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嬰兒配方奶中的反式脂肪 —— 欲避無從？ Trans Fats in Infant Formula – Avoid the Unavoidable?

食物安全中心
食物安全中心風險評估組
科學主任林伏波博士報告

Reported by Dr. Violette LIN, Scientific Officer,
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二零一三年七月初，某報章報道內地幾款嬰兒配方奶粉每100克奶粉含有0.4至0.6克反式脂肪，可能導致心臟病，嬰兒不宜飲用。其後國家食品藥品監督管理總局發表聲明，表示檢測了逾一萬個嬰幼兒配方奶粉樣本，其中國產奶粉中的檢測值為每100克奶粉含0.019至0.574克反式脂肪，而進口奶粉的檢測值為每100克奶粉含0.024至0.367克反式脂肪，全部符合國家及國際安全標準。

In early July 2013, a newspaper reported that some infant formulae in the Mainland contained trans fats at 0.4-0.6g/100g powder that could lead to heart disease and should be avoided by infants. The China Food and Drug Administration subsequently issued a statement noting that the levels of trans fats in over 10 000 samples of Mainland-produced (0.019-0.574g/100g) and imported (0.024-0.367g/100g) formulae for infants and young children were within national and international safety standards.

反式脂肪是什麼？來自何方？

反式脂肪屬於不飽和脂肪，在結構上含有至少一個反式雙鍵。反式脂肪會天然產生，也會在食品加工的過程中產生。

What are Trans Fats and Where Do They Come From?

Trans fats are unsaturated fats with at least a double bond in trans configuration. Trans fats can come from natural sources or be formed during food processing.

奶類和奶製品(如芝士和牛油)、反芻動物(如牛、羊和山羊)的肉和人乳均含有少量天然反式脂肪。反芻動物胃內的微生物把不飽和脂肪轉化為飽和脂肪時可能會產生少量反式脂肪。視乎品種、飼料和季節，奶製品和牛的脂肪通常含有約3-6%反式脂肪(%以總脂肪計算)。

Natural trans fats occur at low levels in milk and milk products (e.g. cheese, butter), meat of ruminants (e.g. cattle, sheep, goats), and in human breastmilk. In ruminants, small amount of trans fats may be formed when microbes in the animal's stomach convert unsaturated fats to saturated fats. Depending on the breed, the feed and the season, dairy and beef fat typically contain trans fats at 3-6% of total fat.

另一方面，植物油的氫化過程中也可能產生反式脂肪。植物油經工業氫化後製成半固體及固體狀脂肪，廣泛用於食物製造和食肆(如人造牛油、餅乾和酥皮餅乾等)。這些成本低廉的部分氫化植物油可延長食品的保質期和改善口感。此外，在高溫精煉植物油的過程中也會產生少量反式脂肪。

Trans fats may be formed during the hydrogenation process of vegetable oils for producing the semi-solid and solid fats that are widely used in food manufacture and catering outlets (e.g. margarines, biscuits, pastries). These partially hydrogenated oils, which are relatively inexpensive, can increase the shelf life and enhance the texture of the food. Low levels of trans fats may be generated when refining vegetable oils at high temperatures.

為何反式脂肪會在嬰兒配方奶中出現？

嬰兒配方奶中檢出的反式脂肪很可能來自奶脂肪和植物油(見圖)。由於反式脂肪是奶脂肪的內源性成分，食品法典委員會容許在嬰兒配方奶中使用奶脂肪，但反式脂肪含量不應超過總脂肪酸的3%。不過，食品法典委員會規定，嬰兒配方奶不可使用商業用氫化油脂。

Why Do Trans Fats Appear in Infant Formulae?

The trans fats detected in infant formulae are likely from milk fat and vegetable oils (see illustration). Since trans fats are endogenous components of milk fat, the Codex Alimentarius Commission (Codex) allows the use of milk fat in infant formulae and accepts up to 3% of total fatty acids from trans fats. However, according to Codex standard, commercially hydrogenated oils and fats shall not be used in infant formulae.

攝取過量反式脂肪對健康有何影響？

攝取過量反式脂肪會提高血液中低密度脂蛋白膽固醇濃度，並使高密度脂蛋白

How Does Excessive Trans Fats Intake Affect Health?

Excessive trans fats intake increases the risk for coronary heart diseases (CHD) through raising low-density

焦點個案
Incident in Focus

膽固醇濃度下降，從而增加罹患冠心病的風險。聯合國糧食及農業組織建議，2至18歲的兒童及成人從飲食攝取的反式脂肪(包括由反芻動物及工業產生)應低於每天攝入能量的1%，因為有令人信服的證據顯示，商業用的部分氫化植物油所含的反式脂肪可增加罹患冠心病的風險。然而，目前還沒有證據表明，反式脂肪的攝入會對一般0至24個月大的嬰幼兒構成安全問題。

人體不能自行合成反式脂肪，亦毋須從膳食中攝取反式脂肪。雖然膳食中難免會有天然反式脂肪的存在，但全球大部分人口所攝取的天然反式脂肪分量很低，而且沒有確實的證據支持平常的攝入量與冠心病的風險有關聯。相反，食品加工過程中產生的反式脂肪對健康有百害而無一利。

如何避免從膳食中攝入反式脂肪？

世界衛生組織(世衛)建議應限制來自總脂肪的能量攝入，並使脂肪攝入從飽和脂肪轉向不飽和脂肪，以及逐步消除反式脂肪。食物安全中心一直致力檢測各種食物中的反式脂肪含量。營養資料查詢系統或營養標籤上的資料均有助消費者選購完全不含或含較少反式脂肪的食品。

雖然嬰兒配方奶和母乳兩者都含微量反式脂肪，但世衛主張母乳是嬰兒健康成長發育的最佳天然食品。衛生署也鼓勵父母在嬰兒出生後首六個月應該純以母乳餵哺，之後在餵哺母乳的同時開始添加補充食物，直至孩子兩歲或以上。

注意要點：

- 嬰兒配方奶中可能含有來自奶脂肪和植物油的少量反式脂肪。
- 嬰兒配方奶存在微量反式脂肪是正常的。
- 目前沒有證據顯示嬰兒配方奶中的反式脂肪會導致嬰兒罹患心臟病。

給消費者的建議

1. 母乳是嬰兒健康成長發育的理想食品。
2. 如須選購嬰兒配方奶，應光顧可靠的店鋪。

給業界的建議

1. 按照優良製造規範來製造嬰兒配方奶。
2. 光顧可靠的嬰兒配方奶供應商，確保其產品的反式脂肪含量合乎食品法典委員會標準。

lipoprotein cholesterol and decreasing high-density lipoprotein cholesterol in the blood. The Food and Agriculture Organization of the United Nations suggests children aged 2-18 years and adults to have less than 1% of daily energy intake from trans fats from ruminant and industrially-produced sources. This is because there is convincing evidence that trans fats from commercial

partially hydrogenated vegetable oils increase risk of CHD. However, currently there is no evidence that trans fats intake has a safety issue in normal infants 0-24 months old.

Trans fats are not synthesised by the human body and are not required in the diet. Whilst natural trans fats cannot be removed entirely from the diet, their intake is low in most populations worldwide and to date there is no conclusive evidence supporting an association between CHD risks and the amount of natural trans fats usually

consumed. In contrast, trans fats formed during food processing have no health benefits but clear risks to health.

How to Avoid Trans Fats in the Diet?

The World Health Organization (WHO) recommends that energy intake from total fat should be limited, and fat consumption should be shifted away from saturated fat to unsaturated fat and towards the elimination of trans fats. The Centre for Food Safety has been studying the trans fats content in various foods. The Nutrition Information Inquiry System or the information in the nutrition labels can help consumers to choose foods with no or lower trans fats.

Even though natural trans fats are present in small amounts in both infant formulae and breastmilk, WHO advocates breastmilk as the ideal natural food for the healthy growth and development of infants. The Department of Health encourages parents to exclusively breastfeed infants for the first six months of life and then provides complementary foods while breastfeeding continues for up to two years of age or beyond.

Key Points to Note:

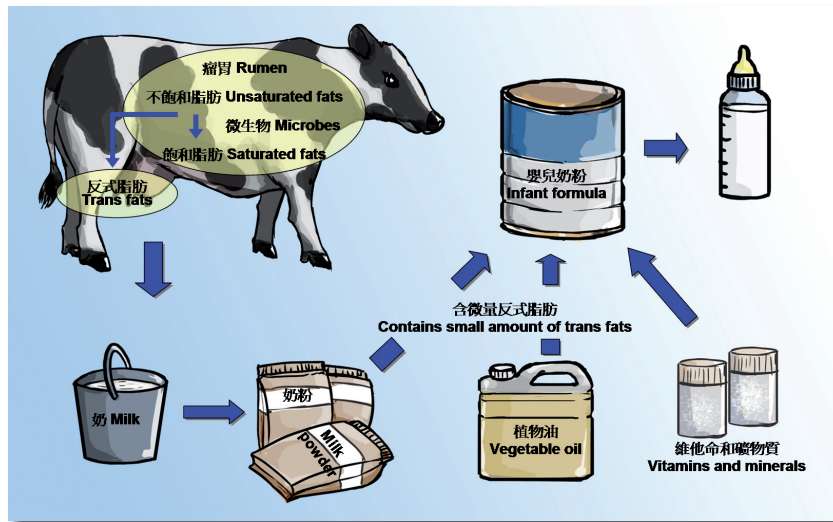
- Low levels of trans fats can be present in infant formulae from milk fat and vegetable oils.
- It is normal to find small amount of trans fats in infant formulae.
- Currently, there is no evidence showing that trans fats in infant formulae could lead to heart disease in infants.

Advice to the Consumers

1. Breastmilk is the ideal food for the healthy growth and development of infants.
2. When it is necessary to choose infant formulae, purchase them from reliable sources.

Advice to the Trade

1. Apply good manufacturing practice when producing infant formulae.
2. Obtain infant formula supplies from reliable sources which comply with Codex requirement for trans fats content.



嬰兒配方奶中的反式脂肪來源 Sources of trans fats in infant formula

基因改造食物劣迹斑斑 — 是耶非耶？

Blemish on Genetically Modified Foods or Not? – Take a Closer Look

食物安全中心
風險評估組
科學主任莊梓傑博士報告

Reported by Dr. Ken CHONG, Scientific Officer,
Risk Assessment Section,
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關於基因改造食物的安全問題時有報道，每次都掀動消費者的神經。大家可能還記得老鼠餵食基因改造粟米後長出巨瘤，還有兒童試食未經批准的基因改造大米作研究用途等報道。這些報道能否證明基因改造食物是不安全的呢？我們會在這期探討這個問題。

駭人的研究結果受到質疑

基因改造食物向來備受爭議。有實驗動物被餵食基因改造食物後出現不良效應，例如器官變大、出現機能障礙、生癌等。有關的研究人員把這些反應歸咎於進食了基因改造食物。消費者可能都被這些駭人的研究結果嚇怕了。然而，這些研究卻受到科學家和各國食物安全機構的批評，指其實驗設計、結果分析及演繹有缺陷。

這些研究受批評的地方包括樣本數量偏少、使用錯誤的統計分析方法及指稱的不良反應證據不足。樣本數量偏少，便不能排除所出現的不良反應是偶然的結果，致癌性研究尤然。統計分析的作用是檢視出現的反應是否純屬偶然或生物學上的變異，但有些研究人員錯誤使用了非正規的分析方法。此外，有些研究對於這些反應沒有提供進一步的證據。由於研究存在以上不足，所作出的結論是站不住腳，且會造成誤導的。

動物餵飼實驗的局限

事實上，餵飼基因改造食物的動物實驗有其局限之處。測試基因改造食物與測試食物添加劑或除害劑不同，食物添加劑和除害劑都是化學上確定的物質，而未經加工食物是複雜的混合物，其成分和營養價值各異。此外，所測試的食物未必是實驗動物的日常食糧，把基因改造食物加入其食糧時必須小心調節，才不會造成營養失衡。

話雖如此，在某些情況下或會採用動物餵飼實驗。例如，通過這類實驗，觀察動物吃了含有強化營養素的基因改造植物後的營養得益及非預期效應。

不道德的試驗而非安全評估

除動物外，基因改造食物研究亦可招募人類參與為受試者。兩者都需要得到倫理批核。曾有一隊研究人員被指未獲倫理批核便利用健康學童進行試驗，讓他們食用經強化的基因改造大米。這種大米通過基因改造技術，提高大米的β-胡蘿蔔素(維他命A原)含量，故呈金黃色，俗稱黃金米。黃金米可能有助減輕發展中國家的人民缺乏維他命A的問題。目前，黃金米尚未經國家食物安全機構的安全評估，故未能確定是否安全供人食用。但該產品將來可能提交作評估，經過評估合格後推出市場。由於該產品含有強化營養素，故須額外進行營養評估，評估有關轉變的後果，以及有關產品供應市場

From time-to-time, there are news reports on the safety of genetically modified (GM) foods that cause ripples of concern among consumers. You may recall news reports on rats showing big tumours after being fed with GM corn, or another story that children were fed with unapproved GM rice for research purpose. Are these reports showing that GM foods are not safe? We will discuss it in this issue.

Criticisms on Scary Findings

GM food is a controversial subject. Consumers are probably scared by studies on animals fed with GM food presented certain adverse effects like enlarged organs, dysfunction of organs, cancers, etc. Researchers of these studies attributed these effects to the intake of GM food. Yet, these studies have been criticised by scientists or national food safety authorities, that there were flaws in the study design, result analysis and interpretation.

Some common criticisms include small sample size, incorrect use of statistical analysis and insufficient evidences on the alleged adverse effects. Small sample size cannot exclude the possibility of occurrence of adverse effects by chance alone, especially for carcinogenicity studies. Statistical analysis is generally conducted to see if the observed effects are random occurrence or biological variation, while unconventional methodology was incorrectly adopted by some researchers. In addition, some studies did not provide further supporting evidence of the observed effect. These all can lead to invalid and misleading conclusion.

Limitations of Animal Feeding Studies

In fact, animal studies using the whole GM food has its limitations. Different from the testing of food additives or pesticides which are chemically defined, whole foods are complex mixtures of compounds that varies in composition and nutritional value. In addition, the food being studied may not be the usual diet of the animal subject, and the incorporation of such food in the diet has to be decided properly to avoid nutritional imbalance.

That said, animal feeding studies on GM foods may be used under certain circumstances. For example, these studies may be conducted to demonstrate the nutritional benefit as well as to detect unintended effects resulting from feeding with GM plant with fortified nutrients.



實驗動物平時未必以該農作物為食，把基因改造食物加入實驗動物的食糧時必須小心調節，以免對其膳食平衡有顯著影響。
The crops may not be the usual diet of animal subjects; the incorporation of the GM food in the diets requires adjustment to avoid significant impacts on dietary balance.

Unethical Research Instead of Safety Assessment

Apart from animals, human subjects may also be recruited for studies on GM foods. In both cases, ethical approval is required. There was an incident in which a group of researchers was accused of carrying out a study in healthy schoolchildren by feeding them with fortified GM rice without ethical approval. The GM rice, known as golden rice, is yellow in colour because of the enhanced β-carotene (pro-vitamin A) content by genetic modification. This GM rice can potentially alleviate the problem of insufficient vitamin A intake in the population in some developing countries. Currently, golden rice has not yet passed the safety assessment by national food safety authorities, and hence, has not been proven safe for human consumption. However, it may be submitted for assessment in the future and sold in the market after evaluation and approval. As the product has fortified nutrient, additional nutritional assessment would be

後，會否改變人們所攝取的營養。

安全與否

消費者可能對市面上的基因改造食物是否安全仍有疑慮。為確保基因改造食物可供安全食用，很多食物安全規管當局都會對基因改造食物進行安全評估，世界衛生組織亦建議就基因改造食物建立安全評估規管架構。鑑於基因改造食物的種類愈來愈多樣化，我們建議在本港推行針對基因改造食物的銷售前安全評估計劃。該計劃將會在本系列的最後一期作詳細介紹。

required to assess the consequences of the change and whether the nutrient intakes are likely to be altered by the introduction of such food into the food supply.

Safe or Not

Consumers may wonder if GM foods in the market are safe. To ensure the safety of GM food, many food safety regulatory authorities have implemented safety assessment for it and the World Health Organization also recommends setting up a regulatory framework for safety assessment of GM food. In view of the increase in the variety of GM food, it has been proposed to introduce a pre-market safety assessment scheme of GM food in Hong Kong. We will go more into the proposed scheme in the last issue of this series.

食物事故點滴 Food Incident Highlight

扇貝中的鎘

最近有傳媒報道，本港街市和食肆出售的扇貝被檢出受鎘污染。

鎘是天然存在於地殼表面的金屬元素，人類活動亦會向環境釋出這種金屬污染物。貝類由於其覓食習性，體內的鎘含量一般較高。雖然從食物攝取鎘導致急性中毒的機會微乎其微，但長期攝取過量的鎘可能會損害腎臟。

食品法典委員會對於帶子中的鎘並沒有制定限量標準。但食物安全中心一直有從入口、批發和零售三個層面抽取食物樣本，評估食物含重金屬(包括鎘)的情況。二零一二年，帶子中的鎘含量測試結果全部令人滿意。

為減低食物風險，市民應保持均衡飲食，避免過量進食貝類。此外，在購買帶子及扇貝等海產時應光顧可靠的店鋪。由於受污染貝類的內臟積聚的重金屬、貝類毒素和微生物含量一般較高，市民在烹煮貝類水產動物前宜先除去內臟。

Cadmium in Fan Scallop

Last month, the local media reported that fan scallops sold in local markets and restaurants were found to be contaminated with cadmium.

Cadmium is a naturally occurring metallic element in the Earth's crust. It can also be released to the environment by human activities. Shellfish generally contains higher levels of cadmium due to their feeding habits. Acute toxicity of cadmium due to dietary exposure is very unlikely but prolonged excessive intake of cadmium may have adverse effects on the kidneys.

The Codex Alimentarius Commission has not established a maximum level of cadmium for scallops. The Centre for Food Safety has been conducting routine surveillance for heavy metals including cadmium in foods collected from import, wholesale and retail levels. In 2012, testing results for cadmium in scallops were all satisfactory.

To minimise food risk, individuals should maintain a balanced diet and avoid over-indulgence in shellfish consumption. Members of the public are advised to patronise reliable shops when buying seafood, including scallops. They are also advised to remove the viscera before cooking as the concentration of heavy metals, shellfish toxins and microbes are generally higher in the viscera of contaminated shellfish.

狂蜜中毒與椴木毒素

最近本港出現“狂蜜中毒”個案，肇因是患者進食了從海外帶返，含椴木毒素的蜂蜜。

椴木毒素是一種影響神經和肌肉正常功能的神經毒素，存在於杜鵑花等杜鵑花科植物，故採自這些植物的蜂蜜可能含有該毒素。如採蜜區多為杜鵑花科植物，該區出產的蜂蜜的椴木毒素含量會偏高。含椴木毒素的蜂蜜進食時喉嚨會有燒灼感。

市民應向可靠的來源或養蜂場購買蜂蜜。蜂蜜如帶有苦澀味便應棄掉。市民亦應盡可能弄清楚生產蜂蜜的花卉種類。由於海外曾出現與土耳其黑海地區的蜂蜜相關的椴木毒素中毒個案，前往該地區的外遊人士應加倍注意。

Mad Honey Poisoning and Grayanotoxins

Recently, there are local reported cases of “mad honey poisoning” after the victims consumed honey brought from overseas. The poisoning was caused by grayanotoxins that was present in the honey.

Grayanotoxin, which affects the normal functions of muscles and nerves, is a type of neurotoxins naturally occurring in plants belonging to the Ericaceae family, including rhododendrons. Honey produced from these plants may contain grayanotoxin which may present at higher levels when the toxin-containing plants are the major floral source within the harvested area. The honey that contains grayanotoxin may cause a burning sensation in the throat.

Members of the public should buy honey from reliable source and apiary. Honey with strange tastes such as bitter or astringent taste should be discarded. Whenever possible, information on the types of flowers used to produce the honey should be sought. Travellers to the Black Sea region of Turkey should pay special attention, as there had been cases of grayanotoxin poisoning reported overseas which were attributed to honey from the area.

風險傳達 工作一覽 Summary of Risk Communication Work

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