# Food Packaging & Labelling


Dr Imtiaz Hussain

Imtiaz@halalfoodauthority.com

Mobile: 00447824473840

# Food Packaging & Labelling

- Packaging terminology &Types of Packaging
- Food grade packaging
- Food labelling, Law & information
- Packaging suitability
- Packaging migration & stimulants
- Food labelling & information
- Halal Packaging & halal food industry challenges
- Halal packaging production environment, Storage & distribution

# Packaging: definition and principles

- Definition: European directive 94/62/EC
- Sales packaging or primary packaging:
- Grouped packaging or secondary packaging
- transport packaging or tertiary packaging
- FCM
- Regulation 1935/2004 EC:

# Food Packaging

- Specification
- Food Grade Packaging
- Chemical Migration certificate
- Valid HALAL certificate/Statement
- Product suitability

**Polymer Based Packaging Materials**

- Polyethylene(PE), LDPE/HDPE
- Polystyrene(PS)
- Polypropylene (PP)
- Poly(ethylene)terephthalate(PET)

- Commission Regulation (EU) No.10/2011
- MW>1000DA not absorbed by GI tract
- NAIS: paper, cardboard adhesives & Ink etc
- Multilayer packaging material
- GC-MS Volatile  & semi-volatiles
- LC-MS Non-volatiles
- FCM

# Specification

- Composition of material
- Type of material used
- Packaging design
- Food tolerance (overall migration/Food suitability)
- Allergen declaration
- Food grade information
- Halal declaration/Certificate

# Food Grade Packaging

- Regulation (EC) No. 1935/2004. GMP, Declared suitable for food contact use
- Compliance general safety requirement (Art.3)
- Compliance with labelling (Art.15)
- Declaration of general food compliance (Art.16)
- Traceability compliance (Art.17)
- GMP requirement of regulation (EC) No. 2023/2006 (flexible & fibre-based packaging
- www.flexpack-Europe.org

# Factors influencing migration phenomenon

- Nature of foods
- Packaging surface area & volume
- Duration of contact
- Temperature of contact
- Nature of packaging material
- Migrant characteristics
- Migrant concentration in packaging

# Listing of common food simulants used for migration testing

| Solvents used for migration testing | Simulant category |
|---|---|
| Distilled H2O | Simulant A |
| Aqueous acetic acid (3% w/v) | Simulant B |
| Aqueous ethanol (15% v/v) | Simulant C |
| Sunflower oil or rectified olive oil | Simulant D |

# Migrants Classification based on Molecular weight

| Molecular weight (Da) (1g/mol) | Characteristics | Analysis technique |
|---|---|---|
| from 40 to 150–200 | Monomers, volatile | Gas chromatography (GC) and head-space techniques |
| from 150 to 600 | Volatile | Gas chromatography (GC) and head-space techniques |
| from 200 to 1,000 | | NMR, liquid chromatography |
| from 40 to 1,000 | Presence of a chromophore | Direct UV spectrophotometry |

# Types of Migration

No or negligible migration

Migration independent of the packaged product

Migration linked to interaction with the product:

- Chemical or electrochemical reactions between the packaging wall and the contents (with metal packaging)
- Ion exchange between the packaging material and the food (glass or ceramic packaging)
- Absorption of liquids by the packaging material (mostly plastic or paper packaging)

# Migration tests and legislation

| | Water | 3% acetic acid | 15% ethanol | Olive oil |
|---|---|---|---|---|
| Non-alcoholic beverages | X | X | - | - |
| Pasta | - | - | - | - |
| Chocolate | - | | | X /5 |
| Oils and fats | - | - | - | X |
| Fish | X | X | | X /3 |
| Vinegar | - | X | - | - |
| Processed cheese | X | | | |
| Chips | - | - | - | X /5 |

# Migration test conditions

| Normal conditions of contact<br>Contact time greater than 24 h | Test conditions |
|---|---|
| $\theta \leq 5°C$ | 10 days at 5°C |
| $5°C < \theta \leq 20°C$ | 10 days at 20°C |
| $5°C < \theta \leq 40°C$ | 10 days at 40°C |
| **Contact time between 2 and 24 h** | |
| $\theta \leq 5°C$ | 24 hours at 5°C |
| $5°C < \theta \leq 40°C$ | 24 hours at 40°C |
| $40°C < \theta$ | in accordance with national legislation |

| Contact time less than 2 h | |
|---|---|
| $\theta \leq 5°C$ | 2 hours at 5°C |
| $5°C < \theta \leq 40°C$ | 2 hours at 40°C |
| $40°C < \theta \leq 70°C$ | 2 hours at 70°C |
| $70°C < \theta \leq 100°C$ | 1 hour at 100°C |
| $100°C < \theta \leq 121°C$ | 30 minutes at 121°C |
| $121°C < \theta$ | n accordance with national legislation |

# Chemical Migration Certificate

- Overall migration limit (OML), regulation (EC) NO.10/2011 (Art.12), 10mg/dm2.
- OML 40◦C for 10 days
- Stimulants: A-10% Ethanol, B-3% Acetic acid & D2-10% vegetable oil
- Specific restriction for substances used in plastic, Regulation (EC) No. 10/2011, e.g., acetic acid, stearic acid,
- Value of migration 10mg/dm2 for finished products.
- Also applied for 500ml-10l packaging (60mg/kgs)
- Used of food additive like titanium oxide, Heavy metals (100PPM)
- TSE/BSE (EC) No. 999/2001

# Properties of packaging

- Mechanical strength
- Thermal conductivity
- Radiation barrier properties

# Packaging materials

## Cellulosic materials

- Wood
- Paper and paperboard
- Molded pulp

## Glass

## Metals

- Steel
- Aluminium
- Protective coating of metal packaging

## Plastics

- Polymers

structural polymers

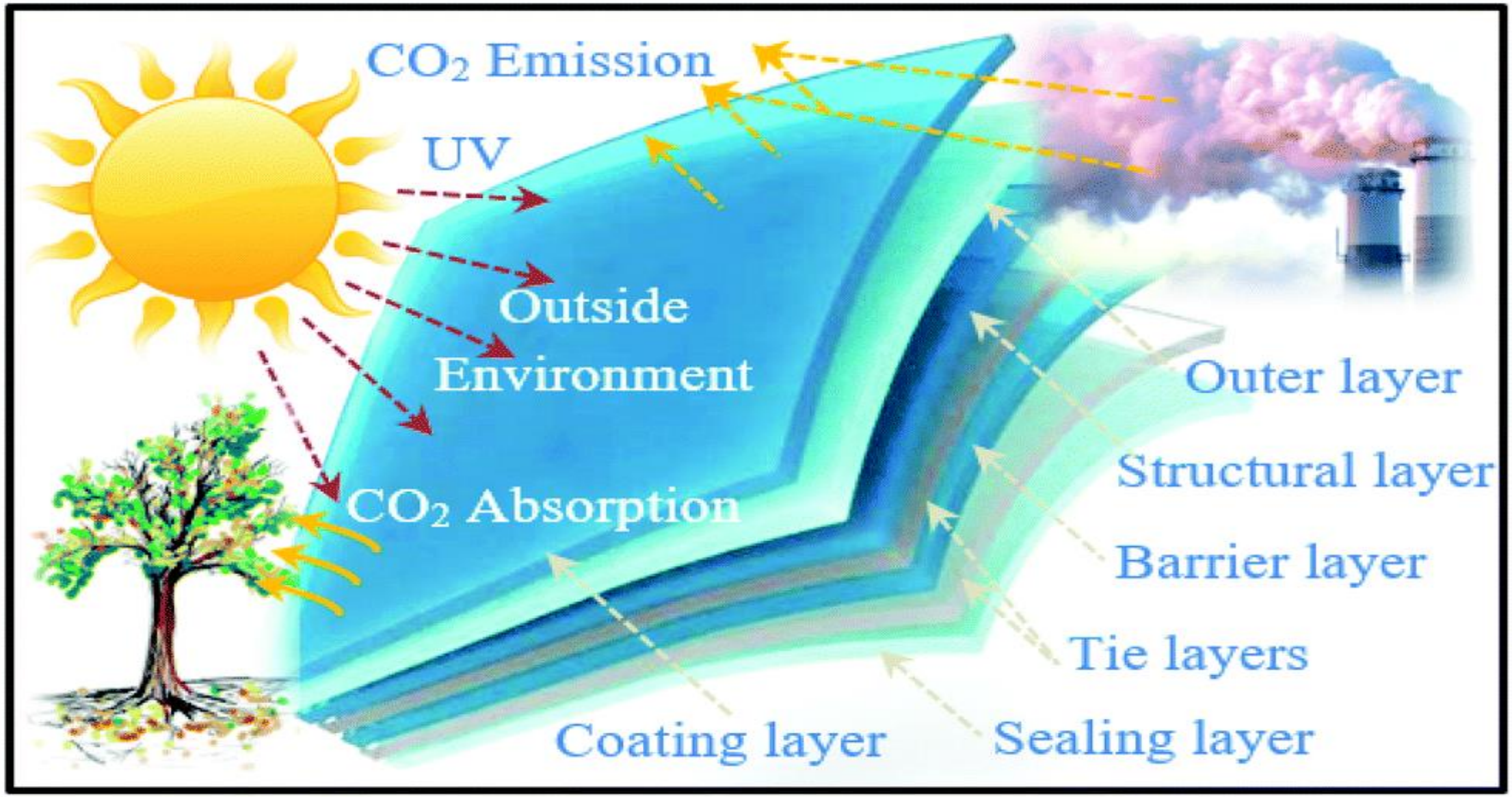
barrier polymers

## Copolymers

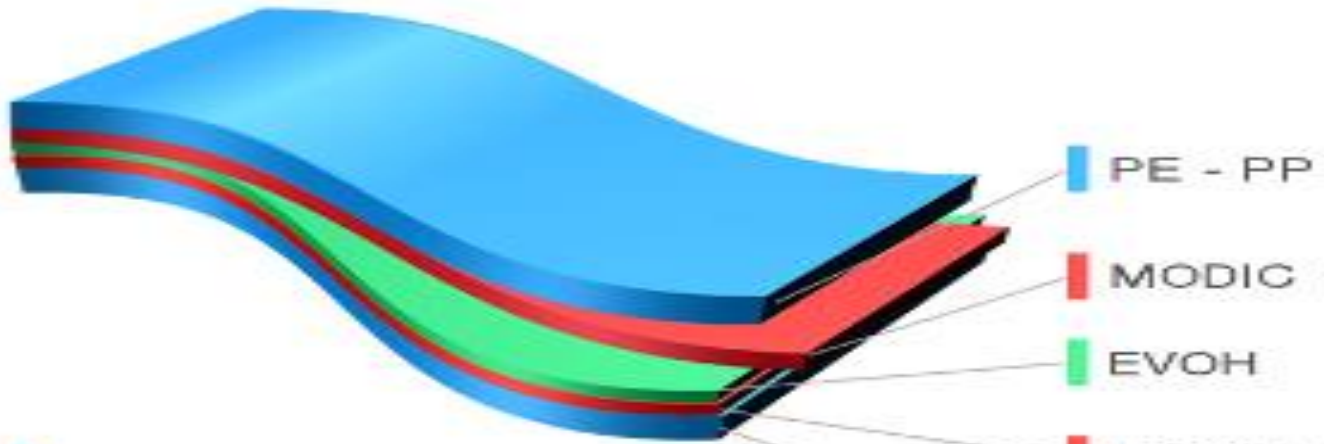
Fillers

# Main groups of organic coatings

| Group | Application | Flexibility | Adhesion | Resistance to sterilization |
|---|---|---|---|---|
| Oleoresins | Fruit and vegetables (anti-sulphur coating) | Poor | Good | Average |
| Phenolics | Fruit, vegetables, meat (barrier coating) | Poor | Poor | Very good |
| Epoxy phenolics | Wide range (fruit, vegetables, meat, etc.) | Good (depends on epoxy/phenolic ratio) | Good | Good |
| Vinyls | Beverages (beer, carbonated drinks) | Excellent | Good | Good |
| Organosols | Wide range for drawn cans | Very good | Very good | Good |
| Acrylics | | Good | Very good | Average |
| Epoxy-urea | Beverages | Good | Good | Average |
| Polyesters | | Average | Good | Good |


$CO_2$ Emission
UV
Outside
Environment
$CO_2$ Absorption
Outer layer
Structural layer
Barrier layer
Tie layers
Coating layer
Sealing layer

## TYPICAL BUILD-UP MULTILAYER BARRIER FILM




| | |
|---|---|
| PE - PP | moisture barrier<br>chemical resistance |
| MODIC | highly adhesive<br>tie layer resin |
| EVOH | oxygene barrier |

# Additives

- Plasticizers
- Stabilizers
- Lubricants
- Antistatic agents
- Flame retardants
- Colorants

# Structural Polymers: Properties

| Polymer | Permeability WPa & O2b | Resistance [g m-2 day-1] at 38°C, 90% HR, 25 µm thickness b : in [cm3 m-2day-1atm-1] at 23°C, 0% HR, 25 µm thickness | Susceptibility | Others | Applications |
|---|---|---|---|---|---|
| LDPE | 10, 7k | Sealable, flexible, printable, transparent | | Sealable, flexible, printable transparent | Sacks, bags, boxes, tubes, bottles, shrink film, stretch film, trays, seals |
| HDPE | 5, 2.1k | Mechanical shock, sterilization | | Rigid, opaque, printable | Bottles, tubes, caps |
| PP | 6-10, 1.8-3.6 | Mechanical and thermal stress (microwave, sterilization), mineral aqueous solutions, dilute acids and alkalis | UV, oxidation | Rigid | Films, boxes, trays (ready meals), blister trays (biscuits), tubs (yoghurt), stoppers, tubes |
| PVC | 10, 35 | Chemical products, fats | Heat, light and oxidation | Rigid, glossy, transparent | Films, bottles (oil, vinegar, wine, syrup), trays, boxes |
| PS | 140, 4k | Dilute acids, aqueous and alcohol solutions | UV, oxidation and organic solvents | Rigid; transparent (crystal polystyrene GPPS); opaque, glossy, breakable (anti-shock polystyrene HIPS); light, thermoformable | Boxes (eggs), tubs (yoghurt), disposable cups, caps, wrapped trays (meat) |
| PET | 32, 65 | Mechanical shock, esters, aromatics, alcohols, fats, dilute acids and alkalis, oxidation, light | | Glossy, printable, transparent | Blow-molded containers (replaces PVC) for liquids (alcohol, water) |
| EVOH | 60, 1.4 | | Moisture | Impermeable to CO2 and flavours | With water impermeable polyolefins (PE or PP) |

# Legislation (MAP)

- EU Directive 94/54/EC requires that labeling must include the phrase “packaged in a protective atmosphere”. Directive 95/2/EC, as amended by Directives 96/85/EC, 98/72/EC and 2001/8/EC, defines packaging gases as additives and only permits carbon dioxide, nitrogen, oxygen, argon, helium and nitrous oxide as packaging gases, propellants or acidity regulators, without restriction or maximum level. The purity criteria for these six gases are defined by Directive 96/77/EC, as amended by Directives 96/86/EC and 2000/63/EC. In addition, Directive 2001/5/EC allows hydrogen as a food additive. None of these directives defines standards for the microbiological quality of packaging gases.

# Food Labelling

- Hidden ingredients such as processing aids, anticaking agents, carriers, and incidental ingredients from various sources present another serious problem for Muslim consumers
- Magnesium or calcium stearates are used in the manufacturing of candy and chewing gum without mention of the origin of the stearates
- European manufacturers use up to 5% vegetable or animal fat in their product and are still able to label it pure chocolate
- Halal certification of the product and proper halal markings and logos can clarify the doubt for consumers
- If alcohol is a part of the food composition or formulation, then alcohol must be included on the label as an ingredient
- Alcoholic beverage and their flavours are not allowed to declared Wine Rice

# Rich sources of Stearic acid

| Source | Stearic acid mg/100g |
|---|---|
| Beef Tallow | 14000 |
| Lard | 13000 |
| White Chocolate | 11000 |
| Salted butter | 7600 |
| Nuts | 6000 |
| Sesame oil | 5400 |
| Cayenne pepper oil | 4700 |
| Sunflower, Soybean & Palm oil | 4000 |
| Chicken | 3100 |

# Food Labelling

## Questionable Ingredients:

- stearates of animal or vegetable origin might be used in production of plastic
- Waxes and coatings applied to plastic, paper, and Styrofoam cups and plates might be from animal fat following the very hot annealing stage, which is hot enough to nullify any animal products found prior to that step
- Metal cans and drums can be contaminated with animal fats. Formation, rolling, and cutting of steel sheets to make containers requires the use of oils to aid in their manufacturing. Such oils can also be animal derived
- Steel drums, which are often reused, can be used to carry foods containing pork or pork fat

- bags and containers
- Hidden ingredients
- Certified halal symbol or logo
- food labelling regulations is to ensure that consumers receive adequate information about food products
- For example, if the label reads that a product contains lard, it is haram
- Gelatine source (Bovine or fish)
- Labelling information requirements: Mandatory, optional or voluntary and instructions for preparation
- For example, making canned peas on the same line as canned pork and beans (No information on Label)

# Food Labelling

- Specific terminology----Red wine vinegar
- Ingredients such as lecithin, mono- and diglycerides, and glycerine can be from animal or vegetable sources
- Labels bilingual or multilingual
- Beef protein isolate (Mislabelling)
- Paper and plastic labels, glue used for pressure-sensitive labels, hot-melt glues, edible printing dyes used directly on food, edible inks, and other similar issues seem very trivial

# Nutrition Facts

Serving Size [redacted] (60g/2.1 oz)
Servings Per Container 12

**Amount Per Serving**

**Calories** 210 Calories from Fat 50

| | % Daily Value* |
|---|---|
| **Total Fat** 6g | 9% |
| Saturated Fat 3.5g | 17% |
| *Trans* Fat 0g | |
| **Polyunsaturated Fat** 1.5g | |
| **Monounsaturated Fat** 1g | |
| **Cholesterol** 10mg | 3 |
| **Sodium** 230mg | 10 |
| **Total Carbohydrate** 38g | 13 |
| Dietary Fiber 2g | 6 |
| Sugars 22g | |
| **Protein** 2g | |

Vitamin A 0% • Vitamin C 0%

* Percent Daily Values are based on a 2,000 calorie diet. Your daily values may be higher or lower depending on your calorie needs:

| | Calories: | 2,000 | 2,500 |
|---|---|---|---|
| Total Fat | Less than | 65g | 80g |
| Sat Fat | Less than | 20g | 25g |
| Cholesterol | Less than | 300mg | 300mg |
| Sodium | Less than | 2,400mg | 2,400mg |
| Total Carbohydrate | | 300g | 375g |
| Dietary Fiber | | 25g | 30g |

Calories per gram:
Fat 9 • [illegible] Protein 4

INGREDIENTS: CORN SYRUP, HIGH FRUCTOSE CORN SYRUP, WATER, SUGAR, ENRICHED BLEACHED AND UNBLEACHED FLOUR (WHEAT FLOUR, MALTED BARLEY FLOUR, NIACIN, REDUCED IRON, THIAMIN MONONITRATE, RIBOFLAVIN, FOLIC ACID), COCONUT (WITH SODIUM METABISULFITE TO PRESERVE WHITENESS), EGGS, SOYBEAN OIL, CONTAINS 2% OR LESS OF EACH OF THE FOLLOWING: COCOA (PROCESSED WITH ALKALI), PALM OIL, DEXTROSE, GELATIN, LEAVENING (BAKING SODA, SODIUM ACID PYROPHOSPHATE, MONOCALCIUM PHOSPHATE), MODIFIED CORN STARCH, WHEAT GLUTEN, EGG YOLKS, CORN STARCH, MONO- AND DIGLYCERIDES, SALT, DATEM, SODIUM STEAROYL LACTYLATE, POLYSORBATE 60, SOY LECITHIN, CELLULOSE GUM, LACTIC ACID, SORBITAN MONOSTEARATE, ARTIFICIAL FLAVORS, CITRIC ACID, XANTHAN GUM, CARAMEL COLOR, PRESERVED WITH POTASSIUM SORBATE, SORBIC ACID AND SODIUM PROPIONATE. IF ORANGE, CONTAINS: FD&C YELLOW #5, FD&C RED #40. IF PINK, CONTAINS: COLORED WITH VEGETABLE JUICE, FD&C RED #40 ALUMINUM LAKE. IF GREEN, CONTAINS: FD&C YELLOW #5 LAKE, FD&C BLUE #1 LAKE.

MANUFACTURED ON SHARED EQUIPMENT THAT ALSO


M&S
Halal
HFA APPROVED
HALAL FOOD AUTHORITY
CHICKEN & ROASTED MUSHROOM TAGLIATELLE
in a creamy mushroom sauce


ASDA
Halal
mutton
حلال
BRITISH HALAL
MUTTON MINCE
£
2.96
14MAY
16MAY

| SUPERMARKET | What halal meat does it sell? | Animals stunned pre-slaughter? | Are the products labelled as halal? |
|---|---|---|---|
| TESCO | Most New Zealand lamb is halal and some suppliers of other meats use halal slaughter techniques. Some stores have halal-only counters. | SOME | Only meat at specified halal counters and from kosher ranges. |
| ASDA | Stocks some branded halal and kosher meals. No comment on whether other meats are halal. | YES | No labelling, apart from on branded halal and kosher meals. |
| Sainsbury's | Sells a range of halal and kosher products. | SOME | Halal and kosher ranges are labelled |
| The co-operative | New Zealand lamb may be halal. Chicken and beef is non-halal. | YES | No halal labelling on New Zealand lamb products. |
| Waitrose | Some of its lamb is halal-slaughtered. All other meat is non-halal. | YES | No halal labelling on lamb products. |
| M MORRISONS | Sells some 'branded' halal chicken, lamb and beef and New Zealand lamb is also halal. | DON'T KNOW | New Zealand lamb is not labelled, but halal ranges clearly indicate the method of slaughter. |
| YOUR M&S | All New Zealand lamb is halal. Chicken, beef and British lamb is non-halal. | YES | New Zealand lamb is not labelled as halal. |
| LIDL | Sells branded halal and kosher products. | YES | All halal and kosher products are labelled. |

# PACKAGING THE FOOD IN A HALAL ENVIRONMENT

- Keeping halal products in a separate room
- Scheduling production to avoid cross-contamination
- Not switching workers from non-halal to halal packing areas
- Properly marking areas to identify halal production
- Ensuring that workers do not bring food into production areas, wash their hands before entering the facility, etc.

# Halal Food Packaging Criteria

- The packaging materials shall not be made from any materials that are non -Halal.
- The packaging materials shall not be prepared, processed or manufactured using equipment that is contaminated with non -Halal materials.
- During its preparation; processing, storage or transportation; it shall be physically separated from any other food that does not meet the halal requirements.
- The food contact materials shall be food grade and shall not contain any materials that are considered hazardous to human health and non-Halal.

# Halal Food Packaging Standards

**Packaging which directly contact to products**

- Plastic Packaging: General packaging for Ready to Eat products, it is made from Polypropylene resin, dye, and adhesive. Pork free statement needed.
- Paper packaging: Packaging for cooked-rice, it is made from cellulose, processing aid (such as whitening agent),filler, adhesive, and dye. Animal free statement and valid halal certificate needed.
- Canned packaging: for canned milk, it is made from metal plate with usage of lubricant. Animal free statement and valid halal certificate needed.

Reference: Number SK11/DIR/LPPOM/MUI/V1/20

# Halal Food Packaging Environment

- Halal food shall be suitably packed using packaging materials that mentioned in previous slide
- Packaging process shall be carried out in a clean and hygienic manner and in sound sanitary conditions and temperature satisfies safety and quality of the product.
- Carcass shall be appropriately packed in clean, new, sound, odourless packages that shall in no way adversely affect the quality and safety of meat.

# Halal Food Labelling

- All Halal products should be appropriately labelled so that they can be identified and differentiated from non-Halal products. For certain products that are sold without packaging, it is possible to mark the point
- In addition to requirements specified in ISO 22000 or Codex CAC/RCP 1 and CODEX STAN 1 each package shall be marked legibly and indelibly or a label shall be attached to the package with the following information of sale:

1. Name of product,
2. List of ingredients,

# Halal Food Labelling

3. Date of expiry,
4. Net content expressed in metric system (SI units),
5. Name and address of the manufacturer, importer and/or distributor and trademark,
6. Code number identifying date and/or batch number of manufacture for traceability,
7. Country of origin,
8. Instruction of use, where applicable,

# Halal Food Labelling

9. The animal source ingredients such as oils, fats, meat derivatives or extracts like gelatin and rennet shall be declared,

10. If a food product contains GMO, this fact shall be explicitly stated,

11. When Halal mark is used, the authority and certificate number should be placed on the product. The HFA already using QR code on the certificate.

12. The nature of product (dried, fresh, frozen, smoked etc.),

Low Fat

# Breakfast Cereals

## Mango, Walnut and Royal Jelly

*Low fat breakfast cereals contains mango pieces, walnuts and royal jelly*

## Nutrition Information

Serving per package: (insert number of servings)
Serving size: g (or mL or other units as appropriate)

| | Qty per Serving | Qty per 100g (or ml) |
|---|---|---|
| **Energy** | kJ (Cal) | kJ (Cal) |
| **Protein** | g | g |
| **Total fat** | g | g |
| Saturated fat | g | g |
| **Carbohydrate** | g | g |
| **Sugar** | g | g |
| **Sodium** | mg (mmol) | mg (mmol) |
| (insert any other nutrient or biologically active substance to be declared) | g, mg, ug (or other units as appropriate) | g, mg, ug (or other units as appropriate) |

**INGREDIENTS:**

Whole grain wheat, corn, rolled oats, palm oil, aspartame, mango pieces *[mango, mango juice, humectant (glycerol), tartrazine, natural mango flavour]*, royal jelly, walnuts, minerals (Calcium carbonate, iron sulphate), vitamins (Vitamin C, Vitamin B6, Folic acid, Vitamin B12) and spices.

**PHENYLKETONURICS:**
CONTAINS PHENYLALANINE

**WARNING** - THE PRODUCT MAY NOT BE SUITABLE FOR ASTHMA AND ALLERGY SUFFERERS.

**USE BY:** 01/12/2010

Low Fat

**Manufactured By:**
Brand Food Pte Ltd
18 Food Safety Road
Singapore 123456

Product of Singapore

NET WEIGHT: **500g**

# Take Home Lesson

- Valid Pork free statement for production and processing area of packed material
- Valid Animal free derivatives statement from supplier
- Packaging specifications & composition for Food Packaging
- Halal certificate
- Migration certificate
- Food grade packaging declaration

# Halal Food Authority, United Kingdom

**Thank you very much for listening & attention**