# SIG **ENSURING HALAL PRODUCTS BY** LABORATORY **TESTING**

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# About Us

**PT Saraswanti Indo Genetech (SIG)** (registration no. LP-184-IDN) is a one stop laboratory services which is located in Bogor - Indonesia and the first Indonesian lab to be accredited ISO/IEC 17025 by the National Accreditation Committee for the scope of GMO (Genetically Modified Organism) before expanding the capability testing to other sectors.

As an **Advanced Solutions Partner**, SIG employ the most state-of-theart technologies for excellent scientific-based solution, accurate, precise, and consistent in all products testing and development needs.





# We Serve Across the Globe



Sig Towards a safer world

### **Accredited & Certified**







# Designation





KEMENTERIAN KELAUTAN DAN PERIKANAN REPUBLIK INDONESIA





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## **Member of**





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KEMENTERIAN KESEHATAN REPUBLIK INDONESIA





# **Our Test Services**

- Food & Feed
- Cosmetic & Personal Care
- Pharmaceuticals & **Traditional Medicines**
- Toxicity & Efficacy
- Pesticides
- Antiseptic & Disinfectant
- Antimicrobial Resistance
- Medical Devices
- Medical Mask



- Textile & Electricity (K3L Products)
- Food Packaging
- Swab Tests
- Physical & Chemical **Test for Toys**
- Research
- Compounds Screening
- Ready to Use Media
- Proficiency Test Provider



# Outline

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# Introduction: Halal in Food Industry Around the Globe



# What is Halal?

Halal (حلال) means what is **permissible in Islamic law** (shariah). The concept applies to various aspects of life as a guidelines of permissibility in dietary and lifestyle for Muslims.

In addition to being halal, the food consumed must also be **thayyib (good)**, which is beneficial for the body and does not conflict with the commands of Allah SWT.

"O humanity! Eat from what is lawful and good on the earth ...." Surah Al-Baqarah verse 168

The Islamic dietary laws specify that **all food and beverages are considered Halal unless explicitly stated as forbidden**.

*"O believers! Do not forbid the good things which Allah has made lawful for you ...." Surah Al-Ma'idah verse 87* 



# The ABCD IS = Forbidden = Non Halal

# Alcohol (ethyl) and all types of intoxicants/drugs



#### Blood – flowing or congealed



#### Carnivorous animals





# The ABCD IS = Forbidden = Non Halal

Dead meat – Not slaughtered according to Islamic slaughtering rites



#### Immolated food



#### Swine and all swine derivatives





# **Ruling on Fruit Called Durian**

**Durian (Durio zibethinus), the "King of Fruits",** is a tropical fruit native to Southeast Asia, and it is particularly popular in countries like Indonesia, Malaysia, Thailand, the Philippines, and Singapore.

Although ripe durian is high in alcohol, consumption of the fruit is basically halal. The alcohol contained in it is not the khamr (intoxicating drink made from fermented grape juice).

In addition, all plant-based foods are halal as long as they are not harmful, especially since durian does not undergo any further food processing, so it is halal to consume.

".... permits for them what is lawful and forbids to them what is impure ...." Surah Al-A'raf verse 157





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The alcohol contained in it is not the khamr (intoxicating drink made from fermented grape juice). So, it is halal to consume.

# How about Tapai?

Tapai (or tape in Indonesian) is a traditional fermented food that is native to several countries in Southeast Asia, including Indonesia, Malaysia, the Philippines, and Thailand.

> Fermentation process can release alcohol as a byproduct. Therefore, is tapai halal for consumption?





".... Eat and drink, but be not excessive ...." Surah Al-A'raf verse 31

".... There should be neither harming (darar) nor reciprocating harm (dirar) ...." Hadith 32, 40 Hadith an-Nawawi







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# Halal Food in Global Market

halal food industry has experienced significant growth and development globally, driven by factors such as the rising Muslim population and increasing awareness of halal food requirements.

The industry has become a major player in the global food market, with a projected growth rate of 11.1%, reaching US\$4.1 trillion by 2028 (Asia Pacific Food Industry, 2023). On the other hand, the Muslim population is projected to reach around 3 billion by 2060, which is a significant driving force for the growth of the halal food market (Aneesh & Khadar, 2022).



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# Food Halal Assurance



# **Urgencies of Halal Products** Certification

The halal status of a product, as evidenced by a halal certificate, plays a crucial role in offering legal assurances and safeguarding the interests of Muslim consumers, particularly when it comes to the consumption of market products.



Quality assurance





# Global Halal Certification Bodies









Majlis Ugama Islam Singapura (Islamic Religious Council of Singapore)

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REPUBLIC OF TÜRKİYE HALAL ACCREDITATION AGENCY

and so on ....



#### **The Standards and Metrology Institute**

for Islamic Countries, is standardization body of the member countries of the Organization of the Islamic Conference (OIC) that conducts standardization activities and conformity meetings by harmonizing standards to eliminate technical barriers to trade among member countries, drafting SMIIC standards, seeking uniformity in metrology, laboratory testing, and standardization activities.

> OIC/SMIIC 24:2020 General Requirements for

OIC/SMIIC 1:2019 General Requirements for Halal Food

OIC/SMIIC 22:2021 Halal Edible Gelatine – Requirements and Test Methods

OIC/SMIIC 50-1: 2022 Halal Pharmaceuticals - Part 1 - General Requirements

General Requirements for Food Additives and Other Added Chemicals to Halal Food



# National Standardization Agency of Indonesia (BSN)

Since 1 December 2020, Indonesia has been registered as member of SMIIC represented by BSN. Indonesia's involvement in SMIIC plays a role in setting halal standards for the global community.

| Particip   | ating Roles  | Observation Roles       |                         |            |           |                          |
|------------|--------------|-------------------------|-------------------------|------------|-----------|--------------------------|
| <u>CCA</u> | SMIIC Com    | imittee on Standards fo | r Conformity Assessment |            |           |                          |
| TC1        | Halal Food   | lssues                  |                         |            |           |                          |
| TC2        | Halal Cosm   | netic Issues            |                         | Participal | ing Roles | Observation Roles        |
| TC5        | Tourism an   | nd Related Services     |                         | TC6        | Agric     | ultural Products         |
| TC9        | Textiles and | d Related Products      |                         | TC8        | Leath     | ner and Tanning Material |
| TC10       | Halal Supp   | ly Chain                |                         |            |           |                          |
| TC11       | Halal Mana   | agement Systems         |                         |            |           |                          |
| TC16       | Halal Pharr  | maceuticals Issues      |                         |            |           |                          |





# 1. you

# Halal in Indonesia



**Indonesia,** as a country with the **largest Muslim majority population**, certainly has great potential in the halal industry, especially halal food, halal tourism, halal fashion, halal pharmaceuticals, and halal cosmetics.

Indonesian government aims to make Indonesia the world's halal center and **the pioneer of halal industry** globalization.





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# **Regulatory Framework**





Regarding Implementation of the Law No. 33/2014

**Regarding Halal Product Assurance Implementation** 

**Regarding Halal Certification Services** 



# **Halal Certification Bodies**

**Collaboration and interdependence** in Halal certification





**Determining product** halalness through a fatwa

BPJPH

#### **Registration, submission and** publication of halal certificates





# **Regular - Halal Certification Process Flow**





# **Self-Declare - Halal Certification Process Flow**





#### Halal Sertification Scheme Comparison Regular **Self-Declare** VS 10 Subject to fees Free of charge Engaging PPH (applicant assistant) for Engaging LPH for halal audit verifying and validating halal audit For medium and large scale industries, For micro and small business, simple complex production processes, production processes, raw materials risky raw materials are not risky and clearly halal Max. turnover 500 M/year, max. capital 200 B

Turnover > 500 M/year, Capital > 200 B



29 OCTOBER 2024



## Head of BPJPH: Halal Certification Obligation for Consumer Protection and Business Convenience

https://bpjph.halal.go.id

# Halal October Program



The obligation to have halal certification for food products, beverages, slaughtered products, and slaughtering services as starting from:

1.October 17, 2019 to October 17, 2024 for macro business,

2.**October 17, 2019 to October 17, 2026** for micro and small business

3.**No later than October 17, 2026**, for imported products that is determined by the Minister of Religious Affairs after considering the completion of cooperation on mutual recognition of halal certificates





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# Halal Checker



#### How to access ?

**01** Go to <u>https://bpjph.halal.go.id</u>

#### 02

Input product name, manufacturer, or certificate number

#### 03

Check the status





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# **SIG Halal Testing** Services



# Why Food Products are Potentially Non Halal?

#### Additives

Derived from animal materials such as gelatin are critical if the source come from non halal materials

#### Coating

Are made from gelatin for reduce moisture loss in food products, provide a barrier against oxygen, film formation, and biodegradable

#### Flavoring

Any flavoring derived from alcohol or containing alcohol ingredients

#### Encapsulation

Commonly technique that are used in the pharmaceutical capsulating drugs in soft and hard capsules using gelatin





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In general, analytical methods for halal testing in food products are based on DNA authentification, protein identification, and alcohol content calculation.

qPCR

LC-MS/MS Technique for detection of specific markers as an indicator of the presence of porcine gelatin

**GC-FID-HS** Technique for calculation alcohol content quantitatively



Technique for DNA identification to authenticate porcine DNA



# **qPCR** (Real-time PCR)

#### **Method Principle**

Detection of porcine DNA fragments in samples by amplifying porcine cyt-b specific targets using qPCR.

#### **Scope of Method**

| Analyte     | Matrix                   |
|-------------|--------------------------|
| Porcine DNA | Meat Sausage             |
| Porcine DNA | Instan noodles*          |
| Porcine DNA | Sauce*                   |
| Porcine DNA | Meat*                    |
| Porcine DNA | Gelatin                  |
| Porcine DNA | Cosmetics*               |
| Porcine DNA | Other food products      |
| Porcine DNA | Pharmaceutical products* |
|             |                          |

\*) Scope accredited



#### 2024 Matrix Recap

# Why using qPCR ?

#### High sensitivity

Capable of detecting very low amounts of DNA, making it effective for analyzing samples with low concentrations

Highly quantitative and accurate Gene expression fold changes can be measured accurately in real-time in contrast to traditional PCR output

#### Amplification Process Monitoring The dynamics of the amplification process can be monitored in real-time

## Specificity

Specific primer are used for porcine DNA, can differentiate between porcine DNA and other types, reducing the risk of false positive results







# **Analytical Procedure**

#### Amplification



#### **Elongation**

04

The DNA polymerase synthesizes a new DNA strand. Resulting formation of a new double-stranded DNA molecule

# 05

#### **Detection**

Fluorescence signal is proportional to the amount of PCR product



# **Raw Data qPCR Analysis**



| Well | Fluor | Content     | C(t)  |
|------|-------|-------------|-------|
| A05  | FAM   | Unkn        | No Ct |
| A07  | FAM   | Unkn        | 24.64 |
| A12  | FAM   | NTC         | No Ct |
| B05  | FAM   | Unkn        | No Ct |
| B07  | FAM   | Unkn        | 24.91 |
| B12  | FAM   | Unkn        | No Ct |
| C10  | FAM   | Unkn        | 15.20 |
| D10  | FAM   | Unkn        | 15.36 |
| E10  | FAM   | Pos<br>Ctrl | 15.23 |



#### Note:

Negative sample Positive sample Positive Control and Inhibitor Control Negative control & extraction blank control





# LC-MS/MS (Liquid Chromatography-Mass **Spectrometry/Mass Spectrometry)**

#### **Method Principle**

Detection of porcine and bovine specific peptide biomarkers using LC-MS/MS qualitatively by comparing sample readings to controls

#### **Scope of Method**

| Analyte                    | Matrix                 |
|----------------------------|------------------------|
| Porcine and bovine gelatin | Gelatin-base<br>produc |
| Porcine and bovine gelatin | Gelatiı                |
| Porcine and bovine gelatin | Soft car               |
| Porcine and bovine gelatin | Other food p           |
| Porcine and bovine gelatin | Soft cape              |
| Porcine and bovine gelatin | Gelatine ca            |
|                            |                        |

\*) Scope accredited



# What is Gelatin?

Gelatin is a mixture of polypeptides derived from hydrolysis of collagen extracted from skins, bones and connective tissues of animals.

Gelatin offers a wide range of properties and functionalities.

For each food, pharma or technical application there is a specific gelatin that brings the exact functionalities required to achieve a perfect end-product such as;

- **Right texture** (in a gummy for example)
- **Mouthfeel** (in a dairy product)
- Transparency (softgel)

| Gelatine F |
|------------|
| Sta        |
| Gellir     |
| Em         |
| Thicker    |
| B          |



#### unctionalities

bilizer

ng agent

ulsifier

ning agent

inder

Nutritional enhancer

Film-forming agent

#### **Gelatin Properties**

Thermo-reversible

Gel-strength

Stabilizing emulsions

Source of protein

Biocompatible



# Why Should Gelatin be Tested for Halal ?

Mammalian sources such as **pig skin and cowhides are the most available sources of gelatin, accounting for 46%** of the world's gelatin source, followed by bones (23%), hooves (29%), and the remaining 1% coming from marine sources such as fish (Rakhmanova, Khan, Sharif & Lv, 2018).

In Europe, **95% of gelatin is obtained from bovine hides and porcine**, and 5% from their bones (Alipal et al., 2021).

Identifying the halal status of gelatin is essential due to its potential porcine origin. This not only helps prevent the consumption of non-halal substances but also **fosters trust**, **compliance with market regulations**, and respect for **consumer beliefs**.





# Why using LC-MS/MS?

#### Specificity

Allowing identification of unique mass signatures and fragmentation patterns of gelatin peptides, which helps distinguish gelatin from other proteins

#### Highly sensitivity

Can detect low concentrations of gelatin, making it suitable for analyzing complex samples where gelatin may be present in trace amounts

### Versatility

Can analyze a wide range of samples, including gelatin raw material, food products, and pharmaceuticals







# **Analytical Procedure**





# **Raw Data LC-MS/MS Analysis**

#### **Porcine "Detected" Result**



#### **Identification with 2 Markers**

#### **Porcine "Not Detected" Result**



# **GC-FID** (Gas Chromatography - Flame Ionization Detector)

#### **Method principle**

Alcohol content (methanol and ethanol) in the samples were quantitated using GC-FID using a standard calibration curve. Head space (HS) method are used for detection methanol and ethanol as residual solvent

#### **Scope of Method**

| Analyte              | Matrix                   |
|----------------------|--------------------------|
| Methanol and ethanol | Chili Sauce*             |
| Methanol and ethanol | Pharmaceutical products* |
| Methanol and ethanol | Beverages                |

\*) Scope accredited



# **Raw Data GC-FID HS Analysis**

#### **Ethanol "Detected" Result**



#### **Ethanol "Not detected" Result**

Software Version Sample Name Instrument Name Rack/Vial Sample Amour Cycle Date Data Data Acquisitio Channel Operator Dilution Factor

Result File : D: Sauce\_A\_036 Sequence File



| 6 2 4 0700                          | CECUE PROVIDE LINE (                      |
|-------------------------------------|---|
| Saus Spagheti Spaghetti Sauce       |   |
| : Clarus 580                        |   |
| : 0/0                               |   |
| : 1.000000                          |   |
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| ime : 7/20/2024 7:47:39 AM          |   |
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| : manager                           |   |
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# Why Should Beverages be Tested for Halal ?

Beverages can easily contain additional ingredients that may not be permitted, such as alcohol or alcohol-based flavorings, natural and artificial flavors from certain sources, and colorings from unacceptable sources.

Testing for ethanol content is one of the critical parameters used to test beverage ingredients because it categorized as Khamr (خمر) an intoxicant drink.

"O believers, **Intoxicants**, gambling, idols, and drawing lots for decisions ...." Surah Al-Ma'idah verse 90





# Are All Alcohol Non Halal?

Based on MUI fatwa, an authorized halal body in Indonesia, Alcohol are categorized into the following two categories:

- 1. **Alcohol/ethanol produced by the khamr industry**, the laws of which are the same as those of khamr, namely **haram** (حرام) and **najis** (نجس)
- 2. Alcohol/ethanol produced from non-khamr industry (whether it is the result of chemical synthesis based on petrochemicals or the result of non-khamr fermentation industry), it is permissible, if it is not medically dangerous





# **Analytical Procedure**









# **Method Infographic**





#### (Yulirohyami et al., 2024)



# 66

Fulfilling regulations, consumer needs, and creating a halal ecosystem through halal testing of foods and pharmaeuticals.







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# Challenges and Recommendations



# **Further Follow Up: Development of Lard Test Methods**







Fats and oils are important nutrients for humans. Using animal fats in foods was very popular in the first 50 years of the twentieth century. Many applications of lard in food make it a popular substance for food products.

1) The glycerolized lard, which is glycerolysed into diacylglyceride and monoacylglycerol, can increase the emulsifying activity and emulsion stability in meat products, 2) Lard-based diacylglycerol can increase water holding capacity of meat product,

3) Lard can reduce the hardness of cookie dough



(Nizar et al., 2023)



# **Candidate Test Method**

## FTIR (Fourier-Transform Infrared Spectroscopy)



Halal and non-halal substances have distinct molecular fingerprints, FTIR spectroscopy can be used to differentiate between these ingredients.

Lard has a distinctive IR absorption signature due to specific molecular vibrations associated with fatty acids.

## **GC-FID** (Gas Chromatography - Flame Ionization Detector)

GC-FID can reveal whether pork fat (lard) or other animal fats are present in a product because it **provides precise information on the composition of** fatty acids in a sample.

Using GC-FID, it is possible to identify the characteristic saturated fatty acids that are indicative of lard and distinguish it from other fats, whether from halal sources (such as beef tallow or poultry fats) or plant-based oils.





# Challenges

**For qPCR method :** 

1. Extraction methods for highly processed products and low level present DNA samples

# Recommendations

For qPCR method :

1. Optimize and validate the DNA Extraction method for each type of matrix samples





# Challenges

For LC-MS/MS method :

- 1. Fatwa on interpretation of results (number of positive markers in sample that must be exist for halal/haram claim)
- 2. Availability of QCM

# Recommendations

For LC-MS/MS method :

1. Important to harmonize the methods used





# Challenges

#### 01

Expansion scope of global halal standard

#### 02

Harmonization and / or adoption existing standard method

# Recommendations

#### 01

Strengthening of halal product assurance synergy and collaboration internationally

#### 02

Collaborative framework involving stakeholders such as certification bodies, industry experts, academia, and consumers for developing global halal standard





# **Thank You** For Your Attention



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# We champion the cause of making a safer world for everyone – for Asia and beyond. We're SIG. Towards a Safer World



# **Got Questions?**

Image: Contract of the second sec

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