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## 焦點個案 Incident in Focus

## 牛奶中的黃曲霉毒素 Aflatoxins in Milk

食物安全中心

風險評估組

科學主任游天頌先生報告

Reported by Mr. Arthur YAU, Scientific Officer,  
Risk Assessment Section,  
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內地當局於二零一一年十二月二十六日公告，某內地著名牌子的盒裝牛奶驗出黃曲霉毒素M<sub>1</sub>超標，含量為每千克1.2微克，事件隨即引起傳媒及公眾廣泛關注。食物安全中心在報道當天，通過每天食物事故監察系統得悉事件後，進行了連串評估和調查工作。本文為大家報告最新情況。

### 黃曲霉毒素對人類健康有害

黃曲霉毒素是由黃曲霉菌屬(*Aspergillus*)的三種真菌(*A. flavus*、*A. parasiticus*及*A. nomius*)產生的一組毒素。在目前已知約20種黃曲霉毒素中，農作物最常受黃曲霉毒素B<sub>1</sub>污染，其次是B<sub>2</sub>、G<sub>1</sub>及G<sub>2</sub>。當乳牛、綿羊、山羊或其他反芻動物吃了受黃曲霉毒素B<sub>1</sub>和B<sub>2</sub>污染的飼料後，毒素經動物肝臟的代謝過程，轉化為黃曲霉毒素M<sub>1</sub>和M<sub>2</sub>，隨乳汁分泌出來。換言之，人類吃了受污染的牛奶和其他食物，也會攝入這些毒素。

黃曲霉毒素會引起急性和慢性中毒。在各類黃曲霉毒素中，以黃曲霉毒素B<sub>1</sub>的毒性最強，可引致動物出現急性肝臟受損及肝硬化。國際癌症研究機構把天然存在的黃曲霉毒素(包括黃曲霉毒素B<sub>1</sub>)列為令人類患癌的物質(第1組)，而致癌性約為黃曲霉毒素B<sub>1</sub>十分之一的黃曲霉毒素M<sub>1</sub>則被列為或可能令人類患癌的物質(第2B組)。黃曲霉毒素與肝癌的關係可能受其他因素影響，如其他肝臟致癌物質包括乙型肝炎病毒等。

### 透過源頭管制減少攝入黃曲霉毒素

黃曲霉毒素一旦產生，在很多食物中都呈穩定狀態，普通的烹煮方法如煮沸、壓力烹調(高壓消毒處理)以及巴士德消毒法都未能徹底消滅黃曲霉毒素。因此，源頭管制是最有效對付黃曲霉毒素的方法。

產生黃曲霉毒素的霉菌多見於世界上較溫暖的地方，因此多種熱帶或亞熱帶地區出產的農作物均受影響，其中以花生、玉米和棉籽最常受到污染。田地裏的農作物受黃曲

Subsequent to the Mainland authority's report on 26 December 2011 regarding the detection of excessive levels of aflatoxin M<sub>1</sub> at 1.2 µg/kg in a popular Mainland brand of pre-packaged milk, there was much media and public attention. This article updates the relevant assessment and investigation after the Centre for Food Safety (CFS) became aware of the report on the same day through daily food incident surveillance.

### Aflatoxins are Undesirable for Human Health

Aflatoxins are a group of toxins produced by three species of mould (fungi) of the genus *Aspergillus*, namely, *A. flavus*, *A. parasiticus* and *A. nomius*. Aflatoxin B<sub>1</sub> is the most predominant form in aflatoxin-contaminated crops while B<sub>2</sub>, G<sub>1</sub> and G<sub>2</sub> are also commonly found among about 20 aflatoxins. When cows, sheep, goats or other ruminant animals have consumed feeds contaminated with aflatoxins B<sub>1</sub> and B<sub>2</sub>, aflatoxins M<sub>1</sub> and M<sub>2</sub> will be formed as a result of the metabolic process in liver of ruminants and excreted in milk. In other words, human beings can be exposed to the toxins through consumption of contaminated milk and other foods.



當乳牛吃了受黃曲霉毒素B<sub>1</sub>污染的飼料後，部分B<sub>1</sub>會經過體內的代謝作用，被轉化為黃曲霉毒素M<sub>1</sub>，隨牛奶分泌出來。Cows will metabolise aflatoxin B<sub>1</sub> in contaminated feeds to give aflatoxin M<sub>1</sub>, which is found in milk.

Aflatoxins can cause both acute and chronic toxicity. Aflatoxin B<sub>1</sub> is the most potent aflatoxin and can cause acute liver damage and cirrhosis in animals. Naturally-occurring aflatoxins, including aflatoxin B<sub>1</sub> has been classified as a human carcinogen (Group 1) by the International Agency for Research on Cancer (IARC). Aflatoxin M<sub>1</sub> is also classified by IARC as a possible human carcinogen (Group 2B) where it has a cancer potency at about one-tenth that of aflatoxin B<sub>1</sub>. The relationship between aflatoxins and liver cancer may be complicated by other factors, including liver carcinogens such as hepatitis B virus.

### Reducing Aflatoxins at Source

Once produced, aflatoxins are stable in many foods. Common cooking methods like boiling, pressure cooking (autoclaving) and pasteurisation will not be able to destroy aflatoxins completely. Control at source is the most effective means for reducing aflatoxins.

Since the aflatoxins-producing moulds are more commonly found in warmer parts of the world, a wide range of tropical and subtropical crops can be affected.

焦點個案  
Incident in Focus

霉毒素污染，最常見的原因是遭遇大旱，因為乾旱的氣候令植物較易受黃曲霉侵染。另一方面，農作物在收成後貯存時，若遲遲未烘乾，或濕度超過一定的臨界值時，也會受到污染。另外，若貯存期間遇鼠害蟲蛀，也會令某些農作物容易受霉菌感染。如有需要，有些物理方法，例如漂洗、剔除發霉的產品、碾磨穀物和發酵等均可減少霉菌毒素的分量，達到可供食用的水平。

牛奶是人類食物鏈中主要的黃曲霉毒素來源之一。雖然黃曲霉毒素M<sub>1</sub>和B<sub>1</sub>可以同時在牛奶中存在，但前者的含量是後者的十倍。考慮到食用量及易受影響的人口等因素，從公眾健康的角度來說，經牛奶攝入黃曲霉毒素M<sub>1</sub>一向比攝入其他黃曲霉毒素更受關注。

注意要點：

1. 產生黃曲霉毒素的霉菌通常生長於熱帶及亞熱帶地區。
2. 農作物於收成期前後均有可能受黃曲霉毒素污染。
3. 黃曲霉毒素是致癌物質。

本港的規管情況

在本港，食物安全中心定期監察牛奶中的黃曲霉毒素。由二零零九年至二零一一年期間，中心一共抽取了129個牛奶樣本作黃曲霉毒素檢測，其中16個樣本驗出黃曲霉毒素M<sub>1</sub>，但含量介乎每千克0.01微克至0.22微克之間，全部低於有關的本地及食品法典委員會(與內地標準一致)的標準。

另外，為跟進前文所述二零一一年十二月二十六日的食物事故，中心分別聯絡了國家質檢總局及有關的本地分銷商了解事件。中心也在本港抽取涉及品牌的牛奶樣本進行黃曲霉毒素檢測，結果符合本地及食品法典委員會的標準。我們其後得悉，該品牌輸港的奶類製品並非來自受影響地區。

給市民的建議

- 光顧可靠的零售商。
- 妥善貯存食物如玉米、花生等，保持環境乾燥。

給業界的建議

- 向可靠的供應商購買穀物產品和牛奶。
- 妥善貯存穀物，防止霉菌生長。
- 從耕作及貯存兩方面採取源頭管制措施，以抑制產生毒素的霉菌生長。

Peanuts, corn and cottonseeds are, among others, most frequently incriminated. The most common cause of aflatoxin contamination for crops in the field is major drought which increases their susceptibility to *Aspergillus* infection. After the crops are harvested, contamination can occur during storage when there is delayed drying or when the moisture level exceeds a certain critical level. Pests like rodents and insects present during storage may also facilitate mould infestation for some commodities. If required, physical methods like cleaning and sorting of mould-affected products, milling of grains and fermentation are known to be capable of reducing the amount of aflatoxins present to levels acceptable for consumption.

Milk is among the important sources of aflatoxins in the human food chain. While both aflatoxins M<sub>1</sub> and B<sub>1</sub> can be present in milk, the former is about ten times more abundant. Taking into account the potential quantity of human consumption as well as the vulnerable population, exposure to aflatoxin M<sub>1</sub> through the consumption of milk has all along been a greater concern than other aflatoxins from the public health perspective.

Key Points to Note:

1. Aflatoxin-producing moulds usually grow in tropical and subtropical areas.
2. Aflatoxin contamination can occur both pre- and post-harvest.
3. Aflatoxins are carcinogenic.

Regulatory Control in Hong Kong

In Hong Kong, the CFS conducts regular surveillance on aflatoxins in milk. From 2009 to 2011, the CFS took a total of 129 milk samples for aflatoxin analysis. Though 16 samples were found to contain aflatoxin M<sub>1</sub> at levels ranged from 0.01 to 0.22 µg/kg, none had exceeded the relevant local standards as well as that of the Codex (same as Mainland standard).

In addition, as a follow-up to the incident detected on 26 December 2011, the CFS has contacted both the General Administration of Quality Supervision, Inspection and Quarantine of Mainland China and the concerned local distributor. Aflatoxin testing on local samples of the alleged brand of milk taken subsequently was able to meet both the local and Codex requirements. It was also revealed that the milk product concerned did not come from the affected area.

Advice to the Public

- Purchase food from reliable retailers.
- Store products like corn, peanuts, etc. properly and avoid excessive moisture.

Advice to Trade

- Source grain products and milk from reliable suppliers.
- Maintain proper storage condition of grains to discourage mould growth.
- Source control should be done in the field and during storage to reduce growth of toxin-producing moulds.

風險傳達  
工作一覽  
Summary of  
Risk Communication Work

風險傳達工作一覽 (二零一二年一月) Summary of Risk Communication Work (January 2012)	數目 Number
事故/食物安全個案 Incidents / Food Safety Cases	68
公眾查詢 Public Enquiries	90
業界查詢 Trade Enquiries	118
食物投訴 Food Complaints	327
給業界的快速警報 Rapid Alerts to Trade	21
給消費者的食物警報 Food Alerts to Consumers	0
教育研討會/演講/講座/輔導 Educational Seminars / Lectures / Talks / Counselling	81
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# 家禽、禽流感與食物

## The Fowl, Avian Flu and the Food

食物安全中心 獸醫公共衛生組 曾然宙獸醫報告  
Reported by Dr. Benedict TSANG, Veterinary Officer,  
Veterinary Public Health Section,  
Centre for Food Safety

在上一期的食物安全平台，我們簡單介紹了為何可傳播給人类的動物疾病(人畜共患病)與食物安全相關。這次，讓我們談談近年屢佔新聞頭條的一種人畜共患病——禽流感。

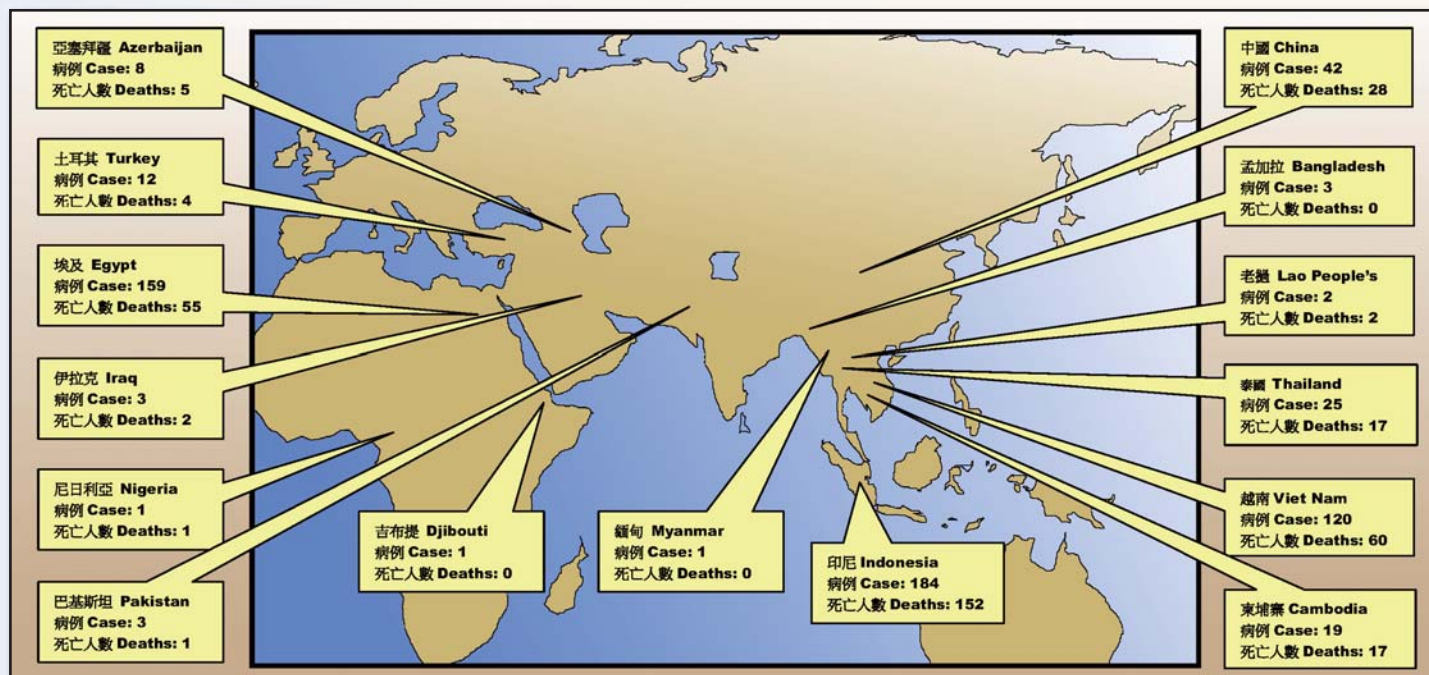
### 禽流感 - 眾所皆知的公共健康威脅

自從一九九七年本港爆發首宗人類感染H5N1禽流感個案，香港人便深深體會到人類感染禽流感的可怕後果。當年，出現了18宗確診個案，其中六人死亡，最終要銷毀全港上百萬雞隻，疫情才得以受控。時至今日，禽流感依然是公共健康的一大威脅。過去十年，全球每年都有數宗至上百宗人類感染病例。圖一顯示自二零零三年起，世界各地人類感染H5N1禽流感確診病例的累積數字。

In the previous issue of Food Safety Platform, we briefly introduced why animal diseases that are transmissible to humans (zoonosis) became a concern in food safety. This time, let's take a look at a zoonotic disease that has often grabbed news headlines in recent years — Avian Influenza (AI).

### Avian Influenza - A Known Public Health Threat

The catastrophic potential of avian influenza (or bird flu) on human beings was well-recognised by the Hong Kong people since the first local human H5N1 case detected in 1997. That year, 18 confirmed cases with six deaths were reported and the outbreak was finally controlled by a territory-wide slaughter of more than one million chickens. To date, avian influenza is still an important public health threat with a few to a hundred human infections annually over the past decade throughout the world. Diagram 1 shows the cumulative number of confirmed human cases of H5N1 worldwide since 2003.



圖一：自二零零三年起出現人類感染H5N1禽流感確診病例的地區(截至二零一二年一月二十四日，資料來源：世界衛生組織)。  
Diagram 1. Areas with confirmed human cases of H5N1 since 2003, according to World Health Organization as of 24 January 2012.

### 禽流感 - 同病相“連”的禽鳥和人類

禽流感是一種由甲型流感病毒引起的傳染病，主要影響禽鳥，包括雞、火雞、鵝鴨和珍珠雞等。禽流感病毒有多種類型(如H5N1、H5N2、H7N7和H9N2等)，大部分自然存在於世界各地的禽鳥身上，尤其是水禽和濱鳥。這些禽鳥的呼吸道和消化道常帶有禽流感病毒，卻一般不會因此而發病(無症狀感染)，被視為攜帶禽流感病毒的宿主。至於在家禽中，大部分的禽流感病毒只會令染病的家禽出現輕微的症狀。然而，萬一感染的是高致病性病毒，禽群的死亡率可以高達百分之九十至一百。著名的H5N1便是其中一種高致病性禽流感病毒。

禽流感病毒會在染病禽鳥的唾液、呼吸道分泌物和糞便中排出，雀鳥接觸到染病禽鳥的排泄物或帶病毒的污染物，便會受到傳染。禽流感原本只會在禽鳥

### Avian Influenza Connecting Birds and Humans

Avian influenza caused by the influenza virus type "A" affects mainly birds including chickens, turkeys, quails, guinea fowl, etc. There are many different strains of AI virus (such as H5N1, H5N2, H7N7, H9N2, etc.). Most of them are found naturally among birds, particularly waterfowl and shorebirds, around the world. These birds normally carry the viruses in their respiratory or intestinal tracts and usually do not get sick (asymptomatic infection), and are often viewed as reservoirs for AI viruses. While most of the AI viruses can only cause mild clinical infection in domestic poultry, others, called highly pathogenic strains, can kill up to 90-100 per cent of poultry in a flock. The notorious H5N1 is one of such highly pathogenic strains.

Infected birds can shed AI viruses in their saliva, nasal secretions, and faeces. Susceptible birds become infected when they have contact with excreta from infected birds, or through contaminated fomites. Though avian influenza is usually highly species-specific, on rare occasions, few of them

之間傳播，但在非常罕見的情況下，少數病毒也會跨越物種障礙，傳播給人類，造成十分嚴重的後果，甚至可能會致命。

### 預防禽流感 由食物安全做起

目前未有證據顯示，禽流感病毒能透過進食妥善處理的禽類或蛋類傳播。人類感染禽流感的主要途徑是直接或間接與病鳥或病鳥屍體接觸，或接觸到受污染的環境。因此，屠宰、去毛、處理及烹製受感染家禽(尤其是在家居環境)，感染禽流感病毒的風險較高。

有鑑於此，食物環境衛生署及漁農自然護理署一直協力實施連串措施，務求在農場、邊境、批發及零售各層面，全面預防禽流感的出現和傳播。

此外，食物安全中心亦會借鑑世界動物衛生組織提供的科學標準、指引及建議，針對禽流感，採取措施保障食物安全。當局一收到爆發禽流感的通報，便會停止由受影響國家/地區進口家禽及其產品。

### 健康生活由家居開始

要避免經由生或未徹底煮熟的家禽感染各類常見或罕見疾病如禽流感等，便要從現在開始養成良好的個人衛生習慣。例如避免直接接觸活家禽及其糞便；勿吃生或未徹底煮熟的家禽肉類及蛋類；經常保持良好的個人、食物及環境衛生等。如欲了解更多有關預防禽流感的資料，請瀏覽食物安全中心網頁。

may have the abilities to cross the species barrier to infect human and bring serious outcomes including death.

### Safeguarding Food Safety from Avian Influenza

There is no evidence to suggest that the AI virus can be transmitted to humans through consumption of properly prepared poultry or eggs. Most human infections with AI viruses have occurred following direct or indirect exposure to infected live or dead poultry or contaminated environments. To this end, slaughtering, defeathering, handling carcasses of infected poultry, and preparing those poultry for consumption, especially in household settings, are more important risk factors.

To address these risk factors, the Food and Environmental Hygiene Department and the Agriculture, Fisheries and Conservation Department have been working together in implementing a series of comprehensive measures to guard against the occurrence and spread of avian influenza at farm, border, wholesale and retail levels.

Besides, the Centre for Food Safety (CFS) also makes reference to the science-based standards, guidelines and recommendations provided by the World Organization for Animal Health (OIE) to safeguard food safety from AI. Suspension of import of poultry and their products from countries or regions affected by AI would be implemented once notified.

### Health Begins at Home

To protect against a range of common and rare diseases including avian influenza transmissible through raw or undercooked poultry, you can begin your healthy life right away. Avoid any direct contact with live poultry and their faeces. Refuse eating any raw or undercooked poultry meat and eggs. Always observe good personal, food and environmental hygiene. For more information, please visit the CFS website.



### 蔬菜留有殘餘除害劑的風險評估

有環保團體在今年一月月中發表蔬菜除害劑(俗稱農藥)殘留檢測報告後，引起了社會上的關注。根據該份報告，在24個從本港超級市場抽取的蔬菜樣本中，有幾個驗出不同含量的殘餘除害劑。這些蔬菜吃下肚子裡安全嗎？為了找出答案，我們把報告裡的數據與有關的安全參考值對照，進行風險評估。結果顯示，以這些蔬菜的殘餘除害劑含量，食用後出現不良影響的機會極微。此外，食物安全中心還抽取了跟進樣本，檢測結果全部合格。

現代耕種經常使用除害劑除蟲，以增加收成。農作物因而不可避免會殘留着除害劑。光是發現有殘餘除害劑，並不能就斷言會“食壞人”，其實是否能安全食用還取決於驗出的除害劑殘餘分量。

中心有既定機制監管本港售賣的蔬菜，包括派員到內地的農場視察，以及在文錦渡食品管制辦事處抽查內地入口的蔬菜和審核有關的文件，例如供港澳新鮮蔬菜出貨清單。當局自九十年代起已設立除害劑監察計劃。二零一一年，中心抽取了21 700個蔬果樣本，其中兩個從內地進口的樣本不合格。中心已通知內地部門採取跟進行動，一間涉及的農場已從內地供港的蔬菜種植基地名單中除名。

為有效管制食物中的殘餘除害劑，並劃一本地與國際間的安全標準，政府擬定了食物中殘餘除害劑建議規管方案，預計於本立法年度內向立法會提交擬議規例。此外，剛於本月生效的《食物安全條例》引入食物追蹤機制，要求食物進口商/分銷商向當局登記及備存食物進出紀錄，亦進一步加強了食物安全監管。

### Assessing the Risk of Pesticide Residues in Vegetables

The safety of our vegetables has aroused some concern recently after the release of a survey on pesticide residues by a green group in mid-January. According to the survey, several out of the 24 vegetable samples collected from supermarkets in Hong Kong were found to contain various levels of pesticide residues. Are they safe for consumption? To answer the question, we conducted a risk assessment by comparing the reported figures in the survey against the safety reference values. We found that consumption of vegetables with the reported levels of pesticide residues was unlikely to result in adverse effects. In addition, the Centre for Food Safety (CFS) has taken follow up samples and all results are satisfactory.

Pesticides are used for pest management to increase crop yield. The use of pesticide will inevitably leave some residues on the crops. To determine whether public health is at risk, one should conduct the assessment based on the levels of pesticide residues detected, rather than their mere presence.

The CFS has established mechanisms to monitor and control vegetables on sale in Hong Kong. These include conducting farm audits in the Mainland, taking samples and inspecting relevant documents, such as export certificate of fresh vegetables supplied to Hong Kong and Macau, at the Man Kam To Food Control Office. A surveillance programme for pesticide residues has been put in place since 1990s. Among 21,700 vegetable and fruit samples taken in 2011, two samples imported from the Mainland were found unsatisfactory. The CFS has contacted the Mainland authority for follow-up actions and an implicated farm has been delisted from the list of registered farms eligible for export to Hong Kong.

The Government proposed a regulatory framework on pesticide residues in food aiming for effective control and harmonising local and international standards. The proposed Regulation shall be submitted to the Legislative Council within the current legislative session. In addition, the Food Safety Ordinance, which comes into force this month, also enhances the control as it introduces a food tracing mechanism requiring registration of food importers/distributors and record-keeping related to movement of food.