

## HAZARDS IN POULTRY FEED PRODUCTION: AN APPRAISAL FROM THE HALAL PERSPECTIVE

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### Abstract

*Animal feed is any processed, semi-processed of raw materials or compound which are fed to animals. Poultry feed are food for farm poultry, including chickens, ducks, geese and other domestic birds (*Gallus domesticus*), whether it is in mash, crumbles or pellets form. Feed supply is central to all animal production systems and any factor that affects the security of the feed supply is a significant constraint to production. In Malaysia, most of the poultry feed comprises of 95% of the sources that are imported and only 5% are obtained locally. In this situation, feed producers are responsible to communicate with crop producers and at the same time connected with primary food producers involved, such as poultry breeders. These phenomena are crucial in maintaining the halal integrity along the supply chain. To produce halal food materials, it is important to make sure that the feed fed to edible animals are Halālan ṭoyyiban. This paper reviews the hazards presence in poultry feed and its production which include biohazards, chemical hazards and physical hazards. In so doing, it employs library research methodology by reviewing the relevant literatures and analysed using content analysis method. Further to that, it also appraises the presence of the respective hazards from the halal perspective. From the halal point of view, the sources of human food shall not only be halal, but shall also be safe for human consumption, non-poisonous and non-hazardous to human health. In the context of poultry feed, the usage of antibiotics, GMOs with hazardous issue or potential toxicity or allergenicity, toxin contamination and presence of physical contaminants in poultry feed, if not properly controlled and regulated seriously, adverse effects might take place in human and this is indeed not in line with the goal of the Shariah to safeguard the interests of human and the universe, to protect life and lineage, and to bring benefits and repelling harms. Nevertheless, considering that contaminants are present everywhere, and that total elimination is almost impossible, taking proactive actions to reduce their presence to the minimum level possible is in compliance with the spirit of Maqasid Shariah. This could be done by putting in place a comprehensive legislation for the control of several of these chemical compounds, pathogens and physical contaminants in poultry feed, or by implementing feed safety management system such as HACCP in feed*

*plants. In addition, to protect the interest of the Muslim consumers particularly in Malaysia, it is also recommended that a Halal standard for Poultry Feed Production should be developed.*

**Keywords:** Hazards, Poultry, Feed, Halal

## 1. INTRODUCTION

The Malaysian livestock industry is significantly important in providing local animal protein sources for daily diet of the population (Collignon, Wegener, Braam, & Butler, 2005; DuPont & Steele, 1987; Ruqayyah et al., 2014). Livestock industry in Malaysia is categorised into two main subsectors depending on the types of livestock reared, either ruminant or non-ruminant. Ruminant livestock includes cattle and goats or sheep whereby non-ruminant livestock includes pig and poultry (United Nations Economics and Social Commission for Asia and the Pacific ESCAP, 2014). In Malaysia, the livestock produce such as beef, mutton, milk and poultry meat and eggs escalated each year. In 2014 to 2015, the value of Malaysia livestock products for beef, mutton, milk and poultry meat and eggs increased from MYR14,351 million to MYR15,769 million.

Animal feed is any processed, semi-processed or raw materials or compound which are given to be fed to animals (Animal Feed Act, 2009). Meanwhile, Codex Alimentarius Commission Code of Practice on Good Animal Feeding in 2004 underlines that feed is animal feedstuffs, ingredients, additives and supplements given to the animals, whereby in Malaysia, the Department of Standards Malaysia has underlined certain definitions for animal feedstuffs which also applies for poultry feed industry. Animal feed in this circumstance is defined as any single or multiple materials whether processed, semi-processed or raw, which is intended to be fed directly to food-producing animals (Department of Standards Malaysia, 2005). Food-producing animals in the stated description are defined as raised animals intended for human consumption. The production of animal feed involves cropping, livestock production and processing, storage and retailing (Zhang et al., 2007).

Poultry feed under the Malaysian Standard MS20:2008 – Poultry Feeds-Specification (Fourth revision) prescribes specifications for chicken (*Gallus domesticus*) feeds, whether it is in mash, crumbles or pellets form

(Department of Standards Malaysia, 2008a). In this standard, poultry feed is divided into different materials; (a) Poultry starter feed; (b) Poultry grower feed; (c) Poultry layer feed; (d) Poultry breeder feed; (e) Poultry layer breeder feed; (f) Male broiler breeder feed; (g) Broiler starter feed; (h) Broiler grower feed; (i) Broiler finisher feed; and (j) Broiler withdrawal feed. Global major ingredients for poultry feed include maize or also known as grain maize or corn. The second sources for poultry feed are soybean meal, rice bran and fishmeal (United Nations Economics and Social Commission for Asia and the Pacific ESCAP, 2014).

In Malaysia, most of the poultry feed which comprises 95% of the sources are imported and only 5% from them are obtained locally (United Nations Economics and Social Commission for Asia and the Pacific ESCAP, 2014). Besides, it is cheaper to import than to grow in Malaysia land. In this situation, feed producers are responsible to communicate with crop producers and at the same time connected with primary food producers involved, such as poultry). These phenomena are crucial in maintaining the halal integrity along the supply chain. To produce halal food materials, it is important to make sure that the feed and crops are *Ḥalālan ṭoyyiban*. For example, the usage of genetically modified soybean meal using the recombinant DNA from swine (Bradley, 2010) in animal feed will shake the *Ḥalālan ṭoyyiban* integrity of the animal feed and later the poultry meat and eggs (Bradley, 2010).

## **2. INGREDIENTS AND COMPONENTS OF POULTRY FEED**

The imported ingredients used by local poultry breeders are mainly corn or maize, wheat, rice, soybean meal, wheat bran and corn gluten feed. Meanwhile, the ingredients for poultry feed either obtained from outside the country or locally are tapioca or cassava, fishmeal, rice bran and palm kernel cake (PKC). In addition, enzymes and preservatives as feed additives are also considered as part of poultry feed since it is given directly to the animals (Pariza & Cook, 2010). The imported ingredients used by local poultry breeders are mainly corn or maize, wheat, rice, soybean meal, wheat bran and corn gluten feed. Meanwhile, the ingredients for poultry feed either obtained from outside the country or locally are tapioca or cassava, fishmeal, rice bran and palm kernel cake (PKC). In addition, enzymes and preservatives as feed

additives are also considered as part of poultry feed since it is given directly to the animals (Pariza & Cook, 2010).

### 3. TYPES OF HAZARDS IN POULTRY FEED

#### 3.1 *Biohazards in Poultry Feed*

The potential biohazards based on the AFIA Safe Feed/Safe Food Certification Program FSC36 hazard guidelines come from the BSE and pathogenic enteric microbes. Pathogenic enteric microbes are defined as any microorganisms that are likely to cause harm to animals or human. The evidence for these problems is outsourced from the scientific research done by Barton (2000), Sapkota et al. (2007), Gulland (2013), Wallinga & Burch (2013) and others. In October 2015, Federation of Malaysian Consumers Association (FOMCA), an independent, non-profit organization once expressed their concern towards the uncontrolled usage of antibiotics towards poultry. They urged the government to monitor the poultry industry as the uncontrolled usage of antibiotics not only cause the development of antimicrobial resistance (AMR) bacteria (Sobry, Ramly, & Adnan, 2015), but also the antibiotics residues may accumulate in poultry meat and eggs. In this case, the antibiotics accumulation is considered as chemical hazard while the potential pathogenic enteric microbes are categorised as biological hazard. The antibiotics used in livestock industry as growth boosters (Collignon et al., 2005; Gulland, 2013). Besides, it is being used continuously in poultry feed for disease prevention (Collignon et al., 2005).

In April 2016, Ministry of Health (MOH) Malaysia through the Ministry of Agriculture and Agro-based Industry have been considering the usage of antibiotics in agro-based industry particularly in animal feed since it is seen to affect vaccination against human antibiotics and causing it to be identified as a major threat to global health. The problem of this antimicrobial resistance (AMR) occurs when the antibiotics which can treat the infection at home is no longer effective due to the bacteria becoming resistant towards the antibiotics (Bernama, 2016). Should these be in place, medicine should not be used therapeutically in food-producing animals, especially for mass medication. For example, Salmonella in fishmeal poultry feed (Gizzi et al., 2004) can spread from animal to man via food chain.

Besides, *Listeria monocytogenes* which is well-known as AMR bacteria can grow on corn and compete in low oxygen and high moisture environment (Maciorowski et al., 2007). At the same time, this type of microorganism also exhibits increasing resistance to thermal and chemical stressors (Maciorowski et al., 2007). This condition creates highly resistant bacteria towards external stress and it can survive for as long as 10-12 years. Animals that are fed with corn containing this pathogen may cause several symptoms and disease such as Septicaemia, abortions, encephalitis and eye infections. Meanwhile, in other parts of the world, 70% of the antibiotics dispensed in the United States were used in animals, particularly in agriculture, where they were used to encourage growth in livestock destined for human consumption. Indeed, antibiotics can be avoided if farming and the other agricultural sectors improve their hygiene that can prevent poultry infections (Gulland, 2013). However, since the antibiotics can be easily obtained and the rules and regulations of drug usage are different between countries, the use of antibiotics towards farm animals are becoming uncontrolled (Gulland, 2013). Consequently, the results for antibiotics used in animal feed vary between developing and developed countries. The difference may be due to the food quality and the environment temperature of the farming area (Collignon et al., 2005).

The Genetically Modified Organism (GMO) in poultry feed is also one of the concerns. GMO is a product that undergoes reconfiguration of genetic material which may be from a source of plants or animals through selective breeding or mutation breeding. The gene from those sources is taken and is inserted into another different species. In other words, the genetic material of deoxyribonucleic acid (DNA) has been altered through several methods using advanced technology (Khattak et al., 2011). Consumer confidence and debates over GMO are critical to the feedstuffs since around post 1990. The debate was initiated by Dr Arpad Pusztai from Rowett Research Institute who worked on snowdrop on the gut of rats. Indeed, the Royal Society, one of the reputable bodies has questioned the same issues. However, the genetically modified (hereinafter known as GM) crops are almost required to meet the demand for crops to satisfy both human food and livestock feed (Dean, 2002). The topmost list for GM crops used in animal feed are corn, soybean and rice. Global major ingredients for poultry feed include maize or also known as grain maize or corn. The second sources for poultry feed are soybean meal,

rice bran and fishmeal (United Nations Economics and Social Commission for Asia and the Pacific ESCAP, 2014).

In Malaysia, most of the poultry feeds which comprises 95% of the source are imported and only 5% from them are obtained locally (United Nations Economics and Social Commission for Asia and the Pacific ESCAP, 2014). Corn for poultry feed is obtained by importing it from other countries (Rittgers & Wahab, 2014) such as the US. However, GM corn has stimulated concerns and issues in terms of Islamic perspectives among consumers and poultry growers (Van der Spiegel et al., 2012). Soybean meal is used as poultry feed and it is obtained mostly from US (United Nations Economics and Social Commission for Asia and the Pacific ESCAP, 2014). In the case of soybean, research done shows that GM soybean is accounted for 60% of the world's soybean harvested area in 2005. US, the main supplier of this commodity in Malaysia possess 87% GM national soybean crop. Meanwhile, report shows that 90% of the Argentinean soybean crop was GM in 2005 (Bradley, 2010).

Rice and rice bran in Malaysia are imported from Vietnam, Pakistan and Thailand (United Nations Economics and Social Commission for Asia and the Pacific ESCAP, 2014). The GM in world trade is increasing since it is planted to 134 million hectares in 2009 and at the same time, the number of countries growing GM crops has increased. This may not be satisfying since the information on the source of recombinant DNA involved for GM crops will be uncontrolled. In this situation, feed producers are responsible to communicate with crop producers and at the same time connected with primary food producers involved, such as poultry breeders. These phenomena are crucial in maintaining the halal integrity along the supply chain. To produce halal food materials, it is important to make sure that the feed and crops are *Halalan toyyiban* which encompasses safety part of the poultry feed.

There are several cases where certain GM products have been identified as hazardous. If the parent crop is associated with any hazard issue or potential toxicity or allergenicity, the risk for GM produce inheriting the same hazards from its parent crop is high. There was a case in Brazil back in 1996 where 2S albumen protein from Brazil nut was transferred into soyabean. Patients who were allergic to Brazil nut and not to soyabean now showed the same

mechanism towards GM soyabean since the GM soyabean inherited the same character with its parent crop (Lack, 2002). Besides, the unexpected alterations could also occur in certain circumstances for GM crops, at which it may result in compositional changes for their toxicological, allergenic or nutritional factors (Cockburn et al., 2004). Besides, adverse effects of GM crops include among others are antibiotic resistance (Lack, 2002) towards animals or human.

### **3.2 Chemical Hazards in Poultry Feed**

Besides the issues of the uncontrolled usage of antibiotics and GM feed, one of the most crucial issues when highlighting the poultry feed safety in terms of chemical hazard is toxin contamination, produced by certain groups of *Fusarium* species. Based on AFIA Safe Feed/Safe Food Certification Program FSC36 hazard guidelines, toxin production may come from dioxin, mycotoxin, heavy metals or pesticides. The toxin produced in poultry feed is introduced by fungi or mold. The cultivation of fungal is a normal part in animal or poultry feed production process. Even though lower mycotoxin might be detected, eventually, the effect of lower dosage over a long period of time has the same effect as the one with large quantities instantaneously (Ksenija, Dobrila, Ljiljana & Bozidar, 2011). However, toxin production is highly dependable on the physical factors, chemical factors as well as biological factors. At the same time, toxin production causes degradation of feed nutritional content (Rather et al., 2014). These toxic substances have high potential to be found in animal feed at which the residues contents can be measured in meat, organs, milk or eggs (Kan & Meijer, 2007). To date, more than 400 mycotoxins have been identified (Rather et al., 2014). Unfortunately, antidotes for mycotoxins are not available and thus, preventing the development of molds and toxin production through feeds are crucial (Ksenija et al., 2011; Rather et al., 2014).

Most of the mycotoxin contamination often occur in the field prior to harvest (Kumar et al., 2008). Fumonisin contamination which originated from *Fusarium* mycotoxins has a potential risk in by-products used in animal feed such as in wheat bran and commonly in corn gluten (Ksenija et al., 2011). It can be transferred into milk, eggs and meat and at the same time, may cause hazards to animal and human health (Cavaglieri et al., 2009). Mycotoxins are

secondary metabolites produced by fungi especially those belonging to the genus *Aspergillus*, *Penicillium* and *Fusarium* (Kumar et al., 2008). Mycotoxin contamination is common in the field or during storage with the favourable conditions for fungal growth (Streit et al., 2012).

### 3.3 *Physical Hazards in Poultry Feed*

Unlike biohazards and chemical hazards, physical hazards are interrelated with the animal welfare (Gregory, 2008). This is because physical hazards can be eliminated by making sure that the facilities are clean and free from traces of metal objects, wire or plastic bags (FAO, 2009). Animal welfare has become contemporary consumer concerns these days (Alserhan, 2010) as it indirectly affects animal health. Besides, Borràs et al. (2011) and Verstraete (2013) agreed to section together the animal welfare and animal health under the same group for livestock risk management. In addition, in terms of physical contamination, the most common contaminants are husk or sand. Therefore, the method used to discard all the physical contaminants by using winnowing method and sieving method are sufficient (Uppal et al., 2002).

## 4. HAZARDS IN POULTRY FEED: AN APPRAISAL FROM THE HALAL PERSPECTIVE

Maqasid Shariah are the objectives or purposes behind Islamic rulings (Mahadzirah M, Nor Azman MA, 2016). The main purposes of Maqasid Shariah are to achieve goodness (*maslahah*) and avoid evil (*mafsadah*) (Muhammad Al-Tahir IA. Ibn Ashur, 2006). On this point, according to Imam al-Ghazali objectives of the Shariah connotes “beneficence intended by Allah for all mankind in this world and the hereafter, either through realization of benefits or elimination of evil”. Protection of Life, Religion, and Lineage are amongst the Maqasid Shariah (objectives of the Shariah) and Muslim are ordained to adhere to all commands of Allah and the instructions of the prophet (PBUH). In the Quran, there are several evidence on the command to only consume what is lawful (Halal) and pure (tayyib). For instance, Allah says “O mankind, eat from whatever is on earth (that is) lawful and pure” (Quran 2:168). In addition, Muslims are also commanded to avoid things that are doubtful when Allah says in Surah Yunus verse 36 “But most of them follow nothing but fancy, truly fancy can be of no avail against Truth. Verily Allah is aware of all that they do”. The instruction to stay away from



doubtfulness to prevent one from falling into haram (the prohibited) can also be seen in the Hadith of the Prophet (PBUH) narrated by Muslim: “What is lawful is evident and what is unlawful is evident, and in between them are the things doubtful which many people do not know. So he who guards against doubtful things keeps his religion and honour blameless, and he who indulges in doubtful things indulges in fact in unlawful things, just as a shepherd who pastures his animals round a preserve will soon pasture them in it. Beware, every king has a preserve, and the things God has declared unlawful are His preserves. Beware, in the body there is a piece of flesh; if it is sound, the whole body is sound and if it is corrupt the whole body is corrupt, and hearken it is the heart.” (Muslim, Hadith no.1599).

In the context of hazards present in poultry feed, it is apparent that the effects of feed contaminants and toxins vary, ranging from reduced intake to reproductive dysfunction and increased incidence of bacterial diseases. Residues transferred to edible animal products represent another reason for concern. Similarly, uncontrolled usage of antibiotics in poultry feed may be harmful to human, even though the use of antibiotics in poultry gives certain benefits for the purpose of preventing disease in poultry to prevent it from hazardous issue or potential toxicity or allergenicity. Similarly, the use of GMOs in poultry feed production which is associated with hazardous issue or potential toxicity or allergenicity is another thing.

From the perspective of the Maqasid Shariah, even though the use of antibiotics in poultry gives certain benefits for the purpose of preventing disease in poultry to prevent it from spreading into human via food chain and therefore acceptable, but the uncontrolled usage of antibiotics is unacceptable as it may be harmful to human. As such, even though the use of antibiotics is seen as necessary under certain circumstances but *al-darurat tuqaddaru bi qadriha* (Necessity is determined by the extent thereof) to the effect that its use in poultry feed must be controlled, restricted and well regulated by the respective authority. Same goes to unregulated use of GMOs and presence of toxin contamination in poultry feed. If not properly controlled and regulated seriously, adverse effects might take place in human and this is indeed not in line with the goal of the Shariah to safeguard the interests of human and the universe, to protect life and lineage, and to bring benefits and repelling harms. The Almighty Allah says in Surah al- Baqarah, Surah al-Nahl and

Surah al-Mu'minun and other Quranic verses stated the command upon Muslim to eat only Halal and tayyib (good) food (Quran, 2:168, 16:114, 23:51). Furthermore, clause 2.3 of the Malaysian Standard for Food (MS1500:2019) defines Halal food and drinks and/or its ingredients must originates from Halal sources, to include among others; food and drinks and/or its ingredients that are "(c) safe for consumption, non-poisonous, non-intoxicating or non-hazardous to health" and in the case of animal-based food, the meats must come from Halal animals and slaughtered in accordance with the Shariah slaughtering rituals.

## **5. CONCLUSION**

Feed supply is central to all animal production systems and any factor that affects the security of the feed supply is a significant constraint to production. From the halal perspective, the sources of human food including poultry, shall not only be halal, but shall also be safe for human consumption, non-poisonous and non-hazardous to human health. In order for poultry to be safe for human consumption the feed fed to poultry shall also be non-poisonous and non-hazardous. Apparently, the presence of various types of hazards in poultry feed and its production might pose certain adverse effects to human if not controlled and regulated. Nevertheless, considering that contaminants are present everywhere, and that total elimination is almost impossible, taking proactive actions to reduce their presence to the minimum level possible is in compliance with the spirit of Maqasid Shariah. This could be done by putting in place a comprehensive legislation for the control of several of these chemical compounds, pathogens and physical contaminants in poultry feed, or by implementing feed safety management system such as HACCP in feed plants. In addition, to protect the interest of the Muslim consumers particularly in Malaysia, it is also recommended that a Halal standard for Poultry Feed Production should be developed. By having this standard, growers of poultry can have choices of feed and further, Muslim consumers can be rest assured that the poultry meats or its produce that they consumed are truly Halal.

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## Act

Animal Feed Act, 2009

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