

ISLAMIC AND MODERN SCIENCE PERSPECTIVES ISSUES OF ANIMAL PLASMA AS A SOURCE OF FOOD ADDITIVES IN FOOD PRODUCTS

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ABSTRACT

Disposal of animal blood from slaughterhouses leads to high risk of water and land resources problem. Due of this concern, food scientists separated the plasma component and transformed into food additives that comprised with tremendous functional properties such as gelling agent, replacing fat and eggs function, emulsifier, binder agent and also has been used as an alternative supplement to boost up human's immune system. This phenomenon is also witnessing emergence of leading key players who globalized animal plasma derivatives market around worldwide food industry. This has raised the concern among the Muslim consumers because consuming any blood and its derivatives are strictly prohibited in Islam mainly spilled out blood. Due to this restriction, modern science techniques are also crucial to detect the presence of animal plasma into food products as it is impossible to be detected through human's naked eyes. Therefore, this paper is purposely written down to highlight Islamic and modern scientific perspectives on the issues of animal plasma as a source of food additives in food products. It is hoped this paper will be a good reference and motivates other researchers to do more research in the context of variety scope in future.

Key words: Animal Plasma; Food Additives; Food Products; Islamic; Modern Science and Perspectives.

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1. INTRODUCTION

Effective management of collected animal blood from slaughterhouses are crucial to avoid land and water resources pollution. By 2016, it is reported that 114.79 million pints of blood are going down to the drains which contributes to environmental problem without taking any effort to manage the blood in a friendly manner (Gandhi, 2017). To minimize the problems, several of innovation has taken place to dig potential of blood's functional properties from wasted materials into useful commercialized values mainly the blood represents a valuable source of protein to be benefitted by the food producers (Bah, Bekhit, Carne, & Mcconnell, 2013). This practice seems as a good initiative to improve resources efficiency, reduce wastage activities and avoid too depending on natural resources which are getting declining as a result of over- cultivation (United Nation, n.d.)

Historically, the use of animal blood is crucial during the first World War 1 whereby it is approximately 10 % of the blood is added into the meal in order to support people's diet as a result scarcity of food sources (Kobert, 1915). For instance, bovine blood has been innovated in Kenya as an additional nutrition among the young children in order to combat anaemia. This prototype was developed to replace cereal porridge flour that contains very low iron levels (Andago, Imungi, Mwangi, Lamuka, & Nduati, 2015).

However, the use of blood is not really preferable among the food producers as food additives because of its metallic taste and dark-brownish colour which lead to less appealing characteristics for food product's presentation (Duarte, Carvalho Simões, & Sgarbieri, 1999). Due of this concern, the plasma component is extracted from the blood's component and has

been transformed into food additives that usually comes in spray –dried form (Mohd Izhar Ariff et al., 2017) or freeze- dried form after went through centrifuge process (Lynch, Mullen, Neill, & Carlos, 2017). The plasma component is more preferable to be transformed into food additives due of its characteristics that tasteless and white-yellowish colour which looks more natural compared to the whole blood (Mohd et al., 2017; Nakyinsige et al., 2012). In addition, the plasma also contains unique functional properties act as emulsifiers, fat replacers in meat-based products, inhibitors for endogenous proteases in surimi products, substitute for egg's products in bakery products and also functions as immune booster in health products (J. Ofori & Hsieh, 2015). There are several well-established of companies involved in producing animal-plasma food grade as commercialized food additives such as Sonac B.V. centred in The Netherlands ,Vepro from Veos Group centred in Belgium, Essentia Protein Solutions (USA), Proliant Meat Ingredients Inc. (USA) and APC Europe (Spain) (Toldrà, Lynch, Couture, & Álvarez, 2019). It demonstrates that animal plasma is no longer considered as wasted material since it has commercialized values.

The use of animal plasma as a source of food additives is regarded as a sensitive issue by certain religious practitioners mainly among the Muslim and Jews. It is because the Muslim are obliged to follow Halal dietary laws and the Jews need to adhere Kosher dietary Laws respectively (Jack Appiah Ofori & Hsieh, 2012). In Islam , the use of spilled out blood is strictly prohibited for the Muslim consumption (A. Fadzllillah, Che Man, Jamaludin, & Ab. Rahman, 2012). This is in line with Quranic verse from surah Al – An'aam; 145.

Say, "I do not find within that which was revealed to me [anything] forbidden to one who would eat it unless it be a dead animal or blood spilled out or the flesh of swine - for indeed, it is impure - or it be [that slaughtered in] disobedience, dedicated to other than Allah . But whoever is forced [by necessity], neither desiring [it] nor transgressing [its limit], then indeed, your Lord is Forgiving and Merciful.

The wisdom behind prohibition to ensure the Muslim obey and not take for granted the commandment from Allah S.W.T. Sheikh Yusuf Al- Qardhawi (n.d) explained the wisdom behind prohibition of blood because the blood is regarded as filth materials (*Khabaith*) and will leave bad impact towards the consumer's health. The prohibition is excluded for non-spilled out blood such as spleen and liver as it is naturally attached into the meat (Kamil Musa, 1986). This prohibition is tolerable while facing extreme difficulties (*dharuriyyah*) such as the Muslim are facing starvation situation and there is no any halal food is available. Hence the Muslim are allowed to consume it for the sake of life preservation (Mustafa Al-Khin & Mustafa Al-Bugha, n.d). This is one of the sign Allah's blessings towards His *a'bd* (Mahaiyadin & Osman, 2017).

Transformation of animal plasma into food additives left a great challenge to the Muslim since there are plenty of food products are potentially incorporated by this source. For example, in 1998, Consumer's Association of Penang (CAP) discovered animal plasma powder is potentially used in surimi products to improve gelling activity, elasticity and binding surimi products' texture. This plasma powder was manufactured by one of the food producer's companies in America (Penang, 2009). In addition, according to the research implemented by (Aravindran, Sahilah, & Aminah, 2014) are capable to detect the presence of animal plasma in surimi products using PCR-southern hybridization analysis. Based on the research, chicken and goat plasma have been incorporated into the products as the protein source. Sandwich ELISA also can be used to detect transglutaminase (TGase) enzyme that derived from animal plasma sources (Alina et al., 2013). In this research, porcine, chicken and bovine plasma have reactivity towards TGase enzyme namely for porcine and bovine

plasma. The usage of modern scientific techniques are crucial to detect the presence of non-halal ingredients due the emergence of tremendous doubtful ingredient nowadays. Thus, this paper will highlight Islamic and modern science perspectives issues of animal plasma as a source of food additives in food products to establish integrative views between Islamic and modern scientific perspectives.

1.1 Terminology of Blood

Blood in Arabic phrase is known as *ad-dam*. According to Ibn Manzur in *Lisan al-Arabi* (n.d) *ad-dam* came from the root word of *damiy*. In “Kamus Dewan”, a Malay language dictionary (n.d) blood is a fluid with red colour found in humans and animal body. Cambridge dictionary (n.d) stated that blood is a red liquid circulates around the body. It carries oxygen and important substances to organs and tissues while removing waste products. Four essential components in blood are plasma, red blood cells, white blood cells and platelets. Blood is high with protein content. Kashim et al. (2015) stated that blood plasma has vital functions in human’s body.

1.2 Categories of Blood from Islamic Perspectives

There are two types of blood known as flowing (spilled out) blood and non-flowing (non-spilled out) blood. Surah al-Maidah in verse 3 stated clearly prohibition of spilled-out blood.

حُرِّمَتْ عَلَيْكُمُ الْمَيْتَةُ وَالْدَّمُ وَلَحْمُ الْخَنزِيرِ وَمَا أُهْلَ لِغَيْرِ اللَّهِ بِهِ وَالْمُنْخَفَقَةُ وَالْمَوْفُوذَةُ وَالْمُتَرَدِّيَةُ وَالنَّطِيحَةُ وَمَا أَكَلَ السَّبُعُ
إِلَّا مَا دُكِّيَتْ وَمَا ذُبِحَ عَلَى النُّصُبِ وَأَنْ تَسْتَقْسِمُوا بِالْأَزْلَامِ ذَلِكُمْ فَسُقُ الْيَوْمَ يَبْسُ الَّذِينَ كَفَرُوا مِنْ دِينِكُمْ فَلَا تَحْشَوْهُمْ
مُنْجَانِفٍ لِإِنَّكُمْ وَأَخْشَوْنَ الْيَوْمَ أَكْمَلْتُ لَكُمْ دِينَكُمْ وَأَتَمَمْتُ عَلَيْكُمْ نِعْمَتِي وَرَضِيْتُ لَكُمْ الْإِسْلَامَ دِينًا فَمَنْ اضْطُرَّ فِي مَخْمَصَةٍ غَيْرِ
فَإِنَّ اللَّهَ غَفُورٌ رَحِيمٌ (٣)

“Prohibited to you are dead animals, blood, the flesh of swine, and that which has been dedicated to other than Allah, and [those animals] killed by strangling or by a violent blow or by a head-long fall or by the goring of horns, and those from which a wild animal has eaten, except what you [are able to] slaughter [before its death], and those which are sacrificed on stone altars, and [prohibited is] that you seek decision through divining arrows. That is grave disobedience. This day those who disbelieve have despaired of [defeating] your religion; so fear them not, but fear Me. This day I have perfected for you your religion and completed My favor upon you and have approved for you Islam as religion. But whoever is forced by severe hunger with no inclination to sin - then indeed, Allah is Forgiving and Merciful.”

(Al-Maidah 5:3)

Imam Al- Ghazali (1998) defined the term of *ad-dam* spilled out blood as “red-coloured liquid” that flowing in blood’s vein . Imam Al- Baghawi in his Tafsir Ma’alim Al-Tanzil interprets the word of Damman Masfuhan means spilled out blood that derived from living animals ‘veins (Mufti Wilayah Persekutuan, 2019).. A contemporary Muslim scholar , Prof. Dr. Abdul Malik Karim Amrullah orprominently known as Hamka refers the term of Ad-dam (Spilled out Blood) in his Tafsir Al- Azhar as animal blood that flows away through the slaughtering process. This is in line with the opinion of another mufassirin ; Imam As-Sa’di in his tafsir As- Sa’di interprets the term of Daman Masfuhan as spilled out blood that specifically on the animal blood flows away through slaughtering process (Adenin, 2017).

قُلْ لَا أَجِدُ فِي مَا أُوحِيَ إِلَيَّ مُحَرَّمًا عَلَى طَاعِمٍ يَطْعَمُهُ إِلَّا أَنْ يَكُونَ مَيْتَةً أَوْ دَمًا مَسْفُوحًا أَوْ لَحْمَ خِنزِيرٍ فَإِنَّهُ رِجْسٌ أَوْ فِسْقًا أُهْلًا لِيُغَيِّرَ اللَّهُ بِهِنَّ أَضْطَرَّ غَيْرَ بَاغٍ وَلَا عَادٍ فَإِنَّ رَبَّكَ غَفُورٌ رَحِيمٌ (١٤٥)

“Say, "I do not find within that which was revealed to me [anything] forbidden to one who would eat it unless it be a dead animal or blood spilled out or the flesh of swine - for indeed, it is impure - or it be [that slaughtered in] disobedience, dedicated to other than Allah . But whoever is forced [by necessity], neither desiring [it] nor transgressing [its limit], then indeed, your Lord is Forgiving and Merciful."

(Al-An'am 6:145)

Imam At –Thabari in his tafsir, Tafsir Al-thabari concluded the prohibition of any kind of spilled-out blood is clear as Allah s.w.t has specifically mentioned in Surah Al- An'am verse 145. Imam Ahmad Al- Razi Al-Jashhash highlighted if Allah s.w.t does not revealed the verse 145; surah Al- An'am the prohibition of blood will be imposed to all kinds of blood regardless of its types and characteristics (Adenin, 2017). Other mufasssirin, M. Quraish Shihab in his Tafsir; Al –Misbah (Shihab, 2002) and also Imam Jalaluddin Al-Mahalli and Imam Jalaluddin As-Sayyuti (Al- Mahalli and As-Sayyuti, n.d). in his Tafsir Jalalain also highlighted the prohibition of spilled out blood are clear and absolute. However, the term of Daman Masfuhan excludes for the blood is naturally attached in the meat's veins due of its difficulty to take out the blood.

Narrated from Ibn Umar R.A., Rasulullah s.a.w. said : “Two kinds of carcasses and two kinds of blood have been permitted to us. The two kinds of carcasses are fish and locusts, and the two kinds of blood are the liver and spleen.”

(Recorded by Imam Ahmad and Ibn Majah).

Despite spleen and liver, the insects is included under the category of non-spilled out blood whereby the Muslim are allowed to consume and take benefit from it as long as it is totally free from any harmfulness scientifically. For example, the Muslim is allowed to consume cochineal colorant as unanimously endorsed by the National Muzakarah Fatwa committee members in Malaysia. However, the fatwa decision will have tendency to change if any there are new scientific discovery can prove its harmfulness to human health (Ahmad, et al., 2019). It is clearly signifies the prohibition of animal blood is specifically for the animals that derived from spilled-out blood.

2. ISSUES ON UTILIZATION OF ANIMAL PLASMA IN FOOD PRODUCTS

2.1. Bakery Products

According to Appiah and Peggy (2012), plasma functions as egg replacer in productions of bakery products such as cakes. Among the ingredients required in bakery products, eggs are needed in a lot of quantity and need for expensive cost compared to other ingredients. Plasma acts as an alternative in replacing egg's functions. Despite reducing cost production, the use of plasma protein may lower up cholesterol level in the cake's products. (Appiah and Peggy, 2012). Meanwhile, the plasma also blended with the flour in order improve the quality of bakery products in terms of flavor, stickiness and producing smooth surface on pastries skin such as dumpling skin (Sahilah et al. 2016).

2.2 Meat-Based Products

Meat based –products used the plasma as a binder during heating process takes place (Appiah and Peggy, 2012). For example, addition of dried plasma albumin into frozen hamburgers can establish good textures of the products by. In addition, inclusion of Porcine plasma hydrolysates can increase juiciness of the products particularly in processed muscle foods (Seo, Seo, and Yang 2016). The plasma also functions as a natural color enhancer, emulsifier, fat replacer and curing agent. Bashir et al. (2017) emphasized the sources of plasma protein derived from beef or porcine.

2.3 Seafood-Based Products

Seafood- based products are among demanding products by the consumers regardless of religious practitioners. In general, Japan is regarded as the first-leading country begins to commercialize seafood- based products throughout global market. These seafood-based products are commonly known as *surimi*. In 1984, the world's largest surimi-processing manufacturer; Kibun Co. Ltd capables to expand surimi market till America through establishment of company's branch at North Carolina. Within 4 years, the sales of surimi products risen up to 70 million pounds (Davis, n.d.). Currently, Republic of Korea, Thailand, New Zealand, and the United States were among key players may challenge Japan as the first world leading surimi producers.

Instead of these countries, Myanmar, Malaysia and Indonesia are getting develop their influence as leading surimi producers in Southeast Asia continents (Pangsorn, Laong-manee, and Siriraksophon, 2007). Currently, the surimi producers produce several of surimi-based products in order to appeal consumer's taste such as fish balls, fish cake, fish fingers, nugget, rolls and other artificial seafood products. Yet, production of *surimi* products in various artificial flavors are capable to minimize allergic reaction specifically whom are allergic towards fresh seafood like prawn and crab (Department of Fisheries Malaysia, Ministry of Agriculture and Agro- Based Industry Malaysia, 2014).

In Malaysia, fish balls are among favorite food regardless of religious practitioners. Norman Kok, Supawan Thawornchinsombut and Jae W. Park (2013) noted fish balls are the second largest processed fish- based product in Malaysia which contributes approximately 15-20% for fish –based processed food products in Malaysia. It is also noted that Malaysia is still depending on several non-Muslim majority countries to import fish and seafood mainly China as the main supplier (\$234 million) and Thailand in (\$81million) (Abdul Ghani Wahab, 2017). Furthermore, Bah Piyon Tan (2019) also stressed that fish-based products such as surimi will be continuously demanding in Malaysia due of its nutritive values as sources of protein, essential fatty acids and mineral are suitable for Malaysian diet instead of plays as an important contributive factor for foreign exchange, generating income and providing employment opportunity which is approximately contributed over 1.2 percent to Gross Domestic Product (GDP).

In general, the process to prepare surimi dough is simple because it needs several ingredients to be mixed altogether. There are possibility inclusion of plasma powder into surimi products as the food conditioner (Anuar, 2015) particularly derived from pig and bovine plasma to enhance stability, water holding capacity, nutrient content of protein in the surimi dough. Hence; the taste, flavor, texture and nutrition values are maximally can be improved (Sahilah, Liyana, M.N., S., Aminah, & Mohd Khan, 2016) although the low quality of fish meat is used as the main raw materials in producing any surimi products. Consumer Association of Penang (CAP) also enhanced the probability of inclusion animal plasma in surimi products because there is no provision under the Food Regulations 1985 to force

manufacturer to be transparent for declaring the types of sources used in food additives. Due of this concern, transglutaminase enzyme used in *surimi* products fall under critical ingredients category as its protein source is potentially extracted from bovine or porcine protein (Mohd Anuar Ramli et al, 2018); (Bahagian Halal Hub, Jabatan Kemajuan Islam Malaysia, n.d.). Incorporation of animal plasma can enhance surimi gel strength due of its function as a proteinase inhibitor particularly the plasma derived from chicken, bovine and porcine species (Alina et al., 2013). Porcine plasma also functions to encourage proteinase whitening activity and surimi autolytic activities (Aravindran et al., 2014). Addition of the plasma in concentrate or hydrolysate form in surimi dough increased inhibitory activities of proteolytic enzymes as a result textural degradation of myofibrillar protein (Huda, Abdullah, & Babji, 1999).

According to the research conducted by (Visessanguan, Benjakul, & An, 2000) noted Porcine Plasma Powder (PPP) is considered as suitable protein additive in surimi products if it is used at optimum concentration. This is confirmed that inclusion of PPP increased gelling properties of bigeye snapper surimi dough at 35 °C for 90 minutes (Benjakul, Visessanguan, & Srivilai, 2000). The capability of animal plasma improves surimi gelling properties because it is naturally enriched with proteins like immunoglobulins, fibrinogen, and serum albumin that encourage gelation and emulsification activities (Mora et al., 2019). Due of its excellent gelling properties, animal plasma has been used extensively in surimi-based products as an alternative for eggs to bind the dough of surimi and stabilize the shapes structures (Mohd Izhar Ariff et al., 2017). Realize with this potential, Fibrimex has been commercialized by Dutch company; Harimex BV that derived from plasma protein fibrinogen and thrombin functions as natural cold binder to provide good emulsifying activities for any meat-based products (Ofori & Hsieh, 2011). Likewise, other companies such as Veos Group and Lican also commercialized animal plasma as natural food binder (Bah et al., 2013).

2.4 Health Supplements

The functional properties of animal plasma is maximally utilized for health supplement production. Concentrated serum from bovine plasma is used as the main component to boost up human's immune system (Toldrà et al., 2019). It is recognized as one of the well-known health supplement producers that used animal plasma as the main component. This product is commercialized under the brand of Immonulin (J. Ofori & Hsieh, 2015) that suitable for those who are involved actively in sport's activity (J. A. Ofori & Hsieh, 2011). The consumers may consume this product conveniently whether added into drinks or eat together with snack bars (Kashim, Samsudin, & Mujani, 2015). Entera Health is another sub company produces health supplements that derived from bovine serum as well. It operates independently with other seven private companies under Laundsen Group Inc. (LGI) to commercialize bovine serum plasma-based health supplements ("Who is Entera Health," n.d.). Currently, this company established cooperation with Lemus Buhils to conduct a clinical test upon patients has mild to severe symptoms on of Covid-19 pandemic. During the test, around 420 selected patients will be receiving Entera Gram regularly along the trials conducted. This product used Bovine Plasma Derived Immunoglobulin Concentrate as the main immune booster. The clinical trials will be conducted in Barcelona Spain (Entera Health, 2020). In addition, plasma protein also has been mixed into milk scheme formula to minimize malnutrition risk among the infants in developing countries (Ofori & Hsieh, 2012). According to a research conducted by Begin, et.al (2008) signified bovine serum can be used as an alternative protein supplement to encourage infant's growth. This research has been implemented among Guatemalan infants with the ages between 6 to 8 months.

3. MODERN SCIENCE TECHNIQUE FOR DETECTION OF ANIMAL PLASMA IN FOOD PRODUCTS

In general, authentication techniques are crucial to confirm the presence of non-halal additives in food products. This technique can be used as supportive evidence to determine whether the process of transformation (*Istihalah*) is accepted (*sahihah*) or null (*fasidah*). Complete physical and chemical transformations are vital requirement to identify whether the finished products are in complete transformation or otherwise (Mahaiyadin & Osman, 2017). For chemical transformation, human's naked eyes, nose and tongue are impossible to detect the presence of non-halal sources in the food products particularly complicated processes are usually involved. Due of this concern, modern science technique is required to determine the purity of products which have tendency to be mixed with unclean materials (Mohd Izhar Ariff et al., 2018).

In the context of detection animal plasma presence in food products, the research is quite scarce compared to the detection of non-halal sources such as lard, pork and alcohol. In addition, the researchers tend to focus on detection animal plasma in animal feed products and in clinical field in particular. (Alina et al., 2012) used Polymerase Chain Reaction (PCR) to detect specific primers of blood thrombin enzyme in the surimi-based products. This research was specifically designed to determine oligonucleotide primers of thrombin enzyme from chicken (*Gallus gallus*) bovine (*Bos Taurus*) and porcine (*Sus scrofa*) blood species. The researchers found out that chicken and bovine blood thrombin enzyme are present in the surimi samples. It signifies there is possibility surimi manufacturers incorporate animal plasma protein as a source of surimi additives. Meanwhile, PCR also was used by (Alina et al., 2013) to identify the sources of blood transglutaminase enzyme in fish surimi-based samples. Chicken, bovine and pig blood were used as positive control and had been veterinary inspected before the blood were collected from selected slaughterhouses. However, the use of PCR is not producing satisfying result as all the samples of fish surimi established no bands and produced the dimers lines. Therefore, it is difficult to determine specifically plasma protein incorporated into fish surimi samples. The researchers suggested optimization method should be done to reconfirm the presence of Transglutaminase sources in the fish surimi samples. ELISA is recommended to authenticate the findings compared to PCR method.

Mohd et al., (2017) developed a method to detect the presence of porcine plasma in fish-based surimi products that has undergone heat treatment. This method capables to identify which blood derived from porcine species and which tissues belong to the halal species. In addition, this method also capables to differentiate between the blood proteins and the protein belongs to other sources such as egg albumin, soy protein and whey proteins that normally incorporated by the food producers. mAb (BE41) monoclonal antibody was developed to analyse antigen belongs to porcine plasma through the protein reaction. The researchers noted that ELISA is sensitive with porcine plasma in fish surimi at 0.25% (w/w) can be used as halal authentication tool to detect the presence of porcine plasma in surimi- based products. Although in this research, the researchers unable to detect the presence of porcine plasma in selected samples of fish surimi, they have contributed a significant contribution in halal authentication field. In addition, Sandwich enzyme-linked immunosorbent assay (sELISA) is proven effective to identify bovine plasma-derived food ingredients (BPFIs) in any commercial dietary supplements. Two mAbs (mAb Bb3D6 and mAb Bb6G12) recognized 60-kDa antigenic protein functions as a marker to detect the presence bovine serum albumin as food ingredient in any supplement products. These two mAbs also have capability to differentiate between porcine and bovine plasma additives in meat-based products also also in dietary supplements (Jack A Ofori & Hsieh, 2015). In this research, spiked raw and cooked

raw ground beef were used as the sample representing meat- based products. Meanwhile, for the dietary supplements, the researcher used several products which are ImmunoLin (ILN), Daily Immune Defense (DID), Immune Advantage (IA), SchiffImmuneassure (SIA), Rifle Protein Powder (RPP), Protein Serum Isolate (PSI), Immuni-T (IT), Humano Growth (HG), and Monster Growth (MV) containing BPFIs.

Rapid UPHLC-MS/MS (Mass Spectrometry) also can be applied to detect the presence of porcine plasma in emulsion –type pork sausages. This method was designed by (Stader, Judas, & Jira, 2019) as a result lack of analytical methods for animal plasma detection in meat-based products. This method is very useful to detect porcine plasma that potentially incorporated in any meat –based as it can identify protein present in food products (Lubis et al., 2016). Due of this capability, HPLC method has been applied in validation and authentication of halal status of food (Iqbal et al., 2020). Based on the research by (Stader et al., 2019), the researchers are capable to detect porcine plasma at 1% of meat substitution with an error probability of 5 % at peak areas of four plasma peptides. However, this method has its limit due of its incapability to detect availability of animal plasma between $\leq 2\%$ and $> 2\%$ of meat substitution. Da, et al., (2007) studied pattern changes of porcine plasma proteins at different PH conditions specifically during heat-induced gelation takes place. The porcine plasma and two major plasma fractions which are serum and albumin are the main subject matter. Polyacrylamide gel electrophoresis (SDS–PAGE) and Differential Scanning Calorimetry (DSC) used by the researchers to analyse the porcine plasma proteins behavior during heat treatments at different PH values in terms of gelation activities, water holding capacities and the textural properties. The researchers emphasized that controlling PH values are important to improve textural properties of food meat-based products particularly after be incorporated with any plasma derived ingredients.

Rawdkuen, et al., (2004) studied the effects of addition chicken plasma into surimi bigeye snapper *Priacanthus tayenus* functional properties in terms of its gelation activities. To characterize protein patterns in surimi products, SDS- PAGE analysis was utilized. This method capables to determine moisture, fat, ash content water binding capacity and major muscle protein emerged in the surimi samples. The result signifies that Myosin heavy chain (MHC) is the major muscle protein found in the surimi sample which appeared at the MW of 200,000 Da and followed with Actin as the second abundant protein at the MW of 45,000 Da after chicken plasma protein (CPP) included into the samples. Albumin and globulin protein were the types of chicken plasma protein can be detected through formation of two major bands at 61,000 and 23,000 Da were found. Meanwhile, Scanning Electron Microscopy (SEM) was used to determine microstructure of surimi gels that incorporated with CPP and without CPP. The result signifies that addition of CPP forms well-structured and interconnected network strands compared without addition of CPP. Meanwhile, addition of 0.5 % CPP in kamaboko gels lead to the less interconnected of fibrils. Although addition of CPP in surimi samples exhibited proteinase inhibitory on surimi gelling strength, the whiteness of surimi samples becomes decreased. (Hurtado, et al., 2012) also used Scanning electron microscopy (SEM) to identify frankfurters sample that has been adulterated with porcine plasma as alternative to commercialize polyphosphate and caseinate which leads to bad impacts upon consumer's health. Based on the scanning, there are no notable differences were found between frankfurter incorporated with porcine plasma and without plasma in terms of its sponginess as a result the capability of plasma bind both of water and fat in frankfurter products.

In summary, development of modern science technique is crucial to detect the presence of animal plasma in any food products. It helps to build consumer's confidence and prevent the consumer from taking food fraud particularly some of the food producers intentionally use animal plasma as cheap source food ingredients to minimize the cost of production. Moreover, not all the food producers are honestly declared the ingredients incorporated into the food products. This has raised rumors and curiosity among the consumers whether food products are totally free from the doubtful status or otherwise. Due of this concern, modern science techniques are needed to confirm any arising rumors. More analytical techniques need to be invented to detect animal plasma presence because there is a greater potential animal plasma incorporated into food products mainly on meat-based products and dietary supplements. Based on the author's research, there are scarce analytical methods have been developed that specifically detect the presence of animal plasma compared to the detection of non-halal sources such as pork and lard-based derivatives.

4. FATWA DEBATE ON THE HALAL STATUS OF ANIMAL PLASMA AS AN ALTERNATIVE SOURCE OF FOOD ADDITIVES FROM NATIONAL AND INTERNATIONAL FATWA

There are several fatwas issued by National Fatwa Committees (Muzakarah National Fatwa Committees of Malaysian Religious Affairs) related to the categories of blood; spilled out blood and non-spilled out blood that have been transformed into various products such as commercialized oil fishes, natural colorants and its usages in cosmetics fields. In addition, there are fatwas issued by Indonesian Council of Ulama' (*'Majelis Ulama Indonesia'*) highlighted the halal status of blood plasma usage for medication treatment, halal status of cochineal as natural colorant and the halal status of fish blood

Among the related fatwas are;

4.1 The Halal Status of Cochineal Colorant

The Fatwa committee members of National Council for Islamic Religious Affairs Malaysia (Muzakarah National Fatwa Committees of Malaysian Religious Affairs) decided the usage of carmine colorant that derived from (female beetle) or cochineal is permissible for the Muslim consumption. It's safety is in line with Good Manufacturing Practices (GMP). In addition, the committees also consider the opinion from recognized *jumhur ulama'* (majority of Muslim scholars) that unanimously agreed that cochineal is under the category of non-spilled out blood animal; Hence, its blood is pure and can be utilized as Halal food natural colorant. This council was assembled on 4th to 6th of July 2012 (Jabatan Kemajuan Islam Malaysia, 2015). In addition, Mufti from Pahang and Perak also come out with the same fatwa decision (Fatwa Negeri Perak, n.d.) & (Fatwa Negeri Pahang, 2012).

In 10th August 2011, the fatwa committees of Indonesia Council Ulama (Majelis Ulama Indonesia) have assembled and issued the fatwa stated that food colorant derived from cochineal insects are pure and halal for the Muslim consumption because it is categorized as non- spilled out blood. However, the fatwa is subjected to change if there are any new findings found the harmfulness of cochineal colorant to the consumers (Komisi Fatwa Majelis Ulama Indonesia, 2011).

4.2 The Halal Status of Filth Sources Derived from Small Fishes' Stomach

The Fatwa committee members of National Council for Islamic Religious Affairs Malaysia decided that anything derived from small fish's organs including blood or feces are pure as there are no clear evidences from Al- Quran and Hadith discussing this matter specifically.

The fatwa committees also considered the difficulties (masyaqqah) to take out the unclean materials particularly involving thousands tonnes of fishes. Besides that, the manufacturers comply with Good Hygiene Practice (GHP) and Good Manufacturing Practice (GMP). The fatwa committee members are taking consideration from the opinion of jumhur u'lama such as the opinion of Ibn Hajar Athqalani, Al- Ramli, Ziyad and other reliable Muslim scholars. In addition, the opinion from medical expertise also is considered to strengthen the evidences. The decision from the fatwa committees will be changed if necessary. This council was assembled on 10 - 11 February 2015 (Jabatan Kemajuan Islam Malaysia, 2015).

4.3 Seeking Medication from Blood Sources

Pejabat Mufti Wilayah Persekutuan, (2019) noted prohibition to seek medication from filth (khabaith) and unclean materials (najs) such as blood, carcasses and any related pig and its derivatives. This is in line with hadith of the prophet Muhammad;

إِنَّ اللَّهَ أَنْزَلَ الدَّاءَ وَالِدَوَاءَ، وَجَعَلَ لِكُلِّ دَاءٍ دَوَاءً فَتَدَاوُوا وَلَا تَدَاوُوا بِحَرَامٍ

“Indeed, Allah S.W.T revealed diseases and medicines to treat the diseases. Consume the medicine but never consume it with any forbidden sources”.

Narrated by Abu Daud (3870)

Another hadith narrated by Abu Hurayrah:

نَهَى رَسُولُ اللَّهِ صَلَّى اللَّهُ عَلَيْهِ وَسَلَّمَ عَنِ الدَّوَاءِ الْخَبِيثِ

The meaning: Rasulullah S.A.W prohibited seeking medication from khabaith (filth) sources

To support the argument, the mufti also took opinion from Al-Tibi (al-Kasyif 'an Haqaiq al-Sunan, 9/2963) into consideration. It is stated that Allah S.W.T revealed diseases together with medicine either derived from Halal or non- Halal sources. However, the Muslim is prohibited to seek medication from the haram sources even in small quantity. The prohibition to seek medication from prohibited sources is nullified if there are no other halal alternatives which effectively can cure the diseases. This is based on the principles of Islamic legal maxims (Qawaid Fiqhiyyah)

الضَّرُورَاتُ تُبِيحُ الْمَحْظُورَاتِ

Meaning: *Necessity may authorize forbidden acts.*

الضَّرُورَةُ تُقَدَّرُ بِقَدْرِهَا

Meaning: *Necessity must only be assessed and answered proportionately*

In addition Majelis Ulama Indonesia (MUI) issued a fatwa by 10th of October 2018 regarding the permissibility status of blood plasma usage for medication purposes after listening the argument from the team of experts from Faculty of Halal Pharmacy and Science; University of Muhammadiyah (UHAMKA) on Wednesday 24 Sya'ban 1439 H/9 Mei 2018

M. The plasma is naturally consisting of good component protein such as hormone, amino acid and albumin which are good for medication treatment purposes. Therefore, the committee members decided the use of blood plasma is allowed for medication purposes as long as it derived from animal not human beings. They opined that plasma have different characteristics with the blood in terms of its natural characteristics such as color, smell and taste (Fatwa Majelis Ulama Indonesia, 2018).

4.4 The Halal Status of Fish Blood

Regarding for the halal status of fish blood, Majelis Ulama Indonesia (MUI), Indonesian Council of Ulama' highlighted this issue. It is explained that fish blood is categorized as "Daman Masfuuhan" or spilled out blood based on the Quranic verse from Surah Al-An'aam (6:145) that included blood (flowing blood) as one of the prohibited sources. Jumhur u'lama' (majority of Muslim scholars); Imam At-Thabari, Imam an- Nawawi and Ibnul A'rabi came out with argument that blood (flowy blood) are prohibited for the Muslim consumption. The prophet Muhammad P.B.U.H only permitted to consume two categories of carcasses; fish and grasshopper and meanwhile two types of blood; liver and spleen (Narrated by Imam Ahmad and Ibn Majah). Taking these considerations, the fatwa committees came out with decision that fish blood is prohibited for the Muslim consumption particularly the big-sized of fishes as it falls under the category of spilled out blood (Hasanuddin & Sholeh, 2020).

4.5 The Halal Status of Transglutaminase Enzyme derived from Animal Plasma Source

Transglutaminase enzyme powder is generally added into surimi dough to stabilize the shapes, strengthening gels activity and texture of surimi. In other word, this enzyme functions as food conditioner for surimi products (Anuar, 2015). However, the use of transglutaminase enzyme is regarded as critical ingredient as there are possibilities, the sources derived from pig or bovine plasma protein. 26th of National committee fatwa Council ("Muzakarah Jawatankuasa Fatwa Kebangsaan") has assembled on 7th till 8th of March 1990 to discuss the halal status of enzyme formulation. The fatwa members concluded that use of enzymes is permissible if the sources derived from halal sources such as the plants, slaughtered halal animals according to Shariah ways and, non-harmful fungus (Mohd Izhar Ariff, 2017). Therefore, utilization of transglutaminase enzyme from animal plasma sources are totally prohibited since there are other alternative ingredients such as whey protein and white eggs may replace the function of plasma sources. Furthermore, the process of Istihalah on transglutaminase enzyme derived from plasma sources are classified as Istihalah Fasidah although there is mixture between other halal ingredients in preparing surimi doughs because the blood's elements are still present at the end of products (Jamaludin & Wan Mohamed Radzi, 2009).

In summary, the issuance of fatwa from different authorities either from Malaysia Office of Mufti or Majelis Ulama Indonesia (MUI) demonstrates the blood that falls under the category of spilled out blood (Daman masfuhan) is prohibited for the Muslim to consume whether to be included as an alternative ingredient in food products, beautification purposes or for medication purposes. In fact, the plasma component is a part of blood's component which means without plasma, the blood characteristics are not complete. The process of centrifuge to separate plasma from the blood components is only the process of separation from other components that will not change the fact the plasma is a part of the blood's element (Ghanem, 2015). However, its usage is tolerable if there is necessity such as in extreme difficulties (masyaqqah) to obtain the halal sources such as for the medical treatments. In the context of utilization animal plasma as a source of food additive, it seems

there are no necessity to use it particularly there are other halal alternatives can replace its function. Additionally, in terms of maqasid shariah, the use of plasma is not considered as necessity for the Muslim (dharuriyyah) as it functions as tahsiniyyah (complementary) to the taste of food. Eventually, although science and technology have capability to transform the animal plasma onto valued food additives, the shariah principles should be prioritized as scientific research functions as supportive evidence only not to determine the hukm.

5. PROHIBITION OF ANIMAL PLASMA AS A SOURCE OF FOOD ADDITIVE FROM QAWAID FIQHIYYAH (ISLAMIC LEGAL MAXIM) VIEWS

5.1. Overview of Qawaid Fiqhiyyah

Islamic legal maxims or Qawaid Fiqhiyyah plays a vital role to refrain upcoming harmful incidents (Eddine, n.d.). It helps the competent jurists to come out with ijthihad on certain issues which are not widely discuss in Islamic primary sources; Al- Quran and Sunnah of the prophet Muhammad p.b.u.h through achieving the objectives of Shariah (maqasid of Shariah). There are five universal principles remarked the concept of Qawaid Fiqhiyyah that representing intention, certainty, removal of hardship, elimination of harm and custom (Fawzy Shaban Elgariani, 2012).

These five universal legal maxims are:

- Al-umuru bi-maqasidiha (Acts are judged by the intention behind them).
- Al-dararu yuzal (Harm must be eliminated).
- Al-yaqinu la yazulu bil-shakk (Certainty is not overruled by doubt)
- Al-mashaqqatu tajlibu al-taysir (Hardship begets facility)
- Al-a'datu muhakkamah (Custom can be the basis of judgment).

The juristic scholars are strictly opined, the application of Islamic legal maxims must be declined if any juristic scholars come out with Ijthihad clashed with Quran and Sunnah arguments. The bases of maxims must correspond with textual Al- Quran and Sunnah (Muhsin, Amanullah, & Zakariyah, 2019). Hence, Islamic Legal maxims can be used as reliable argument particularly when there are difference opinions between Muslim scholars with regards on particular issues. For example, in the case of the halal status the swine and its derivatives, some of Juristic scholars considered it is permissible for the Muslim consumption if the laboratory test cannot trace any swine's characteristics based on the principles of Istihalah namely in processing the medicine derived from non-halal materials. However, to prevent the application of Istihalah in wider scope, several principles of Islamic legal maxims have been used as argument to block any means of harmfulness (sadd al-dharai') (Azri, Mohammad Mahyuddin et al. 2017). Due of this concern, the authors decided to include several principles of Islamic legal maxim as arguments related to the prohibition of animal plasma as a source of food additives since there are opinions stated the use of animal plasma is permissible due it has different entity with the blood. ("World Halal Food Council (WHFC) Bahas Fatwa Plasma Darah Sebagai Obat," 2018).

5.2 Islamic Legal Maxims Related to Prohibition of Animal Plasma as a Source of Food Additives

Allah s.w.t mentioned about the prohibition of blood of spilled out (flowing) blood in Al-An'aam verse 145; "Say, I do not find within that which was revealed to me [anything]

forbidden to one who would eat it unless it be a dead animal or blood spilled out or the flesh of swine - for indeed, it is impure - or it be [that slaughtered in] disobedience, dedicated to other than Allah . But whoever is forced [by necessity], neither desiring [it] nor transgressing [its limit], then indeed, your Lord is Forgiving and Merciful." (Sahih International Quran, n.d).

From this verse , the recognized Muslims scholars such as Ibn Arabi (Kamil Musa, 1986) , Yusuf Al- Qardhawi (1995), Ahmad Mustafa Al-Maraghi and Muhammad Quraish Shihab (2002) are unanimously agreed that any blood in the category of spilled out blood are considered as najis and prohibited for the Muslim to take benefit from it as a source of food or medication. Imam Al – Baghawi in his tafsir Ma’alim Al-Tanzil specifically stated the word of Dam refers to the blood circulates in animal’s veins (Mufti Wilayah Persekutuan, 2019). To be specific, Hannu (2008) takes opinion from Ibn Qayyim Jawziyyah that strictly opined the hukm of spilled out blood is equal to the hukm on menstrual blood (Dammul Haidh) that falls under najis category. Therefore, animal blood whether derived from halal or non- halal animals, is considered as haram for the Muslim to take benefit from it mainly transforming it into blood-derivatives food products (Amir & Saidi, 2019).

In the context of transforming animal plasma as a source of food additives, the authors opined its usage is prohibited although physically the plasma has been transformed into powder and have been mixed up with other ingredients. Several Contemporary Muslim scholars such as Khalid Abd al-Alim Mutawalli Abd al-Fattah Muhammad Idris, Egyptian Mufti; Nasr Farid Wasil and Yusuf al-Badri strictly opined the plasma is a part of blood’s elements and should refer to its original hukm recognized blood as najis (Mahaiyadin & Osman, 2017). For example, the mixture of transglutaminase enzyme that derived from animal plasma with other halal ingredients to formulate good quality texture of surimi products, are still haram for Muslim consumption (Anuar, 2015). This is in line with principle of Islamic Legal Maxim;

“When halal and haram meet, the haram prevails” (Omar, Arifin, & Deenmohdnapih, 2012).

Allah s.w.t has clearly mentioned about the prohibition of spilled out blood from surah Al-An’aam (145), hence; it becomes the responsibility of Muslim to adhere on His commandment. No matter how sophisticated of science and technology transformed any filth materials for human’s benefit, it is not an excuse for the Muslim simply to make everything is permissible although in terms of physical appearance are different with the original entity. Prophet Muhammad P.B.U.H stated in hadith:

"The halal is that which Allah has made lawful in His Book and the haram is that which He has forbidden, and that concerning which He is silent He has permitted as a favor to you." (Reported by al-Tirmidhi and Ibn Majah.)

Quoted from the book of Lawful and Non- Lawful by Yusuf Al- Qardhawi; *“Nothing is haram except what is prohibited by a sound and explicit nas (Nas denotes either a verse of the Qur’an or a clear, authentic, and explicit sunnah (practice or saying) of Prophet Muhammad. These are the two main sources of Islamic law, i.e., its Shari’ah. (Trans. from the Law-Giver, Allah Subhanahu wa Ta’ala. If the nas is not sound, as for example in the case of a weak hadith, or if it is not explicit in stating the prohibition, the original principle of permissibility applies”.* (Al- Qardhawi, n.d). From his statement, it demonstrates that everything is halal for the human being unless there are sound evidences highlighted its prohibition. If there are

clash arguments between ijthad or scientific discovery, the arguments or evidences from Al-Quran and Sunnah of the prophet Muhammad should be prioritized.

As-Safi, (2012) has quoted hadith by Prophet Muhammad "*Allah has ordained certain duties which you should not miss, and He has forbidden certain things which you should not do, and He has set certain boundaries which you should not trespass, but when He has not mentioned many things, do not look for them*", narrated by A-Bayhaqi and Al-Tibrani.

For the countries are following Shafiites school of thoughts like Malaysia, the process of transformation filth materials with the help of human intervention is not acceptable. (Omar et al., 2012). The human being is intentionally transforming the filth materials by adding other ingredients to ensure the filth materials become other entities at the end of products. In the context of transformation animal plasma into food additives, it is clearly demonstrates the scientist is intentionally transformed animal plasma as an alternative cheap protein to be utilized in many food industries sectors. It is undeniable that the transformation of animal plasma into food additives can minimize the environmental problems, provides long-term alternative cheap protein and alternative source of iron (Jack Appiah Ofori & Hsieh, 2012), but "*good intentions will not Make any Haram things are acceptable*". Yusuf Al-Qardhawi (n.d). explained any haram things will be remaining haram no matter how honorable the purpose or aim to achieve it. Islam will never accepted any principle complies to "the end justifies the means" nor "secure your right even through wrong-doing."

It is different with the process transformation happened naturally in three occasion; wine that turns into vinegar naturally, dead animal skin, except of dogs and pigs, become pure after tanning, and something that turns into a new life such as larvae from carcass (Mohd Izhar Ariff et al., 2018). Based on this argument, it signifies the process of transformation animal plasma as a source of food additives is considered as fasid as it is originally derived from the blood and also involving human intervention. This restriction is crucial in order to avoid the Muslim falls into sinful acts (al-Qardawi, 2001). Furthermore, human beings have no right to halalise the haram things which are clearly stated in the Quran in any possible ways. This complies with of the principle Islamic legal maxim; "*To Make Lawful and to Prohibit Is the Right of Allah Alone*" and "*Falsely Representing the Haram as Halal Is Prohibited*" (Al-Qardhawi, n.d).

In logic perspectives, separation of plasma from the blood's component does not change the fact the plasma is a part of blood's elements. It means without plasma, the blood cannot be called as 'blood'. Ghanem, (2015) is also strictly emphasized the plasma is a part of blood, therefore there are no rooms to consider the plasma is different entity from the blood particularly it comes from one source which is from animal's vein. This is in line with another Islamic legal maxim; "Haram of all imposes haram of the part".

Last but not least before end of the discussion, is there any rooms for consuming animal plasma becomes permissible? Allah s.w.t has stated in Al- Quran "*But if one is compelled by necessity, neither craving (it) nor transgressing, there is no sin on him; indeed, Allah is Forgiving, Merciful.*" (Al- Baqarah: 173). Utilization of any recognized najasah materials are tolerable in facing any extreme hardship situation for the sake of human's survival. Allah s.w.t mentioned in Al- Quran;

"*He has explained to you in detail what is forbidden to you except under compulsion of necessity*" (Al-Quran, 6: 111, Translated by Yusuf Ali).

Majority of the scholar (jumhur u'lama) stressed the use of any medicine incorporated by najis is permissible if there are no other alternative medicines to cure the illnesses. It is stated in Sunan Abu Daud based on the Hadith al-'Urniyyin narrated by Imam Bukhari and Muslim that prophet asked the companion to drink the urine of camel although originally urine is considered as najis according to Shariah perspectives. But due facing extreme hardship or emergency period it is allowed to consume it on limited quantity for the sake life preservation only (Afifi et al., 2014). This hadith narrated by Anas Ibn Malik R.A. This hadith also recorded in Sunan At- Tirmizi;

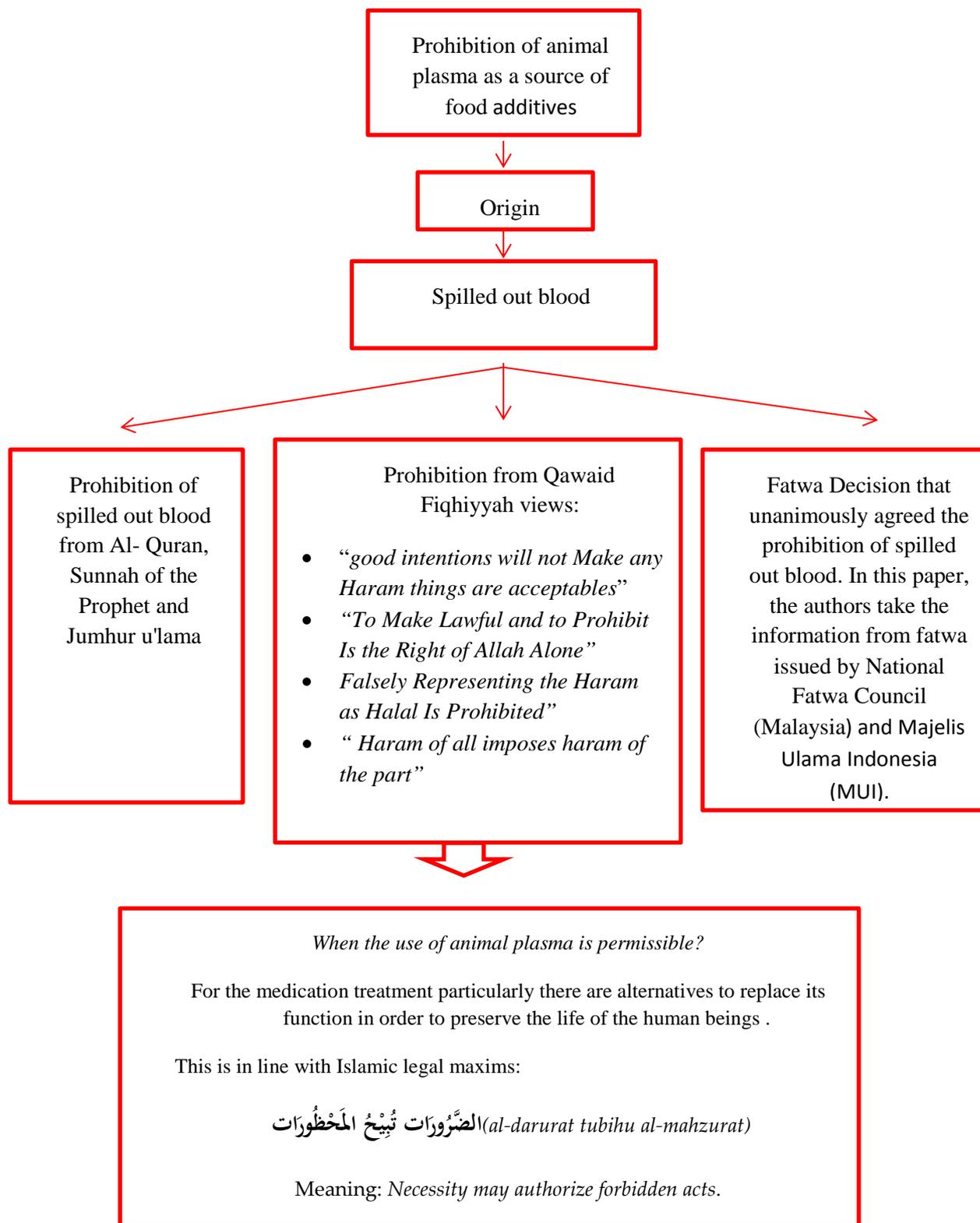
There were some people from 'Urainah who came to Medina; they were exposed to the bad air of Medina. Hence, the prophet Muhammad p.b.u.h sent them a camel (the camel belongs to Prophet through zakat) and the Prophet mentioned: "*Drink the milk and the urine.*"

In this situation, the prophet instructed the Uraniyyin to consume camel's urine as medication treatment due the bad weather in Madinah. Imam Shafii, Abu Hanifah and other majority of Muslim scholars (jumhur u'lama') opined consuming the urine is exclusively permissible in facing extreme hardship (Pejabat Mufti Wilayah Persekutuan, 2019). Considering the opinion cited from Imam Izzuddin bin Abd Salam Rahimahullah in his work Qawaidul Ahkam; In Islam, it is permissible to accept medication treatment from filth materials (najis) for the sake of life survival. In addition, cited also the opinion from Syekh Ibn A'bidin in his book Hasyiah, it is permissible to consume najis or filth materials such as urine, blood or carcasses for the sake of medication if there are no alternatives to replace its function (Pejabat Mufti Wilayah Persekutuan, 2016).

In the context of animal plasma as a source of food additives demonstrates there are no necessities urged of its utilization. Moreover, its usage cannot be categorized as dharuriyyah which means the human being can still survive without use it as a source of food additives. But, if there are difficulties urged the Muslim to consume plasma derivatives such as for medication treatment, the hukm changed into permissible based on Islamic legal maxims; al-darurat tubihu al-mahzurat and al-darurah tuqaddaru bi qadariha (Mahaiyadin & Osman, 2017). In addition, the prophet Muhammad has clearly stated in hadith narrated by Imam Ahmad and Ibn Majah; it is permissible to consume two types of carcasses; fishes and grasshopper and two types of blood; spleen and liver only. It signifies other types of blood excluding non- spilled out blood type, are prohibited for the Muslim consumption (Hasanuddin & Sholeh, 2020). In addition, ulama' also mention another type of forgiven najis (ma'fu a'nhu) is the blood is naturally attached into the meat vein and has difficulty to take it out. In this situation, it is permissible for the Muslim to consume it according to the opinion from Imam Nawawi and Imam Al- Subki (Persekutuan, 2019).

In summary, after went through the sources the authors opined the usage of animal plasma is prohibited for the Muslim consumption since it is originally derived from spilled out blood and its usage is not considered as necessity. In fact, the plasma component is a part of blood's component to complement the characteristics of blood.

The prohibition of animal plasma is summarized in the diagram below:
am below:



6. CONCLUSION AND FUTURE RECOMMENDATION

As a conclusion, the use of animal plasma as a source of food additives is prohibited as a result there are no necessities for the Muslim to consume it. In fact, the plasma is a part of blood's component that mostly collected from pig and cow slaughterhouses. Although science and technology is capable to transform the plasma into alternative food additives, the hukm of Shariah should not be put aside and must be prioritized. The result from scientific detection functions as partial evidence to strengthen the research finding not to decide the Shariah rulings. Therefore, the Muslim consumers should be careful in selecting any food products particularly the products are potentially incorporated by plasma derivatives such as surimi products, cakes and health supplements.

To safe, it is recommended for the consumers check and selecting the food products stamped by halal logo to avoid doubtfulness in terms of the halal status. The Muslim consumers also should keep following with any current updates from recognized halal certification bodies to avoid being victim of consuming food fraud that probably adulterated with non-halal sources. For future research in the context of utilization animal plasma, the authors recommend for researchers come out more arguments from classical works of mu'tabar (reliable) u'lama regards to 'hukm of blood from Shariah perspectives' in deep discussion to establish concrete arguments.. Besides that, the authors recommend also to conduct research determining halal status of animal feeds that incorporated by animal plasma derivatives as its usage is getting popular among animal feed producers and lastly, the scope of research also can be widened into comparative religious studies in order to determine other religious practitioners perspectives regards to utilization animal plasma as a source of food additives such as from Kashrut dietary laws, Hinduism, Christianity and etc. to make the research scope more interesting in future.

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CONFLICTS OF INTEREST

The author declares no conflict of interest.

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