



Importance of perceived naturalness for acceptance of food additives and cultured meat



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ABSTRACT

Four experiments examined some factors influencing the perceived naturalness of food products and their biasing effect on risk perception. The results of Experiment 1a showed that three food additives displaying their respective E-numbers (i.e., codes for food additives in the European Union and Switzerland) decreased perceived naturalness. Experiment 1b demonstrated that mentioning possible health effects decreased the perceived naturalness of a plant-based food additive. This experiment further showed that it would not matter for perceived naturalness whether the food was synthetic or nature-identical. Moreover, the results of Experiments 2 and 3 suggested that the same risk associated with meat consumption was much more acceptable for traditionally produced meat compared with in-vitro meat. Experiment 3 further indicated that the perceived naturalness of the meat (i.e., traditional or cultured meat) had a full mediation effect on participants' evaluation of the acceptability of the risk of colon cancer associated with the meat consumption. Even if the new production method (i.e., cultured meat) was more environmentally friendly and less harmful to animals, the perceived lack of naturalness might reduce the acceptability of the risk associated with such a product. The present study provides evidence that consumers rely on symbolic information when evaluating foods, which may lead to biased judgments and decisions.

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1. Introduction

Consumers have to make a large number of food-related decisions. Given time constraints and limited nutrition knowledge (Dickson-Spillmann, Siegrist, & Keller, 2011; Motteli, Barbey, Keller, Bucher, & Siegrist, 2016; Parmenter & Wardle, 1999), people may use simple heuristics (Tversky & Kahneman, 1982) when evaluating product properties and choosing products. In this research, we examined whether providing information with an inherent and strong symbolic meaning, such as E-numbers (i.e., codes for food additives in the European Union and Switzerland), or information about the food technology would influence the perception of the naturalness of foods and would result in a different judgment of the same hazards. Such an outcome would show the importance of heuristics and symbolic information for decisions in the food domain and their potential biasing effect.

Heuristics are important for a better understanding of how

people make decisions (Gigerenzer & Gaissmaier, 2011; Kahneman, Slovic, & Tversky, 1982). Attribute substitution is a general feature of heuristic judgment (Kahneman & Frederick, 2005). A judgment is mediated by a heuristic when the target attribute is not readily accessible, which is then substituted by an easy-to-judge attribute (i.e., heuristic attribute). Because the substituted heuristic attribute differs from the target attribute, the use of heuristics can result in biased decisions. Recent research shows that due to the tendency to focus on information with a strong symbolic meaning, participants demonstrate biased evaluations and judgments (Siegrist & Sütterlin, 2014; Sütterlin & Siegrist, 2014, 2015). A symbolic meaning attributed to an aspect of a product or behavior is based on participants' interpretation of this aspect. This symbolic meaning is defined by the social context and is constantly renegotiated and redefined in the course of social interactions (for an overview, see Charon, 2007). The meaning is symbolic because it transcends the available facts; stereotypical information associated with the product or behavior shapes perception (Sütterlin & Siegrist, 2015). An example of this phenomenon is that a product containing “fruit sugar” is perceived as healthier compared with a product

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containing “sugar” because the term “fruit” symbolizes healthiness (Briz et al., 2008); consequently, “fruit sugar” is perceived as a natural ingredient that is relatively healthy (Sütterlin & Siegrist, 2015). A closely related phenomenon is the health halo effect (Andrews, Burton, & Netemeyer, 2000; Roe, Levy, & Derby, 1999). It means that a biasing effect on the product evaluation occurs when the perception about a product attribute influences the health evaluation of an unrelated product attribute.

Perceived naturalness is a heuristic attribute that consumers may use as a positive indicator of the quality of foods (Rozin, Fischler, Imada, Sarubin, & Wrzesniewski, 1999). People tend to regard pesticide-related risks as greater than microbial pathogen risks or natural toxins, for example (Williams & Hammitt, 2001). Perceived naturalness is an important factor that influences the acceptance of foods and food technologies. Experiments show that gene technology is viewed as less natural than traditional breeding technologies, which is an important reason why people perceive less benefits associated with the former technology compared with the latter (Siegrist, Hartmann, & Sütterlin, 2016). This cited experimental study demonstrates that the same benefit is valued more if the technology is perceived as more natural.

Several studies have examined the factors that influence people's perception of naturalness (Evans, de Challemaison, & Cox, 2010; Rozin, 2005; Rozin et al., 1999, 2004). An important finding is that judgments about naturalness are more strongly influenced by the process than by the content. If gene technology is used to produce food, it is perceived as less natural compared with a product of traditional breeding technology (Rozin, 2005). For example, people regard domestication as much more natural than gene technology. As mentioned, certain informational attributes carry strong symbolic meanings, and people tend to rely heavily on this significant symbolic information when making decisions, which may result in biased judgments (Sütterlin & Siegrist, 2014). This is also true for food-related informational attributes referring to ingredients and production methods that carry a strong symbolic meaning in terms of naturalness or unnaturalness.

As emphasized by Evans et al. (2010), the perception about biotechnology has been extensively examined (Frewer et al., 2013). However, less attention has been paid to the perception about added food ingredients and the way that food is manufactured. Therefore, in this research, we focused on more or less familiar food ingredients (i.e., food additives) and on unfamiliar food-manufacturing techniques (i.e., cultured meat).

In the European Union and Switzerland, food additives can be labeled as E-numbers. In other words, a manufacturer can indicate on the food package the E-number (e.g., E220) that stands for a food additive instead of its chemical name (e.g., sulfur dioxide). The E-number seems to be perceived as a symbol of unnaturalness (Evans et al., 2010). Therefore, indicating E-numbers on food products may have a strong signaling character. The study of Evans et al. (2010) also shows that a product with a food additive listed as an E-number (e.g., E330) is perceived as less natural than a product with the same food additive whose chemical name (citric acid) is shown instead on the list of ingredient. However, it can be argued that the E-number reduces perceived naturalness because the study's participants may not know what food additive corresponds to a specific E-number.

In this research, we focused on food additives (i.e., familiar products) and cultured meat (i.e., unfamiliar product) to examine the importance of heuristic thinking in the food domain and how symbolic information might cause biased evaluations and judgments. This research had several aims related to the investigation of some factors influencing perceived naturalness of food products and their biasing effect on risk perception and acceptance. In the first part, we aimed to test whether adding an E-number to a food

additive on a product label's list of ingredients would reduce its perceived naturalness. In contrast to the focus of the study of Evans et al. (2010), our interest was whether indicating an ingredient's E-number would be sufficient to reduce the perceived naturalness of the food additive even if participants were informed about which ingredient was represented by the E-number (e.g., curcumin, E100). A reason for consumers' preference for natural foods could be that such products are perceived as healthier. For example, organic food is considered natural (i.e., free of synthetic chemicals) and healthier than non-organic food (Schifferstein & Oude Ophuis, 1998). Health concerns constitute another main reason why consumers purchase organic foods (Magnusson, Arvola, Hursti, Aberg, & Sjoden, 2003; Schifferstein & Oude Ophuis, 1998). This study's second aim was therefore to test whether mentioning possible negative health effects of an ingredient would reduce its perceived naturalness. Furthermore, we were interested in examining whether novel food production methods (e.g., cultured meat) would be perceived as less natural; thus, possible risks associated with its consumption would be viewed as less acceptable compared with traditionally produced foods.

2. Experiment 1a

In the European Union and Switzerland, food additives can be labeled with E-numbers. Consumers in these countries may find information such as “(E100)” on an ingredient list (E100 stands for curcumin, for example). This should increase transparency because each food additive has its own number, and consumers could look up what food additive corresponds to an E-number. However, consumers may perceive this labeling scheme differently from experts and may regard a product with E-numbers as containing synthetic ingredients. In other words, E-numbers may be used as cues that a product is unnatural and unhealthy. As mentioned, the study of Evans et al. (2010) provides some empirical support that E-numbers are considered less natural compared with the chemicals that the numbers represent. In that study, participants were informed about the food additive by using either its E-number (e.g., E330) or name (e.g., citric acid) but not the combination of both (e.g., citric acid, E330). One reason for the finding that participants perceive E330 as less natural compared with the chemical citric acid that it signifies could be that people do not know which chemical matches a specific E-number. People may think of a synthetic additive in the case of the E-number and of a non-synthetic additive in the case of the chemical. We were therefore interested in whether the E-number per se would reduce the perceived naturalness of a product. Thus, we examined whether adding the E-number to an ingredient would be sufficient for consumers to perceive a product as less natural than another containing the same food additive but without the E-number showing next to it.

2.1. Method

2.1.1. Participants

An online experiment was conducted. The participants comprised a convenience sample of residents in the German-speaking region of Switzerland, who agreed to participate in Internet studies conducted by the Consumer Behavior Group from ETH Zurich. Persons were randomly selected based on addresses from the telephone book and recruited for the panel by mail. The panel pool consists of about 800 members, who are invited no more than six times a year for short online experiments or surveys. After two years, they are replaced by new panel members. Participation in studies is recorded to make sure that people are not invited more than once to a study on a given research question. For this

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