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REVIEW

Challenges and prospects for consumer acceptance of cultured meat



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Abstract

Consumer acceptance of cultured meat is expected to depend on a wide diversity of determinants ranging from technology-related perceptions to product-specific expectations, and including wider contextual factors like media coverage, public involvement, and trust in science, policy and society. This paper discusses the case of cultured meat against this multitude of possible determinants shaping future consumer acceptance or rejection. The paper also presents insights from a primary exploratory study performed in April 2013 with consumers from Flanders (Belgium) ($n=180$). The concept of cultured meat was only known (unaided) by 13% of the study participants. After receiving basic information about what cultured meat is, participants expressed favorable expectations about the concept. Only 9% rejected the idea of trying cultured meat, while two thirds hesitated and about quarter indicated to be willing to try it. The provision of additional information about the environmental benefits of cultured meat compared to traditional meat resulted in 43% of the participants indicating to be willing to try this novel food, while another 51% indicated to be 'maybe' willing to do so. Price and sensory expectations emerged as major obstacles. Consumers eating mostly vegetarian meals were less convinced that cultured meat might be healthy, suggesting that vegetarians may not be the ideal primary target group for this novel meat substitute. Although exploratory rather than conclusive, the findings generally underscore doubts among consumers about trying this product when it would become available, and therefore also the challenge for cultured meat to mimic traditional meat in terms of sensory quality at an affordable price in order to become acceptable for future consumers.

Keywords: acceptance, artificial, attitude, consumer, cultured, *in vitro*, meat, synthetic

1. Introduction

Until recently, new product development in the meat sector has typically focused on secondary processing activities

during the post-slaughtering phase that aimed at differentiation from the rest of the products in the commodity meat market. Consumer insight has always been crucial to ensure that the new developments were in line with consumer preferences and to enhance the likelihood of commercial success (Grunert *et al.* 2011). The idea of growing meat from animal cells (Post 2012) presents itself as a radically new way of obtaining meat through substituting livestock production at the very beginning of the meat production chain. This evolution has been referred to as "the third stage in meat production", after hunting and herding (Welin 2013). The technology may

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provide a possible solution to several problems facing current livestock production such as reducing the environmental impact of livestock farming, eliminating issues about animal welfare and slaughter, and improving meat safety and healthiness, although some of this potential is debated as well at least in the short term (reviewed by Hocquette *et al.* 2013). Commonly used names for the resulting product are cultured, *in vitro*, synthetic, artificial, and laboratory-grown or factory-grown meat. The term 'cultured meat' will be used in the present paper.

Cultured meat represents indeed a totally new development with possible benefits but also some issues of debate. Several published studies thus far are situated in the natural sciences domain and have focused on technological aspects, advancements and challenges facing the culturing of meat, most of which are believed to be solvable at some point in time (Datar and Betti 2010; Post 2012, 2014). Meanwhile, a growing number of social sciences studies have focused on sociological, philosophical, moral and ethics arguments around the issue (Pluhar 2010; Chiles 2013; van der Weele and Driessen 2013; Welin 2013; Marcu *et al.* 2015). Up to the present day, it remains largely unknown though how consumers will react to this new technology and, whether and under which conditions they would be willing to accept and adopt this novel food.

While consumers may be likely to place less importance on the issue as long as the product is not available and the time of availability is uncertain (Goodwin and Shoulders 2013), consumer insight will be indispensable for future marketplace acceptance. Several recent examples, such as biotechnology and nanotechnology illustrate that consumers may not embrace novel agro-food technologies as enthusiastically as hoped for at the times when the technologies were developed and adopted (Verbeke 2011). de Barcellos *et al.* (2010), for example, indicated that while consumers may support the development of non-invasive (processing) technologies that improve the healthiness and eating quality of meat, they are very reluctant to manipulations and interventions that are perceived as excessive, invasive and non-natural in meat production chains.

The aim of the present paper is to provide a brief review of first, the criteria or determinants that can be expected to shape consumer acceptance of cultured meat and its production technology and second, the possible reactions, concerns and questions that consumers might raise when facing this new technology and novel food product. Furthermore, this paper presents exploratory findings from a primary quantitative study with consumers in Flanders (Belgium) probing about their initial reactions when facing the idea of cultured meat as a future substitute for traditionally produced meat.

2. Criteria shaping consumer acceptance

Apart from the potential of cultured meat to meet and cope with some of the challenges associated with current livestock production, the question about its acceptability by the general public and consumers must be addressed. Numerous criteria shaping consumer acceptance of novel agro-food technologies and their resulting end-products have been discussed in previous studies. It is an interesting exercise to review and check the case of cultured meat production technology against each of these criteria, and to critically reflect on the complex picture of possible advantages and disadvantages from the perspective of future end users.

Two recent reviews identified about 15 different issues impacting on consumer acceptance of novel agro-food technologies in general (Frewer *et al.* 2011; Rollin *et al.* 2011), while Hopkins and Dacey (2008) proposed about a dozen possible objections that might be provoked if a product like cultured meat would be put on the market. A first set of determinants of acceptance or rejection included the perceived personal and societal benefits and risks of the technology, as well as perceived differences in who eventually benefits and who bears the risks associated with the technology and its end products. Hence, a major challenge lies in identifying the real and perceived benefits and risks of cultured meat (and its production technology), as well as in providing transparency about who (e.g., primary producers, industry, individual consumers or, society as a whole) is bearing them.

A second set of determinants of consumer acceptance or rejection is related to the technology itself. Technology-related perceptions pertain to perceived scientific knowledge or uncertainty (which is still substantial in the case of cultured meat, e.g., scalability of the production process or the replacement of serum-based culture media), perceived controllability of the technological processes (e.g., quality control and safety monitoring of cell and tissue cultures), and perceived naturalness of the technology and product. The perceived naturalness of food and food production technologies, for example has been shown to strongly influence the acceptance of innovative food technologies (Siegrist 2008).

Furthermore, the perceived efficacy of the regulatory framework and general trust in science and regulation in the food domain were identified as trust-related issues that determine public and consumer acceptance of novel agro-food technologies. Other issues pertain to the level of public or consumer involvement in the technology development process, as well as public awareness or familiarity with the technology, each of which is almost non-existent at the present time for the case of cultured meat. Also possible cognitive associations or attitude activation play a role,

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