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## 焦點個案 Incident in Focus

## 肉類製品中的瘦肉精

## Lean Meat Agents in Meat Products

食物安全中心  
屠房(獸醫)組  
施領衛獸醫報告  
Reported by Dr. Tommy SZE, Veterinary Officer,  
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今年八月，食物安全中心(中心)在一批送入上水屠房的本地豬隻尿液中驗出違禁化學物鹽酸克崙特羅後，將該批豬隻人道銷毀。由於鹽酸克崙特羅會令人中毒，故受這種化學物污染的動物肉類不宜供人食用。

### 鹽酸克崙特羅與瘦肉

鹽酸克崙特羅是一種主要用來治療馬匹支氣管痙攣的獸藥。鹽酸克崙特羅屬於名為“乙類促效劑”的人工合成物質。由於乙類促效劑能提高肌肉與脂肪的比例，故亦可用作促生劑令動物長出瘦肉，因而普遍稱為“瘦肉精”。鹽酸克崙特羅及沙丁胺醇是兩種最常見的乙類促效劑。在本港，在食用動物上使用這兩種藥物屬於違法。人們在食用含過量乙類促效劑殘餘的肉類後，可能會出現心跳加速、暈眩、頭痛、顫抖和神經緊張等症狀；如乙類促效劑的濃度高，甚至足以致命。

由一九九八至二零零一年，本港每年平均有15宗證實涉及受鹽酸克崙特羅污染肉類的食物中毒事件。自當局在二零零一年十二月三十一日禁止鹽酸克崙特羅用於食用動物後，涉及鹽酸克崙特羅的食物中毒事件數目在二零零二年跌至九宗，而由二零零三年至今再無錄得這類食物中毒個案。

### 對鹽酸克崙特羅及沙丁胺醇的現行規管

《食物內有害物質規例》(第132AF章)及《公眾衛生(動物及禽鳥)(化學物殘餘)規例》(第139N章)分別訂明，鹽酸克崙特羅及沙丁胺醇禁止用於魚類、肉類或奶類及食用動物中。本港的活生進口食用動物須經證明不含上述兩種違禁藥物。當活豬送入屠房時，牠們將被扣起接受這兩項藥物測試。中心人員會從每批進口的豬隻中隨機抽取樣本進行測試，只有呈陰性反應的樣本才表示整批進口的豬隻獲放行供屠宰。如樣本呈陽性反應，所有同一批進口的豬隻一律會遭隔離和扣留再接受確定測試。一旦確定測試結果為陽性，此批豬隻會被人道銷毀，不會送往屠宰。由二零零二至零六年，本港每年都有濫用鹽酸克崙特羅或沙丁胺醇的個案。由二零零七年起，在鹽酸克崙特羅及沙丁胺醇的測試中，本地持牌屠房內只有一批豬隻在鹽酸克崙特羅測試中確定為陽性反應(見圖一)。

In August 2011, the Centre for Food Safety (CFS) humanely destroyed a batch of local pigs admitted into the Sheung Shui Slaughterhouse after detection of a prohibited chemical, Clenbuterol in their urine. Meat derived from Clenbuterol-tainted animals is considered unfit for human consumption because of the human toxicity associated with the chemical.

### Clenbuterol and Meat-leaning

Clenbuterol is a veterinary drug primarily used for treating bronchospasm in horses. It belongs to the group of synthetic substances called beta-agonists ( $\beta$ -agonists). Since  $\beta$ -agonists can increase muscle to fat ratio, they can also be used as a growth promoter to produce lean carcass, and therefore commonly referred to as lean meat agents. Clenbuterol and Salbutamol, the two most common  $\beta$ -agonists, are illegal to be used in food animals in Hong Kong. People who have consumed meat containing excessive amount of  $\beta$ -agonist residues may experience symptoms including rapid heart rates, dizziness, headaches, tremors, nervousness, and even death at high enough concentration.

From 1998 to 2001, an average of 15 food poisoning outbreaks confirmed to be associated with Clenbuterol-tainted meat were detected annually. Since the prohibition of use of Clenbuterol in food animals on 31 December 2001, the number of food poisoning outbreaks related to Clenbuterol dropped to nine in 2002 and there have been no such food poisoning cases since 2003 to date.

### Current Control of Clenbuterol and Salbutamol

Under the Harmful Substances in Food Regulations (Cap. 132AF) and the Public Health (Animals and Birds) (Chemical Residues) Regulation (Cap. 139N), Clenbuterol and Salbutamol are prohibited in fish, meat or milk, and food animals. Live food animals imported into Hong Kong have to be certified that they are free from these two prohibited drugs. When live pigs are admitted into the slaughterhouses, they are subjected to hold and test for these two drugs. Random samples from each consignment of pigs are taken and only negative samples will mean that the whole consignment can be released for slaughter. For positive samples, all pigs from the same consignment will be isolated and retained for subsequent confirmatory test. If confirmed positive, the whole consignment of pigs would be humanely destroyed. Between 2002 and 2006, cases of Clenbuterol or Salbutamol abuse were identified each year. Since 2007, among the tests for Clenbuterol and Salbutamol, only one batch of pigs has been confirmed to be positive for Clenbuterol from local slaughterhouses (Figure 1).

焦點個案  
Incident in Focus

### 萊克多巴胺用作促生劑

萊克多巴胺亦屬於乙類促效劑，但已獲美國、澳洲、加拿大及日本等20多個國家確認為可供安全用作促生劑，以增加豬隻的瘦肉。此外，萊克多巴胺已於二零零七年在本港註冊使用。動物研究顯示，萊克多巴胺在口服後會被迅速吸收，在血液中循環，並迅速從尿液排出。如遵照標籤指示在食用動物上正確使用萊克多巴胺，有關動物的肉類是可供人安全食用的。

就食物安全管制方面，食品法典委員會已就制定萊克多巴胺在豬、牛組織內的最高殘餘限量一事商討數年。中心會根據最新的國際發展情況，對食物中獸藥殘餘的規管方案作出檢討。



健康的瘦肉豬 Healthy lean pigs

### 有沒有其他方法可增加瘦肉？

品種選育是改良肉質的有效方法。選出具有優良特性(例如肉類精瘦)的動物來繁殖，其後代便會遺傳了優良特性繼續繁殖下去。經過一代又一代的繁衍後，便會形成具有優良特性的血統。

食用動物需要各種營養素，包括水、碳水化合物、蛋白質、脂肪、纖維、礦物質及維他命，以維持正常功能和生長。在食用動物的不同發育階段適當控制營養素的分量，就可令牠們長出更多瘦肉。

#### 注意要點：

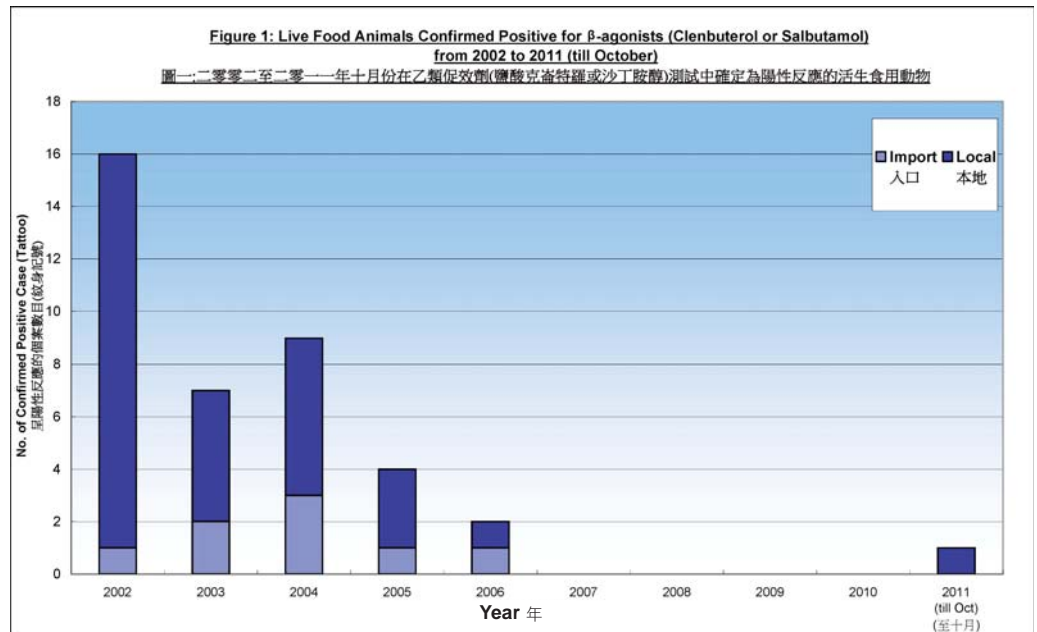
1. 在本港，鹽酸克崙特羅及沙丁胺醇禁止在食用動物中用作促生劑。
2. 萊克多巴胺是近年獲確認可用來促生瘦肉的藥物。
3. 豬農在使用萊克多巴胺時，需奉行良好的飼養規範。

#### 給業界的建議

- 鹽酸克崙特羅及沙丁胺醇是違禁藥物，因此豬農不得使用。
- 豬農應妥善保存獸藥的使用記錄。
- 進口商及肉類商應向可靠和備有溯源記錄的來源採購活生食用動物和肉類製品。

#### 給消費者的建議

- 向可靠的持牌店鋪採購肉類及肉類製品。



### Ractopamine as a Growth Promoter

Ractopamine also belongs to the group of  $\beta$ -agonist but its safe use as a growth promoter to increase leanness of pigs has been established in more than 20 countries, including USA, Australia, Canada and Japan. It has also been registered for use in Hong Kong since 2007. Studies in animals show that an oral dose of Ractopamine can be rapidly absorbed, circulated in blood and quickly excreted in urine. When the drug is used properly according to the label instruction, meat derived from the food animals concerned is safe for human consumption.

In terms of food safety control, the Codex Alimentarius Commission has been discussing the setting of maximum residue level for Ractopamine in cattle and pig tissues for several years. The CFS is currently reviewing the regulatory framework for veterinary drug residues in food and will take into account of the latest international development.

### Other Ways to Increase Lean Meat?

Selective breeding is a useful tool to improve meat quality. Animals with favourable aspects such as leanness are selected, reproduced and their offsprings with favourable traits retained for further reproduction. After generations, a bloodline of animals with favourable traits can be developed.

Food animals require nutrients including a mixture of water, carbohydrates, protein, fat, fibres, minerals and vitamins for proper functioning and growth. By proper manipulation of nutrients content at different stages of development of food animals, increase in growth of lean muscle can be achieved.

#### Key Points to Note:

1. Clenbuterol and Salbutamol are prohibited for use as growth promoters in food animals in Hong Kong.
2. Ractopamine is a recently established agent for increasing leanness of meat.
3. Good husbandry practice needs to be observed when Ractopamine is being used.

#### Advice to the Trade

- Clenbuterol and Salbutamol are prohibited chemicals and therefore cannot be used in pig farms.
- Pig farmers are advised to keep proper drug usage records.
- Importers and meat traders should purchase live food animals and meat products from reliable and traceable sources.

#### Advice to Consumers

- Buy meat and meat products from reliable licensed stores.

# 乾熱烹煮與加工過程污染物

## Dry-heat Cooking and Process Contaminants



食物安全中心  
風險評估組  
科學主任陳蓉蓉女士報告  
Reported by Ms. Melva CHEN, Scientific Officer,  
Risk Assessment Section,  
Centre for Food Safety

我們在上一期談過有關煎炸、烘焗及烘焙等乾熱烹煮方法產生的加工過程污染物，今期將會為大家介紹如何減低這些烹煮方法對健康造成的風險。

### 乾熱烹煮所產生的加工過程污染物

乾熱烹煮方法利用空氣或脂肪烹煮食物。食物在過程中會處於極高的烹煮溫度(通常遠高於攝氏100度)，以致食物的主要成分(即碳水化合物、脂肪及蛋白質)出現化學變化，繼而產生加工過程污染物。

### 減低乾熱烹煮所產生的加工過程污染物對健康造成的風險

目前已證實丙烯酰胺、某些多環芳香族碳氫化合物及雜環胺會令實驗動物患癌，而“苯并[a]芘”這種多環芳香族碳氫化合物可令人類患癌，因此，大家應設法減少攝入這些有害物質，盡量減低潛在風險。

對消費者而言，簡單而又有效減低風險的方法是保持均衡及多元化飲食，包括進食多種蔬果，不要進食太多煎炸、燒烤和肥膩食物。此外，宜採用清蒸或水煮兩種方法烹調食物，特別是肉類及含豐富碳水化合物的食物。如選用油炸、烘焙和燒烤方法烹調食物，消費者應採取措施減少加工過程污染物(見表一)。

In the last issue, we mentioned that some process contaminants can be generated during dry-heat cooking such as frying, roasting and baking. In this issue, we will introduce to you ways to reduce health risks from dry-heat cooking.

### Process Contaminants Formed by Dry-heat Cooking

In dry-heat cooking, either air or fat is used as medium of cooking. During the process, the food is cooked at a very high temperature (usually well above 100°C) and it can cause chemical changes in the major components in food (i.e. carbohydrates, fats and proteins) and subsequently generate process contaminants.

### Reducing Health Risks from Contaminants Formed by Dry-heat Cooking

Acrylamide as well as certain polycyclic aromatic hydrocarbons (PAHs), and heterocyclic amines (HCAs) have been shown to cause cancer in experimental animals while one PAH, benzo[a]pyrene, is carcinogenic to humans. Therefore, efforts should be made to lower our intake of these harmful substances and minimise any possible risk.

For consumers, the simple yet effective way to reduce the risk is to eat a balanced and varied diet, which includes a wide variety of fruit and vegetables, and they should moderate their consumption of fried, barbecued and fatty foods. In addition, steaming and boiling are preferable cooking methods especially for meat and carbohydrate-rich food. When choosing deep-frying, baking and barbecuing as cooking methods, consumers are recommended to take measures to reduce process contaminants (see Table 1).

表一：乾熱烹煮與其加工過程污染物及改善措施  
Table 1: Improvement Measures for Dry-heat Cooking Process Contaminants

食物及加工過程污染物 Food and process contaminants	改善措施 Improvement measures
<p>經油炸的馬鈴薯食品、烘焙食物及咖啡等 Fried potato products, bakeries, coffee, etc</p>  <ul style="list-style-type: none"> <li>含豐富碳水化合物的食物的煎炸、烘焗或烘焙過程會產生丙烯酰胺 Acrylamide will be generated during frying, roasting or baking of carbohydrate-rich foods</li> </ul>	<ul style="list-style-type: none"> <li>減少食品的表面面積，例如把馬鈴薯切得厚一些，因為厚切馬鈴薯的丙烯酰胺含量較薄切馬鈴薯少 Reduce the surface area of the product (e.g. cut potatoes into thicker slices as they contain less acrylamide than thinly cut ones)</li> <li>在油炸或烘焙前先把馬鈴薯焯水或在水中浸切，以去除還原糖 Blanch or soak cut potato products in water to remove reducing sugar before frying or baking</li> <li>避免以太高溫度長時間煎炸食物 Avoid frying at too high temperatures and for too long</li> </ul>
<p>炭燒食品、燒烤肉類、燒味等 Charred foods, barbecued meats, "Siu Mei", etc</p>  <ul style="list-style-type: none"> <li>多環芳香族碳氫化合物會在肉類(特別是脂肪含量高的肉類)的烘焗、燒烤或煎煮過程產生 PAHs will be generated during roasting, grilling/ barbecuing or pan-frying of meats (especially high-fat meats)</li> <li>雜環胺會在肌肉肉類(含豐富蛋白質的部分)的烘焗、燒烤或煎煮過程中產生 HCAs will be generated during roasting, grilling/ barbecuing or pan-frying of muscle (the protein-rich part of) meats</li> </ul>	<ul style="list-style-type: none"> <li>在烹煮前切去肉類可見的脂肪 Trim visible fat before cooking</li> <li>在燒烤前，把肉類煮至半熟(例如用沸水) Partially cook the meat, e.g. by boiling, before barbecuing</li> <li>在燒烤肉類時把炭火移到燒烤爐的一旁，並在爐的中央燒烤肉類，以免油脂滴在熱源上 Avoid dripping fat into the heat source when barbecuing meat by moving the charcoal to the side and grilling food in the centre</li> <li>在燒烤肉類時，應確保肉類與熱源保持距離和避免過度烹煮，但必須徹底煮熟肉類，以殺滅致病原 Place the meat further from the heat source when barbecuing meat and avoid over cooking of meat. However the meat should be cooked thoroughly to destroy foodborne pathogens</li> </ul>

## 食物安全中心發出的業界指引

經過世界各地的科學家、業界和規管機構的共同努力，目前已制定多項措施減少乾熱烹煮所產生的加工過程污染物。這些緩解措施包括改良配料單和食物加工方法。食物安全中心在二零零六年及二零一一年發出了業界指引，分別是《給食品製造商的指引 — 燒烤肉》和《減低食品中丙烯酰胺的業界指引》，當中詳列有關減低食物中丙烯酰胺及多環芳香族碳氫化合物含量的實用、有效方法。

我們將會在下一期探討發酵和加酸水解法所產生的加工過程污染物。

## Trade Guidelines Issued by the CFS

With global efforts made by scientists, industries and regulatory bodies, various measures have been devised to reduce process contaminants related to dry-heat cooking. These mitigations involve modifications of recipes and food processing conditions. The Centre for Food Safety has issued two guidelines, *A Guide to Manufacturers - Barbecued Meat* in 2006 and *Trade Guidelines on Reducing Acrylamide in Food* in 2011 for trade members. These guidelines include practical and effective ways for reducing acrylamide and PAHs formation in food.

In the next issue, we will talk about process contaminants formed by fermentation and acid hydrolysis.

## 食物事故點滴 Food Incident Highlight

### 蠔中的銅

傳媒在上個月報道，內地研究顯示珠江三角洲的蠔中銅含量可能偏高，有關報道引起市民關注。食物安全中心因應報道在市面上抽取蠔樣本進行檢測，檢出的銅含量偏低，風險評估結果顯示，蠔樣本並無有關的食用安全問題。

銅是一種金屬元素，除了天然存在於環境中，亦廣泛分布在人體各器官組織中。人體許多重要的代謝過程(包括血紅蛋白的合成)都需要酵素及結構蛋白質，而銅正是組成這些蛋白質的一種必需營養素。膳食必須提供一定分量的銅，以便人體吸收。除非人們意外或刻意食入大量銅鹽，以及患有銅代謝失調症或肝病，否則很少會出現銅中毒。

根據食品法典委員會的《食物及飼料中的污染物和毒素通用標準》，銅不屬於會影響公眾健康的污染物，因此，無須就銅訂出標準。在內地，水產(如蠔)、豆類、水果等食物的銅限量標準(GB15199-94)已於二零一一年一月十日廢止。

### Copper in Oyster

Last month, according to the media, research conducted in the Mainland reported high levels of copper might be present in oysters from the Pearl River Delta which raised public concerns. In view of the media reports, the Centre for Food Safety had taken some oyster samples from the local market. Risk assessments on the low copper levels detected showed that they were not of food safety concern.

Copper is a metallic element occurring naturally throughout the environment and also widely distributed in the body. It is an essential nutrient incorporated into enzymatic and structural proteins involved in many critical metabolic processes including the formation of haemoglobin. Human diet must supply regular amounts for absorption. Copper poisoning is uncommon except in accidental or deliberate ingestion of large quantities of copper salts and in cases related to disorders in copper metabolism or liver disease.

Under Codex General Standard for Contaminants and Toxins in Food and Feed, copper is not considered as a contaminant with public health significance hence no copper standard is required. In the Mainland, tolerance limits of copper in foods (GB15199-94) for aquatic products (e.g. oysters), beans, fruits, etc have been repealed on 10 January 2011.

### 皺皮瓜中的李斯特菌

自七月底，美國爆發李斯特菌疫情，造成不少嚴重病例，令多名長者死亡。據稱皺皮瓜(又稱哈密瓜)與這次感染事件有關。

李斯特菌是泥土和水中常見的細菌。這種細菌可在一般烹煮溫度下輕易消滅，但能在攝氏零下0.4度的低溫下生存和繁殖。雖然身體健康的人在感染李斯特菌後只會出現輕微症狀或甚至沒有任何病徵，但它們對孕婦、初生嬰兒、長者及免疫力較弱的人卻是危險的細菌。

食物安全中心(中心)已通知業界此事，並向美國當局跟進事件。美國食物及藥物管理局和有關農場均表示，據了解有關問題皺皮瓜沒有輸往香港。

皺皮瓜、西瓜、密瓜等瓜類以往曾多次牽涉入食源性疾病疫情，當中許多個案由沙門氏菌引致。中心建議消費者在流動的清水下以清潔的蔬果刷刷洗整個瓜，然後才切開食用。

### Listeria Monocytogenes in Cantaloupe

Since late July, there have been outbreaks of *Listeria monocytogenes* infection in the United States causing severe illness and some deaths among the elderly. Whole cantaloupes were reported to link to the infection.

*Listeria monocytogenes* is a bacterium commonly found in soil and water. It can be easily destroyed at normal cooking temperature but can survive and multiply at temperature as low as  $-0.4^{\circ}\text{C}$ . Although healthy people develop few or no symptoms when infected, *Listeria monocytogenes* could be dangerous to pregnant women, newborns, the elderly and people with low immunity.

The Centre for Food Safety (CFS) has alerted the trade and followed up the incident with the U.S. authorities. According to the U.S. Food and Drug Administration and the farm of concern, there was no known export of the affected cantaloupe to Hong Kong.

Melons, such as cantaloupe, watermelon, and honeydew, have been associated with a number of outbreaks of foodborne illnesses with a large number being caused by *Salmonella*. The CFS advises consumers to wash and scrub whole melons with a clean produce brush under running water before cutting.

## 風險傳達 工作一覽 Summary of Risk Communication Work

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