CHEMICAL CONTAMINATION IN FOOD

Leong Siew Hong

Director Policy, Strategic Planning & Codex Standard

Food Safety & Quality Program

Ministry of Health Malaysia

4th NATIONAL ENVIRONMENTAL HEALTH ACTION PLAN (NEHAP) CONFERENCE 2018

25 SEPTEMBER 2018

OUTLINE

- Food Safety and Quality Programme, Ministry of Health
- Introduction
- Hazard Categories
- Chemical Contamination in Food
- Regulatory Measure
- Food Safety Control Measure
  (Inspection, Certification, Surveillance etc.)
- Conclusion

FOOD SAFETY AND QUALITY PROGRAMME

- The Food Safety and Quality Programme, Ministry of Health is the regulatory authority for food safety in Malaysia.
- Objectives:
  - to protect the public against health hazards and fraud in the preparation, sale and storage of food
  - to facilitate food trade
- Mandate for Food Safety Regulatory Control:
  - Food Regulations 1985
  - Food Hygiene Regulations 2009
  - Food Regulations (Issuance of Health Certificate for Export of Fish and Fish Product to the European Union) 2009
  - Prescribe EU requirements for exports of fishery products to the EU
  - Food Irradiation Regulations 2011

INTRODUCTION

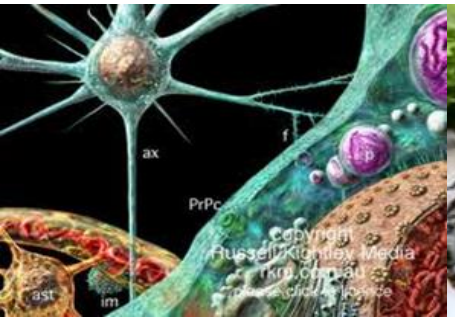
- Food is an essential part of everyone's lives.
- It gives us the energy and nutrients to grow and develop, be healthy
  and active to move, work, play, think and learn.
- Food contamination : the presence of food hazard such as harmful chemicals and microorganisms in food, which can cause consumer illness.
- It can happen during production, transportation, packaging, storage, sales and cooking process.

HAZARD CATEGORIES

- Food Hazard
  - Biological
  - Physical
  - Chemical
  - Others
    - Allergen
    - GMO
    - Radioactive

1. BIOLOGICAL HAZARD

- **Microbiological hazard** (eg: bacteria, parasites, viruses)
- **Fungal hazard** (eg: aflatoxin, fumonisins, ochratoxin)
- **Plant hazard** (eg: Mushroom peptides , Saponins)
- **Biomarine hazard** (eg: tetradotoxins, histamine, saxitoxin)



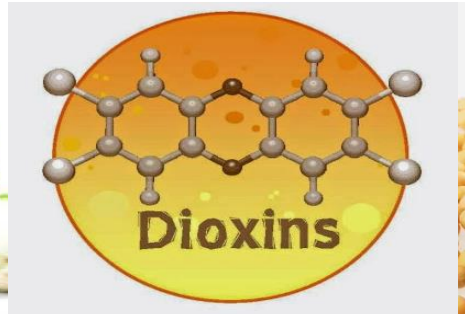


2. PHYSICAL HAZARD

- Broken glass
- Shards of stainless
- Nails steel
- Machinery parts
- Duct tape
- Wire
- Wooden splinters
- Seeds and pits
- Stones
- Building materials
- Metal filings
- Nuts/ bolts
- Screws
- Hair

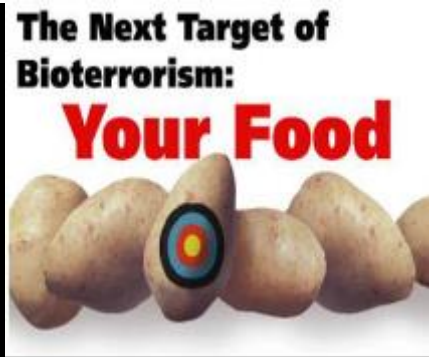
3. CHEMICAL HAZARD

- **Environmental Contaminant** (eg: Heavy Metal, Dioxin & PCB)
- **Processing Contaminant** (eg: Acrylamide, PAH, Nitrosamine, 3-MCPD, Glycidyl Ester)
- **Pesticide Residue** (eg: Organochlorine, Synthetic Pyrethroid, Carbamate)
- **Drug Residue** (eg: Tetracycline, Chloramphenicol)
- **Additives** (eg: Preservative, Coloring)
- **Adulteration** (eg: Melamine, DEHP)
- **Food Contact Material** (eg: Bisphenol A, Phthalates)



4. OTHERS HAZARD

- **Allergen** (eg: peanut, milk, seafood, gluten)
- **Radioactive**
- **Bioterrorism**



What is chemical contamination?

- **Chemical contamination** is a presence of chemicals substances:
  - **unintentionally added** to food or
  - **present** in an amount that is attributed as safe.

- The **chemical hazards** are one of the main causes of **food contamination** that associated with **foodborne disease outbreaks.**

How chemical contaminants present in food?

Chemical contaminants can be present in foods from:

- use of agrochemicals, such as residues of pesticides and veterinary drugs
- contamination from environmental sources (water, air or soil pollution)
- cross-contamination or formation during food processing
- migration from food packaging materials
- presence or contamination by natural toxins
- use of unapproved food additives and adulterants

Chemical Contamination in Food

ARKIB : 20/09/2008

Ujian: Susu tercemar mengandungi bahan melamin

BEIJING 19 Sept - Hampir 10 peratus daripada contoh susu yang diambil daripada syarikat tenusu utama di China didapati tercemar kerana mengandungi bahan melamine, lapor sebuah badan pemerhati kualiti China.

Mereka melakukan ujian ke atas susu yang telah menyebabkan kematian k orang bayi di negara ini.

Pemeriksaan yang dijalankan di selu itu, mendapati masalah pencemaran tersebut adalah lebih teruk berband susu tepung basi yang telah menyeb ribu bayi mengalami masalah kesih

Namun, para pegawai mengeluark selamat untuk diminum, bagi meng merungut mengenai keselamatan laut sejak beberapa tahun kebelak

Agensi Pentadbiran Umum untuk menyalahkan dua syarikat keluar laman web mereka (www.aqsiq.g

Hampir satu persepuluh sampel s Mongolia Yili Industrial Group Co

ARKIB : 21/04/2011

Bahaya BPA dalam botol susu

Oleh ZUHAYATI YAZID

GESAAN Persatuan Pengguna Pulau Pinang (CAP) agar kerajaan mengharamkan serta-merta penjualan botol susu polikarbonat yang mengandungi Bisphenol A (BPA) telah

gan terhadap

rana enyebabkan termasuk

u sebenarnya ra telah lama

Ibu penggunaan botol mengandungi BPA tidak harus dipandang ringan kerana membabitkan kesihatan anak untuk jangka masa panjang. - Gambar hiasan

hanya akan menguatkuasakan larangan rana merasakan belum ada keperluan untuk

Standard dan Informasi Persatuan Pengguna Kah, menggesa pengguna terutama ibu bapa dengan menukarkan penggunaan botol kepada botol bebas kandungan kimia tersebut.

berisiko tinggi iaitu bayi dan kanak-kanak berumur n.

Mi Segera Keluaran China Bebas Bahan Kimia

Diterbitkan: Rabu, 15 Jun 2011 12:00 AM

(Ubah saiz teks)

KUALA LUMPUR: Kementerian Kesihatan hari ini mengesahkan produk mi segera keluaran China jenama 'Shin Ramyun' bebas daripada pencemaran bahan kimia berbahaya DI (2-ethylhexyl) Phthalate (DEHP).

Ketua Pengarah Kesihatan Datuk Dr Hasan Abdul Rahman dalam satu kenyataan berkata analisa pihaknya ke atas produk itu mendapati kesemua produk tidak tercemar dengan DEHP.

Beliau berkata orang ramai tidak perlu khuatir akan keselamatan produk mi segera itu memandangkan kawalan telah dikenakan ke atas makanan terbabit dari negara tersebut.

Menteri Kesihatan Datuk Seri Liow Tiong Lai hari ini dilaporkan berkata kementerian itu sedang menjalankan analisis ke atas mi tersebut dan keputusannya akan dihebahkan untuk makluman umum.

Type of Chemical Contaminants

Environmental Contaminants

- Can be man-made or naturally occurring substances present in air, water or soil.
- Can enter the food chain and even bioaccumulate.
- Some can pose an acute health risk if present at higher concentrations
- Major concern in foods is their potential endocrine disruption, developmental, carcinogenic and other chronic effects.

Environmental Contaminants

Environmental contaminants that can enter the food chain include:

- heavy metals
- polychlorinated biphenyls (PCBs)
- “dioxins” (polychlorinated dibenzodioxins and dibenzofurans)
- persistent chlorinated pesticides (e.g., DDT, aldrin, dieldrin, heptachlor, chlordane)
- polyfluorinated compounds
- perchlorate, pharmaceutical and personal care products and other water disinfection byproducts.

Environmental Contaminants

Tokyo play explores Minamata issue on the 60th anniversary of the official recognition of the mercury-poisoning disease

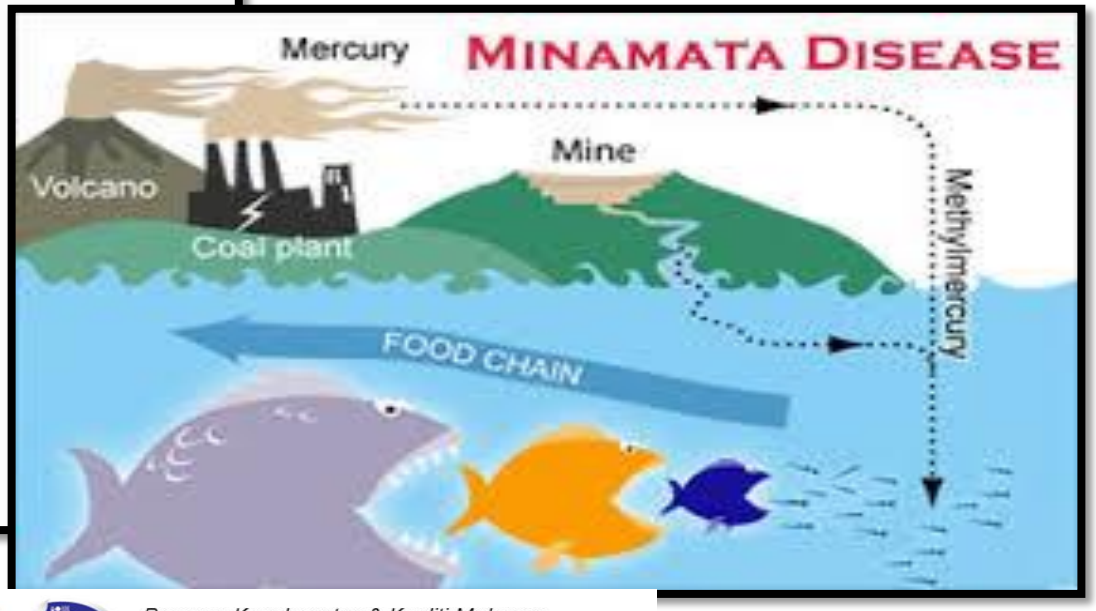
BY KEIJI HIRANO
KYODO

A play featuring a doctor involved in the identification of Minamata disease will open in a Tokyo theater on Friday, marking the 60th anniversary of the official recognition of the mercury-poisoning disease.

The main character in "To a Quiet Ocean — Minamata" is modeled on Hajime Hosokawa, a former director at a hospital operated by Chisso Corp. in the coastal city of Minamata in Kumamoto Prefecture.

Hosokawa reported finding four patients with unexplained neurological disorders on May 1, 1956 — considered later to be the date when Minamata disease was first confirmed.

In pursuit of the disease's cause, the doctor gave wastewater from the Chisso factory to a cat, which eventually developed the disease, confirming that the chemical maker had contaminated the sea and was causing the mercury-poisoning. Despite the discovery, he was urged by his employers to remain silent.



Processing Contaminants

Processing contaminants : substances that form in food or in food ingredients when undergo chemical changes during processing such as :

- Heating
- Baking
- Roasting
- Grilling
- Canning
- Hydrolysis
- Fermentation

Processing Contaminants

Precursors of these contaminants can occur naturally in the food:

- acrylamide being formed during the Maillard reaction between amino acid asparagine and reducing sugar (especially in potato and cereal-based, heat-treated products)
- ethyl carbamate may be generated during fermentation in wine
- 3-MCPD being formed during acid hydrolysis in soy sauce
- 3-MCPD esters are formed during refining process of edible oils and fats

Pesticide Residues

- Pesticide - any substance or mixture of substances intended for preventing, destroying, repelling or mitigating pests.
  - Insecticides - to control insect infestations
  - Fungicides - to control the spread of fungal diseases
  - Herbicides - to control the competing effects of weeds

- Has become an integral part of modern agriculture to increase crop yields and quality by controlling various pests, diseases and weeds.

Pesticide Residues

- Present in food because of the following reasons:
  - direct use of pesticides on food crops
  - animal feeding on pesticide-treated feed
  - environmental contamination
- Common use of pesticides in modern farming might leave some residues on food crops.
- However, if pesticide is used in accordance with good agricultural practice, the residual level would be low and consumption of these vegetables will not affect health.


Pesticide Residues

Racun serangga punca keracunan makanan di Batu Gajah - Mah

Bernama | Mac 09, 2016 18:11 MYT

Siasatan polis membantu kita untuk mengenal pasti bagaimana racun ini boleh masuk ke dalam makanan yang dijual. - Gambar fail

IPOH: Kes keracunan makanan di Siputeh dekat Batu Gajah di sini berpunca daripada racun serangga iaitu karbamat yang terdapat dalam beberapa jenis makanan di sebuah gerai.

Pengerusi Jawatankuasa Kesihatan, Pengangkutan Awam, Infrastruktur, Tenaga dan Air Negeri Datuk Dr Mah Hang Soon berkata Jabatan Kimia cawangan Perak mengesahkan perkara itu menerusi sampel yang diambil daripada sambal nasi lemak, kuey teow goreng, kuih bom dan cucur badak.

- Eating food with excessive pesticide residues may cause acute and/or chronic adverse health effects. Symptoms of acute poisoning include vomiting, diarrhea, abdominal pain, dizziness and numbness.

- Thus, Food Safety and Quality Programme established **Maximum Residue Limits (MRLs) to** protect the health of the consumer.

Veterinary Drug Residues

- Veterinary drugs - a group of substances belonging to different chemical classes and therapeutic areas such as:
  - Antibiotics
  - Anti-parasitics
  - Non-steroidal anti-inflammatory drugs (NSAIDs)
  - Hormones

Veterinary Drug Residues

- Generally used to prevent or cure disease, to reduce potential for disease or as growth promoter to increase feed conversion.
- Can be administered in feed, drinking water or by injection.
- If veterinary drugs are use incorrectly, this could lead to the presence of veterinary drug residues.

Veterinary Drug Residues

Ladang Babi Positif Guna Beta Agonist Hadapi Tindakan Kuarantin

PUTRAJAYA, 18 Dis (Bernama) -- Tiga puluh ladang babi didapati positif menyalahgunakan baha
dan mereka akan dikuarantin selain tidak diberikan sijil kesihatan bagi membolehkan ternakan itu
untuk dijual.

Menteri Kesihatan Datuk Dr Chua Soi Lek berkata ladang-ladang itu dikenal pasti berikutan ujian
Kementerian Pertanian dan Industri Asas Tani terhadap 415 ladang babi di seluruh negara.

"Ada kemungkinan besar ladang terbabit berdepan dengan tindakan kuarantin selama satu bulan
babi yang diternak tidak dibenar dipindahkan ke mana-mana," katanya pada sidang akhbar di sini

Dr Chua yang tidak menolak kemungkinan pengusaha berkenaan cuba menjual babi mereka kepa
sembelih tidak berlesen, berkata pihaknya akan mendapatkan kerjasama polis untuk melaksanak
kuarantin itu.

Beliau menjelaskan bahawa bilangan ladang tertinggi yang menyalahgunakan beta agonist ialah
Selangor, Perak dan Pulau Pinang.

Ladang babi di Johor dan Kedah bebas daripada penyalahgunaan bahan itu.

Menteri itu menarik perhatian bahawa kuarantin satu bulan membawa kepada implikasi kos yang
bagi penternak kerana mereka perlu terus memberikan makanan kepada babi sedangkan tiada pi
membeli ternakan itu "dengan kehadiran polis" di ladang.

ARKIB : 21/04/2006

Bahaya makan daging mengandungi beta-agonist

PERSATUAN Pengguna Pulau Pinang (CAP) menasihatkan para pengguna supaya mengelakkan daripada memakan daging lembu, kambing, dan babi memandangkan ujian kami menunjukkan ia tercemar dengan salbutamol, penambah pembesaran.

Dalam pensampelan secara rawak ke atas daging, tiga daripada enam sampel yang diuji didapati mengandungi salbutamol beta-agonist. Sampel daging ini dibeli dari pasar basah di sekitar Pulau Pinang.

Beta-agonist mampu menyebabkan insomnia (susah tidur), tangan mengigil, keletihan, pening, gementar, berdebar dan memburukkan keadaan jantung.

Kebanyakan pengguna tidak menyedari apabila mereka mengalami keadaan seperti itu adalah disebabkan oleh dadah di dalam daging itu yang telah menimbulkan masalah.

CAP amat terkejut apabila mendapati Kementerian Kesihatan tidak mampu untuk mengawal penggunaan beta-agonist di dalam daging oleh penternak walaupun mengetahui masalah itu.

Food Contact Materials/Packaging

- There are many chemicals involved in the manufacture of packaging and some of these have the potential to migrate into food.
- Examples of substances of health concern:
  - Bisphenol A and phthalates from plastic materials
  - 4-methylbenzophenone and 2-isopropylthioxanthone from inks
  - Mineral oil from recycled fibers
  - Semicarbazide (SEM) from a foaming agent in the plastic gaskets that are used to seal metal lids to glass packaging.

Food Contact Materials/Packaging

Pengharaman Botol Susu Bayi Polikarbonat Bisphenol A Berkuat Kuasa 1 Mac 2012

Diterbitkan: Selasa, 15 Mac 2011 12:00 AM

(Ubah saiz teks)

PUTRAJAYA: Kerajaan memutuskan untuk mengharamkan penjualan susu bot
polikarbonat yang mengandungi 'Bisphenol A' (BPA) berkuat kuasa 1 Mac 201
Menteri Kesihatan, Datuk Seri Liow Tiong Lai.

Beliau berkata, perkara itu diputuskan oleh Jemaah Menteri pada 2 Mac lalu s
langkah berjaga-jaga kerana sehingga kini tiada bukti saintifik yang kukuh me
botol susu tersebut adalah selamat untuk digunakan oleh golongan berisiko t
terutamanya bayi dan kanak-kanak.

"Kementerian tidak akan berkompromi dalam keselamatan pengguna terutar
dan kanak-kanak. Polikarbonat adalah plastik yang digunakan dalam pembua
susu bayi dan 'bisphenol A' ialah bahan kimia industri yang ditambah dalam b
bayi polikarbonat untuk menjadikannya keras dan lutsinar," katanya.

Kenyataan Akhbar Pengharaman Penjualan Botol Susu Bayi Polikarbonat Yang Mengandungi Bisphenol A (Mac 2011)

PENGHARAMAN PENJUALAN BOTOL SUSU BAYI POLIKARBONAT YANG MENGANDUNGI BISPHENOL A

Mesyuarat Jemaah Menteri pada 2 Mac 2011 telah bersetuju dengan cadangan Kementerian Kesihatan Malaysia (KKM) untuk mengharamkan penjualan botol susu bayi polikarbonat yang mengandungi Bisphenol A (BPA).

Dimaklumkan bahawa penguatkuasaan pengharaman penjualan botol susu bayi polikarbonat yang mengandungi BPA akan berkuat kuasa pada 1 Mac 2012. Tindakan pengharaman ini akan dilaksanakan secara berperingkat dan pihak industri diberi tempoh masa satu (1) tahun untuk membuat persediaan bagi keperluan pertukaran atau pembelian mesin dan penggunaan bahan mentah yang sesuai.

Keputusan pengharaman ini diambil sebagai langkah berjaga-jaga kerana sehingga kini tiada bukti saintifik yang menunjukkan bahawa botol susu polikarbonat yang mengandungi BPA adalah selamat untuk digunakan oleh golongan berisiko tinggi terutamanya bayi dan kanak-kanak.

Tindakan ini juga dibuat dengan mengambil kira BPA yang telah diketahui boleh menyebabkan gangguan kepada sistem hormon sekali gus mengganggu sistem fungsi tubuh dan sehingga kini tiada sebarang penilaian dijalankan berhubung sistem hormon dalam tubuh bayi. Ini mewujudkan keadaan yang tidak pasti serta tiada jaminan keselamatan bagi bayi yang terdedah kepada BPA.

REGULATORY MEASURE

FOOD ACT 1983 & REGULATIONS 1985

REGULATION 37 – INCIDENTAL CONSTITUENT

- Any foreign, extraneous, toxic, noxious or harmful substances that is contained or present in or on any food
- Includes metal contaminant, microorganisms and their toxins, drug residue and pesticide residue
- Does not include preservative, colouring substance, flavouring substance, flavour enhancer, antioxidant, food conditioner, non-nutritive sweetening substance or nutrient supplement.
- Comprising Regulations 38, 38A, 39, 40 and 41

FOOD ACT 1983 & REGULATIONS 1985

PART VII : INCIDENTAL CONSTITUENT

Regulations	Title	Schedule
37	Incidental constituent	-
38	Metal contaminant	Fourteenth Schedule (Table I, IA, IB, IC, ID, IE and II)
38A	3-monochloropropane-1,2-diol (3-MCPD)	Fourteenth A Schedule
39	Microorganisms and their toxins	Fifteenth Schedule (Table I and II)
40	Drug residue	Fifteenth A Schedule (Table I and II)
41	Pesticide residue	Sixteenth Schedule

FOOD ACT 1983 & REGULATIONS 1985

REGULATION 27- USE OF HARMFUL PACKAGES PROHIBITED

- No person shall import, manufacture, advertise for sale or sell, or use or cause or permit to be used in the preparation, packaging, storage, delivery or exposure of food for sale, any package, appliance, container or vessel which yields or could yield to its contents, any toxic, injurious or tainting substance, or which contributes to the deterioration of the food.

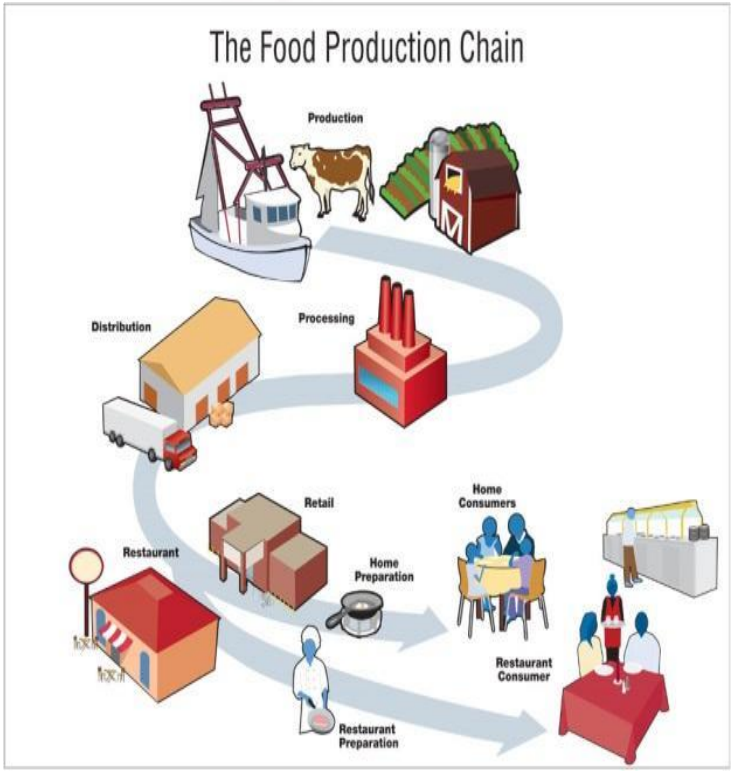
FOOD ACT 1983 & REGULATIONS 1985

PART VI : PACKAGES FOR FOOD

Regulations	Title	Schedule
27	Use of harmful packages prohibited	-
27A	Prohibited feeding bottles	-
28	Ceramic ware	Thirteenth Schedule (Table I, II and III)
29	Use of polyvinyl chloride package containing excess vinyl chloride monomer prohibited	-
30	Food packaged in polyvinyl chloride container shall not contain excess vinyl chloride monomer	-

FOOD SAFETY CONTROL MEASURES

- Activities for food safety control measures:
  - Food Inspection
  - Certification
  - Border control
  - Enforcement
  - Surveillance
- To ensure that food products are safe for human consumption
- To protect consumers from poor food handling practices and the potential spread of food-borne illness



It covers a wide range of activities and processes including production, processing, transportation, storage and food preparation.

Many various sources of contamination need to be addressed to ensure no food safety incidents occur.

Problem of food safety arises due to the use of unknown supply of new raw materials, deviation in the process control, not adhering to the standard operating procedure and the risk of food contamination due to human factor and economic cheat.

FOOD SAFETY INFORMATION SYSTEM OF MALAYSIA – FOOD IMPORTATION PROCESS

1. Registration

IMPORTERS / FORWARDING AGENTS

2. Pre-Import Notification (Optional)

10. Final Decision

5. Generate Import Notification

Ministry of Health

6. Process Import Notification

7. Sample Information

10. Final Decision

ENTRY POINT

INSPECTION / SAMPLING

8. Sample for Analysis

LABORATORY

FoSIM

Food Safety Information System of Malaysia

3. Import Declaration (K1)

10.Final Decision

4. SMK Interface

Recommends Examination Level

9. Analysis Results

7. Sample Information

CUSTOMS INFORMATION SYSTEM (SMK)

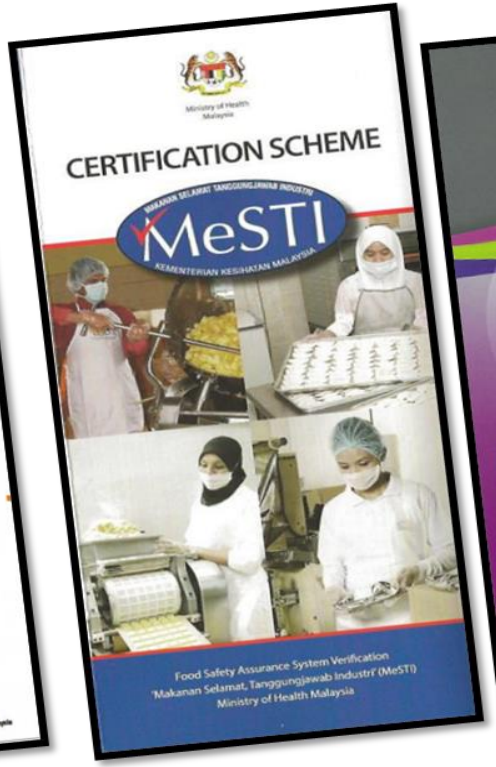
Transaction Database | Knowledge Database | Master Database

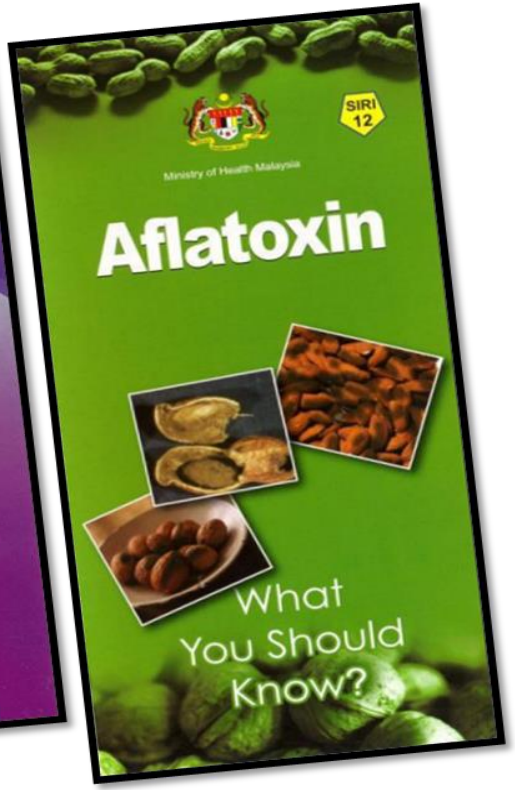
Automated Examination Level

LEVEL 1 AUTO CLEARANCE	LEVEL 2 DOCUMENT EXAMINATION	LEVEL 3 MONITORING EXAMINATION	LEVEL 4 SURVEILLANCE EXAMINATION	LEVEL 5 HOLD TEST & RELEASE	LEVEL 6 AUTO REJECTION

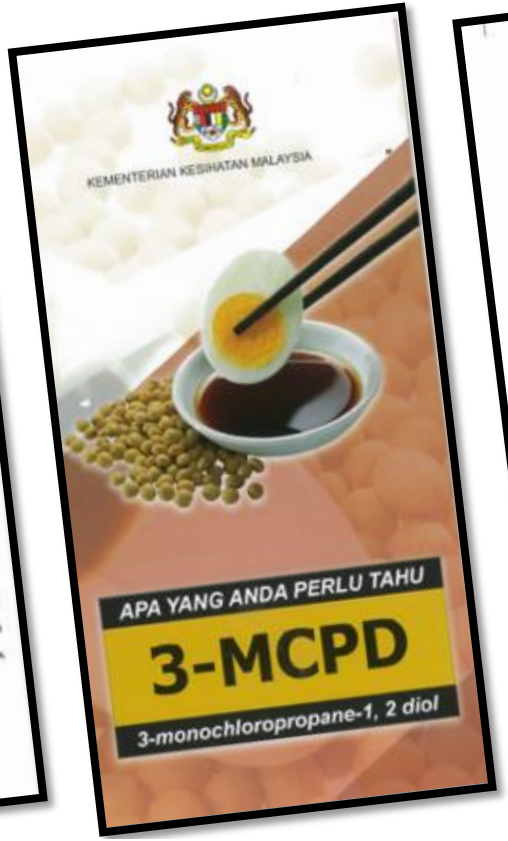
Inspection Action

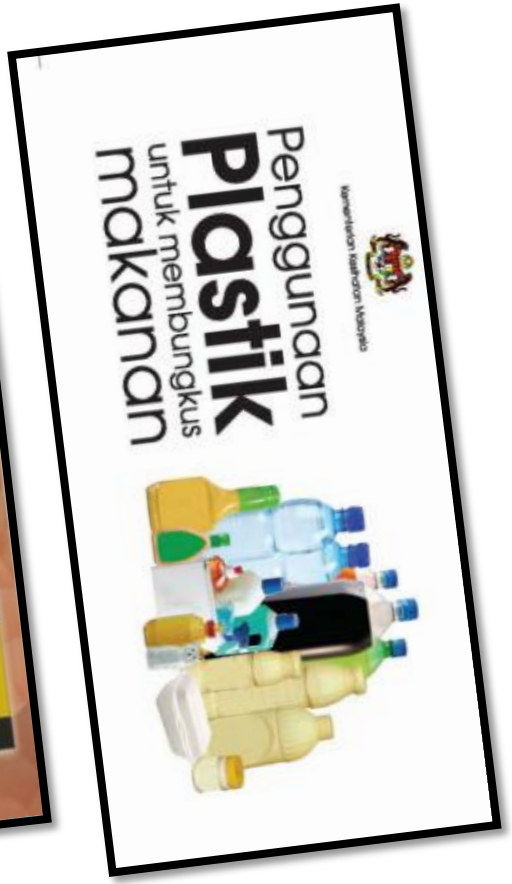
PROMOTIONAL MATERIALS





PROMOTIONAL MATERIALS





CONCLUSION

- Some of food contaminants such as process contaminants and environmental contaminants are unavoidable but they can be reduced by a food safety control measure.
- Thus consumption of a balanced diet without overindulgence of certain foods is important to reduce the exposure to food hazard which might cause health hazards.
- As competent authority on food safety in Malaysia, Food Safety and Quality Program will always ensure that foods sold in the market are safe for consumption and comply with the Food Act and its regulations.

“Prevention is better than cure”

THANK YOU

Food Safety and Quality Programme
Level 4, Menara Prisma
No. 26, Jalan Persiaran Perdana, Precinct 3,
Federal Government Administrative Center
62675 Putrajaya Federal Territory, Malaysia

http://fsq.moh.gov.my
Tel: 03-8885 0797
Fax: 03-8885 0790