

Carne coltivata tra realtà e *rappresentazioni sociali*



UNIVERSITÀ
DI TORINO



Il cibo del futuro tra sfide e opportunità d'impresa

➤ *Accettabilità. La parola ai consumatori*
Barbara Loera

COMMENT | 17 April 2023

Serve un dibattito informato sulla carne coltivata

Esperti in campo tecnico, sociale e umanistico invitano a una discussione razionale sul futuro del cibo.

[Alessandro Bertero](#), [Stefano Biressi](#), [Francesco Buscemi](#), [Luciano Conti](#), [Matteo Cresti](#), [Cesare Gargioli](#), [Luca Lo Sapio](#), [Barbara Lucia Loera](#), [Cristina Poncibò](#) & [Simona Stano](#)



Accettabilità della carne coltivata. La parola ai consumatori

*Cosa pensano e vogliono i consumatori?
Sono disponibili a consumare alimenti prodotti con carne coltivata?*

Parlare di accettabilità della carne coltivata da parte dei consumatori è complesso per diverse ragioni →

- occorre definire cosa si intende per accettabilità (atteggiamenti o disponibilità alla degustazione o disponibilità all'acquisto sistematico, e di quale prodotto?)
- è necessario basare le dichiarazioni su indagini empiriche (verosimilmente inchieste campionarie)
- è indispensabile chiarire la rappresentatività dei dati e la metodologia di raccolta, inclusi strumenti standardizzati e wording, cioè fornire garanzie circa la qualità dei dati, ovvero dei risultati

→ anziché parlare in modo proprio... rischiamo «straparlare» !



Contents lists available at ScienceDirect

Appetite

journal homepage: www.elsevier.com/locate/appet

The Myth of Cultured Meat: A Review

Sghaier Chriki^{1*} and Jean-François Hocquette^{2*}¹ ISARA, Agroecology and Environment Unit, Lyon, France, ² INRAE, University of Clermont Auvergne, Vetagro Sup, UMR Herbivores, Saint-Genès-Champagnelle, France

To satisfy the increasing demand for food by the growing human population, cultured meat (also called *in vitro*, artificial or lab-grown meat) is presented by its advocates as a good alternative for consumers who want to be more responsible but do not wish to change their diet. This review aims to update the current knowledge on this subject by focusing on recent publications and issues not well described previously. The main conclusion is that no major advances were observed despite many new publications. Indeed, in terms of technical issues, research is still required to optimize cell culture methodology. It is also almost impossible to reproduce the diversity of meats derived from various species, breeds and cuts. Although these are not yet known, we speculated on the potential health benefits and drawbacks of cultured meat. Unlike conventional meat, cultured muscle cells may be safer, without any adjacent digestive organs. On the other hand, with this high level of cell multiplication, some dysregulation is likely as happens in cancer cells. Likewise, the control of its nutritional composition is still unclear, especially for micronutrients and iron. Regarding environmental issues, the potential advantages of cultured meat for greenhouse gas emissions are a matter of controversy, although less land will be used compared to livestock, ruminants in particular. However, more criteria need to be taken into account for a comparison with current meat production. Cultured meat will have to compete with other meat substitutes, especially plant-based alternatives. Consumer acceptance will be strongly influenced by many factors and consumers seem to dislike unnatural food. Ethically, cultured meat aims to use considerably fewer animals than conventional livestock farming. However, some animals will still have to be reared to harvest cells for the production of *in vitro* meat. Finally, we discussed in this review the nebulous status of cultured meat from a religious point of view. Indeed, religious authorities are still debating the question of whether *in vitro* meat is *Kosher* or *Halal* (e.g., compliant with Jewish or Islamic dietary laws).

Keywords: cultured meat, *in vitro* meat, muscle cells, livestock farming, consumer perception, vegetarian, ethics

INTRODUCTION: CONTEXT OF ANIMAL FARMING TODAY

The global population, 7.3 billion today, is expected to surpass 9 billion by 2050. The Food and Agriculture Organization (FAO) has forecast that in 2050, 70% more food will be needed to fulfill the demand of the growing population, which is a great challenge due to resource and arable land limitations. Even if meat consumption is decreasing in developed countries, its global consumption is increasing because consumers are generally unwilling to reduce their meat consumption, in particular in developing countries such as in China, India, and Russia (1). These populations becoming more middle-class, they are looking for more luxury products, such as meat or other animal products (e.g., cheese, dairy products).

Review

Consumer Acceptance of Cultured Meat: An Updated Review (2018–2020)

Christopher Bryant^{*†} and Julie BarnettDepartment of Psychology, University of Bath, Claverton Down, Bath BA2 7AY, UK
* Correspondence: C.J.Bryant@bath.ac.uk

Received: 30 June 2020; Accepted: 28 July 2020; Published: 28 July 2020

Abstract: Cultured meat is one of a number of alternative proteins which can help to reduce the demand for meat from animals in the future. As cultured meat nears commercialization, research on consumers' perceptions of the technology has proliferated. We build on our 2018 systematic review to identify 26 empirical studies on consumer acceptance of cultured meat published in peer-reviewed journals since then. We find support for many of the findings of our previous review, as well as novel insights into the market for cultured meat. We find evidence of a substantial market for cultured meat in many countries, as well as markets and demographics which are particularly open to the concept. Consumers mostly identified animal- and environment-related benefits, but there is plenty of potential to highlight personal benefits such as health and food safety. The safety of cultured meat and its nutritional qualities are intuitively seen as risks by some consumers, although some recognize potential benefits in these areas. Evidence suggests that acceptance can be increased with positive information, as well as frames which invoke more positive associations. We conclude by arguing that cultured meat will form one part of a varied landscape of future protein sources, each appealing to different groups of consumers to achieve an overall reduction in conventional meat consumption. We acknowledge a range of pro-cultured meat messaging strategies, and suggest that framing cultured meat as a solution to existing food safety problems may be an effective approach to increase acceptance. In the long-term, objections based in neophobia and norm violation will decrease, and widespread acceptance will depend in large part on the price and taste.

Keywords: cultured meat; consumer acceptance; consumer psychology; food technology; meat replacement; alternative proteins

1. Introduction

The way we produce meat today is resource intensive and harmful to the environment [1]. It is also cruel to the animals who suffer on factory farms before going to slaughter [2], and moreover, it is linked to significant public health issues including animal-transmitted pandemics and antibiotic resistance [3,4]. Yet the global demand for meat is forecast to increase rapidly as the world population grows [5]. Evidence suggests that the current system is not sustainable and if we want to mitigate the associated environmental and public health risks without needing to substantially reduce consumption, an alternative means of meat production is required.

Cultured meat grown from animal cells is one proposed way to address these issues, as its production entails far less environmental and public health harm, as well as avoiding animal slaughter [6,7]. This is achieved by isolating stem cells from the muscle biopsy of an animal and proliferating these cells in an environment which provides the energy and nutrients the cells would need to grow inside an animal [8]. Whilst early prototypes have used fetal bovine serum as a culture medium (and therefore still required animal slaughter to produce), contemporary methods use

Ashkan Pakseresh^{a,*1}, Sina Ahmadi Kaliji^b, Maurizio Canavari^c^a Novia University of Applied Sciences, Department of Bioeconomics, 10600, Tammsaari, Finland^b Sari Agricultural Sciences and Natural Resources University, Sari, Iran^c Alma Mater Studiorum-Università di Bologna, Department of Agricultural and Food Sciences, viale Giuseppe Fanfani, 50, 40127, Bologna, Italy

ARTICLE INFO

Keywords:
Systematic review
Lab-grown meat
In-vitro
Clean meat
Consumer attitudes

ABSTRACT

Concerns about animal welfare and sustainable meat production are growing among consumers. The awareness of carbon emissions linked to livestock and ethical concerns have triggered interest in more sustainable meat alternatives, among which cultured meat (also known as laboratory grown meat) is a recent entry. Like any new food, the ultimate success of cultured meat depends on consumer acceptance. This study analyses the peer-reviewed literature on consumer attitudes towards cultured meat to synthesize the existing evidence and identify priorities for future research. A systematic literature review was undertaken using the Web of Science, Science Direct and Scopus databases over 2008–2020, resulting in a final number of 43 articles meeting our selection criteria. The most important factors influencing consumer acceptance/rejection of cultured meat include public awareness, perceived naturalness, and food-related risk perception. Ethical and environmental concerns prompted consumers to be willing to pay a premium price for purchasing meat substitutes, but not necessarily cultured meat. Also, food neophobia and uncertainties about safety and health seem to be important barriers to uptake of this technology. Availability of other alternatives such as plant-based meat substitutes and product features, such as price and sensory appeal, are considered determinants of consumer reception of this technology. The effect of demographic factors is mixed. More research on the interrelationships between livestock production, food security, and alternative meat products is recommended.

1. Introduction

A new era of sustainability is emerging, which has challenged different sectors of the food value chain, including meat production. On a global scale, the livestock sector has come under greater scrutiny in the past few years owing to its climatic, ethical, and human health impacts (Scollan et al., 2011; Stephens et al., 2018).

Such concerns, combined with the projections of rising demand for protein products in the coming decades, necessitate developing alternative proteins produced more sustainably (Gerber et al., 2013). Cultured meat (also known as "cell-based," "cultivated," "clean," "slaughter-free," "in-vitro," "lab-grown," and "nano-pastured" meat), which promises to help solve some of the livestock-related, challenging environmental problems (for details refer to Stephens et al., 2018), has gained popularity over the past few years. Cultured meat does not require large-scale farming practices but is produced from the in-vitro cultivation of animal cells without growing the whole animals (Datar

& Betti, 2010; Post, 2014a). In contrast to the plant-based meat trying to replicate the taste and texture of traditional meat, cultured meat is derived from animal muscle tissue (Newburger, 2019). Nevertheless, cultured meat technology is still being researched, examining different production methods (e.g., cyanobacteria-based versus plant-based growth media for tissue culturing) to improve the benefits and sensory characteristics (Tuomisto, Ellis, & Hastrup, 2014).

This emerging technology, which was first brought to the public when a cultured beef hamburger was publicly tested on August 5, 2013, in London, is claimed to be a high-quality protein substitute that promotes a more sustainable environment (likely) at a lower cost (Bekker, Fischer, Tobi, & van Trijp, 2017). Proponents argue that cultured meat will be produced with fewer or almost no farm animals and helps alleviate the environmental problems behind the livestock high carbon footprint and water footprint (Hocquette, 2016; Hopkins, 2015; Tuomisto et al., 2014; Tuomisto & Teixeira de Mattos, 2011).

Industrial-scale production of cultured meat is still at an embryonic

^{*} Corresponding author. Novia University of Applied Sciences, Dep. of Bioeconomic, 10600, Tammsaari, Finland.**E-mail addresses:** ashkan.pakseresh@novia.fi, ashkan.pakseresh@slu.se (A. Pakseresh), sina_ahmadikaliji@yahoo.com (S. Ahmadi Kaliji), maurizio.canavari@unibo.it (M. Canavari).¹ Previous address: Swedish University of Agricultural Sciences (SLU), Department of Economics, P.O. Box 7013, 756 51, Uppsala, Sweden.<https://doi.org/10.1016/j.appet.2021.105829>

Received 2 February 2021; Received in revised form 23 November 2021; Accepted 25 November 2021

Available online 1 December 2021

0195-6663/© 2021 The Authors.

Published by Elsevier Ltd.

This is an open access article under the CC BY-NC-ND license

<http://creativecommons.org/licenses/by-nc-nd/4.0/>

OPEN ACCESS

Edited by:

Dietrich Knorr,
Technische Universität
Berlin, Germany

Reviewed by:

Marcia Dutra De Barcellos,
Federal University of Rio Grande Do
Sul, Brazil
Daniel Cozzolino,
University of Queensland, Australia
Joe M. Regenstein,
Cornell University, United States

*Correspondence:

Sghaier Chriki
schriki@sara.fr
Jean-François Hocquette
jean-francois.hocquette@inrae.fr

Specialty section:

This article was submitted to
Nutrition and Food Science
Technology,
a section of the journal
Frontiers in Nutrition

Received: 26 October 2019

Accepted: 20 January 2020

Published: 07 February 2020

Citation:

Chriki S and Hocquette J-F (2020)
The Myth of Cultured Meat: A Review.
Front. Nutr. 7:7.
doi: 10.3389/fnut.2020.00007

Accettabilità della carne coltivata. Cosa sappiamo

Le buone ragioni per:

essere scettici, contrari

essere favorevoli

Rischio salute
Neofobia (in generale e per le food tech.)
Disgusto / Euristiche naturalità
...

Environmental concern and awareness
Neofilia
Positive moral attitude
...

Fattori facilitanti/ostacolanti: età, istruzione

Accettabilità della carne coltivata. Primo contributo empirico di FEAT

Metodologia: inchiesta campionaria con self-report online somministrato a panel Ipsos

Strumento: questionario standardizzato composto con scale validate e adattate (attendibilità accertata in precedenti lavori scientifici)

Campione: rappresentativo per quote della popolazione maggiorenne in età lavorativa (definizione ISTAT 15-68 anni, adattata a 18-65 anni)

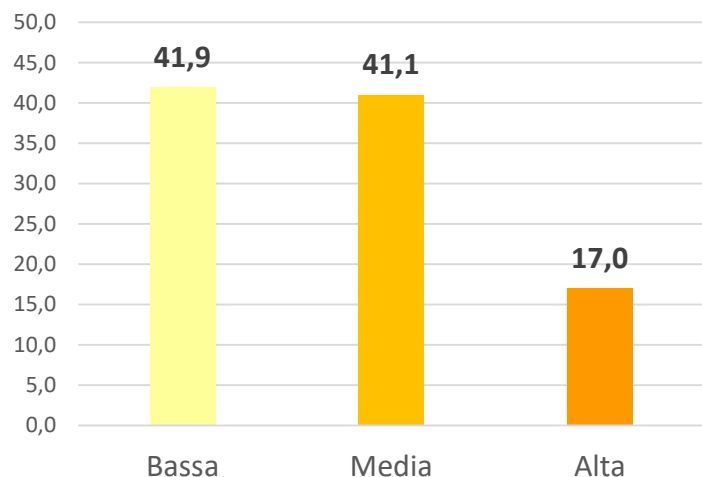
Periodo di somministrazione: aprile 2023

Tempo mediano di compilazione: 16 minuti

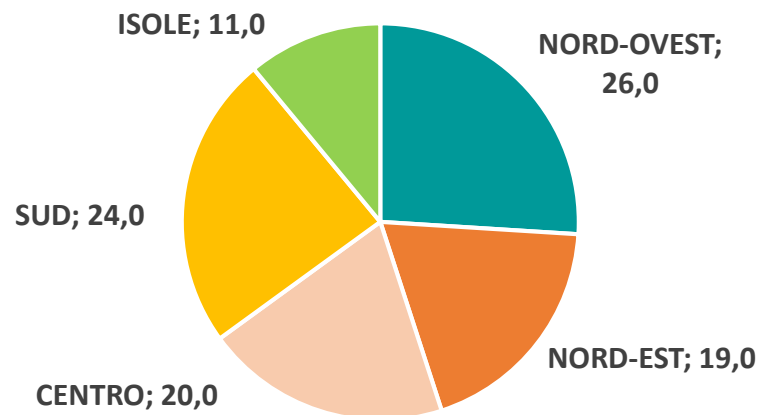
Risultati: descrizione campione

Il campione è costituito da 500 partecipanti (50% M).

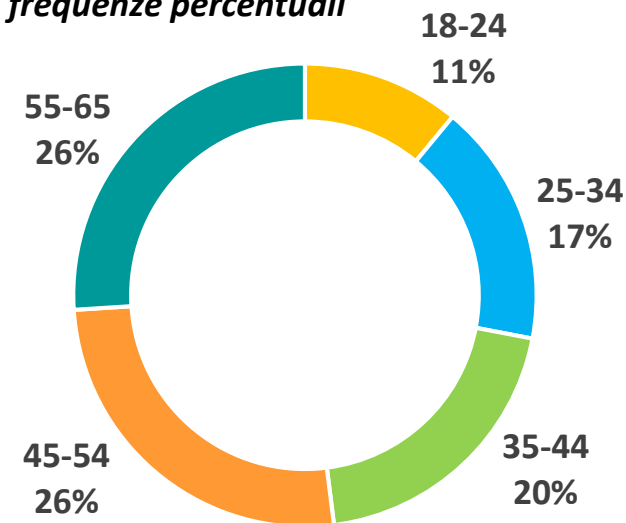
Scolarità, frequenze percentuali



Macro area, frequenze percentuali



Classi di età, frequenze percentuali

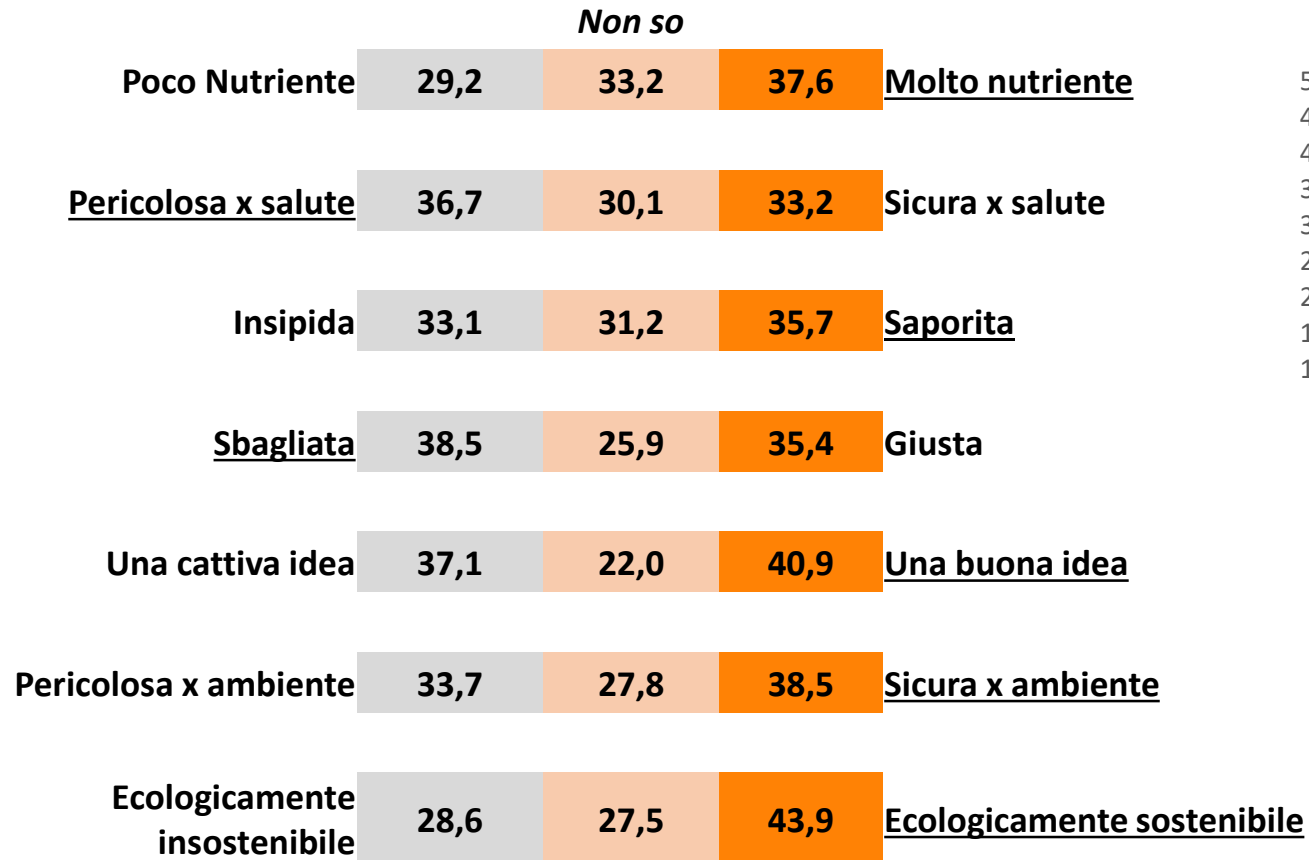


La maggior parte dei rispondenti ha segue un regime alimentare onnivoro (88,3%). Il 6,9% adotta un regime vegetariano/vegano, mentre i restanti seguono diete restrittive per diverse ragioni, collegate ad esempio alla confessione religiosa o a questioni di salute, intolleranze.

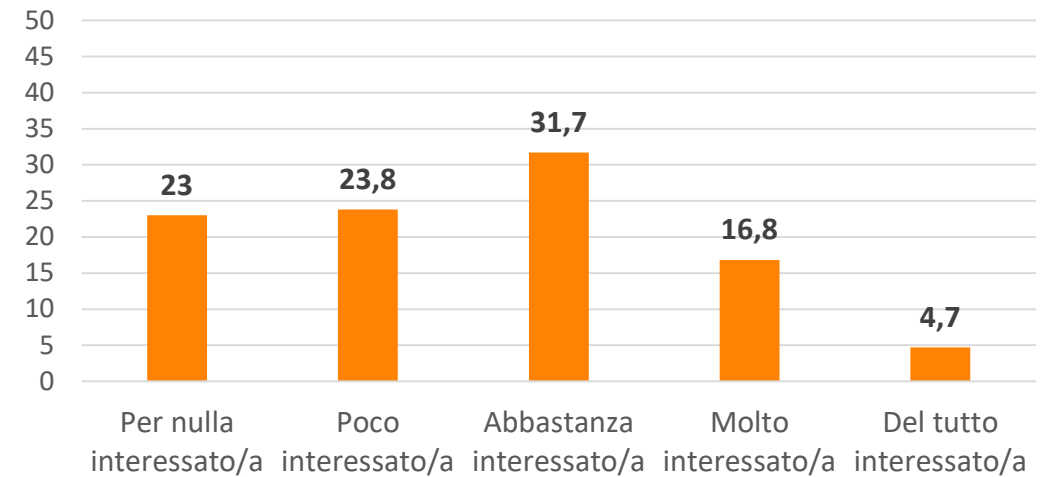
Il 68% dei rispondenti dichiara di occuparsi della spesa all'interno del proprio nucleo familiare o di condividere questa attività con un altro adulto (26,2). Il resto dei partecipanti delega ad altri.

Risultati: atteggiamento verso la carne coltivata e interesse

Secondo Lei, la carne coltivata è:



Rispetto al tema della carne coltivata Lei si direbbe (valori percentuali):

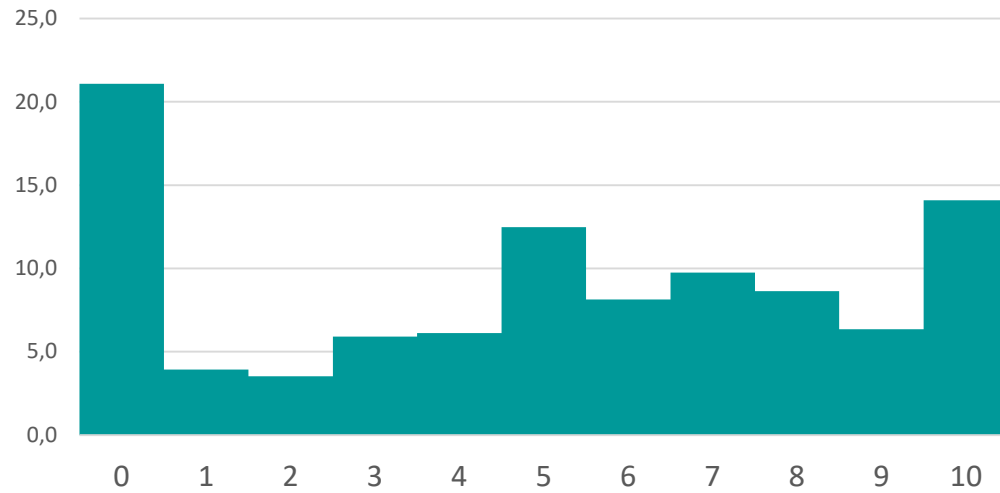


Le è capitato di (valori%):

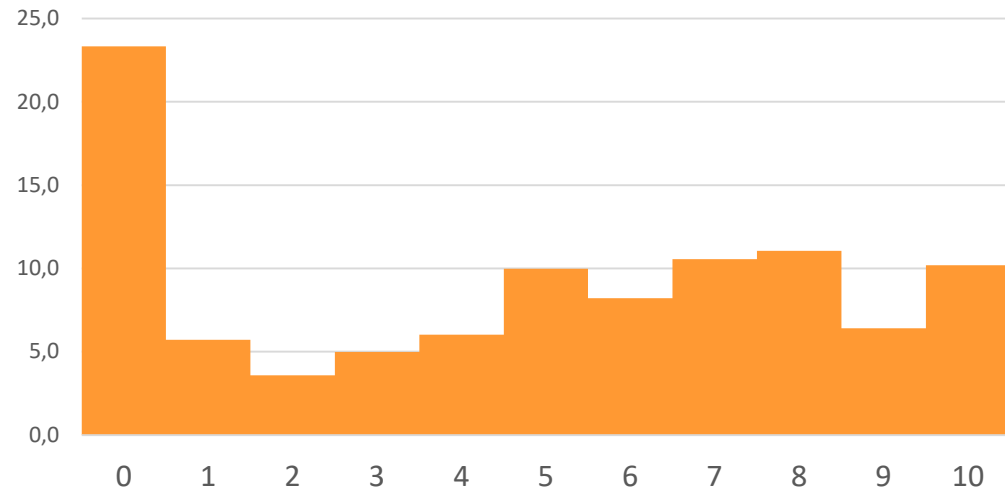
| | NO | SI |
|--|------|------|
| Sentir parlare di carne coltivata | 31,7 | 68,3 |
| Cercare informazioni sulla carne coltivata | 65,5 | 34,5 |
| Leggere le informazioni sulla carne coltivata presenti su siti istituzionali | 66,7 | 33,3 |

Risultati: propensione alla degustazione e intenzione di acquisto

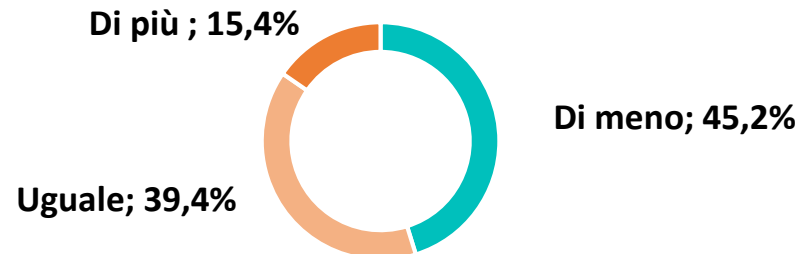
Burger di carne coltivata: quanto ritiene probabile assaggiarlo? (frequenze percentuali)
Media= 4,99 (sd=3,5)



Burger di carne coltivata: quanto ritiene probabile acquistarlo? (frequenze percentuali)
Media= 4,73 (sd=3,5)

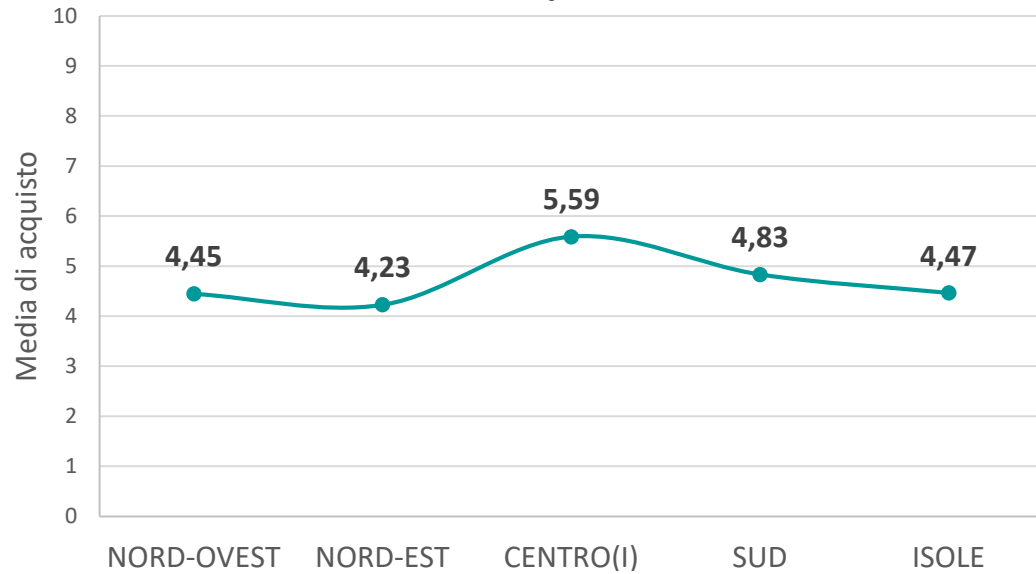


Secondo Lei, rispetto ad un burger tradizionale di manzo, un burger di carne coltivata dovrebbe costare:

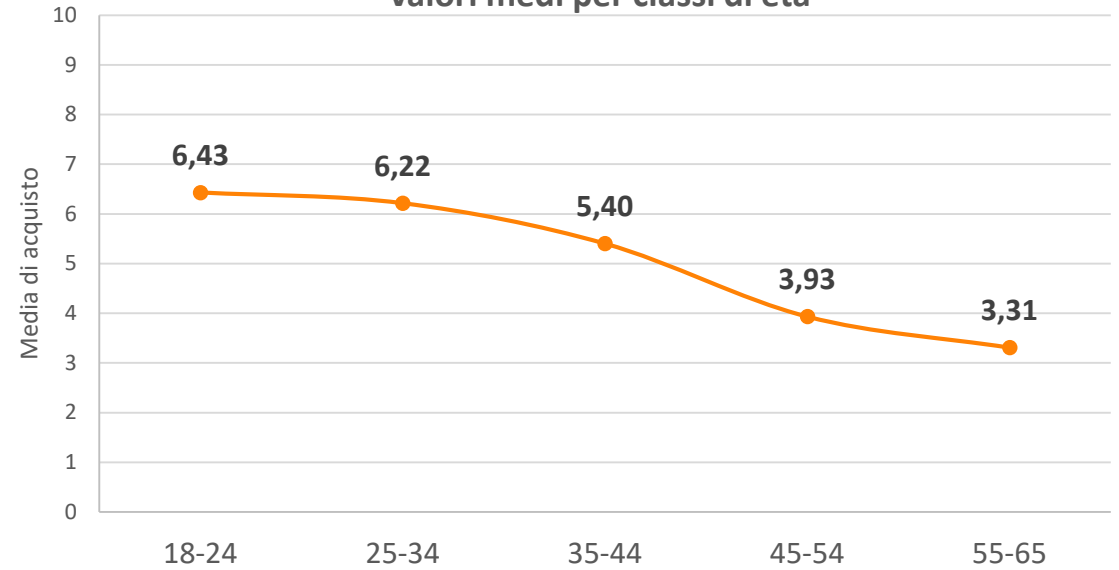


Risultati: intenzione per caratteristiche sociodemografiche

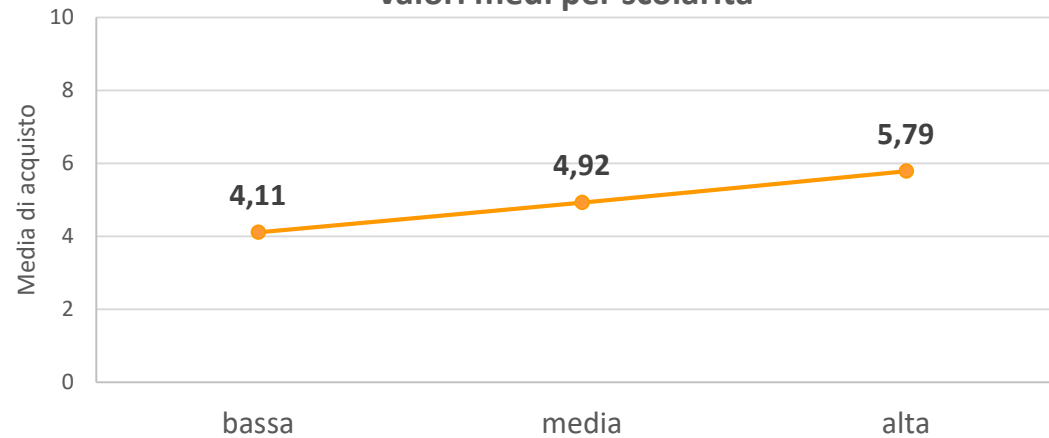
Probabilità di acquisto di un burger di carne coltivata:
valori medi per macroarea



Probabilità di acquisto di un burger di carne coltivata:
valori medi per classi di età



Probabilità di acquisto di un burger di carne coltivata:
valori medi per scolarità



Risultati: modello di previsione dell'intenzione di acquisto con costrutti psicologici

| Modello [R2=0,664] | Coefficienti non standardizzati | | Coefficienti standardizzati | | |
|-------------------------|---------------------------------|-----------------|-----------------------------|--------|-------|
| | B | Errore standard | Beta | t | Sign. |
| (Costante) | 0,609 | 0,691 | | 0,882 | 0,378 |
| Donna | -0,094 | 0,189 | -0,013 | -0,498 | 0,619 |
| Cetà: 18_24 | 0,963 | 0,356 | 0,086 | 2,708 | 0,007 |
| Cetà: 25_34 | 0,943 | 0,317 | 0,101 | 2,974 | 0,003 |
| Cetà: 35_44 | 0,953 | 0,287 | 0,109 | 3,315 | 0,001 |
| Cetà: 45_54 | 0,227 | 0,263 | 0,028 | 0,864 | 0,388 |
| Scolarità: media | 0,221 | 0,209 | 0,031 | 1,058 | 0,291 |
| Scolarità: alta | -0,016 | 0,280 | -0,002 | -0,059 | 0,953 |
| Novest | 0,305 | 0,243 | 0,038 | 1,255 | 0,210 |
| Nest | -0,106 | 0,264 | -0,012 | -0,399 | 0,690 |
| Centro | 0,231 | 0,261 | 0,026 | 0,885 | 0,377 |
| Naturalizza | -0,016 | 0,012 | -0,043 | -1,329 | 0,184 |
| Envir. Concern | -0,031 | 0,032 | -0,032 | -0,977 | 0,329 |
| Tecnofobia | -0,007 | 0,022 | -0,010 | -0,328 | 0,743 |
| Disgusto | -0,115 | 0,030 | -0,124 | -3,820 | 0,000 |
| Positive Moral Attitude | 0,342 | 0,015 | 0,713 | 23,433 | 0,000 |

Accettabilità della carne coltivata. Il futuro secondo i consumatori

E secondo Lei, nei prossimi 10-15 anni, quanto è probabile che:
(percentuale di giudizi uguali o superiori a 6)

| | |
|--|------|
| La carne coltivata diventi uno dei tanti prodotti alimentari da supermercato | 56,3 |
| Alcune grandi aziende italiane sviluppino linee di prodotti alimentari con carne coltivata | 52,5 |
| La carne coltivata diventi una valida alternativa alla carne tradizionale | 48,3 |
| La carne coltivata sostituisca quella tradizionale | 42,7 |

Gli alimenti a base di carne coltivata possono diventare UNA DELLE buone pratiche necessarie per sostenere la cosiddetta Food Transition, ovvero la transizione verso scelte alimentari più sostenibili.



UNIVERSITÀ
DI TORINO



Grazie per l'attenzione !



Il cibo del futuro tra sfide e opportunità
d'impresa

<https://futureating.it/>



BARBARA LOERA, Professoressa Associata
Dipartimento di Psicologia
barbara.loera@unito.it

**La filiera carne: tra tutela e valorizzazione.
Le nuove frontiere.**

Torino, 29 maggio 2023



CAMERA DI COMMERCIO
INDUSTRIA ARTIGIANATO E AGRICOLTURA
DI TORINO