食物中的氯丙二醇酯和縮水甘油酯
3-MCPDE & GE in Food

業界諮詢論壇

2022年9月16日

Trade Consultation Forum

16th September, 2022

食物環境衞生署
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背景
Background

- 縮水甘油酯(GE)和氯丙二醇酯(3-MCPDE)
  - 食物加工過程中自然產生
  - 存在於某類食物中
- 各方（食品規管當局、業界、學者等）
  - 正研究通過改良食物加工技術及條件，以減低這些物質在食物中的含量
- Glycidyl esters (GE) and 3-monochloropropane-1,2-diol esters (3-MCPDE)
  - substances naturally produced during food processing
  - present in certain types of food
- Regulatory authorities, industries and academia around the world
  - studying the improvement of food processing technology and conditions to reduce the content of these substances in food

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氯丙二醇酯
3-monochloropropane-1,2-diol Ester (3-MCPDE)

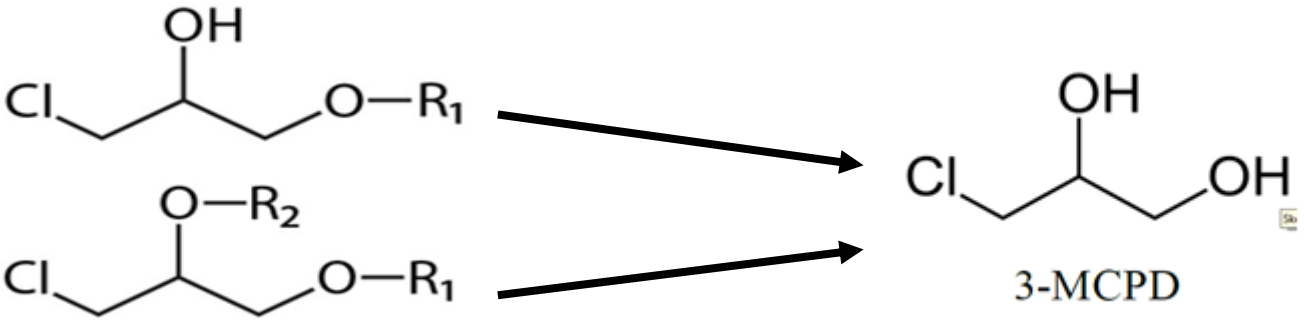
3-MCPDE

3-MCPDE

- 食物中氯丙二醇(3-MCPD)來源之一
- 在人體釋放出有害的3-MCPD

3-MCPDE

- a source of 3-MCPD in food
- release 3-MCPD from 3-MCPDE after ingestion (main concern)



3-MCPDE

3-MCPD可以影響

- 腎臟，中樞神經系統，雄性大鼠的生殖系統

國際癌症研究機構(IARC)將3-MCPD分類為：

- 2B組物質（即“或可能令人類患癌”）
- 目前並沒有充分證據證明3-MCPD會令人類患癌

3-MCPD may affect

- kidney, central nervous system, reproductive system of male rats

IARC classifies 3-MCPD

- group 2B agent (i.e. “possibly carcinogenic to humans”)
- currently, no sufficient evidence that 3-MCPD can cause cancer in humans

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甚麼是3-MCPDE?
What is 3-MCPDE?

3-MCPDE

- 加工過程污染物
- 主要在精煉油脂中發現

形成過程：

- 精煉過程中，脫臭步驟時形成
- 經高溫加工的某些含脂肪和氯化物的食物

3-MCPDE

- a process contaminant
- primarily found in refined fats and oils

It is formed:

- during the deodorization step of oil refining
- certain fat- and chloride-containing foods at high temperature

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食物中3-MCPDE的來源
Source of 3-MCPDE in Food

食物中的主要來源

- 精煉油脂
- 不同的油脂3-MCPDE水平不一
- 棕櫚油水平最高

精煉油3-MCPDE的含量:

- 棕櫚油>合桃油>紅花油>葵花籽油>大豆油>菜籽油

Major source in food

- refined vegetable oils
- level varies in different oils
- highest in palm oil

Levels in refined oils:

- palm oil > walnut oil > safflower oil > sunflower oil > soya bean oil > rapeseed oil

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食安中心以往的風險評估研究
Previous Risk Assessment Study conducted by CFS

- 市民從膳食中攝取3-MCPDE的分量進行評估
- 結果顯示食物中的3-MCPDE令市民受3-MCPD毒性影響的機會不大

- Evaluated the dietary intake of 3-MCPDE in local adult population
- Results showed that 3-MCPDE in food are unlikely to have major toxic effects to the general public

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建議和標準 – JECFA
Recommendations and Standards - JECFA

- JECFA (2016)
  - 暫定最高每日可容忍攝入量(PMTDI)
  - 3-MCPD和3-MCPDE單獨或組合計：4 mcg/kg bw

- JECFA (2016)
  - a provisional maximum tolerable daily intake (PMTDI)
  - 4 mcg/kg bw for 3-MCPD and 3-MCPDE singly or in combination.

建議和標準 – Codex
Recommendations and Standards - Codex

- 食品法典委員會
  - 3-MCPD標準在“含有酸水解植物蛋白的液體調味品” 最高含量：0.4 mg/kg
  - 2019年推出《減少精煉油和以精煉油製作的食品中氯丙二醇酯及縮水甘油酯的含量的實務守則》
    - 協助業界減低精煉油和相關食品中3-MCPDE的含量
- Codex
  - A maximum level (ML) of 0.4 mg/kg on 3-MCPD in “liquid condiments containing acid hydrolyzed vegetable proteins (acid HVP)”
  - Issued the “Code of Practice for the Reduction of 3-MCPDEs and GEs in Refined Oils and Food Products Made With Refined Oils” in 2019,
    - to provide producers and manufacturers with guidance to reduce formation of 3-MCPDE in refined oils and food products made with refined oils

本港標準
Local Standards

- 2021年，中心修訂了《食物內有害物質規例》（第132AF章），為含有酸水解植物蛋白的調味品的3-MCPD含量訂定了最高含量上限
  - 固體調味品: 1 mg/kg
  - 任何其他調味品: 0.4 mg/kg

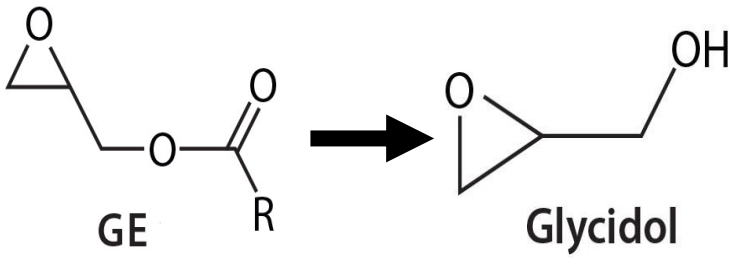
- In 2021, the CFS amended the Harmful Substances in Food Regulations (Cap. 132 AF) and establish the maximum level for 3-MPCD in condiments containing acid hydrolysed vegetable proteins
  - Solid condiments : 1 mg/kg
  - Any other condiments: 0.4 mg/kg

縮水甘油酯 (GE)
Glycidyl Esters (GE)

Glycidyl Esters(GE)
縮水甘油酯(GE)

近年成為關注焦點

- 食物中含有GE
- 進食後：
  - GE在體內分解成縮水甘油(glycidol)
  - 危害健康
- 着手控制食物中GE的含量



Concern in recent years

- presence of GE in foods
- after ingestion:
  - GE is broken down to glycidol in the body
  - considered harmful to health
- action to control the level of GE in food

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什麼是GE？
What are GE?

GE是加工過程污染物

- 主要存在於精煉油脂
- 含油脂的食物

GE are process contaminants

- primarily found in refined fats and oils
- foods containing fats and oils

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什麼是GE？
What are GE?

形成的條件

- 在油脂精煉脫臭過程中形成
- 由甘油二酯 (又稱二酸甘油酯) (DAG) 產生
- 在長時間高溫(>240℃)環境下產生

It is formed

- during deodorization (oil refining)
- from diacylglycerols (DAG)
- associated with elevated temp. (>240ºC) and time

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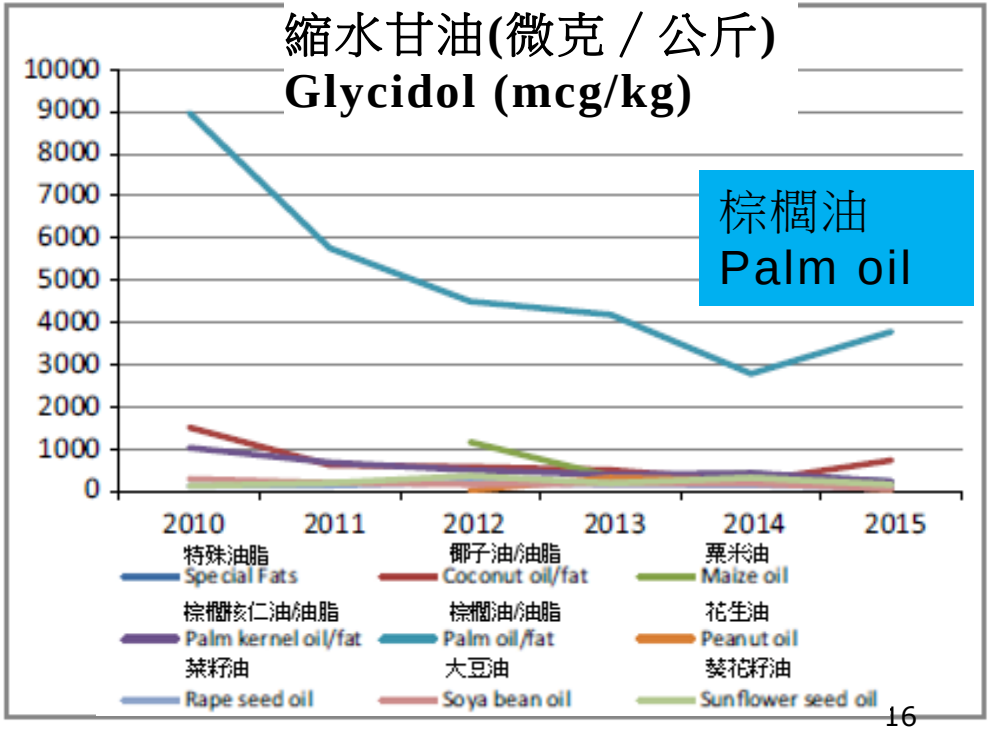
食物中GE的來源
Source of GE in Food

- 精煉植物油
  - 棕櫚油的縮水甘油酯含量一般較高
- Refined vegetable oils
  - Palm oil generally contains higher level of GE



資料來源：
歐洲食物安全局(2016)
Source:
EFSA (2016)

植物油的縮水甘油(歐盟數據)
Levels of glycidol in vegetable oils in EU

GE為何引起關注？
Concerns on GE?

- 動物研究發現，縮水甘油對動物造成以下影響：
  - 神經系統毒性
  - 腎臟毒性
  - 減低生育能力
  - 具基因毒性
  - 致癌
- 國際癌症研究機構(IARC)把縮水甘油分類為
  - 第2A組物質（即“可能令人類患癌”）
  - 目前並沒有充分證據證明令人類患癌

- Effects of glycidol in animal studies:
  - Neurotoxicity
  - Renal toxicity
  - Anti-fertility effects
  - Genotoxicity
  - Carcinogenicity
- IARC classifies glycidol
  - Group 2A agent (i.e. “probably carcinogenic to humans”)
  - Currently, there is no sufficient evidence that glycidol can cause cancer in humans

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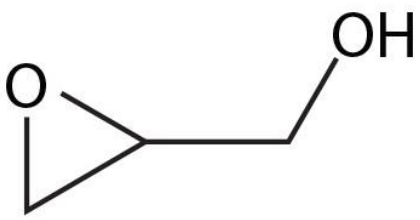
食安中心以往的風險評估研究
Previous Risk Assessment Study conducted by the CFS

- 中心就本地食用油脂和嬰兒配方奶粉中的GE含量進行研究，結果顯示本地食用油脂和嬰兒配方奶粉中的GE含量全部低於歐洲、新西蘭及澳洲的同類型研究

- The CFS has evaluated the levels of GE in edible fats and oils, as well as infant formula available in local market
- GE level for edible fats and oils samples and infant formula in this study were lower than similar study findings in EU, as well as New Zealand and Australia

建議及標準 - JECFA
Recommendations and Standards - JECFA

- JECFA
  - 縮水甘油具基因毒性，並可誘發癌症
  - 不宜就縮水甘油訂定健康參考值
  - 建議採取適當措施，**把油脂中GE和縮水甘油的含量降低**



Glycidol

- JECFA
  - glycidol is both genotoxic and carcinogenic
  - not appropriate to establish a health-based guidance value
  - recommended to implement appropriate efforts to **reduce concentrations of GE and glycidol in fats and oils**

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建議及標準 - Codex
Recommendations and Standards - Codex

- 食品法典委員會
  - 並未就食物中GE和縮水甘油的含量訂定標準
  - 於2019年推出《減少精煉油和以精煉油製作的食品中氯丙二醇酯及縮水甘油酯的含量的實務守則》，以協助業界減低食品中GE的含量

- Codex
  - not established standards on GE or glycidol in food
  - Issued the “Code of Practice for the Reduction of 3-Monochloropropane-1,2- Diol Esters (3-MCPDEs) and Glycidyl Esters (GEs) in Refined Oils and Food Products Made With Refined Oils” in 2019, to provide producers and manufacturers with guidance to reduce formation of GE in refined oils and food products made with refined oils

本港建議和標準
Local Standards on GE

- 2021年，中心修訂了《食物內有害物質規例》（第132AF章），為擬主要供不足12個月大的嬰兒食用的配方產品及較大嬰兒及幼兒的配方產品GE含量訂定了最高含量上限
  - 粉狀的產品: 50 mcg/kg
  - 液態的產品: 6 mcg/kg

- In 2021, the CFS amended the Harmful Substances in Food Regulations (Cap. 132 AF) and establish the maximum level for GE in infant formula and follow-up formula intended to be consumed principally by persons under the age of 12 months
  - Powdered form: 50 mcg/kg
  - Liquid form: 6 mcg/kg

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有用連結
Useful Links

- 食品法典委員會《減少精煉油和以精煉油製作的食品中氯丙二醇酯及縮水甘油酯的含量的實務守則》(2019)
- Codex Code of Practice for the Reduction of 3-Monochloropropane-1,2- Diol Esters (3-MCPDEs) and Glycidyl Esters (GEs) in Refined Oils and Food Products Made With Refined Oils (2019)
  - https://www.fao.org/fao-who-codexalimentarius/sh-proxy/en/?lnk=1&url=https%253A%252F%252Fworkspace.fao.org%252Fsites%252Fcodex%252FStandards%252FCXC%2B79-2019%252FCXC_079e.pdf

~ 完 ~

~The End~