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[HALAL HAZARD IDENTIFICATION: DETERMINATION OF HALAL HAZARD USING PRELIMINARY HALAL HAZARD ANALYSIS]

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Abstract

In risk management, the identification of halal hazard is very important to ensure all products or services comply to the standards set by the Islamic Sharia law. Preliminary Hazard Analysis is a systematic tool in risk management that identifies hazards in a system or production line. The halal hazard is defined as a source, situation, or act with potential harm or contamination. Harm refers to all elements that cause a product and service to be noncompliant with halal standards. On the other hand, contamination refers to something that causes impurity or unsuitability through the contact or mixture with something unclean or najs according to shariah. The Halal Hazard Identification classifies and lists data by gathering information from the JAKIM Manual Procedure for Malaysia Halal Certification (Third Revision) 2014, Jakim Manual Production Procedure for Slaughter Qualification 2014, and legal opinions concerning Islamic law (fatwa) issued by the National and State Fatwa Councils. There are six classifications of hazards: i) involving pig, boar and dog; ii) Shariah-noncompliance of slaughtering; iii) intoxication from wine, liquor or related drinks; iv) any source related to liquid or object coming from human or animal orifice; v) animals categorized as filthy, that inhabit both water and land; and vi) animals that hunt using fangs, nails, poison, and by snatching. This study has identified 63 halal hazards. The effects of haram contamination are discussed using the halal product fault tree.

Keywords: *Halal Hazard, halal risk, najs, halal product fault tree, halal contamination*

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INTRODUCTION

Islam is a comprehensive (*syumul*) religion in all aspects needed by the people. In other words, Islam has determined the principle of laws and regulations in all matters that affect human actions and lives. The principle of halal and *haram* is a decree determined by Allah SWT to all

Muslims. This principle was introduced to provide convenience and essentials that benefit the ummah in facing various issues in their daily lives. The Muslims are required to seek halal in all aspects of their lives, that is to leave *haram* and syubhah matters – as the Sharia law obligates. Seeking halal is obligatory for all Muslims as Prophet Muhammad (PBUH) mentions "*Finding what is halal is an obligation on every Muslim*"(Al-Baihaqi)

In the use of products, Muslims are required to use halal products only, covering pharmaceuticals, cosmetics, chemical substances, health care, logistics, services, livestock, foods, and beverages. According to the Trade Description (Certification and Marking of Halal) Order, the halal product status must be certified by the Department of Islamic Development Malaysia (JAKIM). JAKIM and the State Islamic Religious Council are both in charge of carrying out halal auditing and monitoring to companies with halal certification. In 2019, JAKIM reported that more than 60% of companies and manufacturers of halal-certified products were multinational companies owned by non-Muslims (Insight 2019). Therefore, to ensure that the products are halal, the companies need to appoint Halal Executive as a part of the halal certification requirement. The Halal Executive must be a Muslim, has Islamic education background, and is well-versed in halal procedures. The halal executive is responsible for the company's halal compliance. To monitor and comply to the halal standards, Halal Hazard Identification is a critical operation task that determines halal critical points in the production process. In the present work, the halal hazard identification does its investigation using the Halal Certification Procedure, Manual Production Procedure for Slaughter Qualification, and legal opinions concerning Islamic law (*fatwa*). This document is called the primary documents to determine the hazard (Rausand and Haugen 2020). The Halal Hazard Identification can also be used to evaluate halal risk in the production line.

LITERATURE REVIEW

According to the Halal Development Cooperation (HDC 2020), the global halal market in Malaysia reached USD 68.4 billion in 2018. The value of the global halal market is expected to increase to 113.2 billion by 2030. The sectors that contribute significantly to this industry are food and beverages, with the value market of USD 51.9 billion in 2018, and is expected to increase to USD 85.2 billion by 2030. Cosmetics and personal care are the second sectors that contribute to the global halal market with USD 7.0 billion in 2018 and is expected to increase to 10.5 billion in 2030. Meanwhile, pharmaceuticals contributed USD 3.4 billion in 2018 and it is expected to increase to USD 5.9 billion by 2030. Industries such as shariah-compliant fashion, medical devices, and medical hospitality industry contributed to USD 6.2 billion in 2018, and are also expected to increase to USD 11.7 billion by 2030. The encouraging development of halal industry requires a precise and prudent certification and validation system to coordinate the interests of consumers and the industry according to Islamic Shariah law.

In Malaysia, the provisions of the legislations, policies, and standards outlined in the halal certification are based on the principles and concepts of halal found in the Holy Qur'an, Sunnah, and the views of competent (*muktabar*) Islamic scholars (Buang and Mahmod 2019). A product needs to be halal and toyyibban (having the right intentions). A product is considered halal if the source is halal, no *najs* (ritually unclean), and not doubtful or suspected (Anuwar, Tamkin et al. 2017). Toyyibban element on the other hand, emphasizes hygiene, food nutrition,

halal management and halal monitoring (Hassim and Hamid 2019).

OBJECTIVE AND SCOPE

The objectives of this paper are:

i) to classify halal hazards according to Shafi'i *madhhab* (school of thought);
ii) to identify halal hazards using the primary data source.

The primary data source is the data that the Halal Executive and Halal Auditor needs to refer to determine halal risk. In this case, the primary data are Halal Certification Procedure, Manual Production Procedure for Slaughter Qualification, and legal opinions concerning Islamic law (*fatwa*). Due to the broad scope of halal, the hazard identification only involves halal elements and not hygienic and nutritional values of foods (*toyyibban* element).

SIGNIFICANT OF HALAL IDENTIFICATION

The purposes of halal hazard identification are:

i) to identify all hazards during the operational and manufacturing process;
ii) to describe the characters and forms of halal hazard;
iii) to investigate when and where the hazards in the processes and services are existing;
iv) to determine the possible trigger event by which halal contamination can occur;
v) to make manufacturers and service providers become aware of halal hazards and potential contamination events.

METHODOLOGY

The halal hazards were identified using preliminary hazard analysis in the products and services. At first, the halal hazard was defined. the possible halal hazards were listed by gathering information from JAKIM Manual Procedure for Malaysia Halal Certification (Third Revision) 2014, Jakim Manual Production Procedure for Slaughter Qualification, and legal opinions concerning Islamic law (*fatwa*) issued by the National and State Fatwa Councils. All hazard data were retrieved from the National Fatwa Council and State Islamic Religious Department's websites. The *fatwa* and JAKIM Manuals were the primary data sources used to determine the halal hazard in any of the production lines, manufacturing processes and services systems. Then, the halal hazard was classified into 6 classifications of halal hazards according to al-Khinn, Bugha et al. (2010). Finally, the halal hazard was clearly identified according to the halal hazard definition. Figure 1 shows the halal hazard identification process using the preliminary hazard analysis.

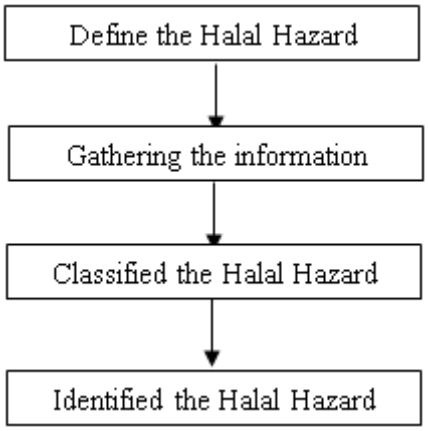

Figure 1: Preliminary Hazard Analysis

DEFINATION

Halal – Halal is a product or service that is lawful and permitted in Islam based on Shariah law and fatwa. In Malaysia, all products and services need to be endorsed by authorities such as JAKIM.

Halal Compliance – Any requirement to fulfill halal procedure or process is called halal compliance.

Halal Hazard – According to Malaysia Standard (2011), the hazard can define as a source, situation, or act with a potential for harm. In this work, the halal hazard can be defined as a source, situation, or act with a potential for harm or contaminate. Harm is referring to all elements that cause a product and service are not halal compliance. Contaminate referring something to make impure or unsuitable by contact or mixture with something unclean or *najs* according to shariah.

Halal Risk – A threat of halal in products and services. Halal risk is the combination of the likelihood of an occurrence of a potential of halal hazard and the severity of damage or contamination to the products or services (Khan, Haleem et al. 2020). Halal Risk is important to be assessed. This ensures the products and services given to customer contain nothing forbidden and *syubhah*.

Halal Critical point – A stage or step that controls the contamination so that the contamination agent can be removed according to Shariah (Kamaruddin, Iberahim et al. 2012)

Haram – A product or service that is unlawful and forbidden in Islam based on Shariah law and fatwa. A person will be punished if he does something *haram* and will be rewarded if he abstains from it.

Istihalah – A transformation or change. According to Shariah, istihalah can be defined as something unclean that changes by itself or through any process to become something clean (Kashim, Alias et al. 2018).

Jallalah animal – Edible animals such as camel, cow, goat, goose, and fish that consume filth or *najs* (Muflih, Ahmad et al. 2017).

Najs – Something impure and contaminated according to Shariah.

RESULT AND DISCUSSION (HALAL HAZARD AND CLASSIFICATION OF HALAL HAZARD)

In the risk management, the halal hazards and threats should be identified clearly which are listed in table 1. In Malaysia, the halal standards are set based on Shafi'i madhhab. In order to facilitate the halal hazards, the classification of halal hazard must be done. As stated by al-Khinn, Bugha et al. (2010), the halal hazards that are classified as *najs* include: Type 1) pigs, boars, and dogs including their limbs, blood, fat, skin, hair, internal organs and others related to them; Type 2) Shariah noncompliance of slaughtering; type 3) wine or any drinks that intoxicate; type 4) any source that is related to liquid or object coming out from human or animal orifice; Type 5) animals categorized as filthy (*al-khabaith*) by Shafi'i madhhab, that live in both water and land; and Type 6) animals that hunt using nails, fangs, poison, and snatching.

Classification Hazard Type 1 involves pigs and dogs. There are 23 Halal Hazards that were found in halal hazard type 1 using preliminary hazard analysis. It is clearly stated in the Holy Quran in Al-Maidah verse 3:

"*Prohibited to you are dead animals, blood, the flesh of swine, and that which has been dedicated to other than Allah"*

The halal hazard based on chemical material is Porcine Follicle-Stimulating Hormone (FSH-P). The FSH-P is a chemical halal hazard that is used for livestock. This hormone increases ovulation time that allows the livestock to reproduce quickly (Baril and Vallet 1990). However, the production of this hormone is synthesized from the porcine element which is forbidden by Islamic law. From the fatwa and the Holy Quran, all hormones synthesized from porcine for the livestock are halal hazard. Livestock that use porcine based hormones produce meat, milk, and offsprings, which become halal hazard. Therefore, the veterinary department and the farmers need to confirm that the breeding stimulating hormones are not derived from porcine.

The Fatwa Committee of the Islamic National Council in 1999 stated that any product, food, and beverage using high technology process porcine DNA is forbidden. DNA is a chain of Deoxi-Ribonucleotide Acid, which is called nucleotides - A, G, C, and T. A is Adenine, G is Guanine, C is Cytosine and T is Thymine. The combination of A, G, C, and T makes up the DNA chain. This chain or genetic information will be copied and subsequently translated into Protein. In the process of DNA biotechnology, if the pig protein substances are in the host or passenger cell of any element in humans, animals, or plants for reproduction and fertility, they are hazardous. Biotechnology is a very broad and complicated area in science technology. Biotechnology integrates biochemistry, chemical engineering, microbiology, and genetic engineering to enhance products. Biotechnology in food production involves the use of micro-organisms, proteins, enzymes, high technology food processing, animals, and plant genetic modification (GM) (Martínez, García et al. 2019). Therefore, the Halal executive, halal auditor, and halal internal community must wisely identify the source of the halal hazard process in the production line. An example of halal hazard includes the fermentation process through the action of porcine enzymes and bacteria cultured from pig media (Chen, Chen et al. 2005). The use of porcine DNA in biotechnology is still avoidable. In food production and manufacturing, the cross-contamination should be avoided. Porcine DNA contamination might occur when there is a direct contact between the halal and non-halal products like pork meat. Therefore,

direct contact between the pork and halal products happen; and the pork stored in the same location with halal meat becomes halal hazard as well.

Islam encourages its people to maintain good health and try to cure a disease. However, in the medical world, there are modern medicines in use today, developed from non-halal sources. In the pharmaceutical industry, all gelatins contain porcine ingredient, and hence they become halal hazard. Clexane and farxiparine are another chemical halal hazard in the pharmaceutical industry. Clexane is obtained from alkaline depolymerization of heparin benzyl ester derived directly from the porcine intestinal mucosa (Sadat-Ali and Al-Turki 2013). while farxiparine is obtained from the depolymerization of porcine mucosal sodium heparin (Sache, Maillard et al. 1982). Clexane and fraxiparine are used in medicine to immediately prevent the occurrence of blood clots for chronic patients. The use of these drugs is prohibited because they contain porcine ingredients, since another alternative drug that has the same effect exist. The use of highly purified insulin from pig is also a halal hazard. The use of insulin is widely practiced in treating diabetes. However, the use of this insulin is permissible (*harus*) for survival (*darurah*).

All body parts in pig and boar are also forbidden. Therefore, brushes made from boar fur are the halal hazard. Hence, any food manufacturing industry that use boar brushes for cooking utensils such as biscuits, cakes, desserts, pastries, or donuts are possible to be contaminated. The combination of nylon or silicon with boar bristles to make a pastry brush can cause halal contamination. Cosmetics and personal care products, including the accessories, do not contain najs. Therefore, their accessories for hair, face, or skin brush must be free from the use of boar brush. However, the use of pig hair causes the hair to be shinier and softer to style (Parkinson and Aguirre 2011).

In the production of ceramics and glasses, raw materials are crucial for ceramic and glass processing. Suitable chemical compositions are needed for powder forming, melt processing, and chemical processing. Furthermore, costing material must also be taken into consideration during the ceramic and glass processing - to optimize the cost of production. Based on Shafi'i madhhab, the raw material of pig bone ash in ceramic production process is also halal hazard. According to the Fatwa Councils of Johor, Sabah, and Negeri Sembilan, the pig bone ash is still categorized as najs. Its physical or chemical changes (*istihalah*) are still Shariah non-compliance. Therefore, the use of plates, dishes, bowls, cups, spoons, teapots, and vases made from pig bone ash in food services and hospitality is halal hazard. The use of halal animal bones including the ash bone can only be used under the condition of being them being slaughtered according to Shariah. Any animal bones that carry doubtfulness or suspicion are also considered as najs, and they are halal hazard. Sand mixture with pig manure is also halal hazard. The usage of this mixture in construction, ceramic, or glass production is halal hazard. Biogas is a gas mixture produced from organic material by micro-organisms using the anaerobic treatment. The organic material for digester system (slurry) can be animal manure, sugar cane, fuelwood, municipal waste, timber mill residue and grain crop (Shin, Im et al. 2019). The biogas yield contains 45-70% methane, 30-55% carbon-dioxide, nitrogen, hydrogen, hydrogen-sulphide, ammonia and other residue-gases (Gyulai, Kovacs et al. 2012). According to the National Fatwa Council 1981, biogas produced from pig manure for the purpose of cooking fire is halal hazard. However, its usage for other purposes is allowed.

In the food industry, any surface-active agent (emulsion) is widely used in food

production and manufacturing. The three main types of emulsions include oil-in-water (o/w) emulsions, water-in-oil (w/o) emulsion, and water-in-oil-in-water (w/o/w) (Kralova and Sjöblom 2009). The emulsion used in food production and manufacturing should be free from pork element. Livestock fish kept in ponds such as catfish must be free of feces. Livestock fish that are fed with pork or carcass is halal hazard. In fact, their ponds' drainage system also must be free from pig manure.

Classification Hazard Type 2 is the Shariah noncompliance of slaughtering. According to Jakim (2014), the requirements of the slaughterer include being a Muslim, scribe, right-minded, not in haj, and intention for the sake of Allah. The requirements for the slaughtering process include using sharp tools, cutting the respiratory track, oesophagus, both carotid and jugular veins, once slaughtered, and intention for the sake of Allah. Therefore, the main halal hazards include hazards number 24 – 27 in the slaughtering process, because of the noncompliance of the slaughterer and slaughtering process.

Stunning using Penetrative Captive Bolt and Non-Penetrative Captive Bolt (Mushroom Head Gun) are not allowed according to the Fatwa Committee of the National Council in 2005. Hence, the stunning procedures using these two methods are halal hazard. The Electrical Stunning procedure is allowed under a specific condition. Any procedural noncompliance is plausible to create halal hazard. The halal hazard associated with stunning procedure is the stunning method using Penetrative Captive Bolt, Stunning method using Non-Penetrative Captive Bolt (Mushroom Head Gun), Electric Stunning not performed at the head, the electric control current exceeds 0.75 *amperes* for goats, the electric control current exceeds 2.0 *amperes* for cows, the duration of the electric flow exceeds 6 seconds, the stunning process is performed or monitored by non-muslim, the electric current is too high and kills the poultry, and the sedative dose is too high until it kills the animal. All these halal hazards (hazards number 28-37) can be eliminated by using a proper standard operation procedure prepared by the Islamic Religious Department or JAKIM.

Classification Hazard Type 3 includes wine, liquor or any drinks that intoxicate. Normal intoxicating drinks contain several percent of alcohol which is made from the process of fermenting fruits such as grapes, dates, apples, and so on. According to Food Regulation 1985, alcohol by volume permissible for wine is between 7% - 15%. Anything intoxicating is illegal according to the Islamic law. The ban on alcohol and intoxicating beverages is based on the Holy Quran in Al Maidah verses 90. "*O you who have believed, indeed, intoxicants, gambling, [sacrificing on] stone alters [to other than Allah], and divining arrows are but defilement from the work of Satan*"

Not all alcohol is wine or liquor. According to the Fatwa Committee of the Islamic National Council on 14 – 16 July 2019, any alcohol made and intended to become wine, beer or liquor is najs. All these alcohols are halal hazard. Alcohol synthesized other than the aforementioned can be used if it is not toxic and not harmful. Beverage containing alcohol with less than 1% volume per volume (v/v) can be drunk with the condition that the alcohol is not made from wine, beer, or liquor. Even though the beverage does not contain alcohol, the beverage becomes halal hazard if the process used wine, beer, or liquor. A product using alcohol-based coloring or flavoring agent must not be intoxicating, and percentage of v/v must be less than 0.5%.

Alcohol produced as by-product in food processing can be consumed, and it not *najs*. Wine vinegar can be used if the chemical process occurrs naturally by itself. The wine vinegar becomes halal hazard when processed and mixed with external ingredients. Tartaric acid is an organic acid that occurs naturally in fruits like banana, grape, apple, citrus, and many more. Tartaric acid can be used if it forms naturally (*istihalah*) and not processed using wine, beer, or liquor. Tartaric acid is halal hazard if the process comes from wine-less. Wagyu is a well-known beef in Japan, it has unique meat texture and tastes delicious. However, Wagyu that is processed with liquor is forbidden and falls under *jallalah* animal.

Classification Hazard Type 4 is any source that is related to liquid or object coming out from human or animal orifice. Alcohol produced as by-product in food processing can be consumed and it is not considered as *najs*. Wine vinegar can be used if the chemical process occurs naturally by itself. The Fatwa Committee of the Federal Territory in 2007 stated that fish kept in livestock ponds fed with *najs* such as pork or carcass is halal hazard. The water flow system also needs to always be clean.

Palm civet coffee (*Kopi Luwak*) involves a unique process in making coffee. Coffee cherries are eaten and digested by the indigenous palm civet (*Paradoxurus hermaphroditus*) (Marcone 2004). Then, the final product of coffee beans is excreted in their feces. The coffee beans can be mixed with water and drunk, but they must be washed cleanly, not perforated, and not broken. This process must be adhered to ensure zero *najs* presence in the drink. In the yogurt production process, the culture bacteria as catalyst must be isolated and sub-cultured to avoid halal contamination in the product.

Classification Hazard Type 5 is animals categorized as filthy (*al-khabaith*) by the Shafi'i madhhab, which live in both water and land. The animals include lizard, leech, worm, and snail (*Achatina fulica*). The use of leeches and worms in medicine and cosmetic ingerdients is permissible. In Sabah and Sarawak (East Malaysia), eating sago grub (sago worm) or the larva stage of Sago Palm Weevil (*Rhyncophorus ferrigineus*) is forbidden for Muslims, and it is halal hazard. Tokay lizard (*Gekko geckko*) is also an animal that is illegal to eat because it is poisonous and belongs under the category of filthy (*al-khabaith*) animal.

Classification Hazard Type 6 is animals using fangs, nails, poison, and snatching for hunting. According to the Shafi'i madhhab, this classification includes wild animals like bear, lion, leopard, tiger, wolf, cat, monkey, and cheetah that hunt using fangs. Birds like eagle, crow, owl, and vulture use nails and snatching during hunting. Animals such as snake and spider that hunt using poison are also prohibited.

Table 1: List of Halal Hazard

Hazard Number	Classification of Halal Hazard	Halal Hazard	Source
1	Type 1	Porcine Follicle- Stimulating Hormone	National (1995) and Pahang (1996)
2		Livestock using hormones Porcine Follicle- Stimulating Hormone	
3		Meat from livestock that is given Porcine Follicle-Stimulating Hormone	
4		Milk from livestock that is given Porcine Follicle- Stimulating Hormone	
5		Livestock offspring using Porcine Follicle-Stimulating Hormone	

Hazard Number	Classification of Halal Hazard	Halal Hazard	Source
6		Meat from livestock offspring that uses Porcine Follicle-Stimulating Hormone	
7		Milk from livestock offspring that uses Porcine Follicle-Stimulating Hormone	
8		Bacteria cultured from pig media	(National 1999)
9		Fermentation process that involves procine enzyme reaction	
10		Direct contact between pork and halal product	Penang (2014)
11		Halal and non-halal meat (e.g. pork) are stored in the same location without lid	
12		Gelatin with pig ingredient/element	National (1984)
13		Clexane	National (2009) and Johor (2010)
14		Fraxiparine	
15		Porcine highly purified insulin	National (1983)
16		Boar bristle/fur used as brush	National (1985)
17		China Bone Ceramic	National (2012), Sabah (2015), Selangor (2009), Negeri Sembilan (2012) and Johor (2010)
18		Ceramic containing pig bone ash	
19		Sand mixed with pig manure	Selangor (2006)
20		Bio-gas produced from pig manure	National (1981)
21		Active agent using pig element	National (1990)
22		Livestock fish fed with pork	Territories (2007) and Selangor (2007)
23		Drainage system contaminated with pig manure	
24	Type 2	The slaughterer is not a Muslim or a scribe	Jakim (2014)
25		Slaughtering not performed for the sake of Allah	
26		One of the veins is not severed	
27		Using pistol or rifle during slaughtering	
28		Stunning method using Penetrative Captive Bolt	National (2005)
29		Stunning method using Non-Penetrative Captive Bolt (Mushroom Head Gun)	
30		Electric Stunning not performed at the head	
31		Electric control current exceeds 0.75 *amperes* for a goat	
32		Electric control current exceeds 2.0 *amperes* for a cow	
33		Duration of the electric flow exceeds 6 seconds	
34		Stunning process performed by a non-muslim	
35		Electric current is too high and kills the poultry	
36		Sedative dose is too high and kills the animal	
37		Gelatin containing cow/bovine ingredient that underwent Shariah	National (1984)

Hazard Number	Classification of Halal Hazard	Halal Hazard	Source
		noncompliance slaughter	
38		Deer antler removed while it is still alive	Pahang (2013)
39		Using deer antler that underwent Shariah noncompliance slaughter	
40		Ceramic containing halal animal bone ash that underwent Shariah noncompliance slaughter	Sabah (2015), Selangor (2009), Negeri Sembilan (2012) and Johor (2010)
41		Animal bones with halal suspicion/doubtfulness	Pahang (2008)
42		Active agent using halal animal ingredient that underwent Shariah noncompliance slaughter	National (1990)
43	Type 3	Alcohol made and intended to become wine, beer, or liquor	National (2011)
44		Beverage containing alcohol with more than 1% volume per volume (v/v)	
45		Beverage containing alcohol made from wine, beer, or liquor with less than 1% volume per volume (v/v)	
46		Beverage did not contain an alcohol but process from wine, beer, or liquor	
47		Flavouring agent extracted from wine, beer, or liquor	
48		Colouring extracted from wine, beer, or liquor	
49		Medicine containing alcohol made from wine, beer, or liquor as the solvent	
50		Wine vinegar processed and mixed with external ingredients	National (2006) and (Selangor 2006)
51		Tartaric acid from wine-lees process	Penang (2017) and Sabah (2017)
52		Cow/cattle fed with wine, beer, or liquor	Johor (2013)
53	Type 4	Fish livestock fed with carcass	Territories (2007) and Selangor (2007)
54		Unwashed coffee beans	Pahang (2012), National (2012) and Selangor (2013)
55		Perforated coffee beans	
56		Broken/defective coffee beans	
57		Unperformed bacterial isolation	National (2014)
58		Presence of human placenta in the product	Territories (2019)
59	Type 5	Worm flash/use in food manufacturing	National (2008), Territories (2008) and Pahang (2008)
60		Leech flash/use in food manufacuring	
61		Sago worm	Sarawak (2012)
62		Gekko gecko	Sarawak (2012)
63	Type 6	Animals that hunt using nails, fangs, poison, and snatching	al-Khinn, Bugha et al. (2010)

Halal Product Fault Tree Analysis – The mixing of both *halal* and *haram* in products or services will produce *haram* products (Qaradawi 2019). A simple example is mutton curry that is mixed with a very small piece of pork. Yet, the result is the curry being *haram*. In risk analysis, this explanation can be explained using fault tree analysis as shown in Figure 2. The combination of halal hazard and input product or source can be represented by '*Or Gate*'(Rausand and Haugen 2020). If the halal hazard is given by *A* and the input product or source is given by *B*, the output product, *C* can be represented by this equation:

$$A + B = C$$

From this equation, any one of the halal hazards identified in Table 1 will cause the output of the product to become *haram*. The halal product fault tree is a different concept as reported by Jamaludin and Radzi (2009). They used *istihalah* concept in the determination of *haram* source in production. The fault tree needs to be identified and treated as halal hazard to ensure that the halal product is free from *haram* contamination. As mentioned earlier, halal hazard includes source, situation, or act with a potential harm or contamination. In risk control measure, for hazards involving non-halal sources or *najs*, the source of the halal hazard needs to be eliminated. The examples of halal hazard sources are the hazards classified in types 1, 3, 5, and 6. The situation or act of the halal hazards (hazards classified in types 2 and 4) needs to be controlled to ensure that the outputs of the products are free from contamination. The standard operation procedure set by JAKIM must be obeyed.

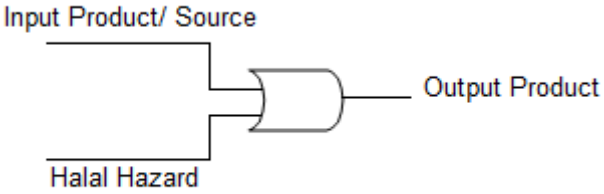

Figure 2: Halal Product Fault Tree

CONCLUSION

In this paper, 63 halal hazards were identified using the Preliminary Hazard Analysis. The data were retrieved from the *fatwa* issued by the Fatwa Committee of the Islamic National Council and the State Islamic council. The halal hazards were classified into six classifications of hazards. The most halal hazards found in the *fatwa* are related to pigs and boars. Twenty-three halal hazards were found in this classification of hazards. It is followed by the Shariah noncompliance of slaughtering (19 halal hazards); wine, liquor or any drinks that intoxicate (10 halal hazards); any source that is related to liquid or object coming out from human or animal orifice (6 hazards); animals categorized as filthy (*al-khabaith*) (4 halal hazards), and animals that hunt using fangs, nails, poison, and snatching (1 halal hazard). The halal hazards have the potential to contaminate products or services with *najs.*

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