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1 Positioning Food Safety in Halal Assurance

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5 ABSTRACT

6 Muslims follow the religion of Islam and the food they eat should be Halal, meaning lawful or permissible.
7 Muslims are allowed to eat halal and wholesome food that has been provided for them. However, some of the
8 main prohibitions are swine flesh, blood, carrion, animals not slaughtered according to Islamic laws and
9 alcoholic drinks. At present Halal assurance is in a complicated state, with various Halal standards differing
10 from each other without gaining mutual acceptance. The world is starting to understand the need for an
11 influential globally accepted standard that would open doors to global markets and gain consumer confidence.
12 This paper discusses issues mainly related to food safety in Halal assurance. The aim was to discover and
13 describe the approach to food safety requirements in Halal food provision and how this is incorporated in the
14 Halal assurance systems. The position of food safety regulation within Halal requirements or Halal standards'
15 requirements for food safety is still unclear. This review also considers whether current Halal standards include
16 criteria in common with internationally accepted food hygiene standards and emphasizes the potential of using
17 the HACCP system for Halal assurance.

18 *Keywords: Certification, GHP, GMP, Halal standard, Halalan and Toyyiban, HACCP, Haram, Islam, Sharia*

19 1. Introduction

20 International trade, migration and travel are increasing and as a result contaminated food might find its way into
21 many countries and be a threat to a wide range of consumers (WHO, 2007). Product recalls due to contaminated
22 ingredients will considerably damage producers' and might even damage countries' reputation affecting trade,
23 tourism and international relations (WHO, 2007). Food safety standards and certification are crucial to ensure
24 food safety and are important for trade and consumer trust (ISO, 2015). One important food certification is Halal
25 assurance. Halal is an Arabic phrase referring to lawful and permissible according to Islamic law and principles.
26 Halal foods are foods that are free from any components that Muslims are prohibited from consuming (Riaz &
27 Chaundry, 2004). Just like contaminated food, food believed to be Halal, but actually not so, can spread and find
28 its way to Muslims around the globe, which is a reason why Halal standards and certification are crucial in Halal
29 assurance. The more complicated question, which will also be addressed in this study, lies in the food safety
30 expectations of Halal food and how the concept of Halal is interpreted regarding food safety. In other words, are
31 the food production methods believed to produce Halal products also following necessary food safety
32 requirements and should they do so?

33 No matter the geographical position or ethnic diversity, the religion of Islam is a way of life for Muslims and
34 eating Halal is an inseparable part of a Muslim's life (Riaz & Chaundry, 2004). The global Muslim population
35 in 2010 was approximately 1.6 billion, which makes 23.4% of the world's population. It is estimated to continue
36 increasing. There are around 49 Muslim-majority countries, which are situated mainly in the Middle East,
37 South-East Asia regions and Africa, where around 74% of the global Muslim population are situated. However,
38 around 26% of the global Muslim population live in Muslim-minority countries (Pew Research Center, 2011).
39 The Muslim population is spread across the seven continents and it is acknowledged that the Halal market has
40 great potential for both Muslim and non-Muslim countries for local producers and exporters alike (WHF, 2009;
41 International Trade Centre, 2015). The Halal food market's potential is constantly rising with the global market
42 value of about USD547 billion in 2006, USD720 billion in 2009 (H-Media, 2011) and an estimated USD1.37
43 trillion in 2014 (International Trade Centre, 2015). To be a part of that market it can be a benefit, especially for
44 non-Muslim countries, to have Halal certification and labelling (Ruzevicius, 2012; International Trade Centre,
45 2015). Although, a trustable Halal certification scheme may support export, it is equally important for Muslim-
46 majority countries to develop their Halal food industry to protect their consumers from consuming non-Halal
47 products (Ratanamaneichat & Rakkarn, 2013).

48 The main aim of Halal certification is to determine whether a product to be consumed by Muslims is Halal or
49 not. After obtaining the certification, companies could use Halal labels on their packages, which is necessary for
50 consumers to make informed decisions (Shariff & Abd Lah, 2014). Muslims are supposed to make an effort to
51 obtain Halal food of good quality and refrain from things that are doubtful to be sure to avoid consumption of
52 haram (prohibited and unlawful) substances (Riaz & Chaundry, 2004). Hence, a Halal logo on the package

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53 could give the necessary assurance and eliminate consumers' uncertainty (Batu & Regenstein, 2014). However,
 54 various Halal logos are used, which in turn reflect different Halal standards (Halim & Salleh, 2012). Therefore,
 55 it is important, that Halal certification bodies (CB) would have competence in awarding certification, which
 56 accurately reflects correct and expected Halal practices by the producer (Din & Duad, 2014).

57 In the late 1980s, in order to penetrate the South-East Asia and Middle East markets, the certification and
 58 production of Halal foods started to increase (Riaz & Chaundry, 2004). The Halal certification process started
 59 from meat and poultry products and with the initiative of the South East Asia countries expanded to processed
 60 foods (H-Media, 2011). Since a public body did not exist to guide the process, the interpretation of Halal
 61 assurance and responsibility for Halal certification were dependent on various institutions like local mosques,
 62 governmental, part-governmental bodies and private organisations (IHIA, 2015). Moreover, at present a halal
 63 certificate is allowed to be issued by any Muslim, Islamic company or association, however, the key is the
 64 acceptability of the certificate by the interested party (Hanzaee & Ramezani, 2011). From an estimated 300
 65 Halal certification bodies around the world, only around a 120 are officially registered as active Halal
 66 certification bodies (CBs) (IHIA, 2015). It is also worth to note, that despite the large number of certification
 67 agencies, Arabic countries, representative of the largest Muslim consumer market, do not play a significant role
 68 in Halal standards and harmonizing certification (Hashimi, et al., 2010).

69 In the global Halal industry a fast growing sector is logistics (H-Media, 2011). This is also demonstrated by
 70 studies on the Halal supply chain (Zailani, et al., 2010; Omar, et al., 2013; Muhammad, et al., 2009; Talib, et al.,
 71 2015; Manzouri, et al., 2013; Tieman, et al., 2012; Tieman, 2011; Ngah, et al., 2014; Zulfakar, et al., 2014),
 72 logistics (Tarmizi, et al., 2014; Tan, et al., 2012; Iberahim, et al., 2012; Tieman, 2013; Tarzimi, et al., 2014;
 73 Talib & Hamid, 2014; Tieman, et al., 2013; Kamaruddin, et al., 2012; Tieman & Ghazali, 2014) and traceability
 74 (Poniman, et al., 2015; Zailani, et al., 2010; Samsi, et al., 2012; Shafii & Khadijah, 2012). The logistics sector is
 75 trying to take a step further by suggesting a minimum standard for non-Muslim countries and a preferred
 76 standard for Muslim countries, which non-Muslim countries could adopt over time (Tieman, 2013). However,
 77 these efforts might be of little consequence if approaches like conventional Halal certification still exist, which
 78 covers only the slaughtering process (Bonne & Verbeke, 2008; Tieman, 2013), e.g. in Belgium, it is only
 79 certified whether the slaughterer is a Muslim (Bonne & Verbeke, 2008). However, another extreme is well
 80 demonstrated by Malaysia with its governmental support for Halal assurance and with the publication of
 81 multiple Halal standards covering different sectors (HDC, 2015; Department of Standards of Malaysia, 2009).
 82 Moreover, a majority of research on the Halal food industry (Abdul, et al., 2009; Abdullah, et al., 2007; Afifi, et
 83 al., 2013; Noordin, et al., 2009; Marzuki, et al., 2012; Mohamed & Backhouse, 2014; Latif, et al., 2014;
 84 Badrudin, et al., 2011; Shariff & Abd Lah, 2014) (Shallah & Hussin, 2013; Samori & Sabtu, 2014; Talib, et al.,
 85 2010; Majid, et al., 2015; Yunus, et al., 2010; Kadir, et al., 2015; Bohari, et al., 2013; Tahir & Abdul, 2013;
 86 Omar, et al., 2014; Rahman, et al., 2013) and consumer awareness of Halal food (Abdul, et al., 2009; Ahmad, et
 87 al., 2013; Ambali & Bakar, 2014; Golnaz, et al., 2012; Golnaz, et al., 2010) is conducted in Malaysia.

88 Possibly due to variations in Halal requirements' interpretation and different standards used for Halal
 89 certification, at present divergence within Halal assurance activities is prevailing (Pointing, 2014). This paper
 90 aims to find out how the concept of Halal is interpreted regarding food safety requirements and whether they are
 91 incorporated into Halal assurance systems.

92 **2. Materials and Methods**

93 Literature searches were conducted on the topics of Halal requirements, standards, certification and legislation
 94 to get an overview of the latest developments on Halal assurance systems. In addition, research was conducted
 95 on topics like food safety management systems in Muslim-majority countries and using the HACCP system for
 96 Halal assurance.

97 First, an overview was made on the basic Halal requirements showing how food safety would be a part of the
 98 Halal concept. Furthermore, Halal standards, Halal certification and food safety assurance were discussed. In
 99 addition, an analysis was made on how basic food safety practices are integrated into one Halal standard and
 100 whether they are sufficient to assure food safety. Finally, the broadening of the Hazard Analysis and Critical
 101 Control Point (HACCP) system as a Halal assurance tool was analysed and discussed.

102 The literature research was conducted by using various databases like ScienceDirect, Springer Link, EBSCO,
 103 IEEE Xplore, Taylor and Francis Online, ACG publications, Scientific Journals. Conference proceedings,
 104 reports, books, guidelines, Codex Alimentarius Commission standards, online newspapers, open-access articles,
 105 governmental, various organisations' websites and legislation were included in the study. The latest peer-review
 106 articles on the topic were mainly used. Since Halal assurance is a fairly new area of research, conference papers
 107 were used to fill information gaps and include latest research. The Codex Alimentarius Commission (CAC)
 108 General Principles of Food Hygiene (CAC/RCP 1-1969) state the main requirements for hygienic and safe food

109 production. These requirements were used as the base guidelines to compare with the Malaysian Standard
 110 MS1500:2009 Halal Food – Production, Preparation, Handling and Storage (MS 1500:2009) requirements for
 111 hygienic and safe food production practices.

112 3. Results and discussion

113 3.1 Halal and Toyyiban

114 At the beginning of Islam there were no government food safety regulations and Islamic dietary laws were the
 115 only regulations for safe and wholesome food products (Riaz & Chaundry, 2004). In their lives Muslims follow
 116 what is Halal, which guides their way of life and an aspect of that is the food they eat. The most important
 117 sources of Islamic law or Shariah and hence determining what is Halal and Haram are the Quran and the Sunnah
 118 and Hadith (the actions and teachings of Prophet Muhammad), followed by ijthihad (legal reasoning) and fatwa
 119 (legal verdict) of qualified scholars of the Muslim community, which are important with regards to finding
 120 answers to contemporary issues (Kamali, 2008). When necessary Halal certification bodies could seek guidance
 121 from Muslim legal experts (muftis) and expert bodies, like the International Islamic Fiqh Academy, the
 122 Department of Islamic Development Malaysia (JAKIM), the Indonesian Council of Ulama (MUI) etc. (OIC,
 123 2016; JAKIM, 2016; LPPOM MUI, 2016).

124 The main requirements include the prohibition of swine flesh, blood, carrion, animals not slaughtered according
 125 to Islamic laws and alcoholic drinks, which could be found in the Qur'an 2:173, 2:219, 5:90, 5:3, 6:118, 6:119,
 126 6:121, 6:145 and 16:115. In addition, the Quran contains various nutritional concepts (Tarighat-Esfanjani &
 127 Namazi, 2014). To distinguish the degree of validity of the Hadith, they were classified according to their
 128 authenticity using rigid criteria. Although not the only one and not complete, a widely accepted and considered
 129 as one of the most authentic collections is by al-Bukhari (Akgündüz, 2010). Some of the Hadith regarding food
 130 include:

131 Narrated Al-Bara' and Ibn Abi 'Aufa: The Prophet prohibited the eating of donkey's meat. (Sahih al-Bukhari,
 132 Vol. 7, Book 67, Hadith 434);

133 Narrated Abu Tha'laba: Allah's Messenger forbade the eating of the meat of beasts having fangs (Sahih al-
 134 Bukhari, Vol. 7, Book 67, Hadith 438);

135 Narrated Rafi'bin Khadija: The Prophet said, "Eat what is slaughtered (with any instrument) that makes blood
 136 flow out, except what is slaughtered with a tooth or a nail." (Sahih al-Bukhari, Vol. 7, Book 67, Hadith 414);

137 In addition, in the Qur'an verses regarding eating and food containing phrases "Halalan Toyyiban" (Qur'an,
 138 2:168, 5:88, 8:69 and 16:114) and "Toyyiban" (Qur'an, 2:172, 5:4, 5:5, 7:160 and 20:81) are brought out in
 139 Table 1. Toyyiban is an Arabic word that could be translated as "good or wholesome" (Hashimi, et al., 2010).
 140 Arif and Ahmad (2011) refer to a more detailed translation as in good, agreeable, palatable, pleasant, pleasing,
 141 delightful, delicious, sweet, embalmed, perfumed and soothing to one's mind. They also bring out a term "Al-
 142 tayyibat", which describes the moral virtues and obligations associated with the products and refers to goods
 143 that are halal and pure (Arif & Ahmad, 2011).

144 **Table 1.** The phrases from the Qur'an regarding Toyyiban:

The Chapter and Verse in the Qur'an	Phrases from the Qur'an
Chapter 2, Verse 168	"O mankind, eat from whatever is on earth [that is] lawful and good and do not follow the footsteps of Satan. Indeed, he is to you a clear enemy."
Chapter 5, Verse 88	"And eat of what Allah has provided for you [which is] lawful and good . And fear Allah, in whom you are believers."
Chapter 16, Verse 114	"Then eat of what Allah has provided for you [which is] lawful and good . And be grateful for the favour of Allah, if it is [indeed] Him that you worship."
Chapter 2, Verse 172	"O you who have believed, eat from the good things which We have provided for you and be grateful to Allah if it is [indeed] Him that you worship."
Chapter 5, Verse 4	"They ask you, [O Muhammad], what has been made lawful for them. Say, "Lawful for you are [all] good foods and [game caught by] what you have trained of hunting animals which you train as Allah has taught you. So eat of what they catch for you, and mention the name of Allah upon it, and fear Allah." Indeed, Allah is swift in account."
Chapter 5, Verse 5	"This day [all] good foods have been made lawful, and the food of those who were given the Scripture is lawful for you and your food is lawful for them...."
Chapter 7, Verse 160	"And We divided them into twelve descendant tribes [as distinct] nations. And We inspired to Moses when his people implored him for water, "Strike with your staff the stone," and there gushed forth from it twelve springs. Every people knew its watering place. And We shaded

them with clouds and sent down upon them manna and quails, [saying], "Eat from the good things with which We have provided you." And they wronged Us not, but they were [only] wronging themselves"

Chapter 8, Verse 69

"So consume what you have taken of war booty [as being] lawful and good, and fear Allah. Indeed, Allah is Forgiving and Merciful."

Chapter 20, Verse 81

"[Saying], "Eat from the good things with which We have provided you and do not transgress [or oppress others] therein, lest My anger should descend upon you. And he upon whom My anger descends has certainly fallen.""

145

146 There are two issues that need to be considered, firstly, interpreting *Toyyiban* and secondly, interpreting
 147 whether *Halal* and *Toyyiban* are intertwined or not. Sirjuddin et al. (2013), brings out that at present the term
 148 "Halalan *Toyyiban*" is not officially used and exposes gaps in interpreting the concept. They propose an
 149 approach to interpret "Halalan *Toyyiban*", that instead of using single verses, all the verses from the Qur'an on
 150 the topic should be used to get a more holistic approach (Sirajuddin, et al., 2013). At present some
 151 interpretations portray *Toyyiban* as nourishing, safe, hygienic and of good quality (Arif & Ahmad, 2011;
 152 Hashimi, et al., 2010; Afifi, et al., 2013; Badrudin, et al., 2011). Saifuddeen and Salleh (2013) based on both
 153 the Qur'an and the Sunnah proclaim that an aspect of *Toyyiban* is food safety (Saifuddeen & Salleh, 2013).
 154 Rahman et al. (2014) relate the concept to food ethics, with the main issues being safe food, animal welfare and
 155 environmental protection. Arif and Sidek (2015) describe *Toyyiban* as clean, without any impurities, derived
 156 from a *halal* source, not causing pain and misery to people consuming it and consisting of nutritious and
 157 beneficial elements. The current study analyses the *Halal* and *Toyyiban* from a food safety perspective.

158 With regards to the second issue, some authors referred to "Halalan *Toyyiban*" as a combined approach
 159 (Samori, et al., 2014; Abdul, 2014; Samori & Sabtu, 2014; Badrudin, et al., 2011; Omar, et al., 2014; Arif &
 160 Ahmad, 2011; Ambali & Bakar, 2014; Omar, et al., 2013; Kassim, et al., 2014; Afifi, et al., 2013) (Said, et al.,
 161 2014; Shallah & Hussin, 2013; Zakaria, 2008; Arif & Sidek, 2015; Din & Duad, 2014; Talib, et al., 2010;
 162 Nakyinsige, et al., 2012). Arif and Ahmad (2011) cite different Islamic scholars, asserting that the concept of
 163 *Toyyiban* and *Halal* are intertwined. Furthermore, it has been stated in the World Halal Forum that *Halal*
 164 products are universal products and they should have high standards regarding quality, safety, packaging and
 165 labelling (WHF, 2009). In addition, a study reports that Good Hygiene Practices (GHP) and Good
 166 Manufacturing Practices (GMP) are compulsory requirements in *Halal* food preparation (Rahman, et al., 2014).
 167 Islamic Manufacturing Practice (IMP) approach based on "Halalan *Toyyiban*" is also being suggested
 168 (Nasaruddin, et al., 2011).

169 On the other hand, in some studies *Toyyiban* assurance is handled as a separate entity from *Halal* assurance
 170 (Batu & Regenstein, 2014; Mohamed & Backhouse, 2014; Riaz & Chaundry, 2004; Yunus, et al., 2010) and
 171 refer to CAC standards, the UK food law, EU general food law or the HACCP system fit to cover the *Toyyiban*
 172 aspect (Tieman, 2013; Mohamed & Backhouse, 2014). Batu & Regenstein (2014) raised a question on how
 173 involved the *Halal* certification bodies would become regarding *Toyyiban* (Batu & Regenstein, 2014). This view
 174 might be further emphasised with the statement of Riaz & Chaundry (2004) that, although, safe food and hygienic
 175 production is a base for *Halal* production, at present food safety is the responsibility of government agencies and
 176 organizations such as the United Nation's Food and Agriculture Organization (FAO) and World Health
 177 Organization (WHO) (Riaz & Chaundry, 2004). This approach might lead to a situation where products certified
 178 as *Halal* may not be safe or of prescribed quality or in other words not be *Toyyiban* (Arif & Ahmad, 2011).

179 Furthermore, for example, from a governmental point of view, Atalan-Helicke (2015) noted, that the Turkish
 180 Standards Institute, a governmental institute responsible for various standards, declared that food safety issues
 181 would have precedence over religious concerns and added that the secular state office could only decide on *halal*
 182 status of food (Atalan-Helicke, 2015). Little is known about governments' approaches, so further research is
 183 needed on how governments interpret and handle food safety and *Halal* issues.

184 It is also interesting to note, that according to the Malaysian Government Trade Description Act 1972 *Halal*
 185 should be non-toxic or injurious to health (Malaysia government, 2011). The MS 1500:2009 states that *Halal*
 186 food should be safe for consumption, non-poisonous, non-intoxicating or non-hazardous to health (Department
 187 of Standards of Malaysia, 2009). On the other hand, the CAC/GL 24-1997's definition of *Halal* does not
 188 include a clause on safety. It just refers to following Codex General Principles on Food Hygiene and other
 189 relevant Codex Standards during *Halal* food production (CAC, 1997). This suggests that the Malaysian
 190 government and the Malaysian standard MS 1500:2009 have a unified "Halalan *Toyyiban*" approach whereas
 191 the Codex guidelines refers to *Halal* and *Toyyiban* independently. Different interpretations of a unified
 192 "Halalan *Toyyiban*" approach are also illustrated by a study conducted by Latif et al. (2014), which gives

193 further insight to Halal assurance by comparing nine certification bodies and their standards all of which had 7
194 aspects in common:

- 195 1) the premises must be clean and not contaminated;
- 196 2) qualified Muslims must slaughter all birds and animals;
- 197 3) facilities and equipment must not be contaminated by non-Halal items;
- 198 4) only Halal ingredients could be used for Halal products;
- 199 5) animal-based ingredients must be derived from Halal animals that have been slaughtered in accordance
200 with the Islamic law;
- 201 6) packaging materials must not contain unlawful and harmful ingredients;
- 202 7) there must be no contamination between Halal and non-Halal products during storage handling,
203 transporting and manufacturing (Latif, et al., 2014);

204 Regarding food safety aspects the important points are 1), 3) and 6). This shows something of an overlap
205 between Halal and food safety assurance activities. When comparing nine Halal standards, only four of nine
206 demanded compliance with Good Manufacturing Practice (GMP) and Good Hygiene Practice (GHP) and two
207 out of nine demanded HACCP (Latif, et al., 2014). The HACCP system referred to was used for food safety
208 assurance, not Halal assurance. From those nine standards the MS 1500:2009 has the highest number of
209 requirements, including reference to GMP, GHP and/or HACCP, which should be fulfilled in order to be Halal
210 certified. (Latif, et al., 2014). However, the study includes a limited number of certification institutions, so no
211 final conclusions could be made on a global level on the most comprehensive certifications and on food safety
212 coverage in Halal standards.

213 Instead of having one common standard, Halal CBs have their own standards and certification requirements
214 demonstrating variance in interpreting the “Halalan Toyyiban” concept (Latif, et al., 2014). As it could be seen,
215 at present the interpretation of the Qur’an and Sunnah regarding halal and food safety is being done by different
216 entities – scholars, governments, standards’ makers and certifiers.

217 In addition, in recent years popular magazines (like *The Halal Journal* and *Standard and Quality News*) and
218 authors have started to refer to halal as a benchmark for safety, hygiene and quality without a proper reference
219 (Nasaruddin, et al., 2011; Mohtar, et al., 2014; Muhammad, et al., 2009; Abdullah, et al., 2007; Talib, et al.,
220 2008; Tahir, et al., 2015; Aziz & Sulaiman, 2014; Marzuki, et al., 2012; Khalek, 2014; Said & Elangkovan,
221 2013). This is a worrisome trend, because without an official and globally accepted approach, it might lead to
222 wrong perception and awareness of the Halal concept. Furthermore, recent Islamic economy reports highlight
223 Toyyiban as a new trend and a marketing opportunity and even refer to Toyyiban as a possible value adding
224 factor (International Trade Centre, 2015; Thomas Reuters, 2013), showing separation of the two concepts in the
225 current Halal food market.

226 It is clear, that the word “Toyyiban” does not have a distinct format and is used in several different forms, like
227 thoyyiban, tayyab, tayyaban, toyyib, etc. The scope of Toyyiban needs to be determined and officially
228 acknowledged, may it be animal welfare, quality, safety or nutritious characteristics. It should be clear to all
229 parties and might even be used to ascertain clarity and extend the scope of Halal assurance. For example, using
230 the definition “Halal” for products meeting the main Halal requirements and “Halal & Toyyiban” for products
231 meeting both Halal and wholesomeness requirements. Only then would it be possible to form universal
232 guidelines and standards. There could be one or multiple standards but they should have clearly defined and
233 globally accepted requirements.

234 Further research is required to determine why Halal standards and certifications are so differently constructed
235 with regards to food safety and who should or are expected to take responsibility for Toyyiban food safety
236 aspects. Interpretation differences of the “Halalan Toyyiban” concept might be a contributing factor, however it
237 might also be assumed, that governments and the food industry take responsibility for food safety assurance,
238 thus leaving it out from Halal standards’ requirements. Dalen and Waarden (2012), brought out that halal
239 certifiers, with regards to Halal standards, are referring to different normative (like cost, technology, reputation,
240 ethnicity and generation), and even emotional values and quality-dimensions, thus creating the predisposition
241 for multiple Halal standards (Dalen & Waarden, 2012). Furthermore, the effect of economic pressure, high
242 product demand and technological methodologies are also suggested to be important factors in Halal
243 certification differences, culminating in differences in interpretations on topics like stunning, mechanical
244 slaughtering, control and monitoring. Variations in Halal certification could also be contributed to different
245 social dynamics, like a top-down approach or in other words cooperating with producers and governments or a
246 bottom-up approach, prioritizing scholars’ and community’s approach (Harvey, 2010).

247
248 According to the CAC/GL 24-1997 the term Halal might be subject to interpretation differences by Islamic
249 schools of law (CAC, 1997). During history many Islamic schools of law have emerged, but four of them have

250 remained with the largest amount of followers, these are Hanafi, Maliki, Shafi'i and Hanbali. They are mostly
 251 similar with some interpretation differences, which are equally valid, in the areas of belief, religious practice and
 252 law, made in the light of needs and realities of their time (Akgündüz, 2010). It has been suggested by Prof. Dr.
 253 M. H. Kamali, an Islamic scholar, that since the Islamic schools of law are united in the fundamentals of Islam,
 254 these differences should not be insurmountable barriers to a harmonised halal standard (The Halal Journal,
 255 2008). A good example in incorporating different Islamic schools of law is a Turkish Halal certification centre
 256 GIMDES, which has also created its own Halal standard. A tick (✓) image in the logo can be added beside the
 257 schools of law (i.e. Shafi, Hanbali, Maliki, Hanafi) according to which the certified company complies. The
 258 certification could be represented by one or even all of them (GIMDES, 2015). Further research needs to be
 259 done on what kind of effect could the causes of variations in Halal certification and the different schools of law
 260 have on the interpretation and incorporation of the "Halalan Toyyiban" concept and their certification process
 261 and whether or not it brings any complications in forming a unified globally accepted Halal standard.
 262 There is very little known about how consumers, both Muslims and non-Muslims, perceive the Halal concept
 263 with regards to foodstuffs. The studies done so far give little insight on the topic. A study conducted in Malaysia
 264 shows, that consumers choose products with Halal logos in search for assurance that the product is suitable for
 265 consumption by Muslims (Abdul, et al., 2009). Although a study showed, that Muslim consumers' Halal
 266 awareness should be improved in Malaysia (Ahmad, et al., 2013), another showed that a significant amount of
 267 the consumers perceive halal as clean, safe and of high quality (Ambali & Bakar, 2014). Furthermore, two
 268 studies also conducted in Malaysia regarding non-Muslims and their Halal awareness showed that they perceive
 269 Halal to incorporate issues like food safety and environmental friendliness aspects (Golnaz, et al., 2010; Golnaz,
 270 et al., 2012). Although, the studies are not globally generalizable, they suggest an understanding of food safety
 271 assurance intertwined with the Halal concept from the consumers' perspective. The present global Halal
 272 assurance situation could lead to a situation, where consumers might not get what they are expecting when
 273 purchasing a Halal product, which might lead to contradiction in Muslims' religious practices. Therefore, it is
 274 necessary to reach an official unified Halal approach and according to that raise consumers' awareness
 275 ultimately satisfying the needs of Muslims globally.

276 *3.2 Halal Assurance – The Current Situation*

277 Lack of uniformity in Halal standards, weak enforcement and the confusing variety of Halal-logos make it
 278 difficult for consumers today to make qualified and informed choices (WHF, 2013; Latif, et al., 2014).
 279 Worldwide there are variations in the Halal food industry in Halal requirements, Halal assurance activities
 280 (Spiegel, et al., 2012) and a lack of a proper accreditation system to oversee Halal CBs' activities rendering
 281 more active and influential institutions both certifiers and supervisors leading to a potential conflict of interests
 282 (International Trade Centre, 2015; Halim & Salleh, 2012). In addition to multiple Halal certification agencies in
 283 a country (Halim & Salleh, 2012; Harvey, 2010; Batu, 2012), variations in countries' Halal legislation cause
 284 further Halal assurance confusion (Halim & Salleh, 2012), e.g. conflicts with the Technical Barriers to Trade
 285 (TBT) and the Sanitary and Phytosanitary Measures (SPS) agreements in trade (Atkearney, 2009). From 2004
 286 specific trade concerns regarding SPS and TBT Agreements about Halal requirements have risen mainly
 287 between non-Muslim and Muslim countries, however, also between Muslim countries, namely Turkey and
 288 Malaysia (WTO, 2015; WTO, 2015).

289 To simplify Halal assurance in the global Halal food industry alternative suggestions like removing pig and its
 290 derivatives have been suggested (Tieman & Hassan, 2015), in addition to not using the istihalah (could be
 291 defined as irreversible transformation of materials to other materials) concept in Halal certification to avoid
 292 further ambiguity. Namely, the concept of istihalah is prone to different interpretations by Muslim scholars,
 293 resulting in varied acceptance of products (Jahangir, et al., 2016; Jamaludin, et al., 2011; Bin Mohamad, et al.,
 294 2012; Farouk, et al., 2016).

295 There have been various attempts to make one global or at least a renowned Halal standard, for example by
 296 Association of Southeast Asian Nations (ASEAN), the Standards and Metrology Institute for Islamic Countries
 297 (SMIIC) established by the Organisation of Islamic Cooperation (OIC), the International Halal Integrity
 298 Alliance (IHIA) or the recently disbanded Halal food project committee of the European Committee for
 299 Standardization (CEN) who were working on a European Halal Standard (Dağ & Erbası-Gonc, 2013; Abdul, et
 300 al., 2009; IHIA, 2015; International Trade Centre, 2015; Kayadibi, 2014; CEN, 2016). In addition, the latest
 301 progressions include developments like the Emirates Authority for Standardisation & Metrology of United Arab
 302 Emirates (ESMA) proposing to the ISO members to set up an ISO Halal standard (ESMA, 2015).

303 Malaysia, a member of the OIC, aims to strengthen its Halal food industry and strives to develop a global Halal
 304 hub with their Third Industrial Malaysia Master Plan (IMP3 2006-2020) (MITI, 2006). Already, the Malaysian
 305 standard MS1500:2009 is widely accepted by OIC members (Arif & Sidek, 2015). However, other OIC member
 306 countries such as Turkey, Pakistan and United Arab Emirates have also showed interest in promoting their own
 307 Halal certification (Rahman, et al., 2013; Rahman, et al., 2014). The Pakistan Standards Quality and Control

308 Authority (PSQCA) established the Technical Committee on Halal Food Standards which formed the Pakistan
 309 Standards (PS) – PS 3733: 2010 Pakistan Standards for Halal Food Management Systems: Requirements for any
 310 organisation in the food chain, PS 4992: 2010 Pakistan Standard for General Criteria for the operation of Halal
 311 Certification Bodies and PS: 5142: 2013 Conditions for Halal Food Conformity Assessment Bodies (Afzal, n.d.;
 312 Lateef, n.d.; PSQCA, 2013). Competition between associations (Atalan-Helicke, 2015; International Trade
 313 Centre, 2015) and countries could be one of the reasons why a globally recognised Halal standard has not yet
 314 emerged from the suggested standards, e.g. in 2011 and 2012 in WTO meetings Turkey invited Malaysia to
 315 participate in the OIC's initiatives in developing a common standard, without any initiative from Malaysia's
 316 side (WTO, 2012).

317 Furthermore, many countries do not have a regulatory body to control whether the products on the market
 318 labelled as Halal are really so (Bonne & Verbeke, 2008; Harvey, 2010; Halim & Salleh, 2012). Even if a
 319 country has a necessary regulatory body, enforcement poses serious challenges (Halim & Ahmad, 2014). Halal
 320 control and monitoring could include procedures like continuous monitoring, regular audits or a combined
 321 approach of audits and laboratory tests (Harvey, 2010; Spiegel, et al., 2012; Farooqui & Kurt, 2013).
 322 Deficiencies in monitoring and control make it hard to prove whether the food production companies located
 323 elsewhere than the certifier's country are following halal requirements even after they have been awarded the
 324 certificate and no longer feel pressure by the certification process (Ambali & Bakar, 2014). Even for the MS
 325 1500:2009 with its governmental support, establishing valid monitoring and control systems poses challenges
 326 (Abdul, et al., 2009; Ambali & Bakar, 2014). Ambali and Bakar (2014) conclude that governmental legislation
 327 or a global Halal authority would be a way of tackling the problem of fake halal certificates from unreliable
 328 sources and would bring Halal compliance to a more significant level.

329 Since, a number of OIC member countries are lacking a Halal CB, Halal import regulations and/or a domestic
 330 Halal Act (Halim & Salleh, 2012), it raises an issue on how products imported to Muslim countries are being
 331 monitored and whether Halal compliance is really being assured. For example, in the Gulf Cooperation
 332 Countries (GCC), a high percentage of food is being imported, which mainly arrives at UAE and is then re-
 333 exported to the rest of the GCC and other countries (Al-Kandari & Jukes, 2011; Al-Kandari & Jukes, 2009).
 334 Generally, in Muslim countries products are assumed to be Halal, if they are not marked otherwise (Ireland &
 335 Rajabsadeh, 2011; Ahmad, et al., 2013). In a region in Turkey only 6% of the survey's participant paid attention
 336 to Halal marking on a product's package (Aktas, et al., 2009). A study showed that the consumers in the United
 337 Arabic Emirates (UAE) have concerns about some product categories, that they might not be Halal (Ireland &
 338 Rajabsadeh, 2011). For example, meat products (hamburgers, beef and sausages) caused great concern, that they
 339 could be dirty or contaminated with pork. The word "dirty" was not further elaborated on. These results are
 340 concerning, because they show that current government regulations (even in a Muslim-majority country) are not
 341 enough for consumer assurance that the products on the market are Halal. However, the authors stated that this
 342 study is the first of its kind and this area clearly need some further research, so at this point it is difficult to make
 343 generalisations (Ireland & Rajabsadeh, 2011). However, it is worthy of note that, just recently, it was announced
 344 that the UAE is preparing a new food law to tighten the control on the food supply chain, including ministry's
 345 approval upon importing and prohibiting false or incorrect labelling (Salama, 2015).

346 Although some research has been done on the food safety systems in the GCC countries, more needs to be done
 347 on Muslim-majority countries' food safety control systems (Al-Busaidi & Jukes, 2014; Fernando, et al., 2014).
 348 A study on food control systems in GCC showed that although their systems have improved, they are still
 349 insufficient to provide necessary protection. Deficiencies of foodborne disease surveillance and inspection were
 350 brought out and that food inspection relies mostly on end product testing (Al-Kandari & Jukes, 2009). Very
 351 recently a study was conducted about the governmental food safety systems in Sultanate of Oman (Al-Busaidi &
 352 Jukes, 2014). The study revealed a lack of sufficient food safety systems at the governmental level. The
 353 government would need to establish strong food safety measures like making the HACCP system mandatory to
 354 all food production companies to have a system in place for the prevention of foodborne diseases (Al-Busaidi &
 355 Jukes, 2014). UAE and Saudi Arabia in recent years have shown dedication in trying to implement HACCP-
 356 based food control systems (Al-Kandari & Jukes, 2011; Al-Kandari & Jukes, 2012). Additionally, Kuwait's
 357 food safety system requires further improvement especially in ensuring food laws are more preventative in
 358 nature and to enforce proper food inspection (Al-Mazeedi, et al., 2012). In Malaysia the Food Hygiene
 359 Regulation (2009) was released and Malaysia's attempts for ensuring compliance among food industries with
 360 the food regulation are still ongoing (Fernando, et al., 2014). A study states, that Malaysia, Singapore, Indonesia
 361 and Thailand have comprehensive food legislation. Enforcement activities, however, need further research
 362 (Ismail, 2011).

363 This demonstrates that, even though the Halal concept may encompass food safety, the Muslim majority
 364 countries might lack systems and enforcement activities for guaranteeing it. When food safety is efficiently
 365 controlled and regulated by governments it would be a strong prerequisite in which a solid Halal assurance

366 system could be built. If the companies in the Muslim-majority countries are assumed to produce Halal products
 367 even without Halal certification they might also be assumed to assure food safety. Further research is necessary
 368 on how food production companies in Muslim-majority countries assure food safety and whether they perceive
 369 food safety as a part of Halal requirements.

370 The unification of standards should be taken as the first milestone, only then would it be possible to start
 371 working on proper certification, controlling and monitoring procedures and give necessary support to policy
 372 makers to move forward in the field of regulating Halal in both Muslim and non-Muslim countries.

373 *3.3 The Malaysian Standard and Food Safety Principles*

374 Malaysia was the first to establish Halal laws (Riaz & Chaundry, 2004). The Malaysia's Trade Description Act
 375 1972 defined Halal to protect its label and determine punishments against falsifying Halal documentation
 376 (Malaysia government, 2011). At present, however, Malaysia's Halal food sector is facing various Halal
 377 assurance barriers (Talib, et al., 2010) and challenges culminating with halal governance hindering the
 378 certification process (Majid, et al., 2015).

379 MS 1500:2004 made Malaysia the first country to issue such a standard for manufacturing, preparation,
 380 management and storage of Halal foods (Abdul, et al., 2009). The 2nd revision of the standard was launched in
 381 2009 with additional requirements, such as management responsibility and demands for premises having more
 382 emphasis on food hygiene and safety (Department of Standards of Malaysia, 2009). However, in the 2004
 383 standard it is stated, that the standard should be used together with MS 1480 (Food safety according to hazard
 384 analysis and critical control point (HACCP) system), MS 1514 (Good Manufacturing Practice (GMP) for food)
 385 standards and that governmental guidelines on good hygiene practice for small and medium scale food
 386 industries towards HACCP should be followed (Department of Standards Malaysia, 2004). In the second
 387 revision these are made voluntary and the industry is given a chance to choose the type of prerequisites they
 388 want to use to ensure food safety. This would seem to be a retrograde step in terms of assuring best practice
 389 food safety management approaches as a part of Halal certification.

390 The CAC/RCP 1-1969 gives guidelines for the production of safe food suitable for consumption. It covers the
 391 food chain from primary production to the consumer. It encompasses general principles for ensuring food safety,
 392 which every company being a link in the food chain should implement (CAC, 2003). The MS1500:2009 is a
 393 standard organized by a government of a Muslim-majority country wishing to be renowned in the world in the
 394 area of Halal. Although, the Malaysian Halal certification system might lack operational efficiency it is still at
 395 present a world renowned Halal standard (Noordin, et al., 2009). The MS 1500:2009 will be evaluated against
 396 the CAC/RCP 1-1969 to see if the basic food safety activities are incorporated in it. The MS 1500:2009 brings
 397 out that Halal food should be safe for consumption, non-poisonous, non-intoxicating or non-hazardous to health.
 398 An important paragraph in the standard regarding food safety assurance is Section 3.4 titled "Hygiene, sanitation
 399 and food safety". It states that "Hygiene, sanitation and food safety are prerequisites in the preparation of halal
 400 food" and "Halal food shall be processed, packed and distributed under hygienic conditions". This shows that
 401 food safety is considered as a part of Halal assurance or in other words they consider food safety aspects of
 402 *Toyyiban* as part of the Halal concept, even though this term is not used in the standard. Therefore, the
 403 MS1500:2009 should take necessary precautions to fulfil food safety requirements in order to comply with the
 404 food safety criteria.

405 A study states, that the MS1500:2009 in its entirety is consistent with the "Halalan *Toyyiban*" concept, however
 406 taking a different approach referring to MS 1480:2007 and Food Acts and Regulations as food safety aspects,
 407 categorizing the 3.4 chapter as a parameter for food cleanliness (Arif & Sidek, 2015). However, the MS
 408 1480:2007 being voluntary and shortcomings in legislation implementation (Duad, et al., 2011) undermine this
 409 approach. This means, that in order for MS1500:2009 to assure "Halalan *Toyyiban*", the standard itself should
 410 incorporate food safety requirements. Although, implementation of the standard could also be lacking among
 411 producers (Duad, et al., 2011; Din & Duad, 2014), at least the "Halalan *Toyyiban*" concept would be under
 412 control of one institution and hence also the responsibility of the producers, who could in turn commit to
 413 implementing "Halalan *Toyyiban*" as a wholesome approach. A situation where a producer is committed to
 414 implement the Halal standard, which does not include sufficient food safety requirements, might lead to
 415 deficiencies in the wholesomeness of the "Halalan *Toyyiban*" concept, if the producer is not also committed to
 416 implement food safety legislation. Therefore, a standard, aiming to capture the "Halalan *Toyyiban*" concept in
 417 its entirety, should not be separated into pieces and scattered between different institutions. In other words, as
 418 "Halalan *Toyyiban*" has a wholesome approach, thereof the corresponding standard should have it as well.
 419 Therefore, this study analyses the food safety aspect of "Halalan *Toyyiban*" in the MS1500:2009, with the aim
 420 to identify shortcomings from a wholesome approach. In addition, in the Arif and Sidek (2015) study analysis
 421 and interviews with auditors were conducted, however on-site audits were not carried out in JAKIM's Halal
 422 certified establishments, which would have shown, whether or not the "Halalan *Toyyiban*" requirements were

423 applied in practice and whether the approach of scattered requirements with responsibility to different
424 institutions would have been viable or not (Arif & Sidek, 2015).

425 An important statement made in the MS 1500:2009 is that where necessary, suitable detection or screening
426 devices should be used, which is also word by word prescribed by the CAC/RCP 1-1969. Furthermore, in order
427 for premises to comply with GMP and GHP requirements, MS 1500:2009 also suggest the standards MS 1480
428 and MS 1514 as a way to comply with these criteria; however these additional standards are voluntary. This
429 raises a question of the certification process, that since many GMP and GHP guidelines exist, how audits would
430 be conducted to evaluate that the food safety criteria are complied with at a necessary level, i.e. at the level
431 described by CAC/RCP 1-1969. The standard also states that the premises must be licensed in accordance with
432 public health legislation currently in force by the competent authority in Malaysia. As a national standard, the
433 guideline tailors to local food industries and could further be expanded to achieve global acceptance. This would
434 also mean that during the certification process the aforementioned regulations should also be strictly audited.
435 These regulations are compulsory for local producers, and governmental support and technical assistance are
436 provided for them to acquire the Halal certification. For exporters to Malaysia this makes their situation more
437 complicated as they will have to abide by the local public health legislation. However, exporters from countries
438 with recognised Halal CB and with a certificate from them will be accepted by the Malaysian government.
439 Finally, it is not clear whether the legislation compliance is audited by the certification agency or by the
440 governmental officials. This is especially important for exporters, whose production facility does not reside in
441 Malaysia. With regards to meat and products of animal origin the Malaysian Department of Veterinary Services
442 inspects aspects of food safety assurance, whereas JAKIM inspects only compliance with Halal requirements
443 (DVS, 2015). Therefore, food safety is mainly assured by the government limiting JAKIM's authority by
444 rendering food safety requirements secondary with regards to the MS 1500:2009 standard.

445 It is also brought out in the standard that it may not contain all requirements. Exporters and local producers alike
446 should be provided with technical assistance in interpreting the MS 1500:2009, as it does not specify exactly
447 what legislation would be compulsory under the current standard. In the bibliography the main laws regulating
448 food (Food Hygiene Regulation 2009, Food Regulation 1985 and Food Act 1983) are specified, but are not
449 mentioned anywhere else in the standard. For exporters, the last two regulations are mandatory (USDA, 2011),
450 which leaves a question on whether the Food Hygiene Regulation 2009 would also be mandatory when applying
451 for the MS 1500:2009 standard.

452 According to the Islamic law najis means dirtiness which includes things that are naturally and non-naturally
453 najis. The latter are things that have become najis upon contact with it and could be purified (The Central
454 Islamic Committee of Thailand, n.d.). MS1500:2009 states that Halal food does not contain and does not come
455 into direct contact with anything regarded as najis, including devices, utensils, machines, equipment, processing
456 aids and packaging materials contaminated with or containing najis. According to the standard dogs and pigs
457 and their descendants, any liquid and objects discharged from the orifices of human beings or animals such as
458 urine, blood, vomit, pus, placenta and excrement, sperm and ova of pigs and dogs, carrion or halal animals that
459 are not slaughtered according to Islamic law, alcoholic beverages, intoxicants and food or drink which is mixed
460 with them are considered naturally as najis. It is also important to note, that feces, urine and vomit are also
461 possible sources of food-borne disease, which need food safety measures to avoid food contamination (FDA,
462 2012).

463 In the comparison it was clear that some of the basic principles of food hygiene were considered. The MS
464 1500:2009 briefly summarises the requirements for the production of safe food, but they are not further
465 elaborated in detail. Table 2 gives an overview of the points that are generally covered in the MS 1500:2009,
466 where these general statements are aligned with equivalent, whereas more detailed, guidelines of the CAC/RCP
467 1-1969. Table 3 cites the requirements in the CAC/RCP 1-1969, which are lacking in the MS 1500:2009.

468 Like the CAC/RCP 1-1969, the MS 1500:2009 also intends to cover the entire supply chain from requirements
469 on animal health to packaging, labelling and transportation. In the MS 1500:2009 it was brought out that Halal
470 manufacturers shall implement measures for: 1) inspection and sorting of raw materials, ingredients and
471 packaging material before processing; 2) waste management; 3) harmful chemical storage requirements; 4)
472 foreign body management; 5) prevention of excessive use of permitted food additives. The MS 1500:2009 quite
473 thoroughly covers the requirements on premises, i.e. it emphasises that the premises should not be situated near
474 a pig farm, but it does not consider other potential sources of contamination. In addition to the above mentioned
475 five requirements, other fairly well covered areas are packaging, management and supervision, transportation
476 requirements, product information and consumer awareness. Although, the MS 1500:2009 brings out waste
477 management, it does not give further guidelines on what is the acceptable level of practice.

478 In relation to management and supervision the MS 1500:2009 states that a Muslim Halal executive officer
479 should be appointed or a Muslim committee should be established, who should have knowledge on Halal

480 principles for the purpose of implementing a Halal control system. However, there is a lack of a food safety
 481 approach, for example CAC/RCP 1-1969 states that managers and supervisors should have sufficient knowledge
 482 of food safety to notice risks and lead preventative, corrective and monitoring activities. In order to assure food
 483 safety the Muslim Halal executive or the committee should also have basic knowledge of food safety and make
 484 sure that the managers and supervisors on every level of the company would be aware of both the main Halal
 485 and food safety requirements.

486 **Table 2.** Food safety requirements in the CAC/RCP 1-1969 and their more general MS 1500:2009 equivalents.

TOPIC	CAC/RCP 1-1969	MS 1500:2009
Establishment: Equipment		
Food control and monitoring equipment	Equipment used to cook, heat treat, cool, store or freeze food should be designed to achieve the required food temperatures as rapidly as necessary in the interests of food safety and suitability, and maintain them effectively.	3.4.1 Hygiene, sanitation and food safety are prerequisites in the preparation of halal food. It includes the various aspects of personal hygiene, clothing, devices, utensils, machines and processing aids and the premises for processing, manufacturing and storage of food.
Temperature control	Depending on the nature of the food operations undertaken, adequate facilities should be available for heating, cooling, cooking, refrigerating and freezing food, for storing refrigerated or frozen foods, monitoring food temperatures, and when necessary, controlling ambient temperatures to ensure the safety and suitability of food.	
Cleaning	Adequate facilities, suitably designated, should be provided for cleaning food, utensils and equipment.	
Establishment: Personal Hygiene		
Health status	People known, or suspected, to be suffering from, or to be a carrier of a disease or illness likely to be transmitted through food, should not be allowed to enter any food handling area if there is a likelihood of their contaminating food.	3.4.1 Hygiene, sanitation and food safety are prerequisites in the preparation of halal food. It includes the various aspects of personal hygiene, clothing, devices, utensils, machines and processing aids and the premises for processing, manufacturing and storage of food.
Illness and injuries	Conditions which should be reported to management.	
Personal cleanliness	Food handlers should maintain a high degree of personal cleanliness and, where appropriate, wear suitable protective clothing, head covering, and footwear. Cuts and wounds should be covered by suitable waterproof dressings. Hand washing procedures.	
Personal behaviour	People engaged in food handling activities should refrain from behaviour which could result in contamination of food, like smoking, sneezing, spitting etc. Personal effects such as jewellery, watches, pins or other items should not be worn or brought into food handling areas if they pose a threat to the safety and suitability of food.	
Visitors	Visitors to food manufacturing, processing or handling areas should, where appropriate, wear protective clothing and adhere to other personal hygiene provisions.	
Establishment: Maintenance and sanitation		
Pest control systems: Harborage and infestation	Potential food sources should be stored in pest-proof containers and/or stacked above the ground and away from walls.	3.4.2 Halal food manufacturers shall implement measures to inspect and sort raw material, ingredients and packaging material before processing
Microbiological and other specifications	Where microbiological, chemical or physical specifications are used in any food control system, such specifications should be based on sound scientific principles and state, where appropriate, monitoring procedures, analytical methods and action limits. Where appropriate, specifications for raw materials should be inspected and sorted before processing. Stocks of raw materials and ingredients should be subjected to effective stock rotation.	
Containers for waste and inedible substances	Containers for waste, by-products and inedible or dangerous substances, should be specifically identifiable, suitably constructed and, where appropriate, made of impervious material.	

Control of operation: Drainage and waste disposal	Adequate drainage and waste disposal systems and facilities should be provided.
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487 As seen in Table 2 requirements on equipment, personal hygiene and pest harbourage and infestation are
 488 encompassed in the MS 1500:2009 standard in a more general manner. These are summarised under the MS
 489 paragraph 3.4.1 with a statement that hygiene, sanitation and food safety include “various aspects of personal
 490 hygiene, clothing, devices, utensils, machines and processing aids and the premises for processing,
 491 manufacturing and storage of food”. The CAC/RCP 1-1969 gives specific guidelines on what should exactly be
 492 done to comply with these categories. Since the MS 1500:2009 states that Halal food should not be
 493 contaminated with human urine, blood and vomit etc., it is suggested that the personal hygiene section should be
 494 further elaborated to contain detailed guidelines to ensure full compliance by the industry. This is because staff
 495 working in direct contact with food products and who do not wash their hands thoroughly and correctly after
 496 going to the toilet, after vomiting or did not take necessary precautions after an injury, would render the product
 497 non-halal if faecal, vomit or blood contamination were to occur. This would be considered as a serious violation
 498 of halal requirements and should be subject to strict precautionary methods like control, monitoring and
 499 employee education.

500 Regarding raw materials, ingredients and packaging materials control before processing, the CAC/RCP 1-1969
 501 brings out the necessity of specifications. MS 1500:2009 does not mention this, which is interesting because
 502 appropriate raw materials are the foundation to Halal assurance. Raw material intake, control and non-Halal
 503 ingredient verification should be thereof very strictly regulated. A way to prove Halal assurance would be with
 504 products’ specifications.

505 In Table 3 it can be seen that the MS 1500:2009 does not include water, air quality and ventilation and lighting
 506 requirements. Temperature control and microbiological growth are also important factors not elaborated by the
 507 MS 1500:2009. Inadequate food temperature control is one of the most common causes of foodborne illness or
 508 food spoilage (CAC, 2003). These might directly influence the Halal status of food when food is contaminated
 509 with pathogenic microorganism or they grow to numbers that might cause illness hence jeopardizing the Halal
 510 status of the product. The standard mentions perishable foods only with regards to loading docks.

511 The MS 1500:2009 does not cover documentation and recall procedures, which would be essential to prove that
 512 both food safety and Halal are assured and would enable quick withdrawal from the market and if necessary
 513 alerting the public of non-Halal products that might be wrongly perceived as Halal by consumers. Furthermore,
 514 in the MS 1500:2009 the importance of cleaning is being emphasised, however, suitable cleaning programs or
 515 cleaning verification are not specified. The MS 1500:2009 states that pests are considered non-Halal and should
 516 be subject to strict precautionary methods. However, it does not mention pest surveillance and that pest
 517 infestation should be dealt with immediately. The MS 1500:2009 does not cover personnel training to raise
 518 workers’ awareness on Halal and food safety and, surprisingly, does not require specific training for non-
 519 Muslim personnel about the general principles of Halal and specific requirements for cross-contamination with
 520 Haram.

521 Although the MS 1500:2009 highlights some food safety requirements, these should be more thorough to ensure
 522 proper food safety assurance. In addition, there seems to be somewhat of an overlap between Halal and food
 523 safety requirements, like personnel hygiene, pest management, cleaning procedures and raw material
 524 specifications. These aspects should be described more thoroughly to ensure Halal and Togyiban assurance.

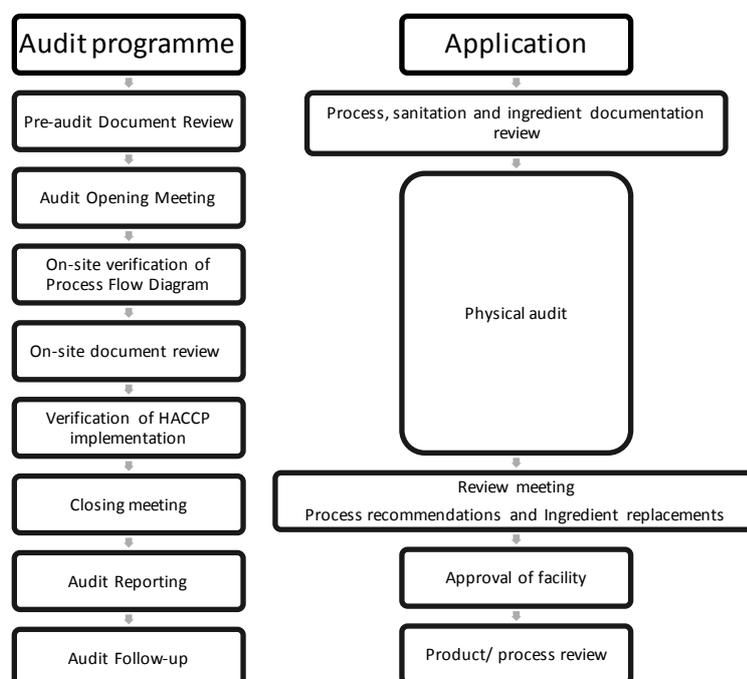
525 **Table 3.** The requirements in the CAC/RCP 1-1969, which were lacking in the MS 1500:2009.

AREA	CAC/RPC 1-1969 REQUIREMENTS (CAC, 2003)
Control of production	
Water requirements	An adequate supply of potable water with appropriate facilities for its storage, distribution and temperature control, should be available whenever necessary to ensure the safety and suitability of food. Only potable water should be used in food handling and processing.
Temperature control	Systems should be in place to ensure that temperature is controlled effectively where it is critical to the safety and suitability of food.
Air quality and ventilation	Adequate means of natural or mechanical ventilation should be provided.
Lighting	Adequate natural or artificial lighting should be provided to enable the undertaking to operate in a hygienic manner.

Documentation and records	Where necessary, appropriate records of processing, production and distribution should be kept and retained for a period that exceeds the shelf-life of the product.
Recall procedures	Managers should ensure effective procedures are in place to deal with any food safety hazard and to enable the complete, rapid recall of any implicated lot of the finished food from the market.
Establishment: Maintenance and sanitation	
Cleaning programmes	Cleaning and disinfection programmes should ensure that all parts of the establishment are appropriately clean, should include the cleaning of cleaning equipment and be continually and effectively monitored for their suitability and effectiveness and where necessary, documented.
Monitoring effectiveness	Sanitation systems should be monitored for effectiveness, periodically verified by means such as audit pre-operational inspections or, where appropriate, microbiological sampling of environment and food contact surfaces and regularly reviewed and adapted to reflect changed circumstances.
Pest control systems: Monitoring and detection	Establishments and surrounding areas should be regularly examined for evidence of infestation.
Pest control systems: Eradication	Pest infestations should be dealt with immediately and without adversely affecting food safety or suitability.
Training	
Awareness and responsibilities	All personnel should be aware of their role and responsibility in protecting food from contamination or deterioration. Food handlers should have the necessary knowledge and skills to enable them to handle food hygienically.
Training programmes	Assessing the level of training required.
Instruction and supervision	Periodic assessments of the effectiveness of training and instruction programmes should be made.
Refresher training	Training programmes should be routinely reviewed and updated where necessary.

526 3.4 Using the HACCP system for Halal Assurance

527 The HACCP system is a recommended approach to enhance food safety from farm to fork. It is a preventative
528 system to deter food safety violations, through identifying, controlling and monitoring hazards (CAC, 2003). In
529 addition, there are suggestions that it could be used to assure Halal compliance (Riaz & Chaundry, 2004;
530 Spiegel, et al., 2012; Dahlan, et al., 2013; Kohilavani, et al., 2013; Kohilavani, et al., 2012; Bonne & Verbeke,
531 2008; Kamaruddin, et al., 2012; Omar, et al., 2013; Ruzevicius, 2012; Ceranic & Božinovic, 2009). At present
532 when HACCP is incorporated in Halal standards it is referred to more as a system of assuring food safety (Latif,
533 et al., 2014).



534

535 Halal assurance is integrated into the HACCP system by simply adding the Halal requirements (Riaz &
536 Chaundry, 2004). Research has resulted in confusion regarding definitions, e.g. Haram Control Point (HCP) was
537 used in a research conducted in Thailand (Dahlan, et al., 2013), Halal Critical Control Point (HCCP) in
538 Malaysian research (Kohilavani, et al., 2012; Kohilavani, et al., 2013), in addition, Halal Control Point (HCP)

539 (Riaz & Chaundry, 2004), Halal Critical Point (JAKIM, 2012), Haram Critical Point (LPPOM MUI, 2008),
 540 Halalan Toyiyiban Critical Control Points (HTCCCP) (Omar, et al., 2013; Omar, et al., 2013), Halal Compliance
 541 Critical Control Points (HCCCP) (Kamaruddin, et al., 2012; Kamaruddin, et al., n.d.), Halal Assurance Point
 542 (HAP) (Hakim, 2013) and Halal CCP or Sharia CCP (Zikrullah, 2014; Al-Mazeedi, 1996). Similarly the
 543 systems have been described variously as Halal Assurance System (HAS), Halal Pre-requisite Programme
 544 (Halal PRP) (Farooqui & Kurt, 2013) and Haram Analysis Critical Control Points (HrACCP) system
 545 (Ruzevicius, 2012; Ceranic & Božinovic, 2009).

546 In 1996 a Halal assurance system was proposed to McDonald's International and named after that as the
 547 McHalal System (Al-Mazeedi, 1996). It suggested using the HACCP system for Halal assurance and even
 548 determined CCPs, which are all related to meat processing and storing characteristics (Al-Mazeedi, 1996).
 549 Kohilavani et al. (2012) proposed a decision tree based approach for the purpose of identifying Halal Critical
 550 Control Points. However, it is dedicated for Halal slaughtering. The concept of the Halal-HACCP system was
 551 taken further by Kohilavani et al. (2013) who discussed the compatibility of the Halal requirements with the
 552 HACCP system by analysing the HACCP steps from a Halal perspective. The study also suggested a decision
 553 tree for identifying Halal Critical Control Points for ingredients and process control.

554 In Thailand, the Halal, Assurance and Liability Quality System (Hal-Q) was developed as a food safety and
 555 Halal assurance management system, based on HACCP principles (Dahlan, et al., 2013). However, this research
 556 did not give any details on how the Halal assurance was integrated into the HACCP approach. In the study,
 557 terms such as "Halal Food Safety", "Halal security" and "Halal Compliance (HC)" were used (Dahlan, et al.,
 558 2013). These were not properly defined and are also not widely used in other research, so they would need
 559 further elaboration. The study concluded, that there were Halal compliance improvements in Halal and non-
 560 Halal certified seafood enterprises (Dahlan, et al., 2013). Since the presence of Haram should have zero
 561 tolerance (Kohilavani, et al., 2012; Kohilavani, et al., 2013) the concept of a company having poor Halal
 562 compliance remains unclear.

563 At present two major players in the Halal assurance sector Indonesia and Malaysia have released guidelines for
 564 Halal Assurance Systems (HAS) (JAKIM, 2012; LPPOM MUI, 2008), both describing some HACCP system
 565 elements, with the main emphasis being on hazard analysis. While the Indonesian version offers an example of
 566 the HAS manual and decision trees for critical points' identification, the Malaysian version brings out principles
 567 like determining Halal critical control points, making and verifying process flow chart, implementing control
 568 measures, developing corrective actions, maintaining documentation, keeping records and verifying. However,
 569 more detailed guidance would be necessary to develop a valid "Halalan Toyiyiban" based assurance system.
 570 While food safety has critical limits, Halal assurance has zero tolerance for Haram, so it should be very clear
 571 what kind of cross-contamination would be considered as Haram. However, at present no detailed guidelines
 572 exist on what kind of contamination from a GHP breach would be regarded as zero tolerance, e.g. hand washing
 573 after using the toilet to prevent faecal contamination. Since faecal contamination is regarded as non-halal
 574 (Department of Standards of Malaysia, 2009), a point in production normally regarded as a GHP from a food
 575 safety perspective would become a Critical Control Point (CCP), when conducting hazard analysis for Halal
 576 assurance. Riaz and Chaundry (2004) incorporated the main Halal requirements and avoiding Haram ingredients
 577 into the HACCP system, but did not take into account possible cross-contamination with the potential of turning
 578 the produced batch into non-halal because of GMP and GHP violations. Also, a Halal certification case study in
 579 a chocolate factory concentrated mainly on the Halal status of the raw materials. (Shariff & Abd Lah, 2014).

580 At present no studies have been conducted or evidence provided that the HACCP system for Halal assurance is
 581 a plausible approach for Halal and Toyiyiban assurance. Further research would be needed on this concept's
 582 practical use. In addition, globally accepted guidelines, maybe even a CAC standard or guidance document, for
 583 the usage of the HACCP system for Halal and Toyiyiban assurance should be developed, which should also
 584 include clear definition of the main terms and concepts. A master list of hazards of all possible contamination
 585 options could be developed, regarding Haram ingredients, Halal requirements, GMP and GHP violation hazards
 586 and hazards from the process, which would render the product not suitable for consumption in accordance with
 587 Halal and Toyiyiban assurance.

588

589 4. Conclusion

590 Halal assurance is increasingly adopted by the global food industries. This can be seen by the growing amount of
 591 research conducted on the topic in recent years. However, there are several areas that still need further research, e.g.
 592 non-Muslim countries' and manufacturers' perception on Halal assurance, how food production companies and
 593 governments in Muslim-majority countries assure food safety, whether they perceive food safety as a part of Halal
 594 requirements and how (or if) Halal assurance is regulated, monitored and controlled in Muslim and non-Muslim
 595 countries for import and export goods. These are just some of the topics that need elaboration, in order to detect
 596 strengths and limitations of Halal assurance and establish a more trustable judicious approach. At present different
 597 Halal standards exist, which gives rise to a global challenge for assuring Halal in the supply chain.

598 Similar to the farm to fork concept which is used in food safety assurance, the same concepts should apply to Halal
 599 assurance. However, different interpretations of Halal requirements by Islamic schools of law in addition to different
 600 interpretation by standards, guidelines and law makers has paved the way for variations in Halal requirements and
 601 certification scope. It is yet to be studied exactly how these factors affect the standardisation process. Without
 602 identifying the variables, it is not possible to take them under control and move toward a more stable framework. The
 603 variations in Halal standards put producers in a tight spot, as they might have to get multiple Halal certificates for
 604 exporting to different countries. A harmonised Halal assurance standard or mutual recognition and acceptance of other
 605 Halal certifications by different standard owners would be similar to the Global Food Safety Initiative (GFSI) which
 606 emphasises the 'once certified, accepted everywhere' concept (GFSI, 2015). Although Halal products are universal
 607 products, unlike food safety Halal is not sought everywhere and by all. This makes the Halal assurance process much
 608 more fragile due to lack of Halal regulatory bodies, governmental regulation and a unified standardisation system.
 609 Hence, monitoring and controlling of Halal products is hard to achieve.

610 One of the aims of this paper was to determine the position of food safety in the Halal concept. The "Toyyiban"
 611 concept, meaning good or wholesome, seems to be one of the factors playing a role in unifying Halal standards. Some
 612 indicate that by default food safety aspects are a part of Halal assurance, whereas others reported that these are two
 613 separate and independent entities. First of all, the "Toyyiban" concept should be provided with a proper definition and
 614 scope. Next, it should be decided whether it is part of Halal requirements or whether it is a set of separate
 615 requirements in the Halal supply chain. One could expand the Halal and Toyyiban assurance schemes by utilising
 616 different standards such as "Halal" for products meeting the main Halal requirements and "Halalan & Toyyiban" for
 617 products meeting both Halal and Toyyiban requirements. This would at least clear the confusion of Halal standards
 618 being so differently constructed regarding food safety and would enable consumers to make informed decisions,
 619 without any breach of religious practices.

620 A comparison was conducted between Codex Alimentarius Commission's general principles of food hygiene and the
 621 MS 1500:2009 standards. It is noted that there are some food safety requirements in the MS 1500:2009 standard,
 622 which seems to embrace the wholeness of Halal and Toyyiban with its requirements for hygienic production and safe
 623 products. Even its definition of Halal indicates that, however, further extensions would be necessary to clarify food
 624 safety requirements. The standard in a general way makes hygienic production obligatory without making appropriate
 625 guidelines and standards mandatory.

626 The requirements for premises, packaging, management and supervision, transportation, product information and
 627 consumer awareness were well covered by the MS 1500:2009, with only some minor details lacking. However,
 628 personnel hygiene, especially hand washing after toilet usage, pest harbourage and infestations, raw material
 629 specifications were referred to quite generally. With regards to protecting the products' Halal status these would also
 630 be of paramount importance, as faecal and raw materials contamination with haram products will render the food
 631 products non-halal.

632 The HACCP system is considered to be an effective system for enhancing food safety. This could also be a plausible
 633 tool for Halal assurance. However, incorporating Halal features into the HACCP system is a new concept. Limited
 634 research has been done on the topic, which in turn remains general without any detailed guidance. Further research
 635 should be done on how food hygiene practices would be crucial for Halal assurance, e.g. hand washing and pest
 636 control. In addition, clear definitions for the Halal-HACCP assurance system are necessary and general guidelines for
 637 the system should be established to avoid confusion in usage and implementation.

638 The authors believe that this study has identified many areas for potential research in Halal assurance in the food
 639 industry and that it has highlighted critical issues that were not confronted in previous research. Primary research to
 640 capture the views of Islamic scholars from different schools of thought and representatives of different Halal
 641 certification bodies should be conducted. Research on Halal assurance is gathering momentum and it is crucial for all
 642 to move towards a common goal, an unambiguous disciplined assurance of Halal and food safety requirements in the
 643 food chain.

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