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焦點個案 Incident in Focus

大米和米製品中的鎘

Cadmium in Rice and Rice Products

食物安全中心
風險評估組
科學主任鍾可欣女士報告

Reported by Ms. Ho-yan CHUNG, Scientific Officer,
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廣東省政府最近抽檢大米及米製品，其中部分批次驗出鎘含量不符合內地標準。有人關注事件對本港食物安全的影響。本文將淺談大米及米製品含鎘的食物安全問題。

Recently, certain rice and rice products collected by Guangdong authorities were found containing cadmium at levels which did not comply with the Mainland standard. Some people raised concerns over their impact on local food safety. This article discusses food safety issues of cadmium in rice and rice products.

鎘的特性

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。鎘在工業上的用途很多，例如電鍍，以及製造鎳鎘電池和電子產品等。由磷礦生產的肥料，以及採礦等工業活動都是鎘污染環境的主要來源。鎘是不會在環境中分解的。

Nature of Cadmium

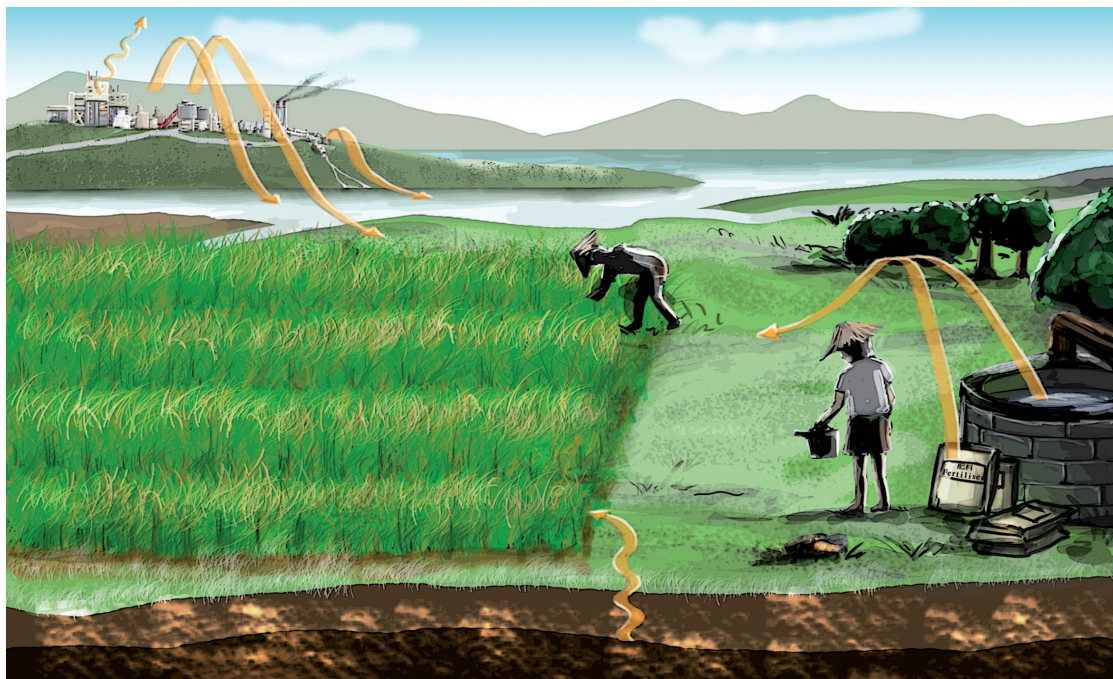
Cadmium is a metallic element that occurs naturally in the Earth's crust. It can be released to the environment by human activities. Cadmium has a number of industrial applications, for example electroplating, nickel-cadmium batteries and electronics, etc. Fertilisers produced from phosphate ores and industrial operations such as mining are important sources of environmental cadmium contamination. Cadmium does not break down in the environment.

食物中的鎘

如植物、動物、魚類和貝類生長的環境(如土壤、空氣、水域等)受到污染，便會攝取到鎘。如農民施用含鎘的肥料及飼料，食物中的鎘含量亦可能較高。動物吃下受鎘污染的農作物及植物後，鎘便會在食物鏈中累積傳遞。

Occurrence in Food

Plants, animals, fish and shellfish take up cadmium when it is in their growth environment (e.g. soil, air, water, etc.). The use of cadmium-containing fertilisers and feeding stuffs may also lead to higher cadmium levels in food. Cadmium can go up the food chain when contaminated crops and plants are ingested by animals.



天然存在或人類活動(例如採礦)釋出的鎘可循土壤及水源進入稻株

Cadmium, which originates from natural sources or from human activities such as mining, can enter rice plant through soil and water.

焦點個案
Incident in Focus

鎘對健康的影響

雖然從食物攝取鎘導致急性中毒的機會微乎其微，但長期攝取鎘會損害腎臟。世界衛生組織轄下的國際癌症研究機構認為有足夠證據證明，因職業關係吸入鎘和鎘化合物會令人患癌，因而將鎘列為“令人類患癌”（即第1組）的物質。然而，現有的證據顯示，從飲食中攝取鎘，似乎不具有明顯的基因毒性，亦不大可能令人患癌。

大米中鎘的規管標準

中國內地和歐盟對大米中鎘的限量標準是每公斤0.2毫克。本港《食物攙雜（金屬雜質含量）規例》（第132V章）指明鎘在穀類中的最高准許濃度是每公斤0.1毫克。

抽檢本港大米中的鎘

食物安全中心(中心)一直有監察大米及米製品中的鎘含量。二零一零至一二年期間，中心一共檢測了128個大米及24個米粉/米線樣本中的鎘，大米樣本全部及格。雖然二零一一年有兩個米粉/米線樣本的檢測結果不合格，鎘含量分別為每公斤0.14毫克及0.24毫克，但這個分量其實不算高。風險評估的結論是，以這個水平的鎘，食用有關食品不會對健康造成不良影響。

本港情況

中心已把廣東省大米鎘超標事件通知有關食物業界，並聯絡內地當局了解情況。本港由中國內地進口的大米不足一成，其中來自廣東省的更為有限。輸港大米及米製品的生產過程一向受到廣東省政府嚴密監督，輸港前須接受檢查，包括檢測鎘含量。廣東省檢出鎘超標的大米及米製品並無輸港。

中心運用**總膳食研究方法**對本港人口從膳食中攝入鎘的情況作風險評估，今年年初發布的研究結果顯示，一般市民從膳食攝入鎘的分量對健康造成嚴重不良影響的機會不大。

注意要點

- 如土壤或灌溉水受污染，大米中的鎘含量可能會較高。
- 本港只有不足一成的大米是來自中國內地。
- 本港數據顯示，一般市民從膳食攝入鎘的分量對健康造成嚴重不良影響的機會不大。

給消費者的建議

1. 保持均衡飲食，以免因偏食某幾類食物而過量攝取某些化學物或污染物。
2. 由於大米的**無機砷含量**較高，市民可考慮在日常膳食中多選擇無機砷含量較低的其他穀物，如麵條、燕麥片及麵包等。

給業界的建議

1. 奉行優良務農規範以減少食用農作物和動物受到鎘污染。
2. 向可靠的供應商選購食物。
3. 確保所出售或進口的食物適宜供人食用，並符合法定標準。

Health Effects of Cadmium

Acute toxicity of cadmium due to dietary exposure is very unlikely but prolonged intake of cadmium may have adverse effects on kidney. The International Agency for Research on Cancer (IARC) of the World Health Organization considered that there was sufficient evidence of carcinogenicity of cadmium and cadmium compounds in humans due to occupational exposure through inhalation, and classified them as “carcinogenic to human” (Group 1 agents). However, available evidence suggests that cadmium does not appear to have significant genotoxic and carcinogenic potential via the oral route.

Regulatory Standards of Cadmium in Rice

Mainland China and the European Union have set standards for cadmium in rice at 0.2 mg/kg. In Hong Kong, the Food Adulteration (Metallic Contamination) Regulations Cap. 132 V stipulates that the maximum permitted concentration for cadmium in cereals is at 0.1 mg/kg.

Testing of Cadmium in Rice in Hong Kong

The Centre for Food Safety (CFS) has been conducting routine surveillance on cadmium in rice and rice products. From 2010 to 2012, a total of 128 rice and 24 rice noodle samples were tested for cadmium. All results for rice samples were satisfactory. Although there were two unsatisfactory results for rice noodles in 2011, with cadmium levels reaching 0.14 mg/kg and 0.24 mg/kg respectively, the cadmium levels detected were not high and risk assessment further confirmed that adverse health effects on consumers from consumption of the concerned rice noodles are unlikely.

Local Situation

The CFS has alerted relevant traders and contacted Mainland authorities for more information regarding the incident. Less than 10 per cent of rice imported to Hong Kong originated from Mainland China, of which those coming from Guangdong Province is limited. Guangdong authority has been closely monitoring the manufacturing process and conducting examination, including cadmium testing, of rice and rice product samples before they are allowed to be exported to Hong Kong. No rice or rice products detected with high levels of cadmium in Guangdong have been found exported to Hong Kong.

A risk assessment on dietary exposure to cadmium using the **total diet study methodology** was conducted. The results released earlier this year indicated that the general population was unlikely to experience major undesirable health effects of cadmium from dietary exposure.

Key Points to Note

- Cadmium may be present at higher levels in rice if the soil or the irrigation water is contaminated.
- Less than 10 per cent of local rice originated from Mainland China.
- Local data indicated that the general population is unlikely to experience major undesirable health effects of cadmium.

Advice to Consumers

1. Take a balanced diet so as to avoid excessive exposure to certain chemicals or contaminants from a small range of food items.
2. Since rice contains higher **level of inorganic arsenic**, consider complementing rice with other cereals, noodles, oatmeal and bread that contain lower levels of inorganic arsenic as part of the diet.

Advice to the Trade

1. Observe Good Agricultural Practice to minimise cadmium contamination in food crops.
2. Obtain food supplies from reliable sources.
3. Ensure foods imported or for sale are fit for human consumption and comply with legal standards.

基因改造食物 —— 冀望與疑慮

Genetically Modified Food – Hopes and Worries

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,
Centre for Food Safety

基因改造食物推出市場已接近20年，但仍未為部分消費者接受。上一期提及基因改造食物是為了某些特定的目的而製造。這期我們會談談現時在市場上出售的基因改造食物的一些特徵，以及人們對這類食物的疑慮。

基因改造農作物

市面上大部分的基因改造食物都是基因改造農作物，其中最常見的是大豆、粟米、棉花和芥花籽(按農地面積大小序)。最初，基因改造農作物開發者希望他們的產品獲得生產者或農民接納，因此重點針對影響產量的各種問題。開發基因改造農作物，令農作物擁有抵受除草劑和防蟲蛀等特性，藉此得到更大的保護。農夫種植含有對特定除草劑有抵抗力基因的基因改造農作物，可使用相關的除草劑去除雜草，而不損害農作物。至於具備防蟲蛀特性的基因改造農作物，改造方式是把生產滅蟲蛋白質的基因(例如由微生物蘇雲金桿菌抽取的Bt蛋白)植入農作物，令農作物能抵抗害蟲。種植了這些具針對性的基因改造農作物後，使用除草劑和除蟲劑會更有效，因而可減少這些除害劑的整體使用量。

此外，具有不同特性的基因改造農作物通過傳統雜交，可育成具有多種特性的新一代品系，種出的基因改造農作物被稱為具有混合特性。這在基因改造粟米和基因改造棉花中很常見。

除了加強對農作物保護的特性外，還有一類是改良了營養成分的基因改造食物，這可能會成為未來基因改造食物的另一個發展方向。舉例來說，大豆的脂肪酸成分可以通過基因改造技術去改變，經改造的大豆可以榨取出品質穩定的植物油，可用於煎炒而無須經過氫化過程，從而減少在部分氫化過程中產生的反式脂肪。

基因改造微生物

基因改造微生物較常用於製造食物添加劑和加工助劑用的蛋白質或酵素。這些物質的天然來源有限，但通過現代生物科技，把這些物質的基因放進酵母，便可大量生產。此外，生物科技公司已為釀酒業成功開發了一些酵母菌株，能夠減少在生產或貯存過程中產生的污染物。

基因改造食物的安全問題

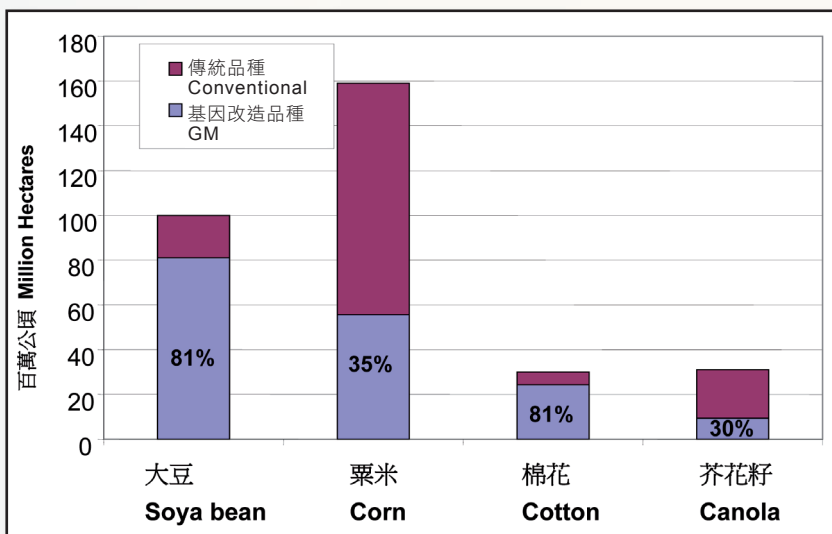
儘管基因改造食物帶來剛才提及的益處，坊間仍有不少反對聲音，認為這些經過改造的食物對健康有害。

基因改造食物通常涉及植入新的遺傳物質。有人擔心經改造的基因，特別是耐抗生素基因會轉移到人體細胞或腸道細菌中，影響人體健康。事實上，類似的基因轉移可能性微乎其微。但為慎重起見，國際組織建議棄用耐抗生素基因開發基因改造食物。耐抗生素標示基因通常在基因改造農作物的研發過程中用來識別轉化細胞。

Genetically modified (GM) foods have been marketed for about 20 years, however, they are still not accepted by some consumers. In the previous issue, we said that GM foods are made for specific aims. In this issue, we will talk about some features of GM foods that are already on the market. Concerns related to GM food will also be discussed.

GM Crops

The majority of GM foods on the market are GM crops and the most common GM crops are soya bean, corn, cotton and canola (in the order of the size of planting areas). As GM crop developers initially wanted the producers or farmers to accept their products, development of GM crops with traits that alleviates common problems associated with crop yield has been the main focus. Beneficial characteristics, such as herbicide tolerance and insect resistance, are introduced to enhance crop protection. For GM crops with genes conferring tolerance to specific herbicides introduced, they are tolerant to the specific herbicides while weeds grown around them are killed. For insect-resistant crops, insect resistance is achieved by incorporating into crops genes encoding insecticidal proteins such as Bt proteins from the microorganism *Bacillus thuringiensis*. Because of the more effective use of herbicides and insecticides, the quantity of these pesticides used can be reduced.



主要基因改造農作物(包括食物、飼料或其他用途)的全球種植比率圖
[資料來源：國際農業生物技術應用服務組織 (ISAAA)，《Global Status of Commercialized Biotech/GM Crops, 2012》]

Figure: Global adoption rates for principal GM crops, including those for food, feed or other uses. [Source: International Service for the Acquisition of Agri-biotech Applications (ISAAA), Global Status of Commercialized Biotech/GM Crops, 2012]

Furthermore, GM crops with different characteristics can be combined by conventional crossing to generate advanced lines with multiple characteristics. The resulting GM crops are said to be with stacked traits. This is common for GM corns and GM cottons.

Apart from traits related to crop protection, GM food with modified nutritional content is also available and this may be another direction of future GM food development. For example, fatty acid content of soya bean is modified in order to provide a stable vegetable oil that is suitable for frying application without the need for hydrogenation. This reduces the formation of trans fats due to partial hydrogenation.

GM Microorganisms

As for GM microorganisms, they are more commonly used for producing proteins or enzymes for use as food additives and processing aids. The natural sources of these substances are limited. With modern biotechnology, genes of these substances can be put into yeasts which can then produce the substances in large amount. Furthermore, a few yeast strains have been developed for wine industry to reduce contaminants that may be formed during production process or storage.

Concerns about GM Food

Despite the benefits of the GM foods mentioned, some people argue that the modification will cause harm to health.

GM foods usually involve the addition of new genetic materials. Some people worry that the modified gene, particularly genes that carry antibiotic resistance, may be transferred to human cells or bacteria in human guts, which may subsequently affect human health. Actually, the probability of gene transfer is very low. As a precautionary measure, international organisations have recommended the production of GM foods without antibiotic resistance genes which are commonly used for

其實我們平常吃的蔬菜、肉類或其他食物全都含有來源生物的遺傳物質，但我們卻很少擔心基因轉移的問題。

人們對基因改造食物的另一個疑慮是植入的基因可能會產生新的致敏原。某種基因改造農作物在未上市前的實驗階段便曾出現過這個問題。不過，至今尚未出現有人因吃了市面售賣的基因改造食物而出現致敏反應的事故。基因改造農作物如含有新的致敏蛋白質，便不大可能通過基因改造食物的銷售前安全評估。

說到基因改造食物，不能不提最富爭議性的基因食物之一——基因改造三文魚。基因改造三文魚或會成為首個獲批准供食用的基因改造動物。下一期我們會詳細談談基因改造三文魚及其他基因改造動物。

identification of transformed cells during the development of GM crops. As a matter of fact, vegetables, meats or other foods that we are eating also contain genetic materials of their source organisms but we rarely worry about the problem of gene transfer.

Another concern about GM foods is the newly introduced genes may express new allergen. This had happened during the pre-commercial development of a GM crop but no incident related to allergic effect of commercialised GM food has been identified so far. GM crops with new allergenic proteins are not likely able to pass the GM food pre-market safety assessment.

Talking about GM food, one of the most controversial GM foods is GM salmon which may be the first GM animal approved for food use. We will talk about GM salmon and other GM animals in the next issue.

食物事故點滴
Food Incident
Highlight

椰棗與中東呼吸綜合症冠狀病毒

自沙地阿拉伯去年首次出現中東呼吸綜合症冠狀病毒(前稱新型冠狀病毒)後，至今已累積逾60宗中東呼吸綜合症個案。最近有報道指，可能是帶有中東呼吸綜合症冠狀病毒的蝙蝠污染了椰棗或椰棗汁，然後人類食用這些受污染的食物而受到感染。事件引起公眾關注。

椰棗在本港並不常見。世界衛生組織推測這種中東呼吸綜合症冠狀病毒的傳染源是動物，偶然會傳播給人類。然而，這種病毒的傳播途徑至今未明，是否經椰棗傳播仍言之尚早。但為防萬一，新鮮收集的椰棗汁應煮沸才可飲用，而椰棗則應清洗乾淨和削皮後才食用。食物安全中心會密切留意事態的最新發展。

Date Palm and Middle East Respiratory Syndrome Coronavirus

Since Middle East Respiratory Syndrome Coronavirus (MERS-CoV, formerly known as novel coronavirus) was first recognised in Saudi Arabia last year, there have been more than 60 confirmed cases of Middle East Respiratory Syndrome. Recently, consumption of fruits or juice of date palm contaminated by MERS-CoV infected bats has been suggested as a possible route of infection for MERS-CoV, which has raised public concerns.

Date palm is uncommon in Hong Kong. According to the World Health Organization, MERS-CoV is thought to be of animal origin and to be sporadically transmitted to humans. However, the route of transmission is yet unknown and whether date palm can transmit MERS-CoV is uncertain. As a precautionary measure, freshly collected date palm juice should be boiled and fruits should be thoroughly washed and peeled before consumption. The CFS will continue to monitor the latest development of the incident.

澱粉製品中的順丁烯二酸

台灣當局上月在魚漿製品、粉麵、芋圓和粉圓等食品中檢出順丁烯二酸。食物安全中心(中心)一方面向業界發出警報，並把事故刊登於食物事故報表，通知業界和市民；一方面在本港市面上抽取食物樣本進行測試。

台灣當局檢出的順丁烯二酸水平遠遠超出食物添加劑中的正常雜質含量，亦超出從食物接觸物料遷移至食物的合理分量。台灣當局調查發現，這次食物事故的肇因是有人濫用順丁烯二酸酐製造食用改性澱粉，部分順丁烯二酸酐改性澱粉再被用於食品製造所致。中心按台灣當局檢出的順丁烯二酸含量進行風險評估，結論是一般市民若偶爾進食有關產品，應不會對健康造成不良影響。到目前為止，中心在本港市面上抽取的食物樣本均沒有驗出順丁烯二酸。

順丁烯二酸及順丁烯二酸酐不應用作食物添加劑。食物生產商應只採用獲准在食物中使用的食物添加劑。市民購買食物時應光顧可靠的店鋪。

Maleic Acid in Starch-containing Food Products

Last month, the Taiwan authority detected maleic acid in a variety of food products including fish paste products, noodles, taro- and tapioca-balls. The Centre for Food Safety (CFS) issued trade alerts and food incident posts to inform the trade and the public about the incident and took food samples from the Hong Kong market for testing.

The levels of maleic acid detected far exceeded the quantities expected to be present as an impurity in food additives or from migration from food contact material that might have used maleic acid as an additive. Upon investigation, the Taiwan authority has linked the food incident to the abusive use of maleic anhydride during the production of modified starches, some of which were in turn used to manufacture further starch-containing food products. According to the risk assessment conducted by the CFS based on the detected levels, occasional consumption of maleic acid tainted starch-containing foods is not likely to pose any significant health risk. No positive samples have been detected in the Hong Kong market from the testing conducted by the CFS so far.

Maleic acid and maleic anhydride should not be used as food additives. Food manufacturers should only use those food additives that are approved for use in food. Members of the public are reminded to obtain food from reliable sources.

風險傳達 工作一覽 Summary of Risk Communication Work

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