0. *Islamiyyat* 4(10): 13-23.

Yun-Hwa Peggy Hseh. Jack Ofori. 2011. Food-Grade Proteins from Animal by Products: Their Usage and Detection Methods. Dlm. Leok.L.Noleet, Fidel Toldra (pnyt). Handbook of Analysis of Edible Animal By-Products. US: Taylor and Francis Group. http://vetphg.pahang.gov.my/index.php?option=com_content&view=article&id=50:bmb-kesihatan&catid=11:regulatori-a-akredetasi [17/10/2023]