



Novel food and VPH: the challenge of entomophagy

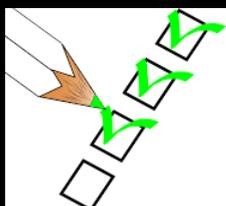


nonit

Prof. Beniamino T. Cenci Goga Dr. Paola Sechi Dr. Maria Francesca Iulietto

Let's eat insects!

Online survey in English, Italian and Spanish



Link:

<https://goo.gl/forms/OdClSYHfKLXpADRU2>

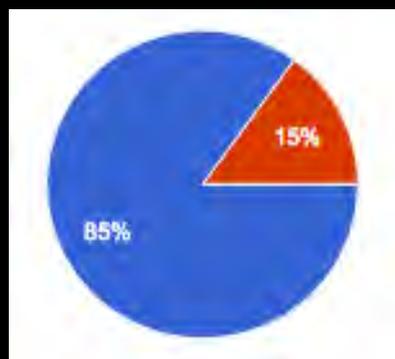
Let's eat insects!

What about us?



My Kahoot

Have you ever heard about Entomophagy?



► Preliminary results from the survey

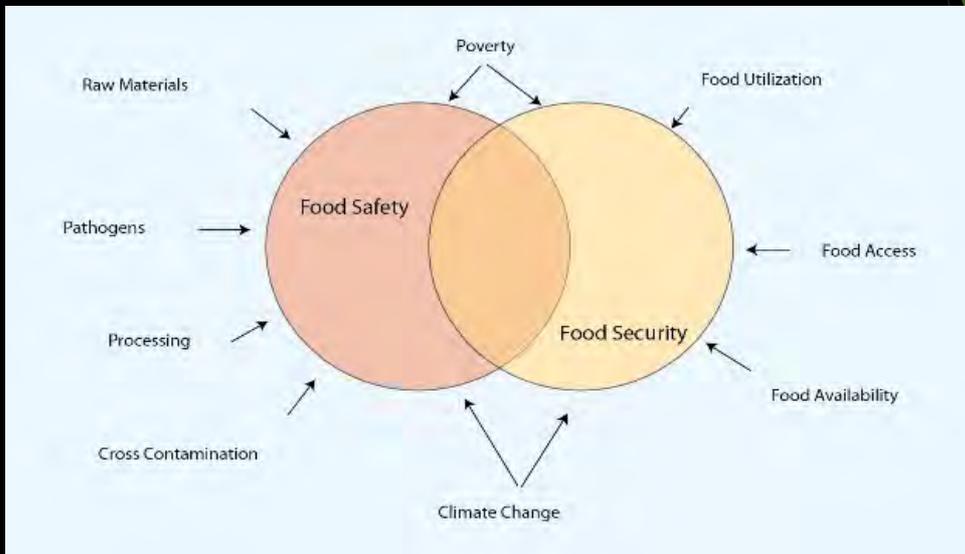
ENTOMOPHAGY

- ▶ Entomophagy is the consumption of insects by humans
- ▶ First published mention in English is in 1871 (Google N-gram)
- ▶ Insects supplement the diets of approximately 2 billion people and have always been a part of human diets.
- ▶ Arachnids (e.g. spiders and scorpions) are considered as well for food and feed, although by definition these are not insects.



- ▶ The term entomophagy is used by FAO since 2012 and helps to draw attention during the launching period to have a general technical term, but once the attention has been gained, then more specific wording is required.
- ▶ Uncertainty in terminology is a barrier to the development of regulations for the use and trade of insects for human consumption in many countries.
- ▶ European food safety legislation is ongoing
- ▶ The term of Insects could be more precise: INSECTA or broadly arthropods

FOOD SAFETY & FOOD SECURITY



Food safety and Food Security. Nature Education Knowledge (2012)

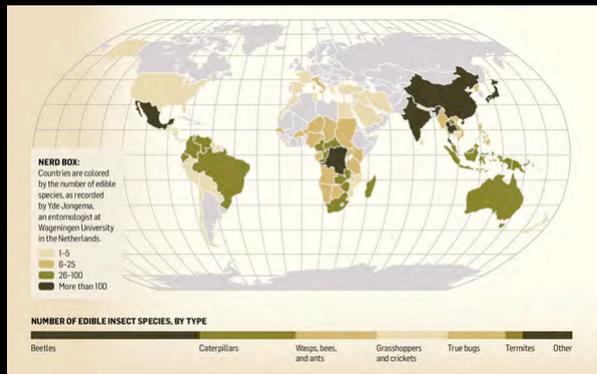
Do you know how many species of insects are edible?



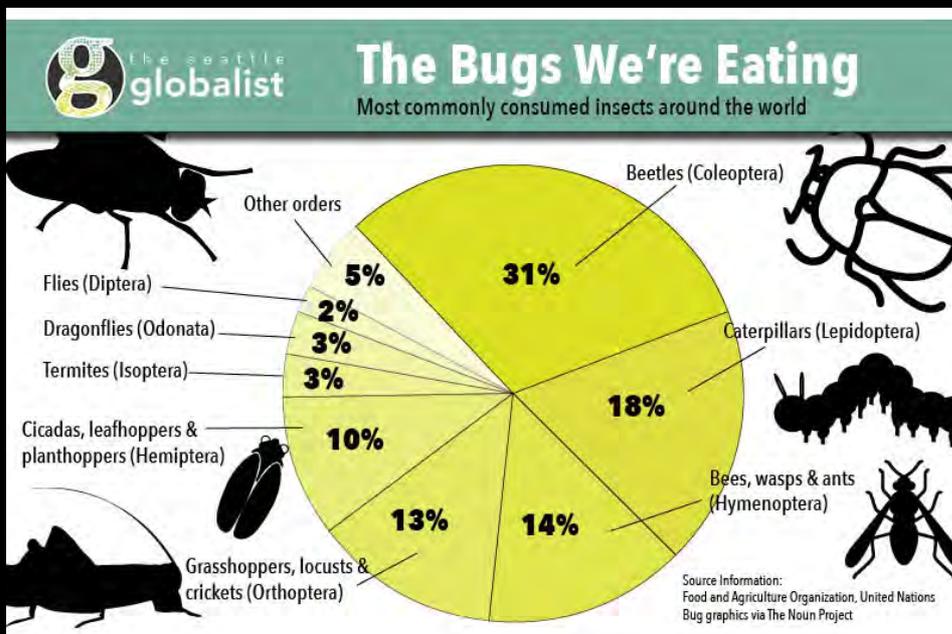
► Preliminary results from the survey

Edible species

- ▶ More than 1 900 edible insect species are consumed around the world. However, this number continues to grow as more research is conducted.



[List of Edible Insects _ Wageningen University](#)



Most commonly consumed species

► Beetles (Coleoptera) 31%



► Caterpillars (Lepidoptera) 18%



Imbrasia Belina - Mopane worms Southern Africa

► Bees, wasps and ants (Hymenoptera) 14%



Ant larvae-Escamoles, Mexico



Red ant-Bastar Tribes, India

► Grasshoppers, locusts and crickets (Orthoptera) 13%



Chapulines, Mexico

- ▶ Cicadas, leaf and planthoppers, scale insects and true bugs (Hemiptera) 10%



Roasted cicadas



Cicada peanut butter cups

- ▶ Termites (Isoptera) 3%
- ▶ Dragonflies (Odonata) 3%



Termites - Indonesia, Africa



Dragonflies

► Flies (Diptera) 2%

► Other orders 5 %



Black soldier flies larvae -*Hermetia illucens*

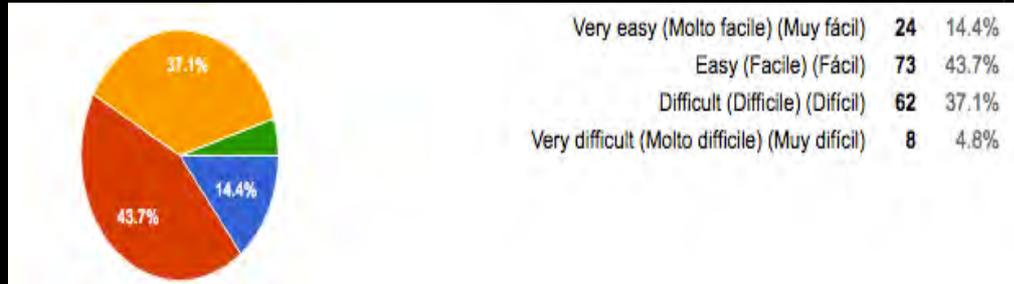
Kitchen Insect Farm -Katarina Urgan

Consumption of Insect in Different Countries

Country	Consumption of Insect
South America	Butterfly ,Grasshoppers, crickets, Cicadas, Ants, Flies, Bees and Wasps.
Colombia	Giant queen ants, Palm grubs and Caterpillars.
Asia	Grasshoppers, Crickets, Silk worm pupa, Dragonflies, Termites, and Beetles .
Thailand	Giant water beetle.
Africa	Caterpillars , Mopane worm, Termites and Locusts.
Pacific Islands	Papua, Palm grubs, Grasshoppers, Crickets, Stick insects, Mantids and Locust.
Australia	Honey ants, Grubs, Moth, Bardi grubs and Cerambycid beetle.
China	Silkworm pupa, Fly larvae, Cricket, Blattaria, Termites and Locusts.
India	Termite, Dragonfly, Grasshopper, Ants, Eri and Mulberry silkworm, Honey bee, Cricket.

Insects Cambridge World History of Food ,Shantibala,2012

How difficult is to find insects-based products ?



[List of entrepreneurs](#)

In Europe: Belgium



UK



SPAIN



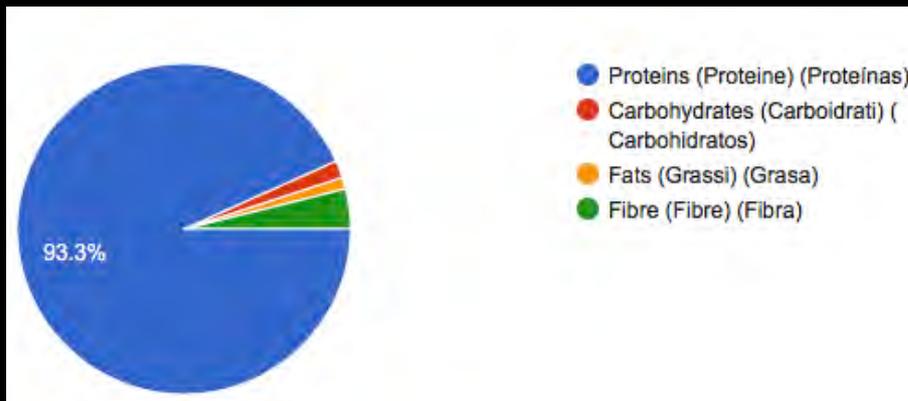
The Netherlands



France

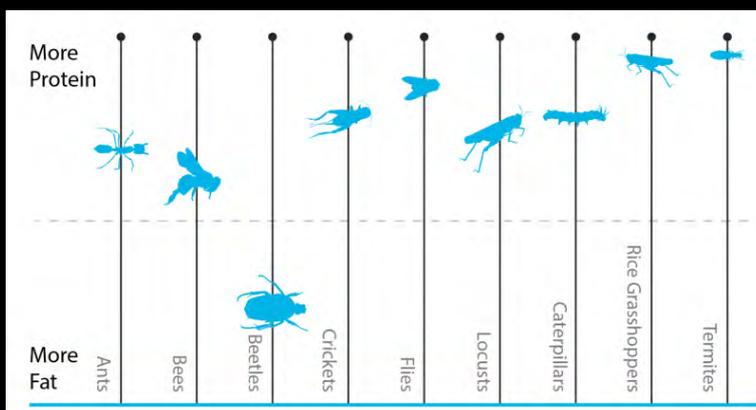


Which nutritional component do you think is the most present in insects?



► Preliminary results from the survey

Nutritional value of insects



Nutritional Value of selected Insect serving size

Insect	Serving size	Calories	Total Fat	Phosphorus	Iron	Calcium	Carbohydrate	Protein
Crickets	100g	122	5.5g	185mg	10mg	76mg	5.1g	12.9g
Giant water bugs	100g	62	8.3g	226mg	14mg	44mg	2.1g	19.8g
Red ant eggs	100g	83	3.2g	113mg	4mg	8mg	6.5g	7g
Small grasshoppers	100g	153	6.1g	238mg	5mg	35mg	3.9g	20.6g

Feed conversion ratio

AMOUNT OF FEED GRAIN IT TAKES TO YIELD 1 KG OF LIVE ANIMAL WEIGHT

- 2.5KG FEED = 1KG Chicken
- 5KG FEED = 1KG Pig
- 10KG FEED = 1KG Cow
- 1.7KG FEED = 1KG Cricket

INSECTS AS FOOD

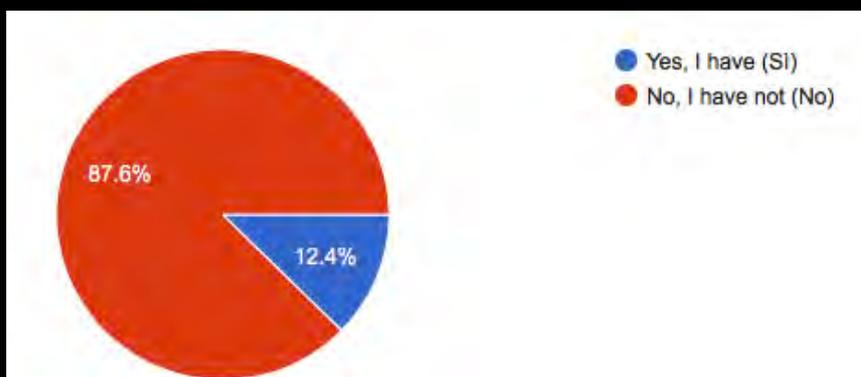
Most commonly eaten insects worldwide

Insect	Percentage
Termites	22%
Other	17%
Caterpillars	18%
Lice	24%
Grasshoppers	19%

Animal	Animal feed	Body weight	Processed meat	Profit margin
Cow	100%	13%	50%	13%
Pig	100%	33%	50%	33%
Cricket	100%	60%	90%	60%

Conversion of animal feed into body mass and processed meat.

Experiences of entomophagy



- ▶ Preliminary results from the survey

Experiences of entomophagy

- ▶ 'cheese fly' *Piophilidae casei* - "rotten/putrid cheese"



- Casu Marzu, Sardegna, Italy
- Casgiu merzu in Corsica, France
- Pecorino Marcatto in Abruzzo, Italy
- Casu du quagghiu in Calabria, Italy
- Cacie' Punt in Molise, Italy
- Formaggio saltarello (latte bovino), Friuli Venezia Giulia, Italy
- "La Robiola o Formaggio Molle con i Vermetti" - Emilia Romagna, Italy



E120



- ▶ Cochineal (carmine) is a red dye obtained primarily from *Dactylopius coccus*.
- ▶ Cochineal is typically used to colour food products and as a dye in textiles and pharmaceuticals.
- ▶ It is commonly eaten by humans, such as carmine dye (a bright red pigment also called E120)
- ▶ Between 2000 and 2006, world production increased more than 2.5 times due to big producers such as Campari, Danone.
- ▶ Cochineal extract: extract is a coloring made from the raw dried and pulverized bodies of insects
- ▶ Carmine: carmine is a more purified coloring made from the cochineal

INTORNO AGLI INSETTI DELLA LOMBARDIA.

La più preziosa derrata della nostra agricoltura si deve ad un insetto. Nel più alpestre dei nostri distretti, dove il rigido clima non accoglie il baco da seta, un altro insetto vi supplisce in parte colla rara squisitezza del mele, che Bormio porge in nitidi vaselli di legno bianco ad ogni viandante che scende dallo Stelvio.

Quando i nostri contadini, avvedendosi dell'untuosità che le *Meloe* trasudano, le mischiano all'olio per ungere gli assi dei carri; quando vediamo i villanelli suggerire per diporto la dolce sostanza latteata contenuta nell'addome della *Melolontha aprilina*; quando leggiamo in Lister che l'*Omaloptia horticola*, infesta ai frutteti, se si pasce della fronda del pomo, si riempie d'un bel colore d'arancio, opportuno alla miniatura, e cose simili, possiamo facilmente immaginarci, come le tribù degli insetti tengano in serbo innumerevoli sostanze, destinate a servizio di più studiose generazioni. Quando la chimica avrà dato la mano all'ento-



Order Coleoptera
Family Scarabaeidae
Genus *Melolontha*
“maggiolini, cockchafer/May bug”

Giovanni Battista Villa. 1884. *Catalogo dei coleopteri della lombardia*.

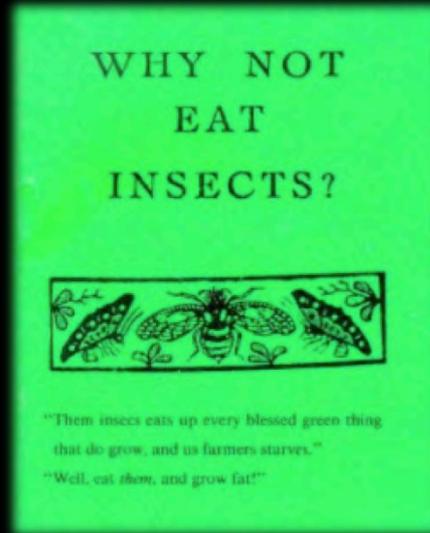
Simmonds, P. 1885. *The Animal Resources of Different Nations*. London: E. & F.N. Spon, pp. 208-209, 347-375.

Klausnitzer, B. 1981. *Beetles*. New York: Exeter Books.

Westermann, W. 1821. *Über die Lebensweise der Insecten in Ostindien und am Cap*. Germar's Magaz. Entomol. 4: 411-427.

Why not eat insects? (Holt, 1885)

- ▶ First document to bring the notion of entomophagy to the wider English public



«CIBO INNOVATIVO»

Snack con grilli e vermi sequestrati dall'Asl nel padiglione OlandaLo speciale Expo - Le foto degli insetti

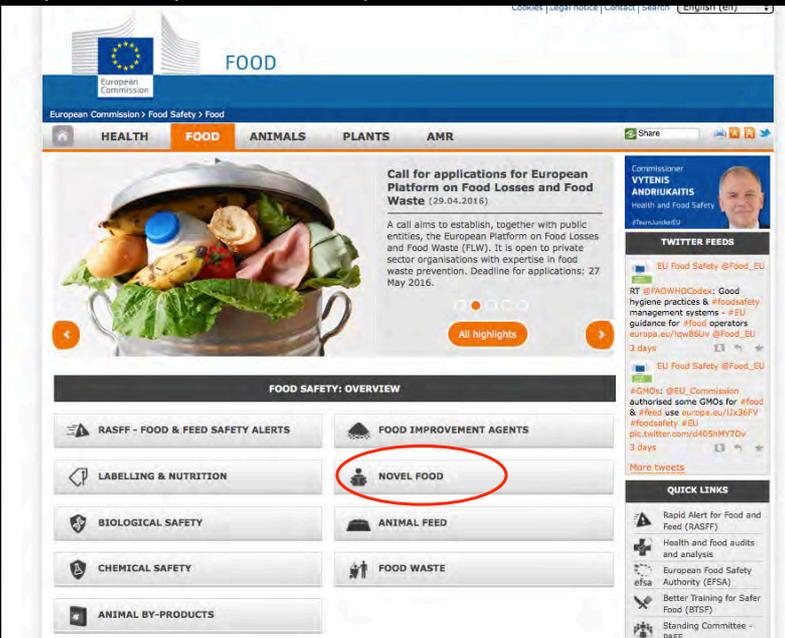
Stop agli assaggi alternativi: non hanno i visti sanitari

di Paola D'Amico



► http://milano.corriere.it/notizie/cronaca/15_giugno_11/snack-grilli-vermi-sequestrati-dall-asl-padiglione-olanda-ad901c1a-100d-11e5-9af2-c0e873d99e21.shtml

http://ec.europa.eu/food/safety/index_en.htm



FOOD

European Commission

European Commission > Food Safety > Food

HEALTH FOOD ANIMALS PLANTS AMR

Share

Call for applications for European Platform on Food Losses and Food Waste (29.04.2016)

A call aims to establish, together with public entities, the European Platform on Food Losses and Food Waste (FLW). It is open to private sector organisations with expertise in food waste prevention. Deadline for applications: 27 May 2016.

All highlights

FOOD SAFETY: OVERVIEW

- RASFF - FOOD & FEED SAFETY ALERTS
- LABELLING & NUTRITION
- BIOLOGICAL SAFETY
- CHEMICAL SAFETY
- ANIMAL BY-PRODUCTS
- FOOD IMPROVEMENT AGENTS
- NOVEL FOOD**
- ANIMAL FEED
- FOOD WASTE

Commissioner **VYTIENIS ANDRIUKAITIS**
Health and Food Safety
@VytenisAndrius

TWITTER FEEDS

- EU Food Safety @Food_EU
- RT @FAO/WHO/CodeX: Good hygiene practices & #foodsafety management systems - #EU guidance for #food operators ec.europa.eu/food/eu/food_eu @Food_EU 3 days
- EU Food Safety @Food_EU
- #GMOs: @EU_Commission authorised some GMOs for #food & #feed use ec.europa.eu/food/eu/food_eu @Food_EU @foodsafety #EU pic.twitter.com/d4G5HM70v 3 days

More tweets

QUICK LINKS

- Rapid Alert for Food and Feed (RASFF)
- Health and food audits and analysis
- European Food Safety Authority (EFSA)
- Better Training for Safer Food (BTSF)
- Standing Committee - RASFF

NOVEL FOOD

- ▶ Novel Food is defined as food that has not been consumed to a significant degree by humans in the EU prior to 1997, when the first Regulation on novel food came into force.
- ▶ 'Novel Food' can be newly developed, innovative food or food produced using new technologies and production processes as well as food traditionally eaten outside of the EU.

REGULATION (EC) No 258/97 OF THE EUROPEAN PARLIAMENT AND OF
THE COUNCIL
of 27 January 1997
concerning novel foods and novel food ingredients

Foods and food ingredients falling within the scope
of this Regulation must not:

- present a danger for the consumer,
- mislead the consumer,
 - differ from foods or food ingredients which they are intended to replace to such an extent that their normal consumption would be nutritionally disadvantageous for the consumer.

Reg.(EC) 258/97 Art.3

The person responsible for placing on the Community market shall submit a request to the Member State in which the product is to be placed on the market for the first time. At the same time, he shall forward a copy of the request to the Commission .

Reg.(EC) 258/97 Art.4

The decision shall define the scope of the authorization and shall establish, where appropriate:

- the conditions of use of the food or food ingredient,
- the designation of the food or food ingredient, and its specification,
- specific labelling requirements (composition, nutritional value, intended use of the food).

Reg.(EC) 258/97 Art.7-8



Are whole insects or worms novel foods?

Insects and other whole animals are currently exempt from the scope of the Novel Foods Regulation. This exemption is mainly because the wording of the existing Commission regulation does not mention whole animals such as insects. However, this will change with the final agreement of the revised novel food regulation expected by the end of this year. In future, insects, and similar whole animals that are currently marketed as foods in the European Union (EU) will require a novel food safety assessment, unless they have been consumed to a significant degree in the EU prior to 15 May 1997. We expect the revised regulation to include transition period of two years to allow operators to adapt to the changes.

In view of this, if you are planning to market insects or other whole animals in the UK as food, it may be sensible to confirm whether they were on the market in the EU to a significant degree prior to 15 May 1997. [See the Commission guidance on demonstrating a significant history of consumption](#) .

Intelligence gathered in the UK in 2011 identified a number of species that may have been on the UK market before May 1997, although this information is yet to be verified at EU level.

REG (UE) 2283/2015

- ▶ Continuity with the Reg.(CE) 258/97
- ▶ Food Business Operators shall provide the necessary information to the Member State where they intend to place the novel food.
- ▶ Union list including the novel food authorised.
- ▶ It shall apply from 1 January 2018
- ▶ Specific rules for traditional foods from third countries

**REGULATION (EU) 2015/2283 OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL
of 25 November 2015**

on novel foods, amending Regulation (EU) No 1169/2011 of the European Parliament and of the Council and repealing Regulation (EC) No 258/97 of the European Parliament and of the Council and Commission Regulation (EC) No 1852/2001



**Autorità Europea per la Sicurezza Alimentare
Reg. (CE) 178/2002**

Fornisce pareri scientifici e informazioni sui rischi esistenti ed emergenti connessi alla catena alimentare.





SCIENTIFIC OPINION

ENDORSED: 1 February 2016
doi:10.2903/j.efsa.2016.NNNN

PUBLISHED: dd mmmm yyyy

- 1 **Draft guidance on the preparation and presentation of**
- 2 **an application for authorisation of a Novel Food**
- 3 **EFSA Panel on Dietetic Products, Nutrition and Allergies (NDA)**
- 4

EFSA prepared a scientific and technical guidance for application
On the basis of the information provided, EFSA will assess the
safety of Novel Food under the proposed conditions of use.



In assessing the safety of Novel Foods, EFSA shall, where appropriate, consider the following:

- (a) whether the Novel Food concerned is as safe as food from a comparable food category already existing on the market within the Union;
- (b) whether the composition of the Novel Food and the conditions of its use do not pose a safety risk to human health in the Union;
- (c) a Novel Food, which is intended to replace another food, does not differ from that food in such a way that its normal consumption would be nutritionally disadvantageous for the consumer.



Risk profile of insects used as food and feed

Microbial hazards

- ▶ Bacteria(intrinsic microbiota and extrinsic)

Kenya: death from *Clostridium botulinum* from vacuum-packaged termites

Namibia: death from *Clostridium botulinum* moths

- ▶ Antimicrobial resistance
- ▶ Viruses (*Arbovirus* - ARthropod-BORne virus)
- ▶ Fungi (*Aspergillus*, *Fusarium*, *Penicillium*)
- ▶ Prions

<i>Tenebrio molitor</i> 	<i>Acheta domestica</i> 
CMT \approx 100.000.000 / gr	CMT \approx 100.000.000 / gr
Enterobatteri > 10.000.000 / gr	Enterobatteri > 10.000.000 / gr
	Salmonella spp.

BOLLITURA
ESSICCAZIONE
TRATTAMENTO CON PLASMA
ALTE PRESSIONI IDROSTATICHE

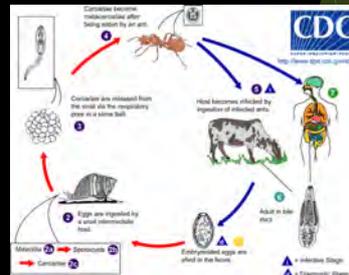
REGOLAMENTO (CE) N. 1441/2007 DELLA COMMISSIONE
del 5 dicembre 2007
che modifica il regolamento (CE) n. 2073/2005 sui criteri microbiologici applicabili ai prodotti alimentari

Criteri di igiene di processo

Categoria alimentare	Microorganismi	Piano di campionamento (%)		Limiti (%)		Metodo d'analisi di riferimento (%)	Fase a cui si applica il criterio	Azioni in caso di risultati inaccettabili
		n	c	m	M			
2.1.6. Carne macinata	Conteggio delle colonie aerobiche (%)	5	2	5×10^5 ufc/g	5×10^6 ufc/g	ISO 4833	Fine del processo di lavorazione	Miglioramento delle condizioni igieniche durante la produzione e miglioramento della scelta e/o dell'origine delle materie prime.
	E. coli (%)	5	2	50 ufc/g	500 ufc/g	ISO 16649-1 o 2	Fine del processo di lavorazione	Miglioramento delle condizioni igieniche durante la produzione e miglioramento della scelta e/o dell'origine delle materie prime.

Parasites

- ▶ Frequent episodes in Thailandia for eating alive insects
- ▶ Tripanosomiasi (Malattia di Chagas) (PEREIRA *et al.*, 2010).
- ▶ Gli insetti possono essere anche portatori di alcuni importanti patogeni di natura protozoaria come *Entamoeba histolytica*, *Giardia lamblia*, *Toxoplasma* spp. e *Sarcocystis* spp (GRACZYK *et al.*, 2005).
- ▶ *Dicrocoelium dendriticum* from parasited ants. Kyrgyzstan è stata riscontrata una prevalenza dell'8%
- ▶ Trematodi *Lecitodendridi* e *Plagiorchidi* (Asia Orientale)
- ▶ *Gongylonema pulchrum* (localizzazione sottocutanea)



Chemical hazards

- ▶ Heavy metals
- ▶ Toxins produced by or accumulated in insects
- ▶ Veterinary drugs and hormones
- ▶ Pesticide residues



Allergens

- ▶ Panallergens -> tropomyosin (crustaceans, house dust mites) and arginine kinase - cross reactions
- ▶ China: *Bombyx mori* - silkworms fried or boiled -> 1000 anaphylactic reaction
- ▶ E120 - from cochineal (*Dactylopius coccus* Costa/*Coccus cacti* L.) -> allergic reactions
- ▶ Acute, short-term, subchronic, carcinogenicity, reproduction and developmental toxicity studies conducted in rats or mice did not show toxicological potential by EFSA Panel on Food Additives and Nutrient Sources added to Food (ANS). ADI should be expressed as carminic acid content, which would correspond to 2.5 mg carminic acid/kg bw/day.



Food POISONING, HISTAMINE, SILKWORMS - Thailandia PRO MED
Some 118 people have fallen ill, with 60 being admitted to hospital, after consuming fried silkworm believed to [contain] the toxic substance histamine

Ordine	Famiglia	Genus	Specie	Nome comune	Categoria di rischio	Potenziale di rischio	
Coleotteri	Tenebrionidae	Tenebrio	<i>Tenebrio Molitor</i>	Verme della farina	Microbica	Alta carica batterica	
		Zw	<i>Zophobas morio</i>	Zophobas	Microbica	Alta carica batterica	
		Alphitobius	<i>Alphitobius diaperinus</i>	Maggiolino minore, Verme del bufalo	Microbica	Alta carica batterica	
		Tribolium	<i>Tribolium confusum</i>	Scarabeo confuso della farina	Chimico	Benzoquinons	
				Coleottero rosso della farina	Chimico	Benzoquinons Benzoquinons	
		Ulmoides (Palembus o Marziano)	<i>Ulmoides (Marziano o Palembus) dermesetoides</i>	ND	Chimico	Benzoquinons	
		Dytiscidae	ND	ND	Maggiolino	Chimico	Ormones
		nd ND	ND	ND	ND	Chimico	Sostanze Cianogenetiche
		Zygaenidae	Zygaena o Sintomis	ND	ND	Chimico	Sostanze Cianogenetiche
		Cerambycidae	Syllitus	ND	Cerambici longicorni	Chimico	Toluene
Odonata	Meloidae	Lytta	<i>Lytta vesicatoria</i>	Mosca spagnola	Chimico	Cantharidine	
	Chrysomelidae	Bruchus	<i>Bruchus lentis</i>	Tonchio delle lenticchie	Allergica		
	ND	ND	ND	Anisoptera	Parassitario	Phaneropsolus bonnei	
	ND	ND	ND	Zygoptera	Parassitario	Phaneropsolus bonnei	
Ditteri	Muscidae	Musca	<i>Mosca domestica</i>	Mosca domestica	Microbica	Alta carica batterica	
	Phoridae	Megaselia	<i>Megaselia scalaris</i>	Mosca gobbe; Mosca scattante	Parassitario	Miasis	
	Dryomizidae	Dryomiza	<i>Dryomiza formosa</i>	ND	Parassitario	Miasis	
	Syrphidae	Eristalis	<i>Eristalis tenax</i>	Mosche volanti	Parassitario	Miasis	
	Stratiomyidae	Hermetia	<i>Hermetia illucens</i>	Mosche soldato	Parassitario	Miasis	
	Sarcophagidae	Sarcophaga	<i>Sarcophaga peregrina</i>	ND	Parassitario	Miasis	
			<i>Sarcophaga crassipalpis</i>	ND	Parassitario	Miasis	
	Calliphoridae	Phormia	<i>Phormia regina</i>	Black blow fly, Nero blow fly	Parassitario	Miasis	

(Marco Ceriani, 2013)

Ordine	Famiglia	Genus	Specie	Nome comune	Categoria di rischio	Potenziale di rischio
Ditteri	Muscidae	Musca	<i>Mosca domestica</i>	Mosca domestica	Microbica	Alta carica batterica
	Phoridae	Megaselia	<i>Megaselia scalaris</i>	Mosca gobbe; Mosca scattante	Parassitario	Miasis
	Dryomizidae	Dryomiza	<i>Dryomiza formosa</i>	ND	Parassitario	Miasis
	Syrphidae	Eristalis	<i>Eristalis tenax</i>	Mosche volanti	Parassitario	Miasis
	Stratiomyidae	Hermetia	<i>Hermetia illucens</i>	Mosche soldato	Parassitario	Miasis
	Sarcophagidae	Sarcophaga	<i>Sarcophaga peregrina</i>	ND	Parassitario	Miasis
			<i>Sarcophaga crassipalpis</i>	ND	Parassitario	Miasis
	Calliphoridae	Phormia	<i>Phormia regina</i>	Black blow fly, Nero blow fly	Parassitario	Miasis
Ortotteri	Gryllidae	Acheta	<i>Acheta domesticus</i>	Grillo sasalingo	Microbica	Alta carica batterica
		Sphenarium		Cavalletta (chapulines)	Chimico	Lead Portare
Hemiptera	Reduviidae	Triatoma		ND	Parassitario	Malattia di Chagas
Lepidotteri	Arctidae	Lophocampa	<i>Lophocampa caryae</i>	Falena del tussock e della carya	Allergica	
	Saturnidae	Gomimbrasia	<i>Imbrasia belina</i>	Verme del mopane	Allergica	
	Bombycidae	Bombyx	<i>Bombyx mori</i>	Baco da seta	Allergica	
	Pyrilidae	Piraliini	<i>Galleria mellonella</i>	Falena del favo	Microbica	Alta carica batterica
	ND	ND	ND	ND	Chimico	Sostanze Cianogenetiche
	Notodontidae	Anaphe	<i>Anaphe venata</i>	D	Chimico	Thiaminase
Noctuidae	Agrotis	<i>Agrotis infusa</i>	Falena del Bogong	Chimico	Arsenico	
Blattaria		Periplaneta	<i>Periplaneta americana</i>	Waterbug	Parassitario	Protozoi
		Blattella		Scarafaggio tedesco	Parassitario	Protozoi

(Marco Ceriani, 2013)

Per concludere

