

March 2018

Where's the beef? 「肉」罷不能?

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Recommended Citation

Lung, Tama (2018) "Where's the beef? 「肉」罷不能?," *AMBROSIA 客道: The Magazine of The International Culinary Institute*, 48-53.

Available at: <http://repository.vtc.edu.hk/ive-hosts-ambrosia/vol5/iss1/18>

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Chefs, scientists and food engineers look to the past and to the future in the race to find viable, sustainable and enjoyable alternatives to conventional animal products. 不少廚師、科學家及食品工程師都回顧過去、放眼未來，為尋找取代傳統動物肉類的食材絞盡腦汁。 **By Tama Lung**

Where's the beef? 「肉」罷不能?

People of Yunnan Restaurant is a small eatery on a quiet side street in Hong Kong's San Po Kong district, and may seem an unlikely place to taste the future of food. But this casual dining spot, specialising in traditional cuisine from the south-western Chinese province of its name, serves what many are hailing as a solution to world hunger and the harmful effects of livestock farming: edible insects.

Born in Yunnan but raised in Hong Kong, chef Li Qing and his wife opened the restaurant in 2005, to introduce locals to Yunnan-style noodles. Li began serving fried cicada, grasshoppers and other bugs as a gimmick, but soon found customers seeking them out – and not only for their novelty, but for their healthful and medicinal properties. “If food becomes scarce, people will turn to insects because they are healthy, clean and nutritious,” Li says, over a serving of fried bee pupae, silkworm pupae and bamboo worms tossed with salt, chilli and a dash of Sichuan pepper. “It will become like the old days, when we kept them in our pockets and ate them as a snack.”

Li might be on to something: a typical mealworm provides the same protein, vitamins and minerals as fish and meat, and more unsaturated omega-3 and fatty acids than cattle and pigs. What's more, thanks to a growing body of research into food security and the environmental impact of the livestock and fisheries industries, insects are emerging as a potential alternative to conventional animal protein.

The Food and Agriculture Organization of the United Nations (FAO) has stated that current food production will almost need to double to accommodate the nine billion people projected to be on the planet by 2050. According to a report published by the FAO in 2013, “Land is scarce and expanding the area devoted to farming is rarely a viable or sustainable option. Oceans are over-fished and climate change and related water shortages could have profound implications for food production.

在香港新蒲崗一條僻靜的小街上，有一間主打正宗雲南風味美饌的小店。這間名為「雲南人家」的餐廳，外表平平無奇，很難想像它竟然與食物的未來扯上關係。它供應的食物，被視為能解決全球糧食危機和禽畜養飼所引致的各種問題：食用昆蟲。

生於雲南、長於香港的李清，2005年跟太太開辦雲南人家，售賣故鄉風味的米線。小店最初以供應炸金蟬、草蜢等昆蟲作宣傳噱頭，想不到因此吸引不少客人慕名來嘗新，甚至有客人趕著昆蟲的健康特性及藥用價值而來。李清一邊端上一碟辣椒花椒炒蜂蛹、蠶蛹和竹蟲，一邊說：「當糧食匱乏，人們就會轉吃衛生、健康而營養十足的昆蟲。就像昔日那樣，將昆蟲放在口袋裡當小吃。」

李清所言不無道理。以黃粉蟲為例，它不止跟魚類和肉類提供同類的蛋白質、維他命和礦物質，不飽和與米加3和脂肪酸的含量更比豬、牛豐富。再者，近年有不少研究探討禽畜業與魚業的糧食供應問題和生態影響，以致人們開始思考昆蟲能否取代傳統的動物蛋白質來源。

聯合國糧食及農業組織 (FAO) 指出，2050年全球人口將達至90億，糧食產量必須比現時增加一倍才能滿足所有人的需要。可是根據FAO於2013年發表的報告估計，「在土地缺乏的情況下，擴大農業用地不切實際，也並非可持續的選項。過度捕魚和氣候變化引致的水資源短缺，也會對糧食生產構成深遠影響。」

報告續指：「目前全球約有十億人長期處於飢餓狀態，因此為了解決今天和未來的糧食與營養攝取問題，我們吃什麼、如何生產這些食物的問題得重新作出評估。生產效率得改善，食物浪費得減少，並且需要找出增加糧食的新方法。」

另外，也有人像美國洛杉磯Beyond Meat食品科技公司總裁Ethan Brown那樣，設法用植物製造素肉，圖以植物蛋白質取替動物蛋白質。該公司以豌豆、

Pan-fried Chicken Breast with Japanese Sweet Potatoes and White Crickets at Insects in the Backyard

曼谷餐廳Insects in the Backyard的煎雞胸肉伴日本番薯及白蟋蟀



“To meet the food and nutrition challenges of today – there are nearly one billion chronically hungry people worldwide – and tomorrow, what we eat and how we produce it needs to be re-evaluated. Inefficiencies need to be rectified and food waste reduced. We need to find new ways of growing food.”

For some, including Ethan Brown, CEO of Beyond Meat, a Los Angeles-based producer of meat-like but plant-based food products, that means completely replacing animal protein with plant protein. The company’s Beyond Burger uses peas for protein, beets for colour, and coconut oil and potato starch for juiciness and chew, resulting in a burger so meat-like that it’s sold alongside the real thing at retailers.

Plant-based foods maker Hampton Creek Foods, based in San Francisco, has a Just line of mayonnaise, dressings and cookie dough concocted entirely from plant-derived ingredients. Also in San Francisco, cellular agriculture company Perfect Day Foods makes milk without the help of cows (using yeast and fermentation). In Germany, food technologists at the Fraunhofer Institute for Process Engineering and Packaging have extracted protein from sweet blue lupine seeds to make a milk-tasting ice cream.

Not everyone, however, is prepared to give up their beloved ribeye and roast chicken, and that’s where people like Uma Valeti come in. “The world loves to eat meat, and it is core to many of our cultures and traditions,” the co-founder and CEO of Memphis Meats has said. The food technology company he heads up, also headquartered in San Francisco, aims to grow sustainable cultured meat. “We want the world to keep eating what it loves. However, the way conventional meat is produced today creates challenges for the environment, animal welfare and human health.”

The answer, claims Valeti (alongside a growing body of scientists, entrepreneurs and high-profile investors), is “clean meat”, or meat engineered directly from animal cells, thereby doing away with the need to feed, breed or slaughter animals. Memphis Meats made the world’s first clean meatball in 2016, and first clean poultry in 2017, joining others such as Dutch company Mosa Meat, which unveiled the first lab-grown burger in 2013, and Finless Foods, also headquartered in San Francisco, which is developing seafood products using similar cellular technologies.

This page: Fried Bee Pupae, Silk Worm Pupae and Bamboo Worms at People of Yunnan Restaurant
Opposite, clockwise from top left: Baby Corn with Chicataná Ant Mayonnaise at Pujol; a chef prepares Memphis Meats’ clean poultry as co-founders Uma Valeti and Nicholas Genovese look on; Memphis Meats’ clean meatball

本頁：雲南人家的炒蜂蛹、蠶蛹和竹蟲
 對頁左上圖起順時針：
 Pujol的粟米筍配飛蟻蛋黃醬；Memphis Meats廚師在創辦人Uma Valeti和Nicholas Genovese的注視下，裝飾以公司的人造肉炮製的雞肉菜式；Memphis Meats的人造牛肉丸

“A lot of ingredients these days have additives, but not insects because they are just caught and frozen. They are also very clean because what they eat – plants, bamboo, corn – is very clean”

現時許多食材都含有添加劑，但昆蟲不同，即捕即冷藏。

昆蟲靠吃植物、竹和粟米等維生，乾淨衛生。

– Li Qing



紅菜頭、椰子油和生粉等，製成蛋白質豐富、顏色幾可亂真和肉汁豐饒、有嚼頭的Beyond Burger漢堡扒。由於Beyond Burger實在與真正的肉製漢堡扒幾無分別，有商店甚至把它放在肉類貨架上出售。

在三藩市，素食食品生產商Hampton Creek Foods也推出Just食品系列，由蛋黃醬、醬料到由寄生麵糰均由植物提煉及製造。同樣設於三藩市的細胞農業公司Perfect Day Foods，則以酵母菌和發酵方法製奶，無須奶牛幫忙。在德國的食品加工與包裝研究機構Fraunhofer內，食品科技研究員從甜美的藍色羽扇豆種子提取蛋白質，以此製造出充滿奶香的雪糕。

然而，不是人人都願意放棄自己喜愛的肉眼扒和烤雞，Memphis Meats等食品科技公司於是應運而生。這間總部同樣設於三藩市的公司，主要生產符合可持續發展原則的人造肉，公司創辦人之一兼行政總裁Uma Valeti表示：「世人喜歡吃肉，那是許多文化和傳統的核心。我們希望人們可以繼續吃自己喜歡的東西，可是現時傳統肉類的生產模式，對環境、動物權益和人類健康都帶來一定的挑戰。」

Valeti與越來越多的科學家、企業家和知名投資者均認定，人造肉就是解決上述問題的答案。這種由動物細胞培植出來的肉類，省卻餵飼、繁殖和屠宰的煩惱。Memphis Meats於2016年製造出全球首個人造牛肉丸，翌年更做出首塊人造雞肉。其實，荷蘭公司Mosa Meat早於2013年已在實驗室培植出首塊漢堡扒，另一家三藩市公司Finless Foods也正在運用細胞培植技術開發海鮮食品。

不過，大部分專家都同意，由細胞培植的人造肉至少還需五年才能投入市場。目前，許多食物研究員和前衛的廚師，都把目光投放在全球有20億人已在食用的1,900種昆蟲上。企業家兼食用昆蟲專家Harman Singh Johar形容，這些「效率奇高的肉類生產機器」比起畜牛，所需空間、耗水和餵飼的食物均少許多。



Most experts agree, however, that it will be at least five years before clean meat is available. In the meantime, food researchers and pioneering chefs are looking to the estimated 1,900 species of insects that are already being eaten by two billion people worldwide. These “stupendously efficient meat machines”, as described by entrepreneur and edible-insects expert Harman Singh Johar, require significantly less space, water and feed than cattle. They can also be found in a wide variety of habitats, are capable of being processed into granular or paste forms, and may pose less risk of transferring disease than mammals and birds.

“A lot of ingredients these days have additives, but not insects because they are just caught and frozen,” explains chef Li of People of Yunnan Restaurant in Hong Kong, who sources his insects from Yunnan. “They are also very clean because what they eat – plants, bamboo, corn – is very clean.” Li uses traditional methods when preparing bugs, such as deep-frying grasshoppers to make their hard shells easier to consume, and lightly frying creamy bamboo worms before mixing them into an omelette.

“The biggest discovery in our research is that insects represent such a large diversity, and that such a vast range of cultures have insects deeply embedded in their food habits,” says Michael Bom Frøst, director of the non-profit Nordic Food Lab in Copenhagen, and co-author of the book *On Eating Insects: Essays, Stories and Recipes*, released in May 2017.

From the roasted witchetty grubs (“nutty, really nutty,” says Frøst) consumed in a remote community of Australia’s Northern Territory to enormous fried

昆蟲可以在許多不同的生態環境下生存，可以製成粒狀或糊狀。而且，與動物和雀鳥相比，大部分昆蟲傳播病毒的風險更低。

雲南人家的廚師李清也表示：「現時許多食材都含有添加劑，但昆蟲不同，即捕即冷藏。昆蟲靠吃植物、竹和粟米等維生，乾淨衛生。」李清從雲南進口昆蟲，並以傳統方法烹調，例如將草蜢油炸，使牠們的硬殼變得酥脆和較易入口，香煎竹蟲蛋餅則先把軟滑的竹蟲煎香再混入蛋漿。

哥本哈根非牟利食物研究機構Nordic Food Lab總監Michael Bom Frøst表示：「我們在研究中最大的發現是，原來昆蟲品種多樣，而且食用昆蟲並不小眾，許多不同的飲食文化之中都有食用昆蟲的傳統。」2017年5月，他與另外幾位作者合著《On Eating Insects: Essays, Stories and Recipes》，講述食用昆蟲的文化及典故，還有分享昆蟲食譜。

由澳洲北部偏遠地區的烤木蠹蛾幼蟲 (Frøst表示：「果仁味很濃，真的很濃。」)，到非洲烏干達東部村落的洋蔥炒巨型蟋蟀（「頭部的味道像羊腦」），Frøst與同袍吃過無數令人毛骨悚然的爬蟲。對昆蟲的營養價值和環保好處推崇備至的還有 Enrique Olvera，他位於墨西哥城的高級餐廳Pujol在「2017年全球50最佳餐廳」中排名20位。Olvera表示：「我用昆蟲烹調菜式純粹因為牠們味美，並不是要表達什麼理念，只是想用自己喜愛的材料煮出眾的食物。」

Olvera表示，在墨西哥，昆蟲通常混在沙沙醬中或夾在粟米卷裡，或是加鹽後與mesclun龍舌蘭酒等一起享用。Olvera是其中一位把昆蟲由街頭小吃提升至高級菜譜





This page, from top left: Chef Mai of Insects in the Backyard; his Green Goddess Wild Greens Salad with Pan-fried Crickets and Grasshoppers; Suri juanesitos (palm weevil larvae), Peru; and Bee Larvae

Ceviche, recipe by Josh Evans with Sebastian Moreno Henao, both from On Eating Insects

Opposite: Pujol's Chef Enrique Olvera

本頁左上圖起順時針：Insects in the Backyard廚師Mai，以及其香煎蟋蟀和蚱蜢配雜菜沙律；《On Eating Insects》介紹的秘魯紅棕象甲蟲，以及根據Josh Evans和Sebastian Moreno Henao的食譜烹調的檸汁醃蜂蛹
對頁：Pujol廚師Enrique Olvera

BEE LARVAE CEVICHE PICTURE BY CHRIS TONNESSEN; SURI JUANESITOS COURTESY OF NORDIC FOOD LAB

crickets tossed with onions and salt (“the head reminiscent of lamb brains”) in a village in Eastern Uganda, Frøst and his team have sampled a dizzying array of creepy-crawlies. And they’re not alone in championing insects for more than their nutritional and environmental benefits. “I use insects because they taste delicious,” insists Enrique Olvera, whose upscale eatery Pujol, in Mexico City, ranked 20th on the World’s 50 Best Restaurants 2017 list. “I’m not trying to make any particular statement, but to cook good food with ingredients that I love.”

Olvera says that in Mexico, insects are most commonly used in salsas, tacos or mixed with salt to accompany mescal and other drinks. He is one of several chefs there who are elevating bugs from street-stall fare to sophisticated fine dining, and his flair for distilling “the taste of terroir” can be experienced in his dish of Baby Corn with Chicatana Ant Mayonnaise, inspired by a favourite rainy afternoon snack, and a seasonal dish of escamole (queen-ant eggs, dubbed “Mexican caviar”) sautéed with onion, garlic and chilli, and served with roasted leek and a bone-marrow confit.

On the other side of the planet, in the Thai capital Bangkok, chef Thitiwat “Mai” Tantragarn has teamed up with fashion designer Khun Lim to introduce entomophagy (the practice of eating insects) to the city’s middle and upper classes. Lim is the entrepreneurial brains behind the ChangChui creative complex in Bangkok, and owner of the Insects in the Backyard restaurant there. “Exploration of edible insects as cuisine has been relatively recent and evolved out of the vision and passion of Lim,” Thitiwat says. “If they are taken out of the familiar rural context and made ‘haute cuisine’, Bangkokians can see edible insects through new eyes. It becomes upscale and fashionable.”

Drawing on American, French, Italian and Mediterranean flavours, but with emphasis on regional ingredients, Thitiwat’s menu boasts such dishes as Crab and Giant Water Beetle Ravioli with Turmeric Saffron Sauce, and Green Goddess Wild Green Salad with Pan-fried Crickets and Grasshoppers. “We don’t expect that insects will become a significant part of the majority of people’s diet,” the chef says, “but it has a much lower carbon footprint than animal protein. Finding ways to introduce it into the culinary portfolio of chefs and a growing segment of the population could have considerable impact.”

Indeed, few expect a single solution to the challenge of feeding the global population, but wider acceptance of everything from edible insects to test-tube burgers could herald a revolution in how we think about food. “I believe that in 30 years or so, we will no longer need to kill any animals and that all meat will either be clean or plant-based, taste the same and also be much healthier for everyone,” Richard Branson, the billionaire founder of Virgin Group (and an early backer of Memphis Meats), wrote on his company’s website in August 2017. “One day we will look back and think how archaic our grandparents were in killing animals for food.” 🐛



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我用昆蟲烹調菜式純粹因為牠們味美，並不是要表達什麼，只是想用自己喜愛的材料煮出美味的食物 🗣️

– Enrique Olvera

的大廚，他炮製的粟米筍配飛蟻蛋黃醬，靈感源自一款著名的窩心小吃；而另一款季節性菜式則用上有「墨西哥魚子醬」之稱的黑蟻蟻卵，與洋葱、蒜頭和辣椒一起嫩煎，配以烤韭蔥和油封骨髓。想品嚐Olvera的墨西哥地道風味，就不要錯過這兩道昆蟲美食。

在地球另一邊的泰國首都曼谷，暱稱Mai的大廚Thitiwat Tantragarn跟時裝設計師Khun Lim攜手向城中的中產和富裕階層提倡昆蟲飲食。Lim是曼谷新興文創區ChangChui的幕後主腦，也是Insects in the Backyard昆蟲美食餐廳的老闆。Thitiwat說：「把食用昆蟲變成上等佳餚這個新鮮的概念，首先是由滿腔熱忱和想像力的Lim提出。如果昆蟲飲食能夠擺脫鄉土氣息，換上『高級料理』的銜頭，曼谷人就會對食用昆蟲另眼相看，視為潮流時尚。」

Insects in the Backyard供應以泰國地道食材烹調的美、法、意和地中海菜式，招牌菜包括有蟹肉田鱉意式雲吞配藏紅花薑黃醬汁、香煎蟋蟀及蚱蜢配雜菜沙律等。Thitiwat解釋：「我們不會期望大部分人改以昆蟲為主要食材，但是吃昆蟲又比吃其他動物能大幅減低碳足印，如果可以讓廚師和更多人將昆蟲加入食物名單裡，其影響是顯而易見的。」

事實上，解決全球糧食危機不可能依靠單一方案，但如果大家能提高對食用昆蟲以至試管漢堡扒等的接受程度，我們對食物的觀念也許會出現革命性的改變。維珍集團創辦人、億萬鉅子Richard Branson是Memphis Meats早期的投資者之一，他於去年8月在其公司網頁上寫道：「我相信在30年內，我們就可以不用為了裹腹而宰殺動物，取而代之是細胞培植的人造肉或是全植物成分的素肉。它們跟真正的肉味道一樣，但對人類更健康。有一天我們回望過去，就會覺得祖先宰殺動物來充飢的行為是多麼的不可思議。」 🐛