MSc Thesis MCB-80433

The effect of product appearance and information provision on consumer perception and acceptance:

The case of cultured meat

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14.06.2017

Acknowledgements

This master thesis has been an incredible journey, in the end I did a research that I'm genuinely proud of, but I did not do it alone. There would have been a time that I would have said; "I didn't do it all by myself, so I can't take credit." But I learned one thing;

No one ever does.

I started Wageningen University in 2013 as a master student animal science. Best part; I did ***not*** *want to go to Wageningen. So, here I was, by myself with a poor attitude (only, what the heck did I knew about attitudes). It dawned quickly that I might wanted to make the best out of the situation, and I did. Animal sciences appeared to be 'easy' and I had some time on my hands to take some extra courses next to the obligatory batch. That's how I landed in a marketing course and discovered that I actually liked the aspects of consumer behaviour. Wageningen University grew on me, I finally found a place where I fit in. I decided not to keep consumer behaviour as a minor next to the animal sciences; I applied for a double master. This was not as... ehh… 'easy' as I thought it would be, but what fun is it to get something without a fight? Once I was told that I should put my dreams aside and should settle for an associates degree at best. I'm not a person that 'settles' – I'm a person that fights!*

First, let me thank my supervisor; professor Hans van Trijp for his patience, guidance and expertise, for his ideas when I had none, for stopping me when I had too many and most of all, for his confidence in my skills and knowledge. I truly appreciate that you pushed me just enough to make the best out it. I would like to thank my second supervisor, Arnout Fischer, for his expertise and input in my research. Then I would like to thank Kristian Dobre and Evert-Jan Bakker for helping me understand odds ratios and logistic regressions. Also, I would like to thank Ellen Vossen for the planning and support during my research.

Then I would like to thank my family. I would like to thank my parents for their endless support and trust in me, even with everything that's been going on you never cease to help me in any way you can. I would especially like to thank my mom, grandmother and grandfather for recruiting their friends and acquaintances to participate in my research. And I would like to thank my three brothers for their support and participation – it's not said enough, but I'm proud of you!

Of course I would not have been able to do my research without participants! So thank you so much for everyone who donated their time and opinion so I could actually do a research. Guests from the restaurant I work at, students from Wageningen University, friends and everyone else that had a part; Thank you!

Lastly I would like to thank my closest friends for their support and input. Kristina, thank you for the dead honest feedback, for calling me out on 'hovno' when that was needed, and for always having my back. Lesley, Rád'a, Claire, Steph thank you for always believing in me and supporting me when I felt lost.

This thesis brought me a lot, I learned a lot and I had the chance to develop myself personally as well as academically. I am grateful that I had this opportunity and I am ready for a next challenge.

Ai gonplei nou ste odon nowe.

MSc Thesis Consumer Behaviour

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Cultured meat is a developing food technology with the potential of becoming a high quality protein source produced at relatively "low costs" in terms of taste, user experience and ecological footprint. However, such potential success largely depends on consumer acceptance, which is being explored in this study. Specifically, this study investigated the influence of product appearance and information provision on categorization processes and schema choice, and how these reflect in consumers' implicit and explicit attitudes. Combining qualitative and quantitative approaches, the experiment followed a 2X3 design with three hamburger appearances (varying in discrepancy levels from conventional meat) in combination with receiving information on cultured meat or not. The experiment (N=156) showed that information did not influence the respondent's implicit or explicit attitude, regardless of the appearance discrepancy. Hamburger appearance was found to influence schema choice, which influenced implicit as well as explicit attitude in terms of liking. Categorization schemata were important for acceptance and based on these findings it is concluded that meat appearance is crucial for consumer acceptance of cultured meat.

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MSc Thesis Consumer Behavior MCB-80433

33 credits

June 2017

Content

1. Introduction

The way meat is produced changed drastically over the past century, going from small family farms to large, industrialized farms (FAO, 2006). The increase of meat production over the last century has implications on the environment. Currently, livestock accounts for 65% of humanities protein intake globally and the demand of animal derived protein is rising due to growth of the world population (FAO, 2006). Meat production globally is expected to more than double (to 465 million tonnes) within the next 34 years, contributing to environmental issues such as CO2 emission and fresh water shortages (FAO, 2006). In 2006 it was reported by the FAO that 70% of all agricultural land globally is used for livestock, which is contributing greatly to deforestation. Moreover, livestock alone was found to have a share of 18% in greenhouse gas emission, leading to the need of more sustainable alternatives for meat (FAO, 2006). Western consumers are becoming more aware of the negative implications meat production and consumption has on the planet, as well as the ethical aspects of killing animals for food (Verbeke et al., 2015). Awareness of these issues causes consumers to gradually change their meat consumption habits towards more sustainable diets such as vegan, vegetarian and flexitarian (Verbeke et al., 2015). These diets usually replace animal derived protein with soy proteins but these products often do not mimic the sensation of consuming meat, resulting in a small market share (Post, 2012). Optimization in terms of taste and structure of plant based meat alternatives is only moderately effective (Elzerman et al., 2011). This leads to the need for another solution, namely a product closer to the properties of meat. This is where cultured meat comes into play.

Cultured meat is aimed at reducing animal suffering along with the ecological footprint, while offering a product with features similar to conventional meat. In short, culturing meat could be explained as growing the meat without growing the animal. Cultured meat is grown by taking muscle stem cells from adult animals, these cells are cultured and grown in bioreactors (Verbeke et al., 2015, Post 2012). Application of this nanotechnology offers benefits in terms of the environment (e.g. greenhouse gas emission and waste of natural resources like water), ethical considerations (culling of animals becomes unnecessary) and public health (e.g. epidemics like H5N1 are less likely to happen, foodborne and nutrition related illnesses can be controlled) (Bhat et al., 2015, Orzechowski, 2015). Moreover, a batch of cultured meat can be produced over the course of six weeks which reduces the ecological footprint largely (Edelman et al., 2005, Mattick et al., 2015). In comparison, bulls need sixteen months to reach slaughter weight. This new technology does pose challenges in terms of consumer acceptance (Bhat et al., 2015). Consumers are concerned about their food choices, now more than ever and express preferences for 'natural'-, organic-, and raw food. The growing concern for chemicals in factory produced food products attests to this trend (Grunert, Bredahl & Brunsø, 2004; Rozin et al., 2004). The term "cultured meat" does not fit the trend of natural-, organic-, and chemical-free food production. Terms affiliated with cultured meat (in-vitro, laboratory grown, artificial) highlight the perceived unnaturalness of the product (Verbeke et al., 2015). Prior studies on how consumers make sense of cultured meat elicited in mixed, but predominantly negative, reaction of the public. It is suggested that unfamiliarity with the production process and the final product creates scepticism, unknown negative long term effects add to this (Marcu et al., 2015). Cultured meat is not yet available on consumer markets but technologies to produce cultured meat on large scale are developing rapidly (Kadim et al., 2015, Orzechowski, 2015). However, it is highly recommended by Bhat (et al., 2015) to address societal and ethical issues before starting the production of cultured meat on a large scale.

Preliminary expectations in terms of production benefits are promising, leaving consumer acceptance the largest challenge to overcome. The gap in the current literature is the doubt whether or not consumers are willing to accept artificially produced meat as a substitute or extension of conventional meat (Bhat et al., 2015; Hocquette, 2016; Hocquette et al., 2015; Kadim et al., 2015; Orzechowski, 2015). The study by Bekker et al. (2017) pointed out that it is not yet known how categorization influences the explicit attitude of people towards cultured meat. Moreover, Bekker et al. (2017) state that it is not yet known what the automatic activated response of consumers towards cultured meat is.

The current study aims to provide insight in what responses are automatically activated upon seeing cultured meat, to which category schemata cultured meat is connected and how this influences the implicit and explicit attitude towards cultured meat.

Therefore the general research question of this research is proposed as follows;

How does categorization reflect in the consumer's attitude towards cultured meat and what is the effect on the final evaluation of cultured meat?

2. Theoretical background on consumer perception and affiliated processes

Consumer perception of objects or products depends on multiple factors, such as familiarity with the product category, the product itself, former experiences, attention, expectations, risk- and benefit perception, emotions and even the current mood (Siegrist, 2007). The case of cultured meat poses a challenge to consumer acceptance since the applied production technology is not familiar to what people expect from meat. Unfamiliarity of attributes in a known product is known to cause psychological discomfort and may in some cases lead to rejection of the product (Schifferstein, Kole & Mojet, 1999; Siegrist, 2007). Several theories are included in this review to pinpoint how consumers deal with unfamiliar attributes, including learning by analogy (Gregan-Paxton, 1997) and categorization (Miller, Malhotra & King, 2005). The attitude that people form generally stems from a sum of evaluations (Fishbein and Ajzen, 1975). Attitude formation and change theories are included to form a general idea about the attitude formation process and the relation to consumer perception of cultured meat (Fishbein and Ajzen, 1975; Gawronsky & Bodenhausen, 2006). The aim of this theoretical review is to gain understanding in the processes affiliated with the perception of unfamiliar attributes, such as the production process of cultured meat.

2.1 Consumer perception and understanding

The world around us is a complex collection of stimuli. Stimuli differ in nature and are picked up on by the senses. Senses are subdivided in five categories; olfaction, audition, vision, gustation and tactics. Seemingly unrelated stimuli need to be processed in order for it to make sense as a whole, a complex neurological processes bring the input from the senses together which results in perception (Krishna, 2012). Sensation is knowing something feels cold and smooth (tactics) that it has a red color (vision) and that it smells sweet (olfaction). Out of context and individually, these sensations do not make sense. When the sensations are put together by the brain it could form the image of a can of coca cola.

Consumer perception is an extensive process that starts with attention triggered by stimuli in the environment, which are then detected by people's senses. Vision is considered the most dominant human sense (Krishna, 2012). However, not all stimuli are noticed. The salience of

cues determines whether or not attention is directed towards the stimuli. Thus not all exposure necessarily leads to attention (Steenkamp, 1990; Bialkova, van Trijp, 2010). The perception process starts with the acquisition of salient cues, which are the little pieces of information that consumers observe prior to consumption (Steenkamp, 1990). These informational cues are physically part of the product and are subdivided as intrinsic cues and extrinsic cues. Intrinsic cues are inseparable from the product (e.g. production process, texture, smell, color etc.) and cannot be changed without changing the product itself, whereas extrinsic cues can be changed without changing the product and are thus separable but part of the product (e.g. label, packaging) (Olson, 1978, Steenkamp 1990). Characteristics of a product hold more interest to the consumer than the product itself, since evaluations on a product are often based on product characteristics rather than the product as a whole (Lancaster, 1966; Steenkamp, 1990).

From perception of the attributes follows association and evaluation, commonly known as the formation of an attitude towards an attitude object. Information is generally dealt with in an efficient matter, leading to fast evaluations or, an implicit attitude. However, if cues are not understood by the consumer, discrepancies arise. This can happen in new products that have characteristics associated with different product categories, such as a phone that looks and acts as a tablet but has features to make a phone call, or a packaging that does not meet the expectation of the product, like vodka in a carton (Ozanne et al., 1992). Not understanding a product can also happen when a product has completely unknown features, such as a nanotechnology based preservative (van Giesen, 2015). In this paper that will be referred to as an 'unfamiliar attitude object'. These discrepancies can be overcome and people can adapt to incongruencies with some effort but until a certain extent, depending on previous available knowledge (Miller, Malhotra & King, 2005).

2.2 Attitude formation

Attitudes stem from inferences people make and the beliefs they form to make sense of the environment around them (Fazio, 2007). According to Fishbein (1975) beliefs are affiliated with cognition, whereas attitudes are based on affect. More recent literature nuances these assumptions further by suggesting that attitudes can be either automatic or evaluative by nature (Gawronski & Bodenhausen, 2006). An important part of a final judgment is the attitude. Therefore it is needed to know what an attitude is, how it is formed and how it relates to food choices. It is proposed by Rosenberg and Hovland (1960) that consumer attitudes consist of three main components; affect, cognition and emotion (Smith et al., 2012; Hamlin, 2016). Additionally, familiarity towards the attitude object was found to play a role, especially in terms of expectancy certainty (Piqueras- Fiszman & Spence, 2015; van Giesen, 2015). In general, attitudes are formed based on salient stimuli from the environment.

Theory on neuroscience implies that perceptual information of stimuli is firstly processed in the thalamus of the brain before it is forwarded to the amygdala (Cunningham & Zelazo, 2007). The amygdala is a part of the telencephalon, situated in the temporal lobe of the brain and this brain structure is associated with motivation and emotion (Murray, 2007; Janak & Tye, 2014). The amygdala is involved in multiple processes in the brain, such as learning, memory, attention, emotion, reward and motivation and is found to respond to valanced stimuli such as olfaction, audition, gustation and vision (Zald, 2002; Murray, 2007). Moreover, the synaptic plasticity (ability to weaken and strengthen over time) within the amygdala is the underlying aspect to associative learning (Johansen et al., 2012). Based the knowledge that associative learning is

grounded in the amygdala it is implied that the amygdala also plays a large role in the formation of attitudes guided by emotions (Smith et al., 1996; Johansen et al., 2012).

Attitudes are typically explained as a relatively stable evaluation of a stimulus and associations formed by this evaluation (Cunningham & Zelazo, 2007) or as shortly stated by Fazio (2007); evaluative knowledge. Attitude activation is either controlled or spontaneous, which is described as two types of attitudes; implicit (spontaneous) and explicit (controlled) attitudes (Fishbein & Ajzen, 1975; Fazio, 1995; Gawronski & Bodenhausen, 2006).

An implicit attitude is generally explained as a *primary* or *automatic* response, solely based on associations which are readily available in existing memories. Implicit attitudes are mostly affective in nature and can be retrieved effortlessly (Cunningham & Zelazo, 2007; Fazio, 2007). In the Elaboration Likelihood Model (hereafter; ELM-model) it is suggested that when the peripheral route is then followed, inferences are made based on simple cues which provide associative information (Petty & Cacioppo, 2012). Gawronski & Bodenhausen (2006) refer to this process as the formation of an implicit attitude, which is constituted through an automatic affective response when a relevant stimulus is encountered. This process is very fast and occurs outside people's awareness, similar to the intuitive process that also relies on prior experiences (Sujan, 1985; van Giesen, 2015). An example of the implicit retrieval process is the game "94%" (available in app stores) in which players are presented with a word such as "soft" and asked to come up with associations to the word. Each correct answer presents a certain percentage and words associated with "soft" in this game are "pillow (34%)", "hair (25%)", "cotton (7%)", "cloud (4%)", "feather (3%)", "blanket (14%)" and "teddy bear (7%)" (source: 94% app). This game shows that certain words spontaneously activate a semantic network associated by the given word. For everyone, the first association with the given word is implicit, the remaining answers are cognitive. Gawronski and Bodenhausen (2006) suggest that the associations are activated based on a relative similarity between *(a) the preexisting structure of associations in memory and (b) the particular set of external input stimuli.* The external input stimuli refer to the context in which something is presented. The word "ball" is typically associated with bouncing, however if the context is changed with water, that same ball can be associated with floating. The same is ought to be applicable in food products, yoghurt is typically associated with "dairy" and "natural", but if the context is changed by adding nanoparticles, people make different inferences and might wonder if the yoghurt is still natural (van Giesen, 2015).

Contrary to implicit attitudes, explicit attitudes are explained as controlled, cognitive processes that one can consciously explain. This process is only triggered when people have the cognitive capacity and motivation to do so (Wyer, 2008). This process is further characterized by the use of "*evaluative judgments*" and the dependency on truth values. It is known that beliefs are formed based on truth values, Fishbein & Ajzen (1975) argue that beliefs result from cognition, whereas attitudes are the result from affect. In line with this knowledge Gawronski & Bodenhausen (2006) propose that explicit attitudes build on beliefs and propositions, which are both dependent on truth values whereas implicit attitudes occur based on associations, regardless of truth values. However, the basis of an explicit attitude is still found in the implicit attitude people hold (Gawronski & Bodenhausen, 2006). When an inconsistency within the existing propositions is detected, a more cognitive approach of processing is triggered and people are forced to evaluate whether prior evaluations are true. Within this process, people are expected to use existing schemata amongst other considerations such as benefits and risks to make sense out of the discrepancy they encountered.

2.3 Categorization and learning by analogy

The starting point of understanding how people can make sense of an unfamiliar attitude object is to understand what underlying mechanisms are involved in making sense of cues. Firstly it is necessary to realise how consumers make inferences and form predictive judgments about products and production techniques. For example, if a skiing garment is evaluated as being of high quality, people might infer that the garment is very warm and comfortable (Miller, Malhotra & King, 2005). How people perceive a product will largely depend on how it is presented, what associations it creates, the personal goals of the consumer, their prior beliefs and values and expectations (Miller, Malhotra & King, 2005). Moreover, existing knowledge about the object are known to influence how judgments are made.

Unknown objects or an object with unknown characteristics can be evaluated by means of an analogy, this method of reasoning is used to build bridges between information and the novel object in order to make inferences about the object (Gregan-Paxton, 1997). Learning by analogy assumes that consumers have a "base" (basic knowledge about a certain product) which helps to understand new products; the "target" which in this case reflects on the way of production as well as the actual object (Gregan-Paxton, 1997). Forming analogies does place a larger constraint on people than categorizing due to the focus on relational similarities (Gregan-Paxton & Moreau, 2003). Categorization on the other hand, largely builds on the assumption that people have existing knowledge stored in their brain which is structured in flexible schemata (Miller, Malhotra & King, 2005; van Trijp and van Kleef, 2008). These memory structures or memory schemata are needed to facilitate inference making on attributes (Olson et al., 1978). Schemata are formulated around existing knowledge, further evaluation of attributes depends on the salience of the provided cues (Miller, Malhotra & King, 2005). Schemata are basically links to existing concepts in the brain, which are established and get stronger over time when previously acquired information is confirmed. When new information comes into play, new links need to be created to fit new information in existing schemata, or to create a whole new schema. An object can only be evaluated when a schema for the target is available, new or adapted. When peoples' expectations are met, categorization is straight-forward. An indicator of straightforward categorization is a fast and strong evaluative reaction (e.g. *"I like it"*) without the need or ability to verbalizing why (Sujan, 1985). In other literature this is referred to as an '*associative process*' which typically leads to an implicit attitude (Gawronski & Bodenhausen, 2006). However, if expectations are not confirmed, people have to deal with the discrepancy. If the discrepancy is large, it likely causes psychological discomfort, which according to the assimilation theory can be overcome until a certain extent (Schifferstein, Kole & Mojet, 1999). Assimilation is achieved by changing perception to 'fit' the discrepancy within expectations. If an attribute of a familiar product is not part of the knowledge structure, consumers might not be able to make inferences without additional information (van Giesen, 2015). Though, a study done on nanotechnology perception in orange juice showed that consumers were able to assimilate and construct a meaningful evaluation of a nanotechnology they never encountered before in orange juice (Steenis & Fischer, 2016). Accommodation occurs on the same level as assimilation, though the main difference is that perception remains the same. Instead of changing the perception, the schemata are adapted to fit the discrepancy in, this is referred to as subtyping. If categorization fails completely because no schema is available or the information is inconsistent, the object can be evaluated through piecemeal processing, which is an attribute by attribute analysis of a specific target. The goal of piecemeal processing is to assign the target to a specific category or to create a whole new category (Edwards, 1993). An indication of piecemeal processing is an

attribute based response (*i.e.* attribute evaluations, trade-offs, comparisons or clarifications) and fewer direct evaluations (*e.g.* "I like it") (Sujan, 1985).

Thus the key distinction between learning by analogy and categorization is found in the treatment of attributes; learning by analogy communicates a novel object as *"is like"* a member of an existing category, where categorization suggests that the novel object is *part* of an existing category (Gregan-Paxton & Moreau, 2003). The next paragraph will explain the effect of categorization in terms of belief formation.

2.4 Belief formation

Beliefs are typically defined as "*a proposition that conveys information about the relationship between two independent concepts"* Kendler, 1968 (Duncan & Olshavsky, 1982). Stemming from this definition it can be inferred that beliefs about an object are generally formed though the association between product characteristics. Beliefs are described as estimates of the chance that an event, state or relation about attributes is true (Wyer, 2008). Thus without information or prior knowledge on attributes, people are unable to create understanding. Therefore information and knowledge are considered to be a critical factor in consumer acceptance of new food technologies (Chen et al., 2013). Once provided with information and knowledge on unknown objects, people can start making associations (form beliefs) with more familiar objects (Olson et al., 1978). According to the expectancy-value model of attitudes (EV-model) by Fishbein and Ajzen (1975), beliefs are usually formed based on past experiences as well as on available information to provide a certain level of certainty or by inference processes. However, the model does not describe in detail how beliefs are formed, this infers that the assumption that attitudes are formed in a rational way might be ambiguous. Fishbein and Ajzen (1975) describe belief formation solely cognitive without affective components. Recent studies argue that a cognitive approach is not deemed to be appropriate for food products, since consumers tend to have an existing (implicit) attitude towards known food products and might omit all cognitive processing on this matter (Fazio & Olson, 2003; Gawronski & Bodenhausen, 2006). Moreover, the theory by Fishbein & Ajzen is compensatory and assumes that attributes can be traded off equally. It can be argued that unfamiliar attributes are a discrepancy in the existing knowledge structure and will be treated with more attention than familiar attributes (van Giesen, 2015). On the other hand, new food products are carefully considered and cognitively processed since discrepancies in existing schemata trigger cognitive processing, leading to the formation of an attitude (Miller, Malhotra & King, 2005).

2.5 Risk and benefit perception

Stemming from the suggestion that risk and benefit perception drives consumer attitude towards food, it is assumed that these phenomena also influence the attitude of people towards unfamiliar foods and foods with unfamiliar attributes such as foods produced with nanotechnology (Costa-Font, Gil & Traill, 2008; Bearth and Siegrist, 2016). Consumers are assumed to make trade-offs between risks and benefits and base their decisions on the relative advantages and disadvantages of their choice (Wyer, 2008).

Risks

Risk in a potential harmful context is defined by Royal Society in 1992 as follows: "*a combination of the probability, or frequency, of occurrence of a defined hazard and the magnitude of the consequences of the occurrence*" (Yeung and Morris, 2001). Risks are delicately handled when it comes to food. The human tendency to avoid unfamiliar food products for safety reasons is referred to as "neophobia" and serves as a mechanism to protect the body from harm done by food not fit for

consumption (Rozin & Vollmecke, 1986). This noted, foods produced by novel techniques such as nanotechnology create consumer concern due to unfamiliarity and inferred risks affiliated with these technologies (Piqueras-Fiszman & Spence, 2015). This is supported by the decline in consumer liking and acceptance as observed when different food technologies were used to either preserve or produce food items. Cardello (2003) found a decline of consumer acceptance when consumers were informed about the use of a novel food technology to preserve chocolate pudding. This technique was aimed to preserve the pudding, which is a benefit to the consumer. The risk of irradiation treatment to preserve the pudding longer should outweigh the perceived benefit associated with this technique to facilitate willingness to buy (Frewer, 2003). Also, it was suggested by Gupta (2013) that fear is one of the main drivers of a negative response towards nanotechnology. Concerns about ethics and little knowledge on the application were suggested to contribute to the fear of the large public (Gupta, 2013). These findings are in line with results of another study that suggests that salience of benefits is crucial for the acceptance of nanotechnologies by the public (Siegrist et al., 2007).

Benefits

On the other hand, it is human tendency to inspect and try new food products or foods, this is referred to as neophilia (van Trijp & van Kleef, 2008). Application of nanotechnologies to food products is acknowledged as necessary and beneficial by consumers, the theory on neophilia might be applicable to new production techniques as well. Additionally, it was suggested that the societal acceptance of such applications is higher than previously suggested by experts in the field (Gupta, 2013). The same study also found that the extent of necessity shapes a positive attitude towards food products enhanced with nanotechnology. Moreover, the attitude towards products produced with novel technologies such as nanotechnology is not necessarily shaped by perceived risk as opposed to perceived benefits (Wyer, 2008).

Temporal distance is expected to be another facilitator of benefit perception. Construal level theory (CLT) proposes that when something is not part of ones here and now, it is considered to be of high construal (low in abstract), whereas low construals are explained as concrete representation of the near future and detailed (high in abstract) (Trope, Liberman & Wakslak, 2007). They suggest that risks are only important in relation to benefits, whereas benefits hold importance by themselves. This was explained by example of undergoing a medical treatment, one will not undergo a surgery without it being beneficial, thus risks only become relevant when benefits do, otherwise the treatment is discarded as a whole (Trope, Liberman & Wakslak, 2007). The same concept is applicable on food, if eating a certain food does not hold benefits to a person (e.g. they do not like the taste), the risks of eating the food become futile since the food is avoided.

2.6 Summary

Common knowledge dictates that consumer understanding depends on many factors but is restricted by cognitive biases (Grunert, Scholderer & Rogeaux, 2010). Consumers rely on the environment for the provision of cues and process them depending on pre-existing knowledge and motivation. If an attitude object has unfamiliar features, processing becomes difficult and might be avoided. Based on preliminary knowledge and existing schemata, consumers may be able to make sense of unfamiliar features, leading to an explicit attitude through categorization, whereas straight associations lead to an implicit attitude via an automatic process. Stemming from this knowledge a model is proposed to sketch possible processing routes.

3 Model definition

Based on prior described theoretical pillars, a new theoretical model (*fig 1*) is proposed which shows how consumers are expected to process cues associated with the appearance of cultured meat. The proposed model is not solely appointed to evaluate how cultured meat is perceived, but also how information provision influences categorization and what the effect of categorization is on belief formation, the trade-offs between benefits on personal and societal level and the explicit attitude.

The proposed theoretical model suggests two possible evaluation routes. The first route is the most direct one, where a direct schema fit leads to an implicit attitude. In the second route it is suggested that consumers try to make inferences and categorize based on available information and thus follow a more cognitive route leading to categorization, belief formation and an explicit attitude towards the product. The cognitive route is also effective when consumers are unable to make sense of the cues and the product cannot be categorized. It is then expected that people try to make sense of the cues through piecemeal processing (attribute-by-attribute) (Sujan, 1985).

The theoretical model consists of different parts; firstly the product itself which consists of physical features (appearance and information), secondly the inferences or the sense a consumer can make of these features (schema association and category) and thirdly the cognitive part (perceived risks and benefits which lead to an explicit attitude). The moderator of the proposed model consists mainly of personal goals and values the consumer might have.

Based on the proposed theoretical model the following main hypothesis is proposed:

"The category to which consumers assign cultured meat influences the implicit and explicit attitude"

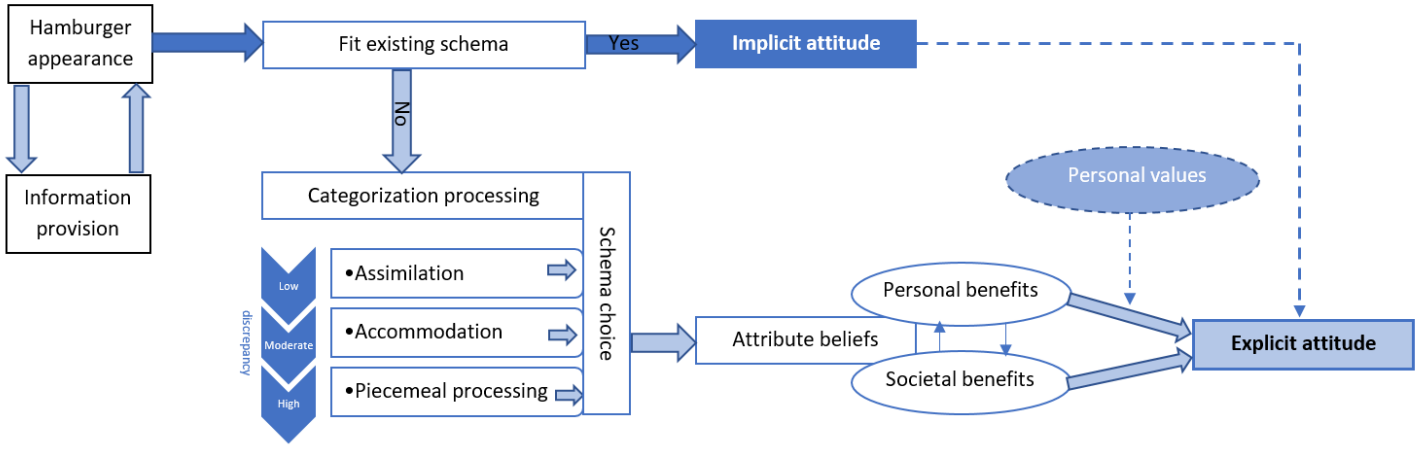

Figure 1: Proposed theoretical model

3.1 Direct (full-fit) route

The direct route (*fig. 2*) is a fast 'shortcut' consumers might use to process provided cues (Sujan, 1985). In the proposed theoretical model, well known stimuli such as a cultured meat hamburger with the appearance of a conventional hamburger are expected elicit this response. It is assumed that conventional meat is a part of an existing knowledge structure (schema), regardless whether or not the person consumes meat. Cultured meat is created to have similar features as conventional meat (Post, 2012) with solely the production process as a differing attribute.

The concept "meat" activates a pre-existing schema in the mind that is likely to be associated with concepts such as: "muscle tissue", "animals" and "natural". These associations are conflicting with the properties of cultured meat, since cultured meat comes from a lab rather than straight from the animal. Gawronski and Bodenhausen (2006) propose that associations are based on *relative* similarity within existing knowledge structures. This suggests that when a cultured meat product looks very similar to a conventional meat product, people are expected to form a quick evaluative response which elicits an implicit attitude. It is expected that this simultaneously solves the discrepancy caused by the conflicting information (i.e. cultured meat) on the label. This expectation is in line with findings by van Giesen et al. (2015) who found that people ignore the unfamiliar attributes when the context provides enough cues. In line with existing literature on attitude change, Bekker et al. (2017) found that the implicit attitude towards cultured meat is not influenced by additional information (Gawronski & Bodenhausen, 2006). Moreover, Fazio (2007) showed that people have the ability to immediately construct an attitude towards an unfamiliar object based on relevant associations. However, the discrepancy between conventional and cultured meat might be highlighted if additional information comes into play, leading to a more cognitive approach.

Thus it is expected that consumers who follow the direct route have a fast and strong evaluative response (e.g. "*I like it*" or "*I hate it*") towards the product they are asked to evaluate. Moreover, it is expected that people following this route will not spontaneously explain why they evaluate the product as such.

Stemming from the assumption that similarity elicits an automatic affective response based on associations with fixed schemata the following hypotheses are proposed:

H_1: Schema choice influences the occurrence of an implicit attitude
H_{1a}: *A match with existing schema is expected to elicit in an implicit attitude when the burger appearance matches the expectation of real meat*

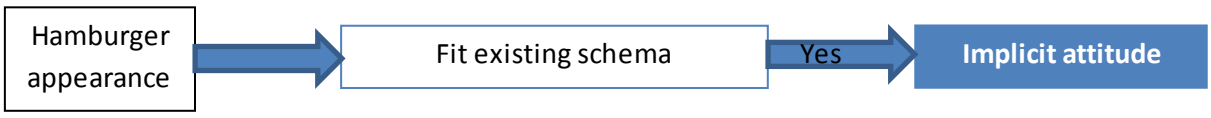

Figure 2: Direct (fullfit) route

3.2 Cognitive route

The cognitive route (*fig. 3*) builds on cognitive processing and categorization. Stemming from the knowledge that discrepancies trigger analytical processing, it is expected that consumers will pay more attention to the properties of cultured meat when the product looks more or less similar to conventional meat, but not the same. It is expected that the (slight) discrepancies trigger consumers towards categorization, resulting in a more cognitive approach. Meat schemata available to people revolve around pre-existing knowledge about conventional meat (e.g. "meat becomes brown when you bake it"). In terms of categorization, it is expected that cultured meat poses a discrepancy that cannot fully be fitted in an existing schema. Meat is generally perceived as a 'natural' product consisting purely of animal tissue, whereas cultured meat is produced in a laboratory. Hence, it is expected to be perceived similar to either artificial/ processed products, genetically modified (GMO) food products, a product derived from animals (similar to eggs, milk, cheese etc.) or a product similar to 'veggieburgers' and meat replacers.

In this study it is expected that the category schema to which people assign cultured meat influences their attitude as well as the manner of categorization (categorization processes). Processing the attributes of cultured meat is done depending on pre-existing knowledge schemata where people try to force fit (assimilate) within existing knowledge or try to adjust their existing knowledge (accommodate) (Sujan, 1985; Miller, Malhotra & King, 2005). The extent of the discrepancy is expected to be a determinant of whether people will try to assimilate or accommodate.

Assimilation likely occurs when the category or domain are similar, which is plausible in the case of cultured meat, whereas accommodation is expected towards large discrepancies (Wyer, 2008). A study on beer concluded that information given on the product was responsible for a disconfirmation amongst respondents due to an assimilation effect (Caporale & Monteleone, 2004). Researchers suggest that this effect is particularly relevant for beer because of the acceptability which is determined by the sensory properties. In line with these findings it is assumed that the acceptability of cultured meat is also dependent on information confirmations and disconfirmations.

When the incongruency between cultured meat and the existing knowledge schemata is too high, people are expected to be forced into attribute by attribute processing. Piecemeal processing is an alternative when available information cannot be force fitted or assimilated to an existing category (Sujan, 1985). The goal is to assign the target to a specific category or to create a whole new category (Fiske & Pavelchak, 1986; Edwards, 1993). Outside of testing conditions, it is expected that this route will only be used if people are interested to understand cultured meat (Sujan, 1985). If the presentation of cultured meat is very different from what people expect of meat (e.g. a substance with an odd color) they will be unable to assign the object to an appropriate category schema, in that case people are forced to evaluate the product attribute by attribute. In order to create a new category for cultured meat, people need information (Fiske & Pavelchak, 1986). The proposed theoretical model suggests that people can then form beliefs about cultured meat, since they have pre-existing knowledge about what they expect from meat.

Stemming from the assumption that a discrepancy leads to categorization based on existing knowledge with fixed schemata the following hypotheses and sub-hypotheses are proposed:

H_2: "(Slight) discrepancies lead consumers towards categorization, resulting in a more cognitive processing approach"
H_{2a}: "Discrepancy between the product appearance and the activated schema leads to elaborated categorization processes"
H_{2b} "A mildly incongruent product from a similar domain leads to assimilation."
H_{2c}: "A moderately incongruent product leads to accommodation."
H_{2d}: "A very incongruent product leads to piecemeal processing"

H_{3a}: "Categorization schema choice is influenced by product appearance"
H_{3b}: "Categorization schema choice is influenced by information provision"

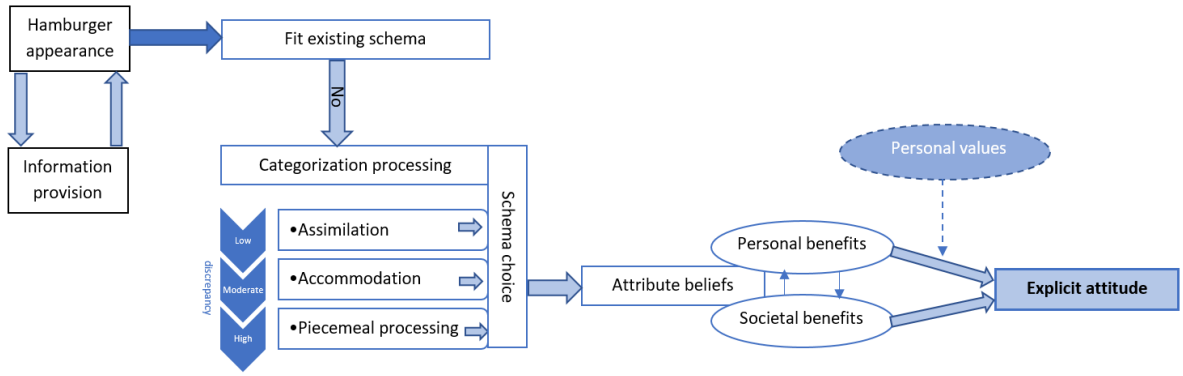

Figure 3: Elaborated cognitive route

Beliefs

The theoretical model suggests, in line with the theory of planned behaviour, that people's intentions and actions are guided by their beliefs (Ajzen, 1991). However, rather than assuming beliefs concerning cultured meat solely build on truth values that consumers can not yet have, the model suggests that beliefs depend on the manner of processing and the assigned schema. For example, inferences people make about the same product differ if the appointed category schema is not the same. If a vegetarian hamburgers is placed in the "vegetarian" category by someone who is concerned with animal welfare and health, this burger likely evokes attributes such "plant-based", "healthy", "no animal tissue". Whereas the same vegetarian hamburger can be placed in a "meat-substitute" category by another person that wants to eat a hamburger to indulge. To the second person the vegetarian hamburger might evoke attributes such as "chewy" and "not tasty". Though it is expected that people will have some trouble with forming beliefs about cultured meat, since truth propositions are not yet confirmed and links need to be stabilized over time. Therefore the hypotheses concerning belief formation are reserved:

H_{4a}: "Beliefs depend on the used categorization process"
H_{4b}: "Beliefs depend on the chosen schema"

Risk and benefit trade-offs

It is assumed that in the case of cultured meat beliefs are not exhaustive to form an explicit attitude towards the product. It is assumed that trade-offs are made between relative advantages and disadvantages to make a full evaluation, especially when consumers are unable to understand the new product (Wyer, 2008). The proposed theoretical model treats advantages and disadvantages in a sophisticated matter by suggesting personal as well as societal levels of costs and benefits. Benefits on personal level relate to possibility of controlling the percentage of fatty acids, proteins and ethical considerations in terms of animal culling (Post, 2012). Costs on personal level, compared to conventional meat, can be a higher price, less tastiness and questionable or unverified safety. On the other hand we distinguish between costs and benefits on societal level. Benefits on societal level are less strain on the environment (e.g. due to less water use, less greenhouse gas emission and less production time), ethical considerations (culling of animals is not needed, solving of food shortages) and public health (chance of epidemical outbreaks reduces largely) (Post, 2012; Verbeke et al., 2015). Costs on societal level are the changing environment, relating to the disappearance of farms since less animals will be needed.

Verbeke et al. (2015) found that benefits of cultured meat are not noted in everyday context by consumers, but rather on global level. This finding suggests that people think about cultured meat in high levels of construal where information is abstract and far from direct experience (Trope, Liberman & Wakslak, 2007). The psychological distance can be reduced by providing a tangible product, this suggests that cultured meat is closer in the near future. Another important notion to take into account in this study is the finding that people are more neophobic towards products of animal origin than of plant origin (Tuorila et al., 2001). On the other hand, animal welfare attributes and benefits related to the environment were found to be important benefits in consumer decision making (Frewer et al., 1997). How people make trade-offs between relative costs and benefits likely depends on the beliefs they hold towards cultured meat.

H_{5a}: "The manner of categorization influences personal and societal benefit perception"
H_{5b}: "The chosen categorization schema influences personal and societal benefit perception"

H_{6a}: "Personal goals and values (meat eating habits) have an effect on perceived personal benefits"
H_{6b}: "Personal goals and values (meat eating habits) have an effect on social benefits"

Explicit attitude

Meat products are familiar to consumers. However, the production method used to produce cultured meat is an unfamiliar attribute that does not fit in existing knowledge structures. The explicit attitude is result of cognitive processing due to detected discrepancies with existing truth values, a process that likely happens when cultured meat is encountered. Explicit attitudes are generally based on an implicit attitude (Wyer, 2008), correlations between the implicit and explicit attitude of respondents in a recent study on cultured meat support that statement (Bekker et al., 2017). Implicit attitudes rely on what is known to the consumer, whereas provided information influences the perception in the formation of an explicit attitude. For example, the liking of the same beer with a different label (GMO versus traditional) decreased when information was discrepant with the expectations (Caporale & Monteleone, 2004). Participants expected traditional beer and were confronted with a beer they thought was GMO-brewed, which decreased the liking.

The study by Bekker et al. (2017) pointed out that it is not yet known how categorization influences the consumers' attitude towards cultured meat. The proposed theoretical model might provide insight on the matter by including categorization as a theoretical pillar. An explicit attitude is thus assumed to be (partially) a result from the implicit attitude, therefore the hypotheses assume that what holds for the implicit attitude is also true for the explicit attitude. The following hypotheses are proposed to support the assumptions made in this paragraph:

H7: "Burger appearance and information provision are the main predictors of explicit attitude"
H_{7a}: "The category schema to which people assign cultured meat affects the explicit attitude"
H_{7b}: "The category process used to assign cultured meat to a schema affects the explicit attitude"

4 Methodology

The objective of this study is to determine how the attitude of consumers towards cultured meat is influenced by categorization and to what extent product appearance and information provision has an influence.

Qualitative studies offer a more varied and deeper insight, where the main weakness is found in its representativeness. Quantitative research, on the other hand, offers insight in consumer attitude but is often restricted and biased (Grunert, Scholderer & Rogeaux, 2010). The two techniques were combined by Grunert, Scholderer & Rogeaux et al (2010) and resulted in development of the Claim Understanding Test (CUT). This methodology offers the possibility to explore both the quantitative and qualitative side of the consumer response and was developed to estimate consumer understanding. The CUT methodology was developed to the research whether consumers were able to understand health claims on Danone packages. In the initial research CUT was applied as a web-based approach where respondents were presented with health claims through the packaging and/or a TV commercial.

To test the hypotheses of the current research, the CUT methodology is adapted to fit to the case of cultured meat with an additional measure for "primary affective response" and "categorization schema association". The primary affective response of people was found to be a predictor of overall attitude and is therefore included in this research (van Giesen et al., 2015).

4.1 Stimuli material

The research includes two manipulations; **information provision** (operationalized through an informational video) and **hamburger appearance** (operationalized through three different hamburgers).

Information provision

Half of the respondents is offered knowledge on cultured meat which is provided by means of a 116 second video on Youtube that explains what cultured meat is and how it is produced. Video link is displayed in appendix 1.

Hamburger appearance

The stimuli appearance is systematically varied between subjects, respondents received one out of three possibilities (*fig. 4)* which were all labelled as cultured meat (Dutch: "*gekweekt vlees*" – full description in appendix 1).

Figure 4: From left to right: conventional hamburger, vegetarian hamburger, beetroot hamburger

4.2 Procedure

The research was conducted in the middle Netherlands area and within the surroundings of Wageningen University. Data collection took place in January and February 2017, running from 08.01.2017 to 14.02.2017. A total of 158 participants took part in the research. Participants were recruited through a personal network, over social media (facebook and twitter) and via flyers. The research was primarily conducted at Wageningen University, location Forum. All participants from outside Wageningen were interviewed on location, either in their own home or in restaurant Mio Girasole. Before starting the survey, participants were randomly assigned to one of the treatments by means of the excel randomization function. Every respondent was met face-to-face and presented with a package of the assigned meat appearance as stimuli. The treatment distribution was based on 2X3 between subjects design (*table 1*). The full procedure took 11 minutes on average.

Table 1: 2X3 design for manipulation
N= respondents

Appearance	Information	
	Yes	No
	N	*N*
Conventional burger	26	27
Vegetarian burger	26	26
Beetroot burger	26	25

Interested respondents were invited to a PC-room in Forum and seated in front of a desktop computer with the survey open. Interested respondents from outside Wageningen university were met on a location convenient for them and presented with the survey on a Samsung Galaxy tablet 10.1. Due to the intensive nature of the procedure, maximum two respondents could participate simultaneously. Before starting the survey, the participants were presented with either a conventional hamburger, a vegetarian hamburger or a beetroot based burger (*fig. 4 & attachment 1*) which they were asked to look at. All hamburgers were labelled to be cultured meat (*fig. 4 & attachment 1*). Thereafter participants were informed to wait for the researcher to do a short interview – the CUT test. The first part of the survey consisted of visually scoring a primary affective response on the affective judgement scale (*fig. 5*). The next item in the survey informed the respondents that it was an "Intermezzo for open questions". If the respondent was assigned to group 2, 4, or 6 they were shown a video on Youtube that explains in 116 seconds what cultured meat is. When the respondents were part of group 1, 3 or 5, the break was solely used to conduct the Consumer Understanding Test. During the CUT, the researcher asked three open questions face-to-face, which participants were allowed to answer without constraint or time limit. Foreign respondents were asked in English and Dutch speaking respondents were asked the same questions in Dutch.

The responses to the CUT test were recorded on an Android device (Samsung Galaxy Tab 10.1) with consent of the participants. The CUT was followed by a questionnaire.

Questionnaire

The questionnaire was created in the web-based survey software "Qualtrics". It consisted of 15 questions, measuring primary affection and explicit attitude towards cultured meat, explicit attitude towards conventional meat and the respondents' demographics.

The questionnaire started with the question whether or not the respondent had studied or is studying at Wageningen University. This was done in order to have the full attention of the respondent on the survey and avoid a delay on the second question which was timed. In the second question participants were asked to indicate primary affection towards cultured meat by clicking an emoticon (*affective judgement scale*) that best fits their feeling with the product they are being presented with *(fig 5)*. This response was timed by means of a click-tracker in Qualtrics. When the response was submitted, a break was built in the questionnaire to interview the participants. Thereafter respondents were asked to score their explicit attitude towards cultured meat and conventional meat, the questionnaire ended with demographical questions. The full version of the questionnaire can be found in appendix 2 (English) and 3 (Dutch).

4.3 Measures

Consumer Understanding Test[1] *(Grunert, Scholderer & Rogeaux, 2010)*

Implicit attitude was operationalized through analysis of participants' responses to open questions. Respondents were asked "*What do you think about the product?"*, the responses to this question were coded as binary variables "0"= no implicit attitude, "1"= formation of implicit attitude according to table 2 (Sujan, 1985). Assignment to implicit attitude was *not* mutually exclusive from assignment to one or more categorization categories!

Categorization variables *(assimilation, accommodation and piecemeal processing)* were obtained in a similar manner; according to the questions *"What do you think of this product?"* and *"If you were asked to describe cultured meat to a friend, what would you tell them?"* the participants' responses were coded as binary variables "0"= no occurrence of assimilation/ accommodation/ piecemeal processing, "1"= occurrence of assimilation/ accommodation/ piecemeal processing according to table 2 (Sujan, 1985). Additional to the pre-determined outcome variables "Implicit attitude", "Assimilation", "Accommodation", and "Piecemeal processing", a fifth variable was established based on the responses acquired; **Self and/ or social gratifying thoughts**. Responses in this category did not have a direct relation to the product, but rather to the feelings or expected experience of the user, or the environment. Full description can be found in *table 2*.

Schema associations were derived from open responses of the respondents to the question "*What do you think cultured meat is most similar to?*". These responses were split in 7 categories; "meat", "plant", "vegetarian", "processed", "new category", "GMO" and "other". The responses were coded as binary variables "0"= no association with the category, "1"= association with the category[1].

Liking is a *spill-over measure* derived from a miscellaneous of all open questions – not to be confused with the primary affective response. Spontaneous responses were coded as "0"= neutral (no explicit or spontaneous opinion), "1"= positive (e.g. "I like it", "I would like to try it", "good development"), "2"= negative (e.g. "I would not eat it", "It looks disgusting", "It seems cheap") and "3"= cautious (e.g. "Maybe if I would have some more information", "I'm cautious", "It looks artificial but if it tastes good, why not").

[1] Actual responses to the CUT test available on request

Table 2: Coding scheme for qualitative measuring (Restructured and adapted from Sujan, 1985)
** Responses were not mutually exclusively treated; occurrence of an implicit attitude did not rule out categorization*

Code and description	Example
Implicit processing	
Overall evaluation of the product	"I (dis)like it"
Qualified evaluation of the product	"It will taste good"- "it will taste bad"
Overall impression of the product	"It looks good" - "it looks bad"
Assimilation/ accommodation	
Categorization thoughts	"It looks like a vegetarian burger" – "it does not look like meat"
Subtyping thoughts	"It is similar to…"
Discrepancy thoughts	"It looks different than meat"
Piecemeal processing	
Attribute evaluation	"The color seems intense" - "Interesting label"
Attribute trade-off	"It does (not) look artificial"
Attribute comparison to standard	"The texture looks (dis)similar to meat"
Attribute clarification	"Does the meat get brown when baked?"
Request for additional attribute clarification	"I am wondering about the texture when it is done"
Self or social gratification	*No relation to the product*
Self-gratification	"Interesting" "I'm curious" "I would like to try" "Nice process"
Social gratification	"No more animal culling" "Better for the environment" "Positive development"
Don't know	"Don't know"

Questionnaire

Primary affection towards cultured meat was measured on the affective judgement scale (*fig 5*) which measures four negative emotions (disgust, fear, sadness, boredom) an four positive emotions (fascination, desire, joy, satisfaction) (van Giesen et al., 2015).

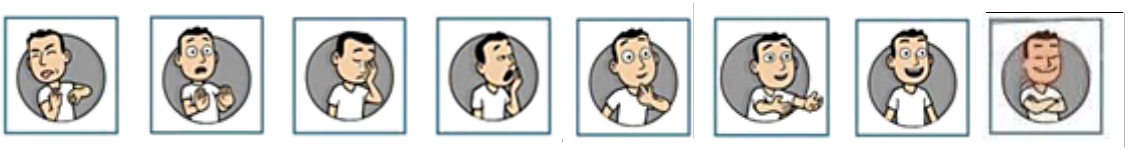

Figure 5: Affective judgment scale, from left to right: disgust, fear, sadness, boredom, fascination, desire, joy and satisfaction (Adopted from Van Giesen et al., 2015)

A 7-point Likert scale (*strongly agree – neutral – strongly disagree*) was used to score the responses towards cultured meat and conventional meat (*fig. 6*) for **Explicit Attitude**, **Beliefs**, **Personal**-, and **Societal benefits**. The items are a derivative from the "Multidimensional Food Attitude Profile" (Steptoe et al., 1995). This instrument is prior validated, tested for reliability and used in many food and meat related attitude studies (Hamlin, 2016). Some small adjustments are done so all items apply to cultured meat instead of conventional meat.

Personal values were measured by scoring meat eating habits of the respondents. The inquiry was "How often do you eat meat?" on which the responses could be: "I am vegetarian/ vegan", "I am flexitarian (1-2 times per week)", "3-4 times per week" or "Every day".

Explicit attitude[1]	Beliefs[2]	Personal benefits[1]	Societal benefits[1]
Is a product I would like to try	Is a natural product	Seems/is healthy to eat	Is good for animal welfare
Gives me a good feeling	Is low in calories	Offers good nutritional value	Is environmental friendly
Seems/ is convenient in usage	Is dangerous		
Seems/ is pleasant to eat	Is ethical		
	Is high in proteins		

Figure 6: Items used for measuring "Explicit attitude", "Beliefs", "Personal benefits", and "Societal benefits"
[1] treated as a construct
[2] treated as individual items

4.4 Data analysis

Consumer Understanding Tool

All interviews consisted of three prior discussed questions to which the answers were audio-recorded. Recordings were coded per respondent (1, 2, 3 … 156) and coded by treatment (1, 2, 3 … 6). All recordings were re-played from a Samsung Galaxy Tab 10.1 device, analysed and coded according to the coding scheme in table 3. Coding was done in a Microsoft Office Excel sheet.

Questionnaire

Data from the questionnaires was downloaded from Qualtrics and imported to Microsoft Office Excel. Once imported to Excel the survey data was aligned and visually assessed to match the questionnaire responses to the interview responses.

Reliability

Reliability was assessed for six constructs; explicit attitude, personal benefits and societal benefits towards both cultured meat and conventional meat. **Explicit Attitude** was measured on a 7-point Likert scale (*strongly disagree – neutral – strongly agree*) across 7 items (*table 3*). The reliability of the Explicit Attitude construct was measured with a Cronbach's Alpha and was respectively α .82 for cultured meat and α .76 for conventional meat indicating a sufficient level of reliability. **Societal benefit**-, and **Personal benefit** constructs were measured on the same 7-point Likert scale. The Cronbach's Alpha for the Societal benefit construct was α .74 for cultured meat and α .81 for conventional meat. For the Personal benefit construct cultured meat was α .70 and conventional meat α .68.

Table 3: Constructs

Constructs	Items	Cultured meat	Conventional meat
		Cronbach's alpha	Cronbach's alpha
Explicit attitude	Is a product I would like to try Gives me a good feeling Seems/ is convenient in usage Seems/ is pleasant to eat	*α 0.82*	*α 0.76*
Personal benefits	Seems/is healthy to eat Offers good nutritional value	*α 0.70*	*α 0.68*
Societal benefits	Is good for animal welfare Is environmental friendly	*α 0.74*	*α 0.81*

Respondents

In total, 158 respondents took part in the research, of which two were excluded from the research due to missing data, leaving a total of 156 responses for analysis. Respondents were

mostly Dutch (64%), other respondents (37%) included people of 22 different nationalities (Belgian, Bolivian, Brazilian, Colombian, Curacaos, Czech, Finnish, French, German, Greek, Indian, Indonesian, Iranian, Italian, Lebanese, Luxembourgian, Mexican, Northern Irish, Slovakian, Southern African, Spanish and Zimbabweans). 58.7% of all respondents had studied or is studying at Wageningen university, 41.3% of the respondents had no affiliation with Wageningen university. The respondents' age ranged from 16 to >75 years. 69% of the respondents were young adults between 16 and 30, respectively 13.6% of the respondents were adults between 31-55 and 14.8% of the respondents were middle-aged (55-75). 2.6% of all respondents was older than 75. Within the research, two respondents were lightly visually impaired, which made reading the questions from a tablet surface difficult. In these two cases the questions were read out loud and the respondent indicated their response vocally.

Table 4: Respondent distribution

			Groups A *No information by video*						Groups B *Information by video*					
Variable	**Total**		**Conventional**		**Vegetarian**		**Beetroot**		**Conventional**		**Vegetarian**		**Beetroot**	
	N	**%**	N	%	N	%	N	%	N	%	N	%	N	%
Gender														
Male	53	34.2	8	5.2	7	4.5	12	7.7	6	3.9	7	4.5	12	7.7
Female	102	65.8	19	12.3	19	12.3	13	8.4	20	12.9	19	12.3	13	8.4
Age[1]														
16-30	107	69	19	12.3	18	11.6	15	9.7	19	12.3	19	12.3	15	9.7
31-55	21	13.6	2	1.3	5	3.2	-	-	7	4.5	3	1.9	-	-
55-75	23	14.8	6	3.9	3	1.9	8	5.2	-	-	3	1.9	8	5.2
>75	4	2.6	-	-	-	-	2	1.3	-	-	1	0.7	2	1.3
Studied at Wageningen UR														
Yes	91	58.7	17	10.8	16	10.3	17	10.8	12	7.7	15	9.7	14	9
No	64	41.3	10	6.5	10	6.5	8	5.2	14	9	11	7.1	11	7.1

[1] Normality assumed for age (Skewness 1.39947474 - Kurtosis 0.67488165)

Further analysis

Data from the interviews was numbered per respondent to facilitate easy matching between the interviews and the questionnaire. Data was manually matched and merged per respondent to ensure correct matches. Data was further examined and visually assessed in Microsoft Office Excel for obvious mistakes and missing values. Two respondents were excluded from the analysis; one respondent's audio file was damaged and the other respondent's questionnaire was not or wrongly submitted and could not be retrieved.

The first twelve responses were done as a trial to test if the questionnaire was understood by respondents and to examine the usability of the method. The trial led to adding one question in order to asses if respondents are studying or had studied at Wageningen University, response to this question was manually added for the twelve trial respondents.

Dataset

Respondents were successfully randomized across groups. Data consisted of a categorical variables (outcome "0" for absent and "1" for occurring), multi-categorical variables and continues variables.

Categorical coded dependent variables; "**Categorization process**", "**Categorization schema**", "**Implicit attitude**" and "**Primary affective response**" were categorical coded as "0" absent/ negative and "1" occurring/ positive.

Multi-categorical dependent variable "**Liking**" includes four levels; "0" for neutral, "1" for positive, "2" for negative and "3" for cautious.

Continuous dependent variables; "Beliefs", "Personal benefits", "Societal benefits" and "Explicit attitude".

Manipulation variables (conventional burger appearance, vegetarian burger appearance, beetroot burger appearance and information received) were dummy coded.

Statistics

Statistics were done in a series of steps. Descriptive statistics were done in order to test whether or not the outcomes were associated with the manipulations by means of a Pearson Chi-Square where $\chi^2 = \sum_{i,j} \frac{(n_{ij} - \hat{E}_{ij})^2}{\hat{E}_{ij}}$. The first analysis was between "Primary affective response" (row) and "Burger appearance" (column). Analyses for "Categorization process", "Categorization schema" and "Implicit attitude" (row) were done with "Burger appearance * Information received" as column variable. Results are shown in *table 6.*

Independent data was further subjected to a logistic regression analysis under link function $logit(\pi) = log \frac{\pi}{1-\pi}$ in order to detect possible relations between the manipulations and behavioural outcomes. All behavioural outcomes were categorical, coded "1" for occurring and "0" for absent. To include all possible relationships between the behavioural outcomes (schema associations, implicit attitude and categorization behaviour) and the manipulations (burger appearance and provided knowledge) an extended model was tested and fitted to the data (Peng, Lee and Ingersoll, 2002).

$$\underline{\text{Logit}(\Upsilon)} = \ln\left(\frac{\pi}{1-\pi}\right) = \beta_0 + \beta_{1x\ \text{appearance}\ 1} + \beta_{2x\ \text{appearance}\ 2} + \beta_{3x\ \text{information received}}$$

$$\Upsilon = \frac{e^{\beta 0 + \beta 1x + \beta 2x + \beta 3x}}{1 + e^{\beta 0 + \beta 1x + \beta 2x + \beta 3x}}$$

Where

Υ = behavioural outcomes: categorization processes, categorization schemata and implicit attitude

β_0 = Conventional hamburger appearance

β_1 = Vegetarian hamburger appearance

β_2 = Beetroot hamburger appearance

β_3 = information on cultured meat

All Υ – behavioural outcomes were tested separately as dependent variable in a binary logistic regression where "burger appearance" and "knowledge provision" were considered fixed factors. In the first model these factors were considered to be main effects, the second model tested main effects as well as an interaction.

Interaction model:

$$\underline{\text{Logit}(\Upsilon)} = \ln\left(\frac{\pi}{1-\pi}\right) = \beta_0 + \beta_{1x\ \text{appearance}\ 1} + \beta_{2x\ \text{appearance}\ 2} + \beta_{3x\ \text{information received}} + \beta_{1x} * \beta_{3x} + \beta_{2x} * \beta_{3x}$$

$$\Upsilon = \frac{e^{\beta 0 + \beta 1x + \beta 2x + \beta 3x + \beta 1x * \beta 3x + \beta 2x * \beta 3x}}{1 + e^{\beta 0 + \beta 1x + \beta 2x + \beta 3x + \beta 1x * \beta 3x + \beta 2x * \beta 3x}}$$

Where

β_0 = Conventional hamburger appearance

β_1 = Vegetarian hamburger appearance
β_2 = Beetroot hamburger appearance
β_3 = information on cultured meat

General Linear Model (GLM) Multivariate linear analysis is used to predict if **beliefs** are formed through *categorization processes* or *schemata* under Pillai-Bartlett distribution $V = \sum_{i=1}^{s=5} = \frac{\lambda_i}{1+\lambda_i}$ which is considered to be the most robust method to test multiple continuous variables can be explained by multi-categorical predictors (Field, 2013). The multivariate linear analysis allows to test if the variance of the five beliefs are independently explained by categorization processes or categorization schemata.

One-Way ANOVA analysis is used to detect if variances in **personal benefits** and **societal benefits** are explained by *manipulations* burger appearance and information provision under model $\Upsilon_{\text{personal/social benefits}} = \beta_{0\text{ conventional}} + \beta_{1x\text{ vegetarian}} + \beta_{2x\text{ beetroot}} + \beta_{3x\text{ information}} + \varepsilon_{ij.}$

The **explicit attitude** towards cultured meat versus conventional meat within respondents is first compared by means of a paired sample t-test. Thereafter, the effects of treatment (burger appearance and information provision) are tested by means of a One-Way ANOVA analysis. The model used is $\Upsilon_{\text{explicit attitude}} = \beta_{0\text{ conventional}} + \beta_{1x\text{ vegetarian}} + \beta_{2x\text{ beetroot}} + \beta_{3x\text{ information}} + \varepsilon_{ij.}$ The One-Way ANOVA analysis is also used in order to detect effects of the categorization process and appointed categorization schemata on the explicit attitude . Significant relationships will be further explored by means of a logistic regression model under link function $logit(\pi)=log\ \frac{\pi}{1-\pi}$ where Υ = categorization (schemata – processes).

Significant relations that are suspected to be influenced by a moderator will be tested for a mediation effect by means of a Hayes model (Hayes & Matthes, 2009)

$$\Upsilon_{\text{behavioral outcome}} = \begin{cases} \beta_1 + \beta_{k(predictor)} + 1M_{(moderator)} \\ \vdots \\ \beta_{k-1} + \beta_{2k-1M} \end{cases}$$

Liking of cultured meat is tested by means of a Multinomial Logistic regression model. The model is applied in terms of probabilities rather than log-odds;

$$\pi_{ij} = \frac{exp\{\eta_{ij}\}}{\sum_{k=1}^{j} exp\{\eta_{ik}\}}$$

i = $1_{\text{vegetarian burger appearance}}$, $2_{\text{beetroot burger appearance}}$ with *conventional burger appearance* as a constant
j = $1_{\text{positive attitude}}$, $2_{\text{negative attitude}}$, $3_{\text{cautious attitude}}$ with *neutral attitude* as a constant
η_{ij} = 0 makes this formula valid for all j possible outcomes (Rodriguez, 2007).

5 Results

5.1 Descriptives

Primary affective judgement of cultured meat

It was found that most respondents initially chose a positive emoticon (n=127, 81.4%, *table 6*) to express their feelings towards cultured meat. No significant ($\chi^2(2) = 1.307$, $p = .520$) associations were found between the appearance of the burgers and the primary affective judgement towards cultured meat. This result implies that respondents showed initial affection towards cultured meat regardless of the appearance.

Categorization schemata

Responses were merged to 5 categories, as shown in table 6 "*Categorization Schemata*". By means of the Pearson Chi-Square statistics it was shown that the categorization schemata had a significant association ($\chi^2(20) = 57.123$, $p = .000$) with the appearance of the burger, information provision or both.

It was found that 58.5% of N=53 respondents appointed a "*real meat*" schema for cultured meat when they were confronted with a conventional meat hamburger. *Vegetarian* schemata towards cultured meat were more often used when confronted with a beetroot appearance (N=22) than towards a vegetarian burger appearance (N=16). Cultured meat is an entirely new concept for which 29 respondents (18.6%) created a new category to place this product in. The effort of creating a new category was most often seen (55.2%) when respondents were presented with a conventional hamburger as opposed to the vegetarian and beetroot appearance.

Categorization processes

Categorization processes were subdivided in four possible outcomes; assimilation, accommodation, piecemeal-processing and self/ social gratifying thoughts. Results in table 6 show that categorization behaviour was dependent ($\chi^2(15) = 40.483$, $p = .000$) of the manipulation.

Implicit attitude

The occurrence of an implicit attitude was found to be dependent ($\chi^2(5) = 11.222$, $p = .047$) of the burger appearance. The implicit attitude was most often formed towards the conventional hamburger (N=30) as opposed to the vegetarian appearance (N=19) and the beetroot appearance (N=14). Provision of information is suspected to have no contribution on the formation of the implicit attitude since an almost equal amount of respondents formed an implicit attitude towards cultured meat, regardless of receiving additional information.

Table 5: Pearson χ^2 table for association of "Primary affective judgement", "Schema association", "Implicit attitude" and "Categorization behaviour" (categorization) with regard to the burger appearance and knowledge of cultured meat.

	No information by video						*Information by video*						χ^2	p-value
	Conventional burger		**Vegetarian burger**		**Beetroot burger**		**Conventional burger**		**Vegetarian burger**		**Beetroot burger**			
	N=27	*%*	*N=27*	*%*	*N=25*	*%*	*N=26*	*%*	*N=25*	*%*	*N=26*	*%*		
PRIMARY AFFECTIVE RESPONSE														
Positive	45	84.9	43	82.7	39	76.5							1.307[a]	.520
Negative	8	15.1	9	17.3	12	23.5								
CATEGORIZATION SCHEMATA														
Real meat	16	59.3	4	14.8	7	28.0	15	57.5	8	32.0	8	30.8		
Vegetarian	0	0	6	22.2	12	48.0	1	3.8	10	40.0	10	38.5		
Processed food	0	0	5	18.5	1	4.0	1	3.8	2	8.0	2	7.7	57.123[b]	.000
New category	9	33.3	5	18.5	5	20.0	7	26.9	1	4.0	2	7.7		
Other	2	7.4	7	25.9	0	0	2	7.7	4	16	4	15.4		
CATEGORIZATION PROCESS														
Assimilation	12	44.4	8	29.6	14	56.0	5	19.2	9	36.0	6	23.1		
Accommodation	0	0	0	0	6	24.0	1	3.8	2	8.0	7	26.9		
Piecemeal processing	7	25.9	6	22.2	3	12.0	5	19.2	2	8.0	2	7.7	40.483[c]	.000
Self/social gratification	8	29.6	13	48.1	2	8.0	15	57.7	12	48.0	11	42.3		
ATTITUDE														
Implicit attitude	15	55.6	11	40.7	5	20.0	15	57.7	8	32.0	9	34.6	11.222[d]	.047

[a] df under χ^2 (3-1)*(2-1) = 2
[b] df under χ^2 (6-1)*(5-1) = 20
[c] df under χ^2 (6-1)*(4-1) = 15
[d] df under χ^2 (6-1)*(2-1) = 5

5.2 Implicit attitude

Table 6 shows the results of manipulations in relation to the implicit attitude towards cultured meat. The odds of forming an implicit attitude towards cultured meat were 3.4 times higher ($\chi^2(1)$ –*Wald* = 8.756, p = .003) when a burger with conventional appearance was shown as opposed to a burger with beetroot appearance. The odds of forming an implicit attitude towards burgers with a conventional appearance was 2.3 times higher ($\chi^2(1)$ –*Wald* = 4.194, p = .041) than when burgers had a vegetarian appearance. This result confirms hypothesis 1 and 1_a, showing that a conventional hamburger appearance triggers an implicit attitude towards cultured meat. Schemata were found to have an effect on occurrence of the implicit attitude (Likelihood Ratio $\chi^2(4)$ = 9.697, p = .046), the odds of forming an implicit attitude were significantly lower ($\chi^2(1)$ –*Wald* = 7.590, p = .006) when the vegetarian schema was appointed as opposed to the real meat schema. Thus, respondents were 3.6 times more likely to form an implicit attitude if they categorized cultured meat as real meat as opposed to vegetarian.

H_1: Schema choice influences the occurrence of an implicit attitude – accepted
H_{1a}: *A match with existing schema is expected to elicit in an implicit attitude when the burger appearance matches the expectation of real meat – accepted*

Table 6: Logistic Regression analysis for Implicit Attitude
Manipulations: Likelihood Ratio $\chi^2(3) = 9.742$, $p = .021$
Categorization schemata: Likelihood Ratio $\chi^2(4) = 9.697$, $p = .046$
[a] Conventional hamburger appearance
[b] Real meat schema

IMPLICIT ATTITUDE	β1	eβ	χ2 -Wald	P
MANIPULATIONS				
Constant[a]	.230	1.258	.508	.476
Vegetarian appearance	-.819	.441	4.194	.041
Beetroot appearance	-1.239	.290	8.756	.003
Information	.073	1.076	.047	.828
CATEGORIZATION SCHEMATA				
Constant[b]	.069	1.071	.069	.793
Vegetarian	-1.273	.280	7.590	.006
Processed	-.629	.533	.855	.355
New category	-.138	.871	.092	.762
Other	-.842	.431	2.269	.132

5.3 Categorization

Categorization processes

Categorization processes were not found to have an association with schema choice ($\chi^2(12)$ – *Pearson* = 12.325, $p = .420$, *table 7*). The manipulations burger appearance and information provision were found to have an association ($\chi^2(15) = 40.483$, $p = .000$, *table 7*) with categorization processes. The occurrence of **assimilation** behaviour (Likelihood Ratio $\chi^2(3) = 6.393$, $p = .094$, table 8) was not shown to be linked to burger appearance. However, data shows a marginal effect of the informational video irrespectively of the type of burger. Table 8 shows that assimilation ($\chi^2(1)$ –*Wald* = 5.533, $p = .019$) is 2.2 times *less* likely to occur when an informational video was presented to the respondents as opposed to when respondents did not see the video. Results are in line with expectations, considering that assimilation is an adaptation of reality when a discrepancy is detected (Sujan, 1985; Miller, Malhotra & King, 2005).

When all parameters in the model are kept constant, **accommodating behaviour** has a significant ($\chi^2(1)$ –*Wald* = 15.957, $p = .000$, table 8) negative relation to the predictors. When confronted with a burger with beetroot appearance, respondents were 18 times more likely ($\chi^2(1)$ –*Wald* = 7.404, $p = .007$, table 8) to accommodate their thinking pattern towards cultured meat than when they were confronted with the conventional burger appearance. This finding supports hypothesis 2c.

All categorization processes are affiliated with a product evaluation (e.g. assimilation, accommodation and piecemeal-processing) with exception of **self and social gratifying thoughts,** which hold no place in the proposed theoretical model. Respondents were 2.3 times more likely ($\chi^2(1)$ –*Wald* = 4.244, $p = .039$, *table 8*) to form self or social gratifying thoughts towards a burger with vegetarian appearance as opposed to a conventional burger. When respondents were provided with additional knowledge on cultured meat they were found to form twice as many ($\chi^2(1)$ –*Wald* = 4.652, $p = .031$, *table 8*) self or social gratifying thoughts towards cultured meat as opposed to those who did not receive additional knowledge. There

was no interaction effect ($\chi^2(1)$ –*Wald* = .905, *p* = .636, *table 8*) found for self or social gratifying thoughts between the burger appearance and the receiving additional knowledge.

Piecemeal processing was not influenced by any of the manipulations ($\chi^2(1)$ –*Wald* = 1.457, *p* = .692, *table 8*), leading to the rejection of hypothesis 2d. Providing respondents with **additional information** on cultured meat was expected to influence categorization processing positively. Results show that there was a negative effect ($\chi^2(1)$ –*Wald* = 5.533, *p* = .019, *table 8*) of providing information on the assimilation process, leading to the partial acceptance of hypothesis 2e.

The results support the overall hypothesis 2 concerning categorization processes;

H_2: "(Slight) discrepancies lead consumers towards categorization, resulting in a more cognitive processing approach" - accepted
H_{2a}: "Discrepancy between the product appearance and the activated schema leads to elaborated categorization processes" - accepted
H_{2b} "A mildly incongruent product from a similar domain leads to assimilation." - rejected
H_{2c}: "A moderately incongruent product leads to accommodation." - accepted
H_{2d}: "A very incongruent product leads to piecemeal processing" - rejected

Table 7: Association of categorization processes with categorization schemata χ2(12) – Pearson = 12.325, p = .420

	Appointed schema									
	Real meat		Vegetarian		Processed		New category		Other	
CATEGORIZATION PROCESSES	N	%	N	%	N	%	N	%	N	%
Assimilation	21	38.9	15	27.8	3	5.6	9	16.7	6	11.1
Accommodation	6	37.5	6	37.5	2	12.5	2	12.5	0	0.0
Piecemeal processing	8	32.0	5	20.0	1	4.0	9	36.0	2	8.0
Other	23	37.7	13	21.3	5	8.2	9	14.8	11	18.0

df under χ^2 (5-1)*(4-1) = 12

Categorization schema

Burger appearance and providing knowledge were both found to improve the logistic regression model for the real meat (Likelihood Ratio $\chi^2(3)$ = 16.544, *p* = .001, *table 8*), vegetarian (Likelihood Ratio $\chi^2(3)$ = 31.869, *p* = .000, *table 8*) and new category (Likelihood Ratio $\chi^2(3)$ = 10.436, *p* =.015, *table 8*) categorization schemata. However, the provision of knowledge did not significantly influence the schemata used to place cultured meat.

Respondents were 4.7 times more likely to appoint the conventional burger appearance to the **real meat** schema than a burger with the vegetarian appearance ($\chi^2(1)$ –*Wald* = 12.933, *p* = .000, table 8). The burger with the beetroot appearance ($\chi^2(1)$ –*Wald* = 8.712, *p* = .009, table 8) was 3.4 times less likely to be associated with real meat. The **vegetarian schema** was mostly appointed for cultured meat when respondents were shown a burger with beetroot appearance. The odds of appointing the vegetarian schema were 39.5 times higher for burgers with a beetroot appearance as opposed to burgers with a conventional meat appearance. Burgers with a vegetarian appearance were 23.1 times more likely to be placed in the vegetarian schema than hamburgers that had a conventional appearance.

Of all respondents (n=156), 18.6% indicated that they could not categorize cultured meat or compare it with something they already know. Therefore, respondents created a **new category** to put cultured meat in. Appointment to a **new category** schema happened most often when respondents were presented with a conventional hamburger (55.2% from n=53, *table 5*). It was 3.3 times *less* likely ($\chi^2(1)$ –*Wald* = 5.232, p = .022, *table 8*) for respondents to ask for a new category when they were shown a hamburger with vegetarian appearance as opposed to a conventional hamburger. When confronted with the beetroot appearance, respondents were 2.7 times *less* likely ($\chi^2(1)$ –*Wald* = 3.904, p = .048, *table 8*) to need a new category for cultured meat as opposed to when a conventional burger was shown.

H_{3a}: "Categorization schema choice is influenced by product appearance" – accepted
H_{3b}: "Categorization schema choice is influenced by information provision" – rejected

Table 8: Logistic Regression analysis for Categorization processes and schemata

[a] df under Likelihood model $\chi^2 = 3$

	Constant				Vegetarian burger				Beetroot burger				Information				Model		
	β1	eβ	χ2 -Wald	P	β1	eβ	χ2 -Wald	P	β1	eβ	χ2 -Wald	P	β1	eβ	χ2 -Wald	P	Likelihood	χ^{2a}	p
CATEGORIZATION PROCESS																			
Assimilation	-.380	.684	1.309	.252	.037	1.038	.008	.931	.340	1.405	.658	.417	-.816	.442	5.533	.019	**6.393**	**.094**	
Accommodation	-4.294	.014	15.957	.000	.728	2.072	.344	.558	2.888	17.962	7.404	.007	.609	1.839	1.107	.293	**19.532**	**.000**	
Piecemeal processing	-.493	.611	2.197	.138	-.236	.790	.311	.577	-.205	.815	.234	.629	-.361	.697	1.066	.302	**1.457**	**.692**	
Self/social gratification	-.632	.531	3.647	.056	.838	2.311	4.244	.039	-.455	.634	1.215	.270	.730	2.074	4.652	.031	**14.626**	**.002**	
CATEGORIZATION SCHEMA																			
Real meat	.215	1.240	.436	.509	-1.556	.211	12.933	.000	-1.229	.293	8.712	.009	.263	1.301	.562	.453	**16.544**	**.001**	
Vegetarian	-4.060	.017	15.444	.000	3.142	23.139	8.891	.003	3.676	39.469	12.285	.000	.211	1.235	.272	.602	**31.869**	**.000**	
Processed food	-3.853	.021	13.513	.000	2.094	8.115	3.700	.054	1.183	3.265	1.019	.313	-.211	.809	.109	.741	**5.831**	**.120**	
New category	-.475	.622	1.806	.179	-1.220	.295	5.232	.022	-1.011	.364	3.904	.048	-.807	.446	3.370	.066	**10.436**	**.015**	
Other	-2.705	.067	20.679	.000	1.191	3.291	3.665	.056	.035	1.035	.002	.963	.376	1.457	.555	.456	**6.086**	**.107**	

5.4 Beliefs

Respondents scored five beliefs with regard to cultured meat; "*Is a natural product", "is low in calories", "is dangerous", "is ethical"* and *"is high in proteins".* By means of a multivariate linear regression under Pillai's trace it was tested if the score of these beliefs were affected by categorization processes and schema choice. Neither categorization processes (V = .105, F (15, 450) = 1.093, p = .360) nor schema choice (V = .178, F (20, 600) = 1.396, p = .117) were found to have a significant effect on any of the belief scores.

H_{4a}: "Beliefs depend on the used categorization process" – rejected
H_{4b}: "Beliefs depend on the chosen schema" – rejected

5.5 Personal,- and societal benefits

The manner of categorization did not account for differences in mean score for personal benefits (F (3) = 1.178, p = .320, *table 9*) or social benefits (F (3) = 1.493, p = .219, *table 9*). No differences were found in mean score for societal benefits between categorization schemata (F (3) = 1.203, p = .312, *table 9*). Categorization schemata did have an effect on personal benefit score (F (3) = 4.872, p = .001, *table 9*). Mean score for personal benefits was highest when the real meat schema (M = 5.142) was appointed, lowest mean score was found when cultured meat was assigned to the processed food (M = 3.977) schema.

Meat consumption habits were found to moderate the relation between personal benefit score and chosen schema. When respondents were **flexitarians** it was found that choosing the *real meat* schema led to .799 points increase in personal benefit score (b = .799, t(148) = 3.29, p = .0013). Whereas a negative relationship was found between the *other* schema and personal benefit score (b = -1.004, t(148) = -2.65, p = .0089), leading to 1 point decrease in personal benefit score when *other* schema was chosen

For **not-every-day meat consumers,** a positive relationship (b = .906, t(148) = 2.05, p = .042) between the *real meat* schema and personal benefit score was found. When the *real meat* schema was chosen, personal benefit score went up by .906 points. For **every day meat consumers**, the *other* schema resulted in a 1.37 point score increase (b = 1.367, t(148) = 3.64, p = .004) for personal benefit score.

H_{5a}: "The manner of categorization influences personal and societal benefit perception" – rejected
H_{5b}: "The chosen categorization schema influences personal and societal benefit perception" – accepted

H_{6a}: "Personal goals and values (meat eating habits) have an effect on perceived personal benefits" - accepted
H_{6b}: "Personal goals and values (meat eating habits) have an effect on social benefits" – rejected

Table 9: Benefit perception by means of a One-Way ANOVA

Benefit perception	Mean	Std dev	Std error	F	P
CATEGORIZATION PROCESSES					
Personal benefits	4.778	1.179	.094	1.178	**.320**
Societal benefits	5.503	1.257	.101	1.493	**.219**
CATEGORIZATION SCHEMATA					
Personal benefits	4.778	1.179	.094	4.872	**.001**
Societal benefits	5.503	1.257	.101	1.203	**.312**

5.6 Explicit attitude

By means of a paired t-test (*table 10*) respondents were found to have a significantly more positive explicit attitude (t = -2.864, p =.005) towards conventional meat (M = 5.277) than to cultured meat (M = 4.904). For personal benefits (t = -.202, p = .840) no significant differences were found. Perceived societal benefits towards cultured meat scored significantly more positive towards cultured meat (M = 5.503) than to conventional meat (M = 2.676). Other items were compared as individual beliefs, cultured meat was perceived as more ethical (t = 4.923, p = .000) than conventional meat. Conventional meat was perceived as more dangerous (t = -2.346, p = .020) and more natural (t = -11.063, p = .000) than cultured meat.

Predictors of explicit attitude

The explicit attitude score (*table 10*) towards cultured meat was not affected by burger appearance (F (2) = .487, p = .615) or provision of knowledge on cultured meat (F (1) = .140, p = .709). Categorization processing was not found to have an effect on explicit attitude score either (F (1, 154) = .224, p =. 637).

Schema choice did cause differences in explicit attitude score (F (4, 151) = 3.360, p = .009). Respondents had a higher explicit attitude score (M = 5.325) when cultured meat was assigned to the real meat schema as opposed to other schemata. In order to explore the individual relationships between categorization schemata and the explicit attitude, a logistic regression model under link function $logit(\pi)=log\frac{\pi}{1-\pi}$ is applied.

Real meat schema was found to have a positive relation (χ^2 –*Wald* = 5.956, p =.015, *table 11*) to the explicit attitude score towards cultured meat. Assignment to the real meat schema results in an increase of .45 in explicit attitude score. Simultaneously, increase in explicit attitude score led to respondents being 1.6 times more likely to choose the real meat schema as opposed to any other schemata.

This finding supports the main hypothesis;

"The category to which consumers assign cultured meat influences the implicit and explicit attitude"

H7: Burger appearance and information provision are the main predictors of explicit attitude – rejected

H_{7a}: The category schema to which people assign cultured meat affects the explicit attitude – accepted

H_{7b}: The category process used to assign cultured meat to a schema affects the explicit attitude – rejected

Table 10: Paired t-test between the mean perception score of respondents towards cultured meat and conventional meat on a 7-point Likert scale (1 – strongly disagree, 7 – strongly agree)

Measures and items	Mean - cultured	Mean - conventional	t	p
Explicit attitude (α=.82)	**4.904**	**5.277**	**-2.864**	**.005**
• Gives me a good feeling	4.423	4.942	-2.798	.006
• Seems/ is convenient in usage	5.340	5.181	1.059	.291
• Seems/ is pleasant to eat	4.577	5.677	-6.991	.000
• Is something I would like to try	5.269	-	-	-
Personal benefits (α=.69)	**5.167**	**5.191**	**-.202**	**.840**
• Seems/is healthy to eat	4.859	4.788	.456	.649
• Offers good nutritional value	5.250	5.224	0.183	.855
Societal benefits (α=.74)	**5.503**	**2.676**	**17.949**	**.000**
• Is good for animal welfare	5.615	2.686	15.753	.000
• Is environmental friendly	5.391	2.442	17.117	.000
Beliefs				
Is ethical	5.177	3.833	4.923	.000
Is dangerous	3.013	3.353	-2.346	.020
Is low in calories	4.519	3.529	7.442	.000
Is high in proteins	5.391	5.574	-1.543	.125
Is a natural product from animal origin (such as milk and eggs)	3.929	5.814	-11.063	.000

Table 11: Logistic Regression analysis predicting if chosen schema influences Explicit attitude score Likelihood Ratio $\chi^2(3) = 9.742$, $p = .021$

	Explicit attitude				
	β0	β1	eβ	χ2 -Wald	P
CATEGORIZATION SCHEMA					
Real meat	-2.825	.449	1.566	5.956	.015
Vegetarian	-.2.255	.226	1.253	1.346	.246
Processed food	.016	-.538	.584	3.639	.056
New category	.094	-.316	.729	2.557	.110
Other	-.020	-.398	.672	3.017	.082

5.7 Liking

Liking of cultured meat is a **spill-over finding**. Burger appearance was found to influence liking of cultured meat (Likelihood Ratio $\chi^2(6) = .21.244$, $p = .002$). As opposed to neutral, respondents were positive ($\chi^2(1)$ –*Wald* = 15.462, $p = .000$) towards burgers with a conventional appearance. Respondents were 8.9 times more likely to be positive towards cultured meat when meat had a conventional appearance as opposed to a beetroot appearance ($\chi^2(1)$ –*Wald* = 13.565, $p = .000$). The bar chart in *fig. 8* shows odds of positive, negative and cautious evaluation as opposed to a neutral evaluation with conventional-, and vegetarian appearance as opposed to a beetroot appearance. When respondents are confronted with a burger with beetroot appearance they are more negative towards cultured meat ($\chi^2(1)$ –*Wald* = 7.055, $p = .008$) than neutral. Differences are shown in *fig. 8.* Information provision did not add to the Likelihood ratio model (Likelihood Ratio $\chi^2(2) = .168$, $p = .919$).

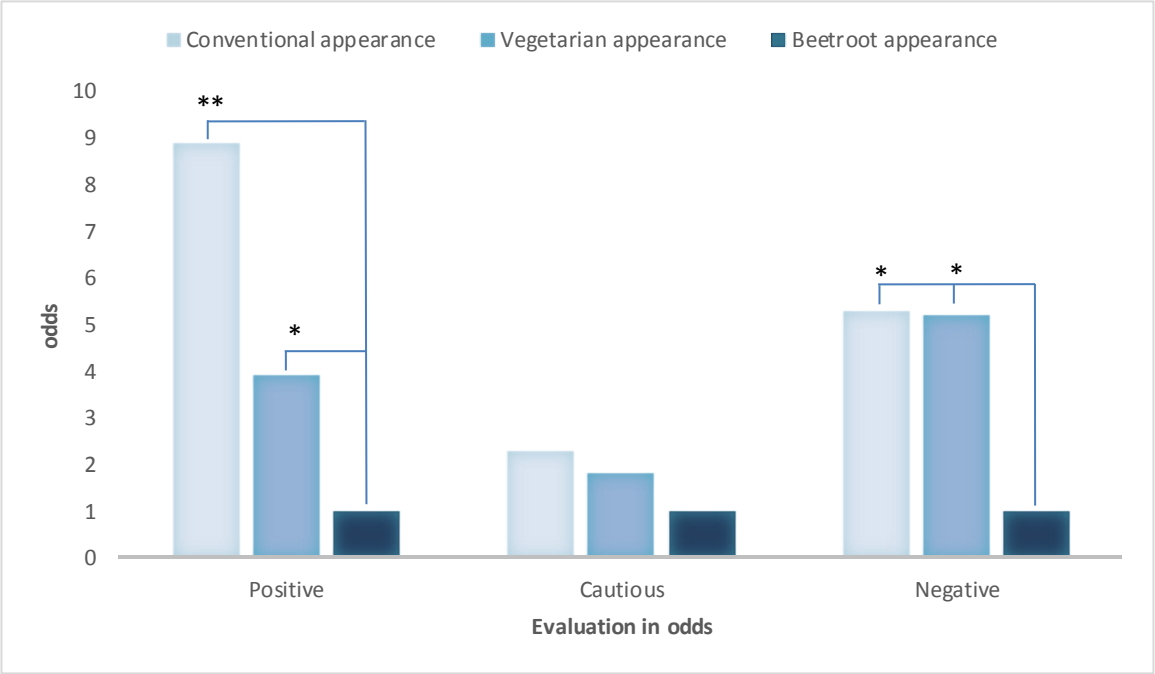

Figure 7: Evaluation of cultured meat, neutral as opposed to positive, negative and cautious. Reference group: beetroot appearance.
** $p = <.001$
* $p = <.05$

5.8 Hypotheses summary

Table 12 summarizes all hypotheses outcomes. The table is organized by manipulation (top) and shows whether or not the manipulation had an effect on the outcome variables.

Table 12: Hypotheses summary organized by manipulation and other dependent variables (e.g. categorization processes and schema choice, moderator personal values)

		Burger appearance	Information provision	Burger appearance * information provision
	Primary affective judgement	✗	✗	✗
H_{2-2a}	**Categorization processes**	✗	✓	✗
H_{2b}	• Assimilation	✗	✓	✗
H_{2c}	• Accommodation	✓	✗	✗
H_{2d}	• Piecemeal processing	✗	✗	✗
spillover	• Self/ social gratification	✓	✓	✓
H_{3a-3b}	**Categorization schemata**	✓	✗	✗
H_{3a-3b}	• Real meat	✓	✗	✗
H_{3a-3b}	• Vegetarian	✓	✗	✗
H_{3a-3b}	• Processed food	✗	✗	✗
H_{3a-3b}	• New category	✓	✗	✗
H_{3a-3b}	• Other	✗	✗	✗
H_{1-main}	**Implicit attitude**	✓	✗	✗
-	**Beliefs**	✓	✗	✗
-	**Personal benefits**	✓	✗	✗
-	**Societal benefits**	✓	✗	✗
H_{7-main}	**Explicit attitude**	✓	✓	✗
spillover	**Liking**	✓	✗	✗

		Categorization process	Categorization schema	Personal values[1]
H_{4a-4b}	**Beliefs**	✗ 4a	✗ 4b	✗
$H_{5a-5b-6a}$	**Personal benefits**	✗ 5a	✓ 5b	✓ 6a
$H_{5a-5b-6b}$	**Societal benefits**	✗ 5a	✗ 5b	✗ 6b
H_{7a-7b}	**Explicit attitude**	✗ 7a	✓ 7b	✓
H_{1-1a}	**Implicit attitude**	-	✓	-

[1] Moderator

6 Discussion

The aim of this paper was to investigate if categorization plays a role in attitude formation towards cultured meat. As expected in this study and suspected by Bekker et al. (2017), categorization had an effect on both implicit and explicit attitude. More specifically, categorization schemata were found to be a predictor for implicit as well as explicit attitude. The manner of categorization (categorization processes) did not have an effect on attitude. The sample size was sufficient (N=158, medium effect, statistical power of 80%), the participants were recruited from Wageningen University (58.7%) and from the general population (41.3%). Categorization processes might have an effect when the sample size is larger and more heterogeneous.

Manipulation effects

The research design was a 2X3 design ($2_{\text{information yes/ no}}$ X $3_{\text{burger appearance}}$) with 6 possible manipulation combinations. Burger appearance was varied in order to cause a discrepancy in the mind of respondents and to prevent the activation of set knowledge structures. The variation in burger appearance indeed constituted the use of different categorization processes, which reflected in the final attitude. Respondents were found to be 8.9 times more positive than neutral about burgers with a conventional appearance as opposed to burgers with a beetroot appearance.

The video manipulation used to provide respondents with information on cultured meat was not effective. Information was expected to influence categorization processing, but did not have an effect on categorization processes, assigned schemata or the attitude. The video manipulation was used based on the suggestion by Chen et al. (2013) who suggested that information and knowledge are a critical factor in consumer understanding and acceptance of new food (technologies). However, meat itself is a familiar product and the attitude towards familiar objects already revolve around broad knowledge structures which might have eliminated the need for additional information (Eagly and Chaiken, 1995). Another cause could be that the tangible product took the attention of the respondents and made them already form a subconscious opinion about it or respondents simply did not understand the information from the video.

Providing respondents with a tangible "cultured meat" burger was done to remove psychological distance between respondents and cultured meat. It was suggested by Trope and Liberman (2010) that *large distance* from an object activates *high construals*. In perspective with cultured meat this would imply that consumers are not able to infer attributes such as "quality" in cultured meat, because this is a *low-level* detail (Trope and Liberman, 2010). Giving respondents a tangible product to assess possibly eliminates the psychological distance that exists when the product is merely a "futuristic concept". It was found that when cultured meat resembles real meat, respondents were more positive about the concept than when it did not perfectly resemble a conventional hamburger. Verbeke et al. (2015) did a research on consumer perception of cultured meat and did not provide respondents with a tangible product. Participants were found to be sceptical and their responses were underpinned with disgust (Marcu et al., 2014; Verbeke et al., 2015). In the current research participants were mainly positive towards cultured meat, in 81.4% of all cases.

Thus based on results from this research it is assumed that providing respondents with a tangible product results in a more positive attitude towards cultured meat. However, since testing differences in psychological distance was outside the scope of this research, it is recommended to research this phenomenon further.

Implicit attitude

Supporting hypothesis 1 and 1a, schema choice was found to be a predictor for the formation of an implicit attitude. Especially the schema 'real meat' was found to constitute this choice, which is in line with the expectations. Van Giesen et al. (2015) found that primary affect is a predictor for realistic unfamiliar attitude objects. Providing respondents with a tangible cultured meat product made the product realistic. However, in this study primary affect was not found to influence the implicit attitude or the formation hereof. This could be due to the need of a sudden attitude change. Gawronski and Bodenhausen (2006) suggest that changes occur when simple context cues are sufficient to influence the association pattern, which is in line with the finding that implicit attitudes are most often formed when respondents assigned cultured meat to a *real meat schema*. Otherwise, van Giesen et al. (2016) also found that consumers shift from an affective process to a cognitive process when attributes are provided in context of an actual product.

Categorization processes

The theoretical framework suggested that discrepancies lead to a more cognitive approach, acceptance of hypothesis 2 and 2a confirm this assumption. The level of discrepancy however, did not necessarily guide consumers in appointed categorization processes as was previously expected. Assimilation is explained as fitting new information into a readily existing schema (Veg-Sala, 2014) and was expected to solve mild incongruences existing within cultured meat which did not hold (hypothesis 2b). This could be due to the discrepancy being too large to assimilate into existing knowledge structures, which would explain why 18.6% of all respondents chose to create a new category schema to put cultured meat in. Accommodation, on the other hand, is the process of altering existing schemata when the object cannot fit (Veg-Sala, 2014). Similarly it was found that accommodating behaviour occurred when respondents were confronted with a burger with beetroot appearance, supporting hypothesis 2c. Evaluating cultured meat attribute-wise (piecemeal processing) was not found to be related to product appearance, leading to the rejection of hypothesis 2d. It can be argued that the product appearances within this research were not incongruent enough to trigger piecemeal processing, this is in line with the finding that the most incongruent product appearance (beetroot burger) elicited in accommodation behaviour.

Additional to the pre-fixed processes, a spill-over processing way was found that was not necessarily affiliated with the product cultured meat, but rather with self and/ or social gratification. The self and social gratification thoughts reflect to the impact the product has on the user or on the environment. Self-gratification thoughts were mainly affiliated with unfulfilled experience attributes such as curiosity to taste and texture whereas social gratifying thoughts were affiliated with credence attributes such as the impact of the concept on animal welfare and the environment. Therefore it is expected that benefits become more salient when consumers are able to try cultured meat. Interestingly, respondents seem to find consolidation in these self and/ or social gratifying thoughts when a discrepancy in product appearance arises, significant differences (p <.05) were found between the conventional burger appearance and the

vegetarian-, beetroot burger appearance. This infers that the inability to process cultured meat results in processing on higher goal levels.

Categorization schemata

The inclusion of this study suggested that acceptance of cultured meat depends on how consumers perceive cultured meat. Findings of this study show that categorization schemata are indeed influenced by product appearance and more important, reflect in the final attitude. It was found that when cultured meat was presented with a conventional meat appearance, respondents were most likely to associate it with real meat. Interestingly it was found that burgers with beetroot appearance were 16.4 times more likely to be placed in the 'vegetarian' schema than burgers with the appearance of a vegetarian hamburger. Most given (spontaneous) reason for this phenomenon is the colour resemblance between the beetroot burger appearance and the actual beetroot vegetable. The results infer that resemblance with real meat is an important factor for accepting cultured meat.

Within this research, respondents were asked to make an analogy for cultured meat. Similarly to earlier research on the perception of cultured meat, analogies with genetic modification and cloning were made (Verbeke et al). Additionally, respondents made comparisons with unnatural fish breeding, growing organs or bodyparts and stem cells. Verbeke et al. (2015) suggested that cultured meat is likely to be rejected by consumers as long as it is categorized as 'heavily processed'. Results from this research contradict that finding. When respondents appointed the 'processed' schema (N=11), they were still positive (N=5) towards cultured meat in 45.5% of the cases. Only 9.1% of the respondents (N=1) were negative towards cultured meat within the 'processed' schema, the remaining 45.5% was found to be neutral.

Beliefs

Results show that there is no link (yet) between categorization schemata, categorization processes and beliefs concerning cultured meat. This is suspected to be due to non-existing truth values, which are most likely not yet stabilized (Gawronski & Bodenhausen, 2006). Even though respondents were not able to form appropriate beliefs about cultured meat, intention for acceptance was shown in a positive evaluation. In line with previous assumptions it was confirmed that beliefs are not exhaustive to form an explicit attitude towards cultured meat.

Benefits

Similar to the research done by van Giesen et al. (2015), respondents were presented with a realistic unfamiliar 'attitude object' – cultured meat, that potentially offers benefits. However, in relation to conventional meat, respondents did not perceive the benefits of cultured meat on personal level. This is possibly due to the nature of the attributes which are all in a credence dimension; as opposed to intrinsic characteristics (i.e. color, marbling etc.) of cultured meat, credence attributes are not generally verifiable by the consumer. Among credence attributes, health effects and environmental benefits are generally not determinable by consumers (Oude Ophuis & Van Trijp, 1995).

In contrast to the personal perception score, the perception score on societal level was found to be significantly more positive (p = .004) towards cultured meat than conventional meat. Since personal benefit perception score was affiliated with credence attributes such as "healthiness" and "nutritional value", the result could be linked to not being able to try the actual product might cause consumers to omit these attributes and rely stronger on search and experience

attributes. The societal benefits are made up from two credence attributes (animal welfare and environment) which are simultaneously high construal social goals (Liberman & Trope, 2010). High construal goals are known to be more stable over time. Consumers show concern for environmental issues and for animal welfare, however an attitude-behaviour gap still exists between intention and action (Bamberg & Möser, 2007). Interestingly 14.1% of the respondents spontaneously made a link between meat consumption and the environment, whereas other studies suggest that this link is rarely made (VanHonacker et al., 2013; Pohjolainen et al., 2016). In a research by Verbeke et al. (2015), some participants carefully pinpointed benefits on societal level with regard to cultured meat. The environmental consciousness amongst consumers with regard to meat consumption is rising, but the effect on consumer behaviour is not yet extensively researched (Pohjolainen et al., 2016). Therefore positive response towards societal benefits might not be an exhaustive predictor for acceptance of cultured meat.

Explicit attitude

Bekker et al. (2017) conducted a research on the explicit attitude towards cultured meat on a sample of university students and remarked that the average explicit attitude might differ over a more general population. However, the current research showed no differences in explicit attitude score between respondents from Wageningen University (58.7%) and respondents that had no affiliation with Wageningen University (41.3%). This suggests that the results found by Bekker et al. (2017) can be generalized towards the general population. It is recommended to investigate this finding further, since population generalization was beyond the scope of the current research.

As opposed to implicit attitude, the explicit attitude was not found to be constituted through burger appearance or categorization processes, discarding hypothesis 6 and 6b respectively. Schema choice did affect the explicit attitude, results infer that association with the real meat schema increases the explicit attitude score significantly (p = .015). This is in line with previous studies suggesting that familiarity constitutes to a more positive evaluation of a not completely familiar object (van Giesen et al., 2015).

Findings highlight some interesting points with regard to the primary affective response and overall liking of cultured meat. The primary affective response was noted to be a predictor for overall attitude by van Giesen et al. (2015). Bekker et al. (2017) acknowledged the primary affective response towards cultured meat as an unknown variable. In this study 81.4 % of the respondents indicated a positive primary affective response on the affective judgement scale. A spill-over from the CUT test provided a more specific view. Respondents were in 44.9% of the cases absolutely positive towards cultured meat and 14.7% of the respondents was found to be negative towards cultured meat. Respondents with a negative attitude towards cultured meat named unknown additives, a mismatch in appearance and general disgust as reasoning. Additionally, 19.9% of the respondents were cautious, the reasoning behind was mostly concerned with genetic modification, unnaturalness and unverified experience attributes such as taste. Thus from these results it is inferred that primary affective response is not a perfect predictor for overall attitude towards cultured meat. However it should be noted that this research was focused on how categorization reflects in the attitude, liking is merely a spill-over result from qualitative data which might be interesting to research further.

From these results it is inferred that a negative or cautious attitude are potentially solvable by providing additional information on cultured meat and the production process. Within this

research, no effects of information provision were found. Therefore it is suggested that information should entail more details on cultured meat as a product and the production process behind it.

Limitations and recommendations

The theoretical model is limited by exclusion of psychological distance to the concept of cultured meat. The results of this study suggest that psychological distance plays a role in the acceptance of the concept cultured meat, however it is not researched until which extent this is true. It is recommended to research the extent to which psychological distance influences consumer perception of cultured meat. The manipulation of providing respondents with information prior to the research did not have an effect on attitude. It is suspected that information given was not understandable enough for the respondents. It is recommended to carefully formulate information in order to have it positively affect the attitude.

Conclusion

In this study we were looking to determine if and how categorization reflects in the attitude of consumers towards cultured meat and what the effect is on the final evaluation of cultured meat. Results show that categorization schemata are indeed a predictor for acceptance of cultured meat whereas categorization processes are deemed less important. From the results it can be concluded that a match with expectations is essential for acceptance of cultured meat. A slight mismatch triggers a more cognitive approach in which benefits of cultured meat are more carefully considered. However, if consumers are not able to try the product and verify these benefits, a more negative evaluation is given. Stemming from this it is inferred that in ultimate production a slight mismatch is not a real problem. More specifically, it is expected that a slight mismatch lowers expectations in terms of taste and elicits in a more positive reaction when expectations are exceeded.

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Appendix 1: Stimulus materials

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1. Conventional meat hamburger from Lidl: a beef meat hamburger. This hamburger consists of 92% beef. The weight of the burger is 100 grams

2. Vegetarian hamburger from Albert Heijn is a burger based on soy and wheat protein. The weight of the burger is 75 grams.

3. Beetroot with honey hamburger from Albert heijn is beetroot based and consists for 74% of red beetroots, 3% honey, egg-white powder and oats. The weight of the burger is 80 grams.

4. Informational video on the production of cultured meat
   https://www.youtube.com/watch?v=3LKsSEbSrUQ

5. Label nutritional information – English

Nutrition Facts

Serving Size 80 g

Amount Per Serving	
Calories 200	Calories from Fat 60
	% Daily Value*
Total Fat 7g	11%
Saturated Fat 0g	0%
Trans Fat 0g	0%
Cholesterol 15mg	5%
Sodium 60mg	2%
Total Carbohydrate 0g	0%
Dietary Fiber 0g	0%
Sugars 0g	0%
Protein 50g	

Vitamin A	0%	•	Vitamin C	0%
Calcium	5%	•	Iron	15%

***Percent Daily Values are based on a 2,000 calorie diet. Your daily values may be higher or lower depending on your calorie needs.**

6. Label nutritional information – Dutch

Gemiddelde voedingswaarde per stuk	
energie	200 kcal
vetten	7 g
waarvan verzadigde vetzuren	0 g
koolhydraten	0 g
waarvan suikers	0 g
eiwitten	50 g
zout	60 mg

7. Product information label – English

8. Product information label - Dutch

Appendix 2: Questionnaire (English version)

1. **Can you indicate on a scale of 1 (strongly agree) to 7 (strongly disagree) indicate how much you sympathize with the following statements?**

Cultured meat…

		Strongly agree			Neutral			Strongly disagree
r/b	Seems healthy to eat	1	2	3	4	5	6	7
	Gives me a good feeling	1	2	3	4	5	6	7
	Seems convenient in usage	1	2	3	4	5	6	7
r/b	Seems pleasant to eat	1	2	3	4	5	6	7
	Is a natural product of animal origin (such as eggs and milk)	1	2	3	4	5	6	7
r/b	Is good for animal welfare	1	2	3	4	5	6	7
	Is a product I would like to try	1	2	3	4	5	6	7
r/b	Offers good nutritional value	1	2	3	4	5	6	7
r/b	Is low in calories	1	2	3	4	5	6	7
r/b	Is unethical	1	2	3	4	5	6	7
r/b	Is high in proteins	1	2	3	4	5	6	7
r/b	Is environmental friendly	1	2	3	4	5	6	7
r/b	Is dangerous	1	2	3	4	5	6	7
	Is something I am familiar with	1	2	3	4	5	6	7

2. **Can you indicate on a scale of 1 (strongly agree) to 7 (strongly disagree) indicate how much you sympathize with the following statements?**

Meat…

		Strongly agree			Neutral			Strongly disagree
r/b	Is healthy to eat	1	2	3	4	5	6	7
	Gives me a good feeling	1	2	3	4	5	6	7
	Is convenient in usage	1	2	3	4	5	6	7
r/b	Is pleasant to eat	1	2	3	4	5	6	7

	Is a natural product of animal origin	1	2	3	4	5	6	7
r/b	**Is good for animal welfare**	1	2	3	4	5	6	7
r/b	**Offers good nutritional value**	1	2	3	4	5	6	7
r/b	**Is low in calories**	1	2	3	4	5	6	7
r/b	**Is unethical**	1	2	3	4	5	6	7
r/b	**Is high in proteins**	1	2	3	4	5	6	7
r/b	**Is environmental friendly**	1	2	3	4	5	6	7
r/b	**Is dangerous**	1	2	3	4	5	6	7
	Is something I am familiar with	1	2	3	4	5	6	7

3. **How often do you eat meat?**

☐ I am vegetarian/ vegan
☐ I am flexitarian (1-2 times per week)
☐ 3-4 times per week
☐ Every day

4. **Were you familiar with the term "Cultured meat" before participating in this research?**

☐ Yes, I know exactly what it is
☐ Yes, I have heard of it
☐ Yes, but I don't know what it is
☐ No, I never heard of it before I participated in this study

5. **Can you indicate on a scale from 1 to 7 which products are according to you most similar to cultured meat?**

	Very different						**Exactly the same**
Vegetarian hamburger	1	2	3	4	5	6	7
Genetical modified food	1	2	3	4	5	6	7
Heavily processed food	1	2	3	4	5	6	7
Meat replacer	1	2	3	4	5	6	7
Product of animal origin (e.g. milk and eggs	1	2	3	4	5	6	7
Other							

General - personal

This part of the survey consists of general questions on personal level. Please indicate which option closest resembles your situation.

6. What is your gender?
☐ Male
☐ Female

7. What is your age?
☐ < 16
☐ 16-30
☐ 31-55
☐ 56-75
☐ >75

8. What is your place of birth? (country/ place)

……

9. What is your highest education?
☐ Grammar school (or a part of it)
☐ High school (or equivalent)
☐ Technical school
☐ Associates degree
☐ Bachelor degree
☐ Master degree
☐ PhD

10. What is your marital status?
☐ Single
☐ Married or registered partnership
☐ Divorced
☐ Widower

11. How is your home situation best described?
☐ Living with parents or family
☐ Student housing
☐ Living alone
☐ Living together with a partner
☐ Living together with a partner and children
☐ Other :……

12. What is your employment status?
☐ Fulltime employed for wages
☐ Parttime employed for wages
☐ Study supporting job
☐ Self-employed
☐ Looking for a job

- ☐ Student
- ☐ Retired
- ☐ Unable to work
- ☐ Volunteer
- ☐ Other :……

Appendix 2: Questionnaire (Dutch version)

1. **Kunt u op een schaal van 1 (zeer mee eens) tot 7 (zeer mee oneens) aangeven in hoeverre u het eens bent met de volgende stellingen?**

Gekweekt vlees…

		Zeer mee eens			Neutraal			Zeer mee oneens
r/b	Lijkt mij gezond om te eten	1	2	3	4	5	6	7
	Geeft mij een goed gevoel	1	2	3	4	5	6	7
	Lijkt mij handig in gebruik	1	2	3	4	5	6	7
r/b	Lijkt mij plezierig om te eten	1	2	3	4	5	6	7
	Is een natuurlijk en dierlijk product (zoals eieren en melk)	1	2	3	4	5	6	7
r/b	Is goed voor dierenwelzijn	1	2	3	4	5	6	7
	Is een product dat ik zou willen proberen	1	2	3	4	5	6	7
r/b	Biedt een goede voedingswaarde	1	2	3	4	5	6	7
r/b	Is laag in calorieën	1	2	3	4	5	6	7
r/b	Is ethisch niet verantwoordt	1	2	3	4	5	6	7
r/b	Is hoog in proteïnen	1	2	3	4	5	6	7
r/b	Is milieuvriendelijk	1	2	3	4	5	6	7
r/b	Is gevaarlijk	1	2	3	4	5	6	7
	Is iets dat ik ken	1	2	3	4	5	6	7

2. **Kunt u op een schaal van 1 (zeer mee eens) tot 7 (zeer mee oneens) aangeven in hoeverre u het eens bent met de volgende stellingen?**

Vlees…

		Zeer mee eens			Neutraal			Zeer mee oneens
r/b	Is gezond om te eten	1	2	3	4	5	6	7
	Geeft mij een goed gevoel	1	2	3	4	5	6	7
	Is handig in gebruik	1	2	3	4	5	6	7

r/b	**Vind ik plezierig om te eten**	1	2	3	4	5	6	7
	Is een natuurlijk en dierlijk product	1	2	3	4	5	6	7
r/b	**Is goed voor dierenwelzijn**	1	2	3	4	5	6	7
r/b	**Biedt een goede voedingswaarde**	1	2	3	4	5	6	7
r/b	**Is laag in calorieën**	1	2	3	4	5	6	7
r/b	**Is ethisch niet verantwoordt**	1	2	3	4	5	6	7
r/b	**Is hoog in proteïnen**	1	2	3	4	5	6	7
r/b	**Is milieuvriendelijk**	1	2	3	4	5	6	7
r/b	**Is gevaarlijk**	1	2	3	4	5	6	7
	Is iets dat ik ken	1	2	3	4	5	6	7

3. Hoe vaak eet u vlees?

☐ Ik ben vegetarisch/ veganistisch
☐ Ik ben flexitarisch (1-2 keer per week)
☐ 3-4 keer per week
☐ Elke dag

4. Bent u bekend met de term "kweekvlees"?

☐ Ja, ik weet precies wat het is
☐ Ja, ik heb er wel eens van gehoord.
☐ Ja, maar ik weet niet wat het is
☐ Nee, ik had er voor dit onderzoek nog nooit van gehoord

5. Kunt u op een schaal van 1 tot 7 aangeven met welk(e) product(en) kweekvlees volgens u het meeste overeenkomsten mee vertoont?

	Heel verschillend						**Exact hetzelfde**
Vegetarische hamburger	1	2	3	4	5	6	7
Genetisch gemodificeerd voedsel	1	2	3	4	5	6	7
Bewerkte voedingsmiddelen	1	2	3	4	5	6	7
Vleesvervanger	1	2	3	4	5	6	7
Dierlijk product (zoals eieren, melk)	1	2	3	4	5	6	7
Anders							

Algemeen - persoonlijk

Dit deel van de vragenlijst bevat een aantal vragen die betrekking hebben op u als persoon. Kies het antwoord dat op u van toepassing is.

6. Wat is uw geslacht?
☐ Man
☐ Vrouw

7. Wat is uw leeftijd?
☐ < 18 jaar
☐ 18-30 jaar
☐ 31-55 jaar
☐ 56-75
☐ > 75 jaar

8. Wat is uw geboorteplaats? (land/ plaats)

……

9. Wat is uw hoogst genoten opleiding?
☐ Basisonderwijs / lagere school (of een deel daarvan)
☐ MAVO, (M)ULO
☐ Lager beroepsonderwijs (LTS, LAS etc.)
☐ HAVO, VWO
☐ Middelbaar beroepsonderwijs (MTS, MAS, MEAO etc.)
☐ Hoger beroepsonderwijs (HTS, HAS etc.)
☐ Wetenschappelijk onderwijs (WO, Universiteit, PhD)

10. Wat is uw burgerlijke status?
☐ Single
☐ Getrouwd of geregistreerd partnerschap
☐ Gescheiden
☐ Weduwe/ weduwnaar

11. Hoe is uw woonsituatie
☐ Inwonend bij ouders of familie
☐ Studentenhuis
☐ Alleenwonend
☐ Samenwonend
☐ Samenwonend met kinderen
☐ Anders, nl:……

12. Wat is uw arbeidssituatie?
☐ Fulltime in loondienst
☐ Parttime in loondienst
☐ Bijbaan
☐ Eigen bedrijf
☐ Zoekende naar een baan
☐ Student

☐ Met pensioen
☐ Arbeidsongeschikt
☐ Vrijwilliger
☐ Anders, nl:……

Appendix 3: Explicit attitude

	Explicit attitude					
	Mean	Std dev	Std error	F	df	p
BURGER APPEARANCE						
Conventional	5.162	1.109	.152			
Vegetarian	5.063	.963	.134	.487	2	.615
Beetroot	4.966	.944	.132			
INFORMATION PROVISION						
Information provided	5.095	.916	.104	.140	1	.709
Information not provided	5.035	1.094	.124			
CATEGORIZATION PROCESS						
Assimilation	5.146	.941	.128			
Accommodation	5.313	.887	.222	.790	3	.501
Piecemeal processing	5.057	1.161	.232			
Self/social gratification	4.932	1.027	.132			
CATEGORIZATION SCHEMA						
Real meat	5.325	.972	.128			
Vegetarian	5.227	.820	.131			
Processed food	4.493	1.567	.472	3.539	4	.009
New category	4.793	1.006	.187			
Other	4.684	.784	.180			

Appendix 4: Randomization pilot study

Pilot resp	Group	Group #	0.939544	
1	1	1	0.689459	
2	3	5	0.986845	
3	3a	6	0.628824	
4	3	5	0.062994	
5	3a	6	0.954286	
6	1a	2	0.676273	
7	2	3	0.764683	
8	2a	4	0.376619	
9	1a	2	0.403075	
10	2a	4	0.487149	
11	1	1	0.799211	
12	2	3	0.863276	

Appendix 5: Randomization final study

respondent	group	group #	0.478583			
1	3a	6	0.872684			
2	2	3	0.64217			
3	2	3	0.902165			
4	2a	4	0.101546			
5	3	5	0.460417			
6	2a	4	0.598315			
7	3	5	0.222742			
8	3a	6	0.134147			
9	2	3	0.103427			
10	1a	2	0.481126			
11	2a	4	0.409241			
12	3a	6	0.050706			
13	1a	2	0.129364			
14	1	1	0.688244			
15	1	1	0.766455			
16	2	3	0.120695			
17	1a	2	0.573839			
18	1a	2	0.071851			
19	1a	2	0.616503			
20	2a	4	0.101812			
21	2	3	0.481017			
22	3a	6	0.740468			
23	2a	4	0.126878			
24	3	5	0.905143			
25	3	5	0.508672			
26	1a	2	0.568106			
27	3	5	0.882537			
28	2a	4	0.835262			
29	3	5	0.357775			
30	2	3	0.547859			
31	3	5	0.016398			
32	2	3	0.256874			
33	1	1	0.202255			
34	3	5	0.134457			
35	2	3	0.50949			
36	2a	4	0.929306			
37	1	1	0.203535			
38	2a	4	0.617638			
39	1a	2	0.5582			
40	2a	4	0.084699			
41	1	1	0.508203			
42	1a	2	0.218279			
43	1a	2	0.328302			
44	3	5	0.707971			
45	3	5	0.883495			
46	2a	4	0.483249			
47	1	1	0.411881			
48	3a	6	0.280304			

48	3a	6	0.595834			
49	1a	2	0.725946			
50	2	3	0.111854			
51	2	3	0.206081			
52	1	1	0.065233			
53	3a	6	0.491467			
54	3a	6	0.213883			
55	2	3	0.417618			
56	1a	2	0.214384			
57	3a	6	0.572785			
58	3a	6	0.815594			
59	2a	4	0.528147			
60	3a	6	0.932924			
61	2a	4	0.896581			
62	3a	6	0.02577			
63	1	1	0.575015			
64	2a	4	0.291468			
65	2	3	0.53705			
66	1a	2	0.118461			
67	2a	4	0.852784			
68	2a	4	0.270564			
69	3	5	0.342946			
70	3	5	0.102103			
71	3	5	0.942291			
72	2a	4	0.685277			
73	1	1	0.662414			
74	2a	4	0.374464			
75	3a	6	0.807782			
76	2a	4	0.343313			
77	2	3	0.917758			
78	3	5	0.843956			
79	3	5	0.004155			
80	3	5	0.505639			
81	2a	4	0.523034			
82	1	1	0.641422			
83	1a	2	0.834543			
84	1	1	0.985913			
85	3a	6	0.240349			
86	2	3	0.967325			
87	3a	6	0.572558			
88	3a	6	0.025019			
89	1a	2	0.641576			
90	1	1	0.198035			
91	3a	6	0.223911			
92	1	1	0.545567			
93	2	3	0.307316			
94	1a	2	0.594417			

95	2	3	0.248527			
96	1	1	0.385019			
97	1a	2	0.021229			
98	2	3	0.782083			
99	2	3	0.806176			
100	3	5	0.492371			
101	3a	6	0.823639			
102	2	3	0.108396			
103	3	5	0.38769			
104	3	5	0.499179			
105	1a	2	0.027825			
106	3	5	0.926024			
107	1a	2	0.89144			
108	3	5	0.921063			
109	3a	6	0.837119			
110	3a	6	0.142833			
111	1	1	0.395083			
112	3a	6	0.14581			
113	3a	6	0.253278			
114	2	3	0.47715			
115	3a	6	0.469655			
116	3a	6	0.659342			
117	2	3	0.133168			
118	2a	4	0.194955			
119	2a	4	0.497432			
120	1	1	0.312206			
121	2	3	0.866345			
122	1	1	0.895691			
123	2a	4	0.159802			
124	1	1	0.53341			
125	2	3	0.866637			
126	1a	2	0.693925			
127	3	5	0.585918			
128	1	1	0.008645			
129	1	1	0.484736			
130	3	5	0.277802			
131	1	1	0.519219			
132	3a	6	0.916911			
133	3	5	0.473394			
134	1	1	0.720925			
135	2a	4	0.747907			
136	3	5	0.518469			
137	2a	4	0.474031			
138	2a	4	0.696324			
139	1a	2	0.103485			

139	1a	2	0.20767			
140	1a	2	0.063073			
141	1	1	0.613054			
142	1a	2	0.23531			
143	1	1	0.552316			
144	1	1	0.422375			
145	2	3	0.002258			
146	1a	2	0.914422			
147	3a	6	0.757284			
148	1a	2	0.142215			
149	1a	2	0.929924			
150	3	5	0.48899			
151	2	3	0.201053			
152	1	1	0.863014			
153	2a	4	0.675588			
154	3a	6	0.667951			
155	1a	2	0.111287			
156	2	3	0.902171			