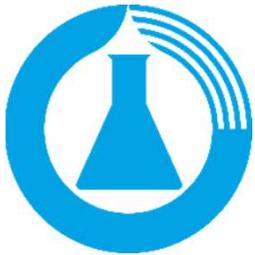


Authentication Analysis of Tonic Food Products in Hong Kong

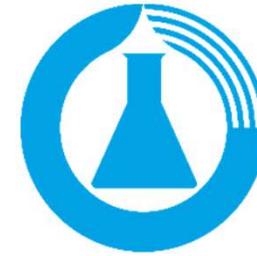
Foo-wing LEE

Government Laboratory Hong Kong



Overview

- ▶ Tonic food products in Hong Kong
- ▶ Role of Government Laboratory
- ▶ Laws and Regulations in Hong Kong
- ▶ Case sharing



Tonic food products in Hong Kong

- ▶ Chinese medicinal products / tonic food products
- ▶ Traditional culture and believe of Chinese
- ▶ “*Eating-for-healing*”



Fraudulent tonic food products

▶ Product fraud

REUTERS World Business Markets Breakingviews Video More

ODDLY ENOUGH NOVEMBER 15, 2007 / 10:10 PM / UPDATED 14 YEARS AGO

Fake crocodile can lead to tears

By Reuters Staff

HONG KONG (Reuters) - Hong Kong people have long believed in the age-old remedy of a dish of crocodile meat to cure ailments such as sore throats, constipation, nosebleeds and insomnia, but a recent study has found that this is because about two-thirds of the supposed crocodile meat probably comes from other reptiles, the Standard

Hong Kong's Consumer Council tested 24 samples from seafood shops across the territory and found that

South China Morning Post

'Deer tendon' failed to stand up to scrutiny

Amy Nip [+ FOLLOW](#)
Published: 12:00am, 16 Mar, 2012 - [Why you can trust SCMP](#)

PICKS

- [Why does the Greater Area raise worms?](#)
- [Post](#)

The Consumer Council yesterday named and shamed 28 shops which cheated customers by selling 'deer tendon' - a popular Chinese medicine ingredient - which actually came from cattle.

Customs officers tested deer tendon, which is said to boost men's sexual performance. But DNA testing proved that only one sample was genuine, and the others were fines with fines of up to HK\$50,000.

In September last year, customs officers raided the shops (some of which sold grams) of suspected fake tendon, said to be worth HK\$2,000 per gram. In the month, all the shops had been convicted of selling fake tendon. Each outlet was fined between HK\$2,000 and HK\$50,000.

'Deer tendon is quite common ... eating cattle tendon is much cheaper, but deer tendon is rarer and more expensive,' the council said.

'The council said that the price of deer tendon is between HK\$50 and HK\$80 a catty, while the price of fake deer tendon is between HK\$20 and HK\$40 a catty.'

消費者委員會 CONSUMER COUNCIL

Highlights Shopping Guide Complaints & Protection Policy & Research

Articles Press Releases Multimedia Gallery CHOICE Subscription

Specials

Advice on purchase of genuine Cordyceps sinensis - CHOICE # 384

16 October 2008

[f](#) [t](#) [d](#) [g+](#) [r](#)

Beware of the diverse array of Cordyceps products in the market.

Because of their well-known medicinal properties, the demand for Cordyceps products is on a steady upward trend. And so are their prices.

Due to the many species of Cordyceps, the Consumer Council advises consumers to decide beforehand what exactly they have in mind to purchase.

The most prized Cordyceps species of all is probably the Cordyceps sinensis, a valued traditional Chinese medicine, or

Role of Government Laboratory

- ▶ Provision of analytical and advisory services by comprehensive and suitable scientific means in an objective basis
- ▶ As referee analyst under various ordinances and regulations
- ▶ Support various government departments in legal enforcement

Consumer's right

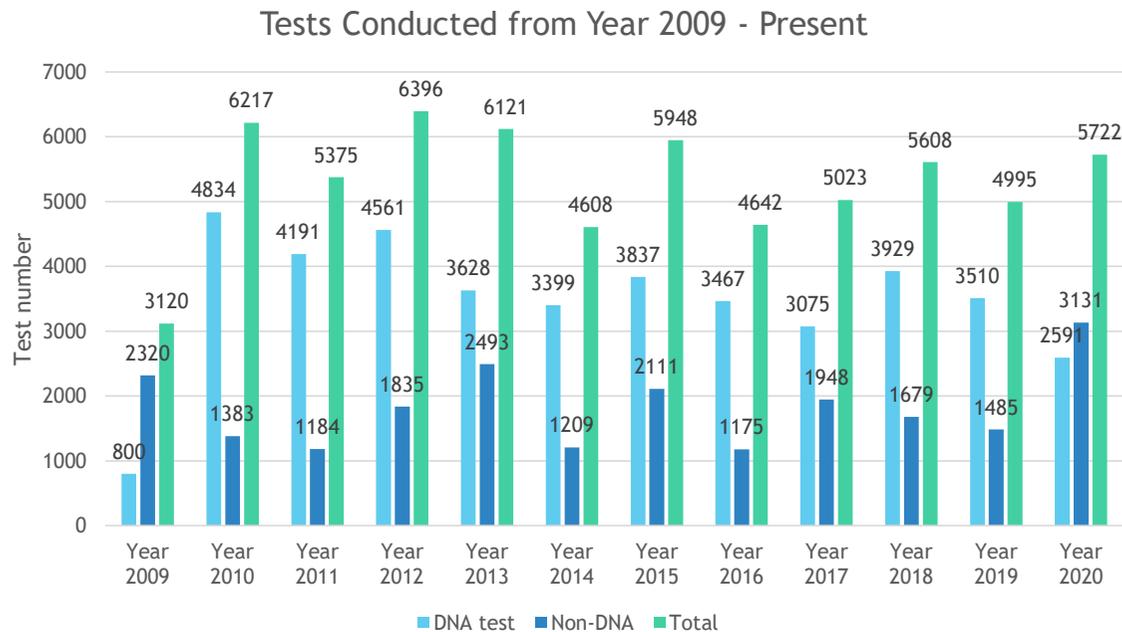
Public safety and health

Environmental conservation

Implementation of government policies

Trade Descriptions Ordinance (Cap. 362 of the Laws of Hong Kong)

- ▶ To prohibit false or misleading trade descriptions, false marks and mis-statements in respect of goods in the course of trade or business.
- ▶ Maximum penalty: HK\$500,000 fine and 5 years' imprisonment.



Authentication of tonic food products

Species identification by DNA test

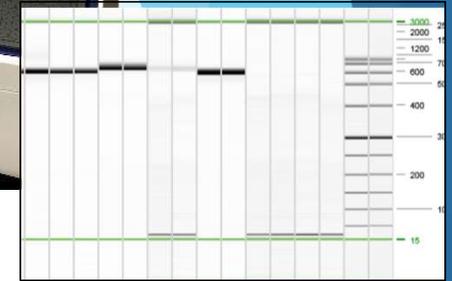
Test Sample →



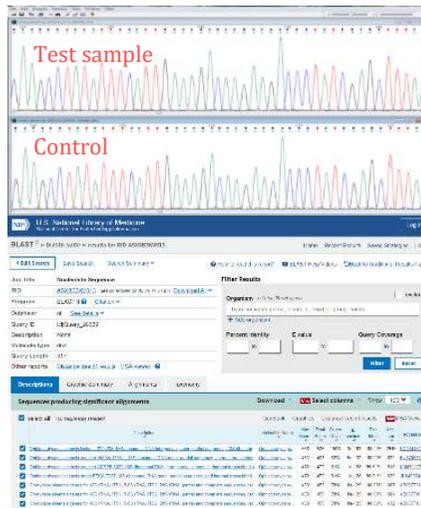
DNA Extraction



PCR Amplification of DNA marker



Test Result ←



DNA Sequence Analysis

Case sharing

Fake Crocodile Dried Meat

- ▶ Dried crocodile meat: putative health product good for **asthma** and **coughs, nourishing lungs**
- ▶ Sundry seafood retail shops suspected to offer fake crocodile meat for sale



Fake

HK\$100-500 per kg



Genuine

HK\$500-1000 per kg



Authentication by DNA sequencing

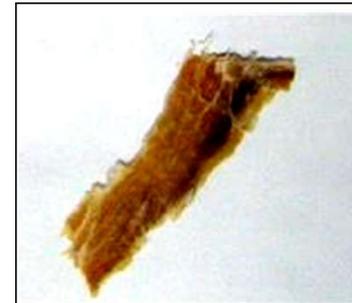
- ▶ 16S ribosomal RNA



Snake: *Python reticulatus*



Lizard: *Varanus salvator*



Crocodile: *Crocodylus niloticus*



- ▶ Six businessmen were fined from **\$1,000 to \$60,000** under the Trade Descriptions Ordinance for supplying to consumers **water monitor lizard meat** or **snake meat** which were falsely described as “crocodile meat”.

The screenshot shows the 'LAW & ORDER' news.gov.hk website. The main headline is '3 arrested for selling mislabelled meat' dated November 14, 2007. The article text states: 'Two men and a woman, aged 43 to 51, have been arrested for selling fake crocodile meat.' Below the text is a photo of two jars of meat. To the right of the article is a 'Report Drug Dealing 24 Hours Hotline' button and a 'Print This Page' link. A 'Press Releases' section is visible below the article, with the headline 'Six businessmen fined for supplying fake crocodile meat' dated 3 September 2008. The text in this section reads: 'Six businessmen have been fined from \$1,000 to \$60,000 under the Trade Descriptions Ordinance this year for supplying to consumers water monitor lizard meat and snake meat which were falsely described as crocodile meat.'

Press Releases

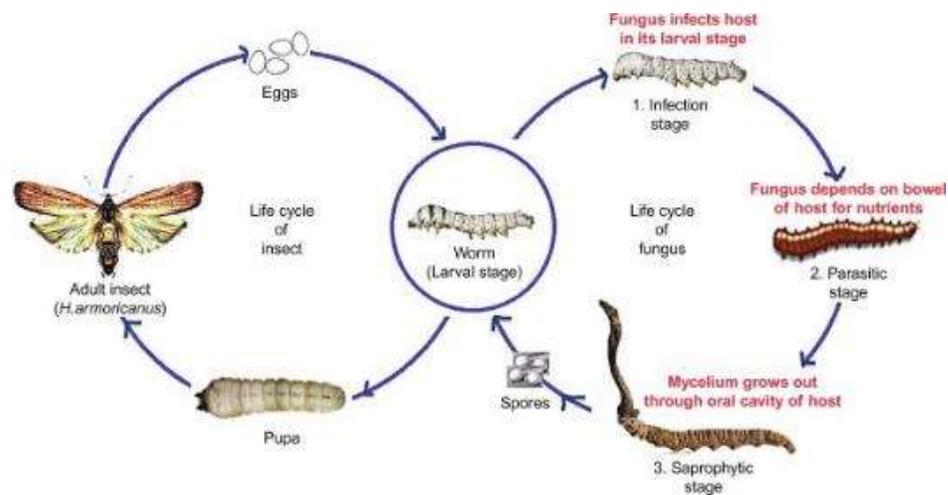
Six businessmen fined for supplying fake crocodile meat
3 September 2008

Six businessmen have been fined from \$1,000 to \$60,000 under the Trade Descriptions Ordinance this year for supplying to consumers water monitor lizard meat and snake meat which were falsely described as crocodile meat.

Case sharing

Cordyceps sinensis

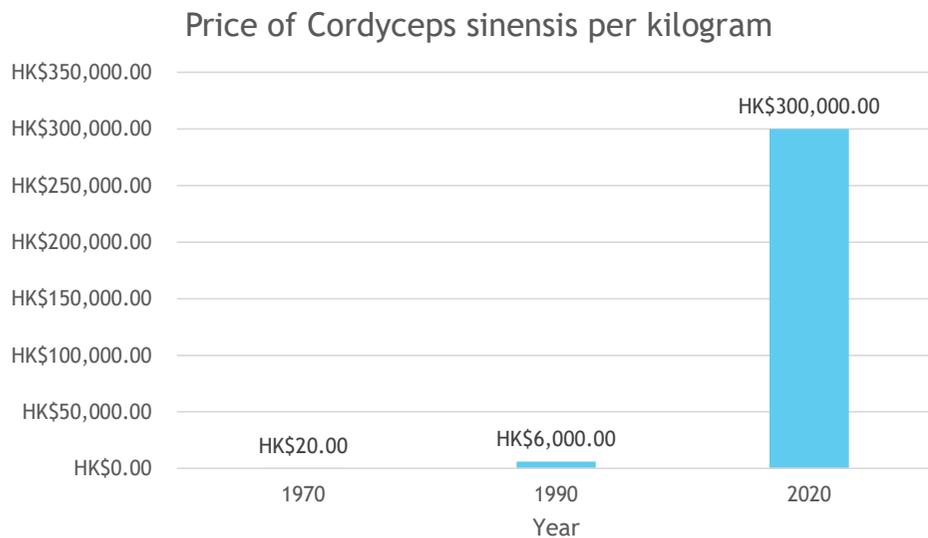
- ▶ **Definitions:** 「... a composite consisting of the stroma of the fungus, *Cordyceps sinensis* (Berk.) Sacc.* (Fam. Hypocreaceae), parasitized on the larva of certain insect species (Fam. Hepialidae) ...」
《Chinese Pharmacopeia 2020》
- ▶ Caterpillar fungus
- ▶ “DongChongXiaCao” 冬蟲夏草



Adapted from Mamta Pal & Kshipra Misra. 2018. *Cordeceps* sp: The Precious Mushroom for High-Altitude Malaiides. In: Management of High Altitude Pathophysiology. p93-114
**Cordyceps sinensis* is the synonym of *Ophiocordyceps sinensis*

Cordyceps sinensis

- ▶ Considered to be valuable tonic for human body
- ▶ Haemostatic and expectorant
- ▶ >30 bioactivities, including immunomodulatory, anti-tumour,
- ▶ Present: HK\$300 000 per kg



Authentication by DNA testing

- ▶ 18S ribosomal RNA
- ▶ Internal transcribed spacer
- ▶ RNA polymerase II largest subunit

Fraudulent species

▶ Other fungi



Cordyceps hawkesii



Cordyceps ramosa



Metarhizium spp.

▶ Plant materials



Stachys geobombycis

Several to 10 times
lower price than
Cordyceps sinensis

- ▶ The Chinese medicinal herbs shop proprietor was sentenced to carry out **160 hours of community service** and to offer the victim **HK\$ 16,320 compensation** for supplying cordyceps with a false trade description

Press Releases

Chinese medicinal herbs shop proprietor and Japanese restaurant convicted of violation of Trade Descriptions Ordinance

9 August 2017

A Chinese medicinal herbs shop proprietor and a Japanese restaurant were convicted today (August 9) at Kowloon City Magistrates' Courts for violation of the Trade Descriptions Ordinance.

The Chinese medicinal herbs shop proprietor was sentenced to carry out 160 hours of community service and to offer the victim \$16,320 compensation for supplying cordyceps with a false trade description.

The Japanese restaurant was fined \$4,000 for engaging in commercial practice involving misleading omission.

Hong Kong Customs earlier received information alleging that a Chinese medicinal herbs shop sold suspected fake cordyceps to a customer.



飲食物語

購買冬蟲夏草 慎防魚目混珠

冬蟲夏草一直是受歡迎的中藥材之一，我們不時都可看到冬蟲夏草產品的廣告，價格在過去幾年間更有急升趨勢，動輒每兩售數千元。但消費者可能不知道，原來「蟲草」有很多品種，若不仔細看清楚，有可能「誤中副車」，以高昂價錢買入廉價「蟲草」。本會邀請了衛生署及中藥專家，提醒消費者選購冬蟲夏草時要注意的事項。

Choice Magazine Vol. 384

Case sharing

Deer, dried tendon

- ▶ *Cervus spp.*
- ▶ Enhancing bone and tendons



Press Releases

Customs seizes fake deer tendons (with photos)

12 September 2011

The Customs and Excise Department (C&ED) seized 187 catties of suspected fake dried deer tendons worth about \$41,200 in a series of raids on 28 dried food retailers last week.

Customs investigations in the previous months revealed that some unscrupulous retailers were selling suspected fake deer tendons to deceive consumers. Samples of the suspected dried deer tendons were given to an accredited laboratory for DNA tests and examined by experts of the dried food trade. Results confirmed that the samples were cattle tendons.

To protect consumer rights, the Department took enforcement action last week and searched 28 dried food shops in To Kwa Wan, Mong Kok, Sham Shui Po, Tuen Mun, Shatin, Tsuen Wan, Tai Po, Yuen Long, Tin Shui Wai, Shau Kei Wan and North Point. Some 187 catties of

- ▶ Cytochrome b
- ▶ 16S ribosomal RNA



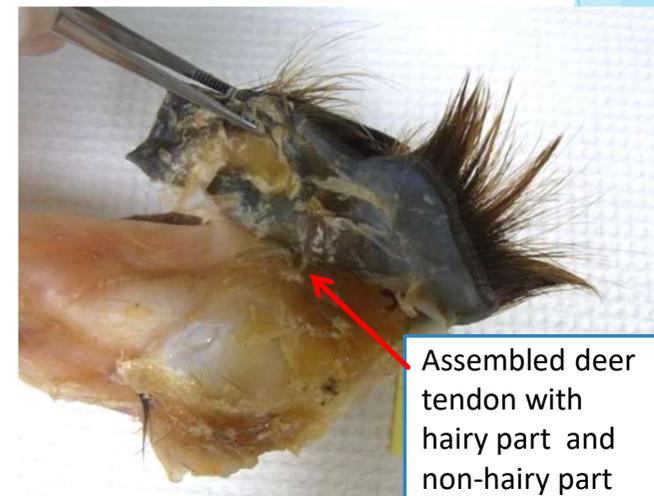
Deer 4% (2/51)

Cattle 80% (41/51)

Water buffalo 4% (2/51)

Deer + Cattle 12% (6/51)

- ▶ ~5 times lower price than genuine deer tendon
- ▶ The seafood retail shops and wholesaler involved in having possession and selling of fake dried deer tendon were fined a total sum of HK\$ 338,500



Case Sharing

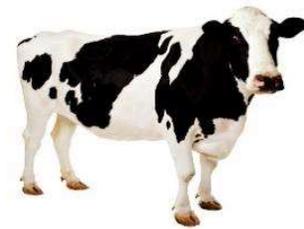
Authentication of Donkey-hide glue

- ▶ Highly processed animal collagen: derived from skin of donkey (*Equus asinus*) by decoction and concentration
- ▶ Promoting haematopoiesis and arresting bleeding
- ▶ Treatment of gynecologic diseases and some chronic diseases
- ▶ ~HK\$6 000 per kg



Common adulterants

- ▶ wholly or partly blended with skins from other animals such as *cow (Bos taurus)* or *pig (Sus scrofa)*
- ▶ ~5-8 times lower price than genuine donkey glue



DNA method

- ▶ Specific PCR
 - ▶ Cytochrome b ¹
 - ▶ SINE element ²

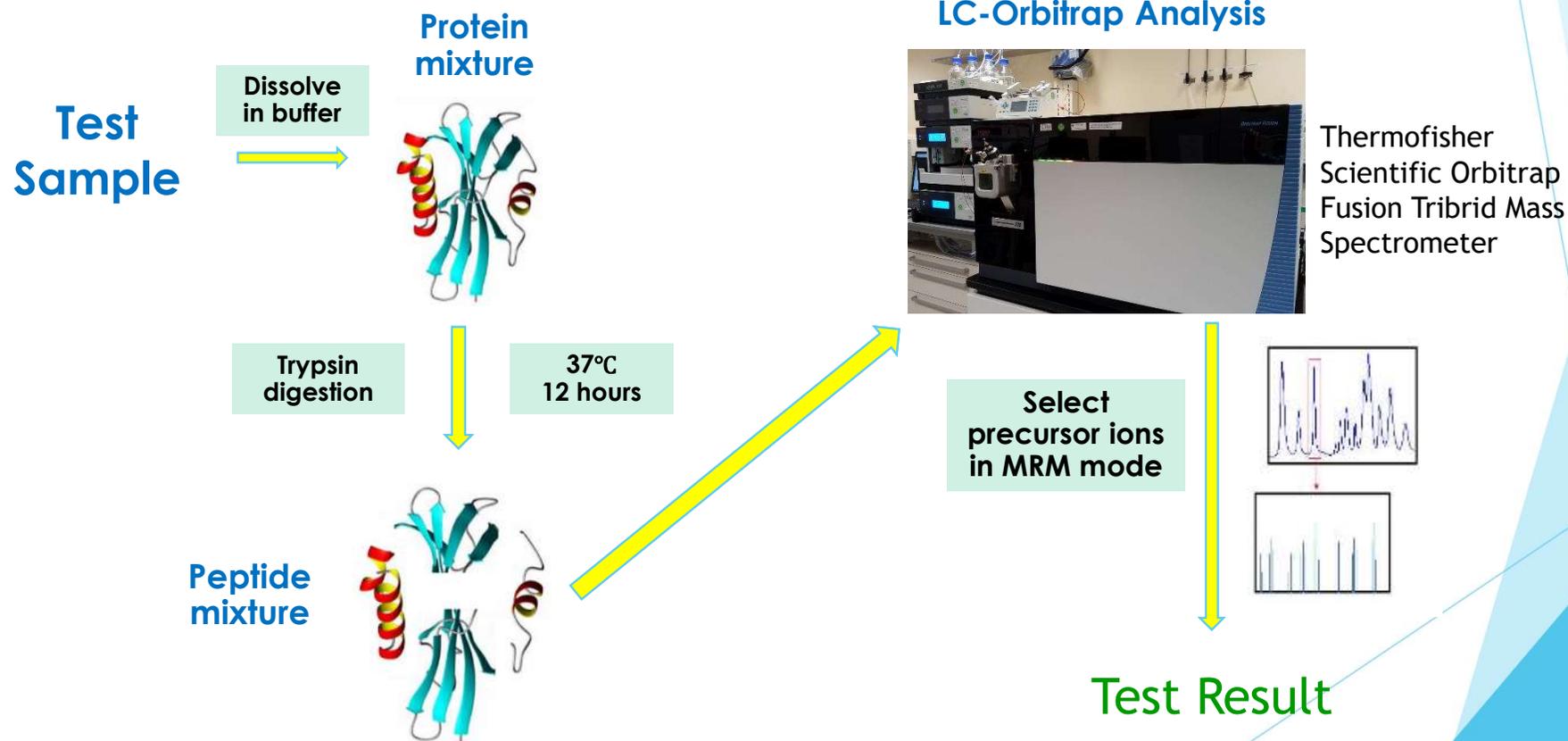


¹ J Nat Med. 2014. 68:181-185

² J Food Drug Anal. 2011. 19(2):123-130

Characteristic marker peptide method

Workflow of donkey-hide marker peptides by using LC-Orbitrap-MS



Quantitative Analysis of marker peptide

▶ Requirements in 《Chinese Pharmacopoeia 2020》 for Ejiao

▶ Acceptance limit in ChP 2020 :

▶ Peptide A1 (GPAGPTGPVGK³) + A2 (GEAGAAGPAGPAGPR³) > 0.15%

▶ Linearity of marker peptide A1 and A2 :

▶ 50 - 1250 µg/g



▶ Modified method for pCm (Proprietary Chinese Medicines)

▶ Low level range : 2 - 50 µg/g

▶ MDL : 5 µg/g for each peptide



³ Chinese Traditional and Herbal Drugs. 2018. 49(13):3166-3173

Conclusion

- ▶ Comprehensive analytical approach for tonic product authentication
 - ▶ DNA analysis
 - ▶ Chemical analysis
 - ▶ Peptide analysis
- ▶ Scientific contribution in enforcement of Trade Descriptions Ordinance in Hong Kong