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焦點個案

Incident in Focus

輻射污染與食物鏈 Radioactive Contamination and the Food Chain

食物安全中心

風險評估組

科學主任周淑敏女士報告

Reported by Ms. Shuk-man CHOW, Scientific Officer,
Risk Assessment Section,
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今年三月十一日，日本發生強烈地震，令福島第一核電廠損毀，導致放射性物質不斷外泄至附近地區。在日本及鄰近地區生產的食物驗出含放射性物質後，大家開始關注食物會否受污染。本文將會探討輻射污染如何透過食物鏈影響我們的健康。

影響健康的放射性核素

在核意外或核事故中，外泄的放射性物質可能會污染食物。食物所受的影響視乎外泄的放射性核素種類，以及沉降在食物表面或存在於食物中的輻射量。在外泄的各種放射性核素中，影響人體健康的主要是放射性碘(碘-131)及放射性銫(銫-134及銫-137)。

在輻射污染初期，碘-131會散布在不同地方，存在於水中和新鮮農作物的表面，並從受污染的飼料迅速轉移至牛奶。人們如吸入或食入放射性碘，放射性碘會積聚在甲狀腺，增加患上甲狀腺癌的風險，特別是兒童的風險會較高。食物含碘-131的問題會在核事故發生後隨即出現。不過，碘-131的半衰期短暫(八天)，在不足八星期便會衰變至原有輻射量的1%(見圖一)。

放射性銫與放射性碘不同，其半衰期較長(銫-134：兩年；銫-137：30年)。放射性銫會在環境中殘留多年，繼續對食物和食物生產造成問題，可能會對人類健康帶來長遠影響。如放射性銫進入人體，放射性銫會均勻分布在肌肉等人體軟組織，因而增加患癌的風險。

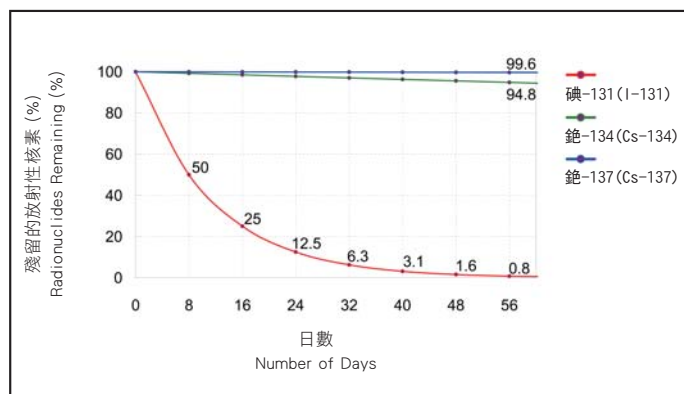
The damage caused by the massive earthquake on 11 March 2011 to the Daiichi Nuclear Power Plant in Fukushima, Japan has led to continuous release of radioactive materials to the surrounding areas. Subsequent to the detection of radioactivity in food produced in Japan and neighbouring areas, concerns have been raised over the possible contamination of our food supply. In this article, we are going to discuss how radioactive contamination may affect our health through the food chain.

Radionuclides of Health Concern

Foods may be contaminated by radioactive materials released from nuclear accidents and emergencies. The impact on food will depend upon the types of radionuclides released and the amount of radioactivity deposited or present in food. Of the different radionuclides released, radioiodine (I-131) and radiocaesium (Cs-134 and Cs-137) are the main radionuclides presenting health concern.

I-131 is distributed over a wide area, found in water and on fresh produce and is rapidly transferred from contaminated feed into milk in the initial phase of contamination. If radioiodine is breathed in or swallowed, it

will concentrate in the thyroid gland and increase the risk of thyroid cancer, particularly in children. Presence of I-131 in food is of immediate concern after a nuclear incident. However, I-131 has a short half-life of eight days; it takes less than eight weeks for I-131 to decay to 1% of its original radioactivity (Figure 1).



圖一. 碘-131、銫-134及銫-137的衰變
Figure 1. Decay of I-131, Cs-134 and Cs-137

In contrast to radioiodine, radiocaesium has a long half-life (Cs-134: 2 years, Cs-137: 30 years). Radiocaesium can linger in the environment for many years and continue to present a problem for food and food production. It may have long term impact to human health. If radiocaesium enters the body, it is distributed fairly uniformly throughout the body's soft tissues such as muscle tissues, increasing the risk of cancer.



在本港攝入輻射污染的可能途徑

根據一九八六年切爾諾貝爾核電廠意外的經驗，在放射性物質外泄初期，農產品、動物和水的表面主要因放射性核素(以放射性碘為主)沉降而受污染。在初期的直接沉降結束後，持久性放射性核素在食物中累積的問題漸趨重要。在野外採摘或捕獲的食物，例如野菇、野莓和野味肉類，繼續受到輻射污染，經過20多年後仍然含有大量輻射。長遠而言，牛奶及肉類中的銫-137仍然是人們攝入內輻射劑量的最主要來源，其次則為食用植物及農作物中的銫-137。

在本港，我們可能會透過進食受污染食品而攝入從受損的日本核電廠外泄的放射性物質。由於本港與日本相距很遠(超過3000公里)，當煙羽飄至本港時，當中的放射性物質已大為稀釋，本港的農作物不會因放射性微塵沉降而受到嚴重污染。不過，視乎空氣中放射性物質的濃度和沉降量，日本鄰近地區的農作物可能會有微量放射性銫及放射性碘。此外，亦需留意持久性放射性核素在肇事核電廠附近地區生產的食物中累積的問題。

食物安全管制

鑑於福島核電廠發生輻射洩漏事故，食物安全中心(中心)已在進口和零售層面加強監察日本進口食物。今年三月二十三日，本港有三個蔬菜樣本驗出含過量放射性物質，當局遂頒布禁制令，對日本五個縣的食物實施進口和供應管制。除此之外，所有結果全部合格。另一方面，中心正透過日常監察計劃監察本港或日本以外地區進口食物中的放射性，根據至今所得資料顯示，食物並無放射性問題。由於中心採取多項有效措施，本港市面上供應的食物不會有大量輻射污染。中心將會留意事態的最新發展和國際原子能機構及世界衛生組織的消息，並在有需要時考慮修訂禁制令。我們亦會繼續監察日本進口食物中的放射性。

注意要點：

1. 影響健康的放射性核素有放射性碘(碘-131)和放射性銫(銫-134及銫-137)，兩者已涵蓋在中心有關食物中的放射性監察計劃內。
2. 由於中心採取多項有效措施，本港市面上供應的食物不會有大量輻射污染。
3. 中心將會留意事態的最新發展，並在有需要時考慮修訂禁制令。

給市民的建議

世界衛生組織指，由日本以外其他國家生產的食物可能會有微量放射性物質。直至目前為止，驗出的輻射量遠低於可接受水平，不會造成健康問題。

給業界的建議

業界不應自行購買儀器進行輻射測試，因為必須具備專業知識才能正確進行測試和詮釋結果。

Probable Routes of Exposure in Hong Kong

From the experience of the Chernobyl nuclear power plant accident in 1986, agricultural products, animals and water bodies were contaminated mainly by surface deposits of radionuclides, primarily radioiodine, in the initial release of radioactive materials. After the early phase of direct deposit, the accumulation of relatively persistent radionuclides in food became increasingly important. Foods collected from the wild, such as mushrooms, berries and game meat continued to be a radiological problem and high levels of radioactivity have persisted for more than two decades. In the long term, Cs-137 in milk and meat and, to a lesser extent, in plant foods and crops remain the most important contributors to human internal dose.

In Hong Kong, we may be exposed to radioactive materials released from the damaged Japanese nuclear plant through the ingestion of contaminated foodstuffs. Due to the long distance from Japan (more than 3 000 km), the released radioactive substances in the plume will be much diluted when it reaches Hong Kong, produce grown locally is not likely to be significantly contaminated by deposits of the radioactive fallout. However, depending on the concentration of radioactive materials in the atmosphere and amount of deposition, minute amount of radioactive caesium and iodine might be found in produce grown in neighbouring areas of Japan. Moreover, the accumulation of some persistent radionuclides in food produced in areas near the affected nuclear plant is of concern.

Food Safety Control

In view of the radiation leak at the Fukushima nuclear plant, the Centre for Food Safety (CFS) has stepped up surveillance at both the import and retail levels for food imported from Japan. Other than the detection of excessive radioactivity in three vegetable samples on 23 March 2011, which led to the issuance of a prohibition order to control import and supply of food from five prefectures in Japan, no unsatisfactory results have been detected. On the other hand, radioactivity of food produced locally or imported from areas other than Japan is being monitored through CFS's routine surveillance programme. Information obtained so far did not suggest that is an area of concern. With effective measures in place, foodstuffs available on market are not likely to be contaminated with high level of radioactivity. The CFS will keep in view the latest development on the issue and the information provided by the International Atomic Energy Agency and the World Health Organization and consider updating the prohibition order as appropriate. We will also continue to monitor radioactivity in food imported from Japan.

Key Points to Note:

1. The radionuclides presenting health concern are radioiodine (I-131) and radiocaesium (Cs-134 and Cs-137) which have been covered by the CFS's surveillance programme on radioactivity.
2. With effective food control measures in place, foodstuffs available on market are not likely to be contaminated with high level of radioactivity.
3. CFS will keep in view the latest development on the issue and consider updating the prohibition order as appropriate.

Advice to the Public

According to World Health Organization, minute amounts of radioactive materials might be found in food produced in countries other than Japan. The amounts detected so far were well below acceptable levels and would not pose a health concern.

Advice to Trade

The trade is not recommended to purchase instruments for radiological testing since professional expertise is required for proper testing and result interpretation.

使用食物添加劑的秘訣 – 在適當食物中使用適當分量的適當化學物 Right Chemical for Right Food at Right Level – A Key for the Use of Food Additives

食物安全中心 科學主任馬嘉明女士報告
風險評估組
Reported by Ms. Janny MA, Scientific Officer,
Risk Assessment Section,
Centre for Food Safety

大家都知道，未經准許的添加劑不得在食物中使用，因為可能會損害健康，但經准許的食物添加劑已通過國際當局的嚴格評估獲評為安全，為什麼在食物中使用仍會出岔子呢？

在不適當食物中使用適當化學物 – 誤導消費者

大部分人都會挑選顏色奪目誘人的食物。我們不會選購顏色變深或偏淡的魚類或肉類，因為看起來不新鮮。不過，如果奸商使用二氧化硫和染色料等添加劑掩蓋食物難看的顏色，我們便可能會被騙。

二氧化硫不得用於新鮮肉類

二氧化硫是用途廣、毒性低的食物添加劑，但可能會令對二氧化硫有過敏反應的人出現過敏症狀。二氧化硫是准許使用的防腐劑及抗氧化劑，可用於多種食物中。它亦可令牛肉和豬肉等生肉的色彩變得鮮艷，而對因氧化以致顏色隨時間變深的肉類效果尤其明顯。部分奸商會利用二氧化硫當作神奇粉一樣灑在肉類上，令肉類看起來更新鮮，甚或使用二氧化硫把冷藏肉類冒充為售價較高的新鮮肉類。

染色料不得用於新鮮食物

在消費者對食物的觀感印象中，顏色是關鍵因素。染色料常用於食物中，以添加或保存顏色，令食物賣相更加可觀吸引。獲評為安全的經准許染色料可用於各種食物中，但可能會有濫用情況，舉例來說，為提高銷量，麗春紅4R(一種經准許的染色料)會濫用於大眼雞，令大眼雞看來更紅更新鮮，而部分奸商甚至可能會以酒石黃和日落黃把白鯧等其他品種的魚類染色，冒充作黃花魚，以圖賺取更高利潤！

雖然經准許食物添加劑在正常食用情況下對一般是安全的，但食用經這些食物添加劑處理的不新鮮甚或腐壞的食物是否安全則存疑。為防止食物添加劑可能對市民健康構成威脅，保障消費者免受欺騙，當局已制定法例。根據本港規例，二氧化硫嚴禁用於新鮮肉類中，而染色料亦絕對不得用於未經烹煮及未經加工處理的肉類、野味、家禽、魚類、水果及蔬菜。



部分奸商會把白鯧(下)染色當作黃花魚(上)出售，以賺取更高利潤
Some dishonest vendors may dye white croakers (below) and sell them as yellow croakers (above) for higher profit

使用不當分量的適當化學物 – 過量使用

食物添加劑在提供安全食物和滿足消費者需要方面十分重要。不過，部分不法製造商在食物中加入過量添加劑，以偽裝食物的性質，例如令食物賣相更吸引、味道更可口或延長保質期，以賺取更高利潤。

在乾鮑中使用過量二氧化硫並不恰當

二氧化硫是在乾果及醃菜中常見的添加劑之一，但過量使用情況偶爾會發生在多種食物中，不限於乾果及醃菜甚至乾鮑。為了令乾鮑等昂貴食物延長保質期，顏色較淺和較吸引人，有些商販會在乾鮑中過量使用二氧化硫(部分甚至添加較法定上限高出數十倍的分量)。

We all know that using non-permitted additives in food is not allowed as they may pose adverse effects to our health. However, for the permitted ones, which are determined to be safe under stringent evaluations conducted by international authorities, how can it still go wrong when they are used in food?

Right Chemicals on Wrong Food - Mislead Consumers

Most people choose food bearing alluring colours that appeal to their eyes. We are not likely to buy fish or meat with darkened or pale colour as they do not appear to be fresh. But what if the undesired colour is masked by some cunning tricks with the use of additives such as sulphur dioxide and colouring matters, we may be deceived.

No sulphur dioxide is permitted in fresh meat

Sulphur dioxide is a multi-functional food additive of low toxicity. However, for susceptible individuals who are sensitive to it, allergy-like symptoms may be experienced. Sulphur dioxide is a permitted preservative and antioxidant in a wide range of food. It can also brighten the colour of raw meat e.g. beef and pork. The effect is particularly noticeable in meat that has been darkened over time after oxidation. Some dishonest traders take this advantage to sprinkle sulphur dioxide like magic powder to make the meat look fresher or even use it in frozen meat to disguise them as fresh meat which can then be sold at a higher market price.

Colouring matters are not allowed in fresh produce

Colour plays a distinguishing role in consumer perception of food. Colouring matters are often put into food to add or restore colour so as to make them more attractive and appetising. Permitted colouring matters determined to be safe can be used in a variety of food. However, some colouring matters may be exploited. For instance, to boost sales, ponceau 4R, a type of permitted colour, is misused in bigeye fish to make them look redder and fresher. Some dishonest traders may even dye other types of fish e.g. white croakers with tartrazine and sunset yellow FCF to imitate yellow croakers for higher profit!

Despite the safety of the permitted food additives upon normal consumption in the general population, the safety of consuming staled or even spoiled food treated by them is questionable. Legislation has been introduced to prevent potential health threats they may bring as well as protecting consumers from possible deception. Under local regulations, the uses of sulphur dioxide in fresh meat as well as colouring matters in raw and unprocessed meat, game, poultry, fish, fruit and vegetables are strictly not permitted.

Right Chemicals at Wrong Level - Excessive Use

Food additives play an important role in providing safe food supply as well as meeting consumers' needs. However, some unscrupulous manufacturers add excessive level of additives to disguise the properties of food e.g. make them look nicer, tastier and have longer shelf-life so as to generate higher revenue.

Excessive use of sulphur dioxide in dried abalone is not appropriate

Sulphur dioxide is one of the commonly used additives in dried fruits and pickled vegetables. However, the excessive uses of this additive have occasionally been detected in different foods, not limited to dried fruits and pickled vegetables but also dried abalone. In order to give expensive products like dried abalone longer shelf-lives and more pleasing lighter colours, some vendors use excessive levels of sulphur dioxide (some may even add several tens of times more than the legal limit) in dried abalone.

為保障市民健康，本港有關規例參考食品法典委員會的標準，就個別添加劑訂出最高准許含量。業界在使用添加劑時除了要證明技術需要外，也須符合規管標準，以確保市民從各種食物中攝取添加劑的分量不會超逾安全參考值。此外，亦應按照優良製造規範使用添加劑，即只添加能達到所需技術用途的最低分量。

使用添加劑的秘訣

為保障食物安全和消費者權利，食物安全中心時刻留意不當使用食物添加劑的情況，推行食物監察計劃，密切留意這一問題。

總括而言，食物業有責任謹慎使用食物添加劑，時刻奉行“在適當食物中使用適當分量的適當添加劑”，就能使用得當！

To safeguard public health, maximum permitted levels are set under specific local regulation for some additives, making reference to the Codex Standard. Not only the technological needs of using the additives have to be justified but the regulatory standards should also be complied with so as to ensure the intake of additives from all food uses does not exceed the safety reference values. Furthermore, the use of additives in accordance with Good Manufacturing Practice (GMP) i.e. only the minimum amount is added to achieve the desired technological effect should be followed.

Key for the Use of Additives

To protect food safety and consumers' right, the CFS is vigilant of improper uses of food additives. Food Surveillance Programme is in place to keep a close watch of the problem.

All in all, it is the responsibility of the trade to exercise due care in using food additives; right chemical for right food at right level is always the key to their appropriate use!

食物事故點滴 Food Incident Highlight

與草酸鈣有關的食物中毒

根據衛生防護中心的資料，由二零零八年一月至二零一一年四月期間，本港共有35宗與草酸鈣有關的食物中毒個案，受影響人數為49人。今年的中毒個案涉及的蔬菜有西洋菜、芥蘭、生菜、菠菜和枸杞。由於這些蔬菜多不會含有大量草酸鈣針晶體，故懷疑這些蔬菜意外混有少量含草酸鈣針晶體的植物。

部分水果及蔬菜含有草酸鹽，例如楊桃、大黃、紅菜頭、生菜及莧菜。草酸鹽有多種形態。草酸鈣有針狀、簇串或沙狀晶體等不同形態，而針狀草酸鈣較容易滲入皮膚及黏膜，引起刺激。海芋這種野生植物已知含有草酸鈣針晶體。

根據懷疑與草酸鈣有關的食物中毒個案患者表示，常見症狀包括舌頭、口部與唇部麻痺和出現灼熱感覺，舌頭或唇部脹大，這些症狀均與文獻所載吻合。此外，部分患者又表示有腸胃不適，例如噁心、肚痛及吐瀉。

為免出現與草酸鈣有關的食物中毒，業界不應在運送和加工處理期間以海芋葉覆蓋蔬菜，因為這種做法並不恰當。至於消費者，則應從可靠供應商購買蔬菜，徹底洗淨蔬菜，並取走混入食用蔬菜中的其他植物。



以海芋葉覆蓋蔬菜的做法並不恰當
Covering vegetables with leaves of Giant Alocasia is not an appropriate practice

Calcium Oxalate Food Poisoning

According to the Centre for Health Protection, a total of 35 outbreaks of calcium oxalate food poisoning were recorded from January 2008 to April 2011, involving 49 affected persons. Watercress, Chinese kale, lettuce, spinach and Chinese boxthorn were the vegetables identified to be associated with the calcium oxalate food poisoning this year. As these vegetables are unlikely to contain high level of calcium oxalate raphides (i.e. needle-shaped crystal), it was suspected that the vegetables might have been mixed with small amount of calcium oxalate raphides-containing plants accidentally.

Oxalates are found in some fruits and vegetables, such as starfruit, rhubarb, beetroot, spinach and amaranth. Oxalates are in many forms. Calcium oxalates may be in the forms of needles, clusters or crystal sands. When they exist in needle shape, they penetrate the skin and mucous membranes more readily and cause irritation. A wild plant elephant ears (Giant Alocasia) is known to contain calcium oxalate raphides.

According to the affected persons of suspected calcium oxalate food poisoning cases, their commonly reported symptoms matched the ones described in literatures, which included numbness and burning sensation of the tongue, mouth and lips, swelling of tongue or lips. Furthermore, some patients reported gastrointestinal symptoms, such as nausea, abdominal pain and diarrhoea as well.



海芋葉
Leaf of Giant Alocasia

To prevent calcium oxalate food poisoning, it is advised that the trade shall not use the leaves of Giant Alocasia to cover vegetables during transportation and processing as it is not an appropriate practice, and consumers shall purchase vegetables from reliable suppliers, wash vegetables thoroughly and remove any plants mixed with the edible vegetables.

風險傳達 工作一覽 Summary of Risk Communication Work

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