



UNIVERSITY OF TWENTE.

Faculty of Behavioural, Management and
Social Sciences

Attitudes towards in vitro meat and how they can be influenced

An online experiment in the German population using
Facebook-posts

Nina Brömmelhaus
B.Sc. Thesis
June 2017

Supervisors:
Dr. Margôt Kuttschreuter
Dr. Sven Zebel

Psychology of Conflict, Risk and Safety
Faculty of Behavioural, Management
and Social Sciences
University of Twente
P.O. Box 217
7500 AE Enschede
The Netherlands

ABSTRACT

Even though concerns about ethical, environmental and health-related issues have risen during the past years, the demand for meat is continuously rising due to the growing world population. Therefore, some alternatives to conventional meat production have been developed. One of these alternatives is in vitro meat, which is basically meat that has been grown in a lab. Since in vitro meat is a rather new and unknown alternative, a lot of research is still needed to find out what attitudes potential consumers hold towards the product and how these attitudes can be influenced. This study was therefore set up to explore general attitudes towards in vitro meat as well as to examine whether other people's opinions that are expressed through a Facebook-post have an influence on potential consumers' attitude. The study was set up in Germany using 133 participants who were divided into two experimental groups (provided with positive vs negative opinions) and a control group. Statistical analyses revealed that there was no significant effect of the Facebook-post on people's attitude. However, it was shown that the variables gender and frequency of meat consumption were rather good predictors of attitude. Males were shown to be more perceptive towards in vitro meat than were females and people who never or very seldom eat meat were shown to be more willing to try in vitro meat. Even though the study had some weaknesses, especially regarding the effect of the manipulation and a high mortality rate, it makes an important step and forms the basis for further research on the rather new topic of in vitro meat.

Keywords: in vitro meat, theory of planned behavior, attitude, social media

SAMENVATTING

Hoewel de zorg om problemen met betrekking tot ethiek, milieu en gezondheid steeds groter zijn geworden tijdens de afgelopen jaren, neemt de vleesconsumptie toe aangezien de wereld populatie steeds groeit. Daarom werden er enkele alternatieven tot conventioneel vlees ontwikkeld. Een van deze alternatieven is in vitro vlees. Dat beschrijft in principe vlees dat in een laboratorium wordt gemaakt. Aangezien in vitro vlees een redelijk nieuw en onbekend alternatief is, is er nog een grote behoefte aan meer onderzoek over de houdingen en meningen van mensen tegenover dit product en hoe deze worden beïnvloed. Deze studie was daarom uitgevoerd om zowel algemene attitudes tegenover in vitro vlees te onderzoeken als ook om uit te vinden of de meningen van anderen die via een Facebook-post geuit worden een invloed hebben op de attitudes van potentiële verbruikers. De studie was uitgevoerd met 133 Duitse respondenten die opgedeeld werden in twee experimentele groepen (en dus of negatieve of positieve meningen over in vitro vlees zagen) en een controle groep. Statistische analyses lieten zien dat er geen significant effect was van de Facebook-post op de attitude van de participanten. Het werd echter wel duidelijk dat de variabelen *geslacht* en *frequentie van vlees consumptie* redelijk goede voorspellers van attitude waren. Verder waren mannen eerder positief ingesteld tegenover het product dan vrouwen en mensen die nooit of bijna nooit vlees eten waren eerder geneigd om het te proeven. Hoewel de studie enkele zwakke punten had (vooral met betrekking tot het effect van de manipulatie en een best hoge uitvalpercentage) is het wel een belangrijke stap en vormt een goede basis voor verder onderzoek op het redelijk nieuwe onderwerp in vitro vlees.

Sleutelwoorden: in vitro vlees, theorie van gepland gedrag, houding, sociale media

Table of Contents

ABSTRACT	0
SAMENVATTING	1
1. INTRODUCTION.....	4
1.1 Consequences of high meat production and consumption	4
1.2 In vitro meat – an alternative to conventional meat?.....	5
1.3 Challenges to in vitro meat.....	6
2. THEORETICAL FRAMEWORK.....	7
2.1 Theory of Planned Behaviour.....	7
2.2 Attitude formation	8
2.3 Social influence on attitudes.....	9
2.4 The role of social media	9
2.5 The present study.....	10
3. METHOD.....	11
3.1 Design.....	12
3.2 Participants	12
3.3 Instruments	13
3.3.1 Perception of in vitro meat compared to conventional meat	14
3.3.2 Expected consequences of in vitro meat production	14
3.3.3 Willingness to try in vitro meat	15
3.3.4 Demographic variables.....	15
3.4 Procedure.....	16
3.5 Data analysis.....	17
4. RESULTS.....	18
4.1 Answering the sub-question	18
4.2 Testing the hypothesis	20
4.2.1 First variable.....	20
4.2.2 Second variable	20
4.2.3 Third variable	20
5. DISCUSSION	21
5.1 Answering the research question.....	21
5.1.1 Answering the sub-question	21
5.2 Possible explanations	23
5.2.1 Intervention	23

5.2.2 Research	23
5.2.3 Theory	24
5.3 Generalization issues	25
5.4 Conclusion/Recommendations for further research	25
REFERENCES	27
APPENDIX	31

1. INTRODUCTION

1.1 Consequences of high meat production and consumption

Especially in Western countries like Europe and the USA, the meat production has been increasing at a high rate due to the growing demand of meat. This development is likely to continue to do so in the future as well (McLeod, 2011).

Even though there is already a lot of evidence of negative impacts of meat production and consumption, the demand for meat is still high in many countries. Problematic issues regarding meat production and consumption are especially consequences for the consumers' health and the environment as well as ethical issues.

Especially in high-income countries like the USA and many European countries, the high meat consumption raises the chance for countless different health issues. It contributes to many foodborne and nutrition-related illnesses, cardiovascular diseases as well as other chronic diseases like diabetes mellitus and different types of cancer (Walker et al., 2005; Edelman et al., 2005). The same is the case for wealthy citizens in middle- or rather low-income countries who are adopting similar high-meat eating habits and therefore developing increased rates of many chronic diseases (Walker et al., 2005).

Furthermore, the high meat production of Western countries has a lot of consequences for the environment. In 2008, the production processes for meat products were already shown to account for between 15% and 24% of all current greenhouse gas emissions (Fiala, 2008). Also, meat production accounts for a great deal of more direct effects on the environment due to the extensive use of fertilisers and pesticides, an unsustainable resource use and an overall environmental pollution (Walker et al., 2005). Another issue that comes with an excessive meat production are ethical concerns with regard to the keeping and slaughtering of farm animals to produce meat. To reduce costs and meet the high demand for meat, these animals are often kept in horrific conditions (Mosel, 2001).

Due to these severe concerns, it is necessary to develop alternatives to conventional meat to account for the severe problems surrounding conventional meat production and consumption as well as to meet consumers' growing demand for meat. This study discusses in vitro meat as a possible alternative and explores the attitude of German citizens towards in vitro meat in general. Furthermore, an experiment is set up in which it is tested to what extent the opinions of others displayed in the form of a Facebook-post can influence these attitudes.

The case of in vitro meat as an alternative to conventional meat will be discussed in the following.

1.2 In vitro meat – an alternative to conventional meat?

Even though meat has enjoyed – and is still enjoying – great popularity, consumers' concern regarding these issues have risen during the past years (Edelman et al., 2005). Therefore, scientists have developed different ideas of how to solve these problems but still meet the populations' high demand for meat. One of the most recent alternatives that have therefore been developed is in vitro (or synthetic) meat. In vitro meat describes a method of producing meat synthetically. Stem cells derived from farm animals are cultured inside a bioreactor by the use of advanced tissue engineering techniques. Therefore, it is also called “cultured meat” (Bhat, Kumar, & Bhat, 2017).

Some scientists believe that in vitro meat could be the solution to the major challenges our society faces with regard to the impacts of meat consumption and production. One of these is that consumers want the meat industry to reduce any discomfort on farm animals or even avoid killing animals for meat at all. The production of in vitro meat offers a great advantage since the keeping and slaughter of farm animals becomes unnecessary. This alternative therefore also wins the favour of animal rights activists due to its animal-friendlier meat production (Bhat, Kumar, & Fayaz, 2015).

Furthermore, many citizens want to reduce the negative impacts on our environment through excessive meat production (Hocquette et al., 2015). A study of Tuomisto and Texeira de Mattos (2011) using life cycle assessment (LCA) research method showed that in vitro meat production is way more efficient by using only a small percentage of the resources that are needed for conventional meat production. According to the results, the production of 1000kg cultured meat would require about 7%-45% less energy (with poultry being the only meat production requiring less energy than in vitro production) and 78%-98% lower GHG emissions. Furthermore, the use of land would be reduced by 99% and use of water by around 82-96%. By drastically decreasing the amount of farm animals, the threat of antibiotic-resistant pathogen strains and massive methane emissions – which contribute greatly to global warming - could also be limited to a minimum (Bhat, Kumar, & Fayaz, 2015). These results are strong evidence that the overall environmental impacts could actually be reduced by producing in vitro meat instead of conventional meat production.

In vitro meat as a new way of meat production not only help to support environmental but also health advantages. Since the conditions in the production process are constantly

controlled and manipulable, in vitro meat can be produced chemically safe and disease-free (Bhat, Kumar, & Bhat, 2017). It could therefore be a safer alternative to conventional meat and avoid many health issues like nutrition-related and foodborne illnesses (Bhat, Kumar, & Fayaz, 2015). Another aspect that has become of great importance is that there is a feed the world's population by increasing protein sources while the population has grown rapidly and is predicted to do so in the future (Hocquette et al., 2015).

However, even though there are a lot of benefits that come with in vitro meat as an alternative to conventional meat, this rather new approach faces some difficulties which are discussed in the following.

1.3 Challenges to in vitro meat

Edelman et al. already stated in 2005 that the techniques that are necessary for the production of in vitro meat were not beyond imagination. It is also stated however, that these techniques are only able to produce boneless meat like hamburger or sausages. The production of higher structured meat like steak is too complex.

One important factor that also has to be taken into consideration is the attitude of potential consumers towards in vitro meat. A study by Wilks and Phillips (2017) with U.S. citizens made a first step into examining people's general attitudes towards synthetic meat. They found that most people were actually willing to try it but only few participants were actually willing to eat it regularly or as a replacement for conventionally farmed meat. This was mainly due to concerns about higher prizes, expected limited taste and appeal and especially the belief that in vitro meat would be unnatural.

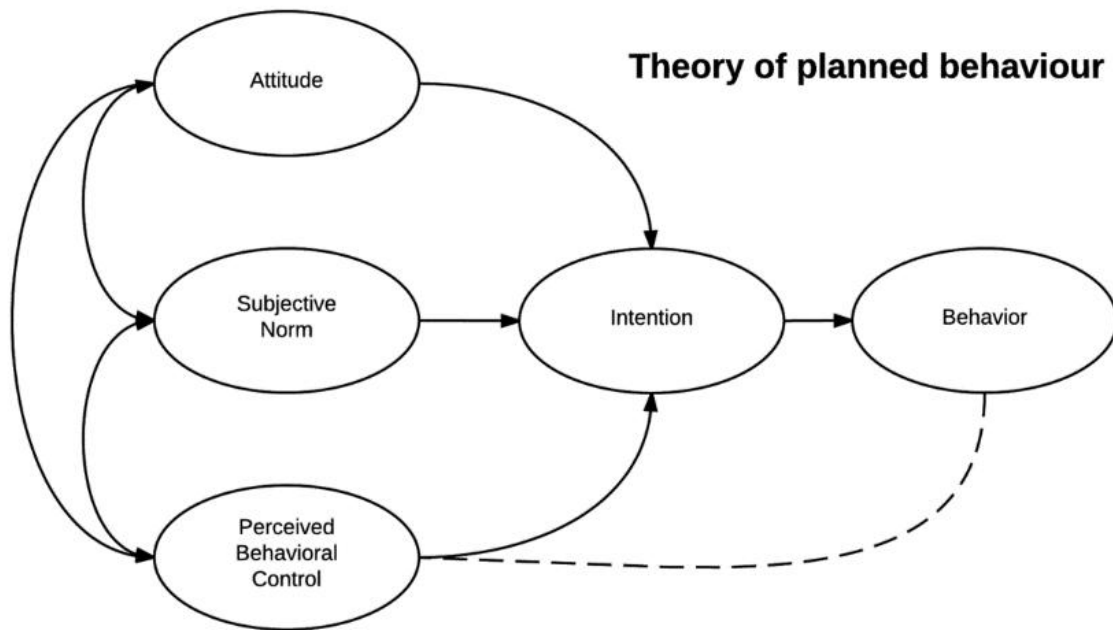
It seems that, even though the production of in vitro meat is theoretically possible, it faces greater technical as well as financial challenges. Furthermore, the attitude of many people towards synthetic meat seems to be rather sceptical with regard to its health impacts, naturalness and influences on traditional agriculture. However, there is evidence that people are not entirely negative towards the consumption of in vitro meat. To be able to set the production up on an industrial level, this research is therefore set up to find out how consumers perceive in vitro meat and how these views are influenced. Since it is important to consider which factors have an influence on potential consumers' purchasing and consumption behaviour, one has to understand what actually determines someone's behaviour.

2. THEORETICAL FRAMEWORK

2.1 Theory of Planned Behaviour

One model that tries to describe the processes that influence behaviour is depicted by Ajzen (1991): The Theory of Planned Behaviour. This theory has already been used in the past to explain eat meat eating behaviour (Povey, Wellens, & Conner, 2001). According to this theory, behaviour is based on people's intention to perform a specific behaviour, such as buying in vitro meat. These intentions are influenced by three different factors which are believed to operate independently from each other. The first factor is attitude and refers to the views that a person holds about a specific behaviour. This basically includes the degree of how favourable or unfavourable the behaviour in question is thought to be. The second predictor of human behaviour is a factor termed social norm. This determinant refers to the perceived social pressure of performing or not performing a certain behaviour. The third determinant that has an influence on an individual's behaviour is the degree of perceived behavioural control. This term refers to the degree to which an individual thinks performing a certain behaviour is actually within his or her control (Ajzen, 1991). These three factors usually work together and each have an influence on the intention someone has to act in a certain way. They are believed to be rather independent from each other and their relative importance can vary across different situations and behaviours. In one context, one of the factors might be sufficient for an individual to perform a certain behaviour, in another context two or even all three factors might make contributions to intentions (Ajzen, 1991).

Figure 1
Theory of Planned Behaviour (Ajzen, 1991)



2.2 Attitude formation

Even though all of these three determinants do have an influence on the behavioural intention and eventually on someone's behaviour, it has been shown in the past that attitude is often the main factor for an individual to follow. Defining the term "attitude" has been an ongoing issue for at least about a decade. Today, most have accepted the view of attitude being an "evaluative integration of cognitions and affects experienced in relation to an object" (Crano, 2008). An attitude therefore integrates, summarizes and evaluates cognitive reactions. The intensity of an attitude can vary depending on the situation and the object the attitude is referring to, in this case a certain behaviour.

Based on this assumption, the theory of planned behaviour states that the more favourable someone's attitude is, the stronger an individual's intention should be to perform a certain behaviour (Ajzen, 1991). However, the model does not fully capture how attitudes are formed. Research on behavioural science has indicated that additionally to the three proximal determinants there are several distal determinants as well which can influence behaviour indirectly by influencing the proximal determinants. One example hereof is given by Fishbein and Ajzen (1977), who state that an attitude is developed from the beliefs that people hold about the object the attitude is about. This basically means that we form an attitude towards an object based on certain attributes we ascribe to it, like other objects, characteristics

or events. However, in case of the attitude towards a behaviour, the beliefs that someone owns connect the behaviour to a specific outcome or other attributes that are already labelled positively or negatively. Therefore, a simultaneous attitude is formed immediately. By this process, an attitude towards a behaviour is formed based on how desirable the expected consequences of performing said behaviour are.

2.3 Social influence on attitudes

However, the beliefs someone has about a specific behaviour are not the only factor to influence attitude. There has been a lot of research in the past showing that people's perceptions of how others think about a specific subject can greatly influence one's own attitude towards this subject as well. This is basically described as social influence (Raven, 1964). Research on social influence has come up with the view of a dual-motive scheme regarding how others can influence an individual's attitude. This scheme differentiates between information influence and normative influence. Informational influence basically involves the acceptance of information that has been provided by others as a fact of reality. Normative influence on the other hand refers to the conformity with positive expectations of another group, person or one's self. One reason to conform to normative concerns is that people usually want to ensure a satisfying relationship with others regarding potential rewards or punishments they can provide (Wood, 2000). According to Wood, people tend to adopt an induced behaviour of others when they hope to receive a favourable reaction and gain a specific reward by conforming. These findings are in line with a study of Norton et al. (2003) who found that people are likely to change their attitudes when they witness members of important social groups display behaviour that is inconsistent with their former attitude.

2.4 The role of social media

In today's time, one of the most obvious types of social influence is provided by social media. With millions of users worldwide, social media platforms like Facebook, Youtube, Instagram or Twitter present unlimited means to interact with each other as well as to present and share any content with other users (Muntinga, Moorman & Smit, 2011). Among these platforms, Facebook is currently the most used one among adults with 73% of all adult profile owners having a Facebook profile. Furthermore, 48% have a Myspace-profile and 14% a profile on LinkedIn (Lenhart, Purcell, Smith, & Zickuhr, 2010). Regarding the exponential increase of the popularity of these platforms in the past years, a lot of research has been done

on its potential influences on users. The majority of users act passively and use social media mainly as a source of information (Romero et al., 2016). There has been some research indicating that social media platforms do indeed have an influence of their users' attitudes. However, a lot is still to be investigated regarding this issue.

2.5 The present study

Due to the lack of research and the current relevance of social media and interest in alternative meat production, a study was set up to find out more about how these factors are related. This study focuses on potential in vitro meat consumers in Germany. It was chosen for this target group since the demand for meat alternatives has been risen significantly during the past years in Germany, making the outcomes of this study relevant for producers and consumers likewise. Furthermore, like in most countries in the past years, social media plays an important role in the society, which puts the focus on its influence on people's attitudes (Duggan & Brenner, 2013).

The purpose of this study is to explore the general attitudes towards in vitro meat in the German society as well as to what extent the attitude of others expressed on social media influence these attitudes. Therefore, the following research question is put into focus: *“What are German citizens' general attitudes towards in vitro meat and how do other people's opinions that are shared on social media influence these attitude?”* The first part of this question is of explorative nature. This study aims at finding out more about how in vitro meat is viewed in the German population by therefore answering the following sub-question:

Explorative question

“How do German citizens view in vitro meat in general and how are these views distributed across the German population?”

Therefore, a questionnaire has been employed to measure people's general attitudes towards in vitro meat.

The second part of the research question is of inferential nature and aims at directly testing the influence of people's opinions on participants' attitudes. Therefore, a Facebook-post with corresponding comment that expressed either a positive or a negative attitude towards in vitro meat were employed. It was chosen to imitate a post on Facebook due to Facebook's incomparable popularity in Western countries. By using this approach, it was examined if the exposure to other people's opinion about in vitro meat influence participants'

attitudes, meaning that a positive formulation will lead to positive attitudes and negative formulation leads to negative attitudes. Therefore, the following hypothesis was formulated:

Hypothesis

“Participants who see the positive Facebook-post will have a more positive attitude and participants who see the negative Facebook-post will have a more negative attitude towards in vitro meat compared to conventional meat than people who do not see any Facebook-post at all.”

To examine the research question, the determinant “attitude” is split into two factors that are expected to provide an accurate representation of someone’s attitude towards in vitro meat. These factors are “perception of in vitro meat compared to conventional meat” and “expected consequences of in vitro meat production”. Based on the Theory of Planned Behaviour, it is also expected that someone’s attitude has an influence on one’s behavioural intention. The behavioural intention that is of special interest with regard to the case of in vitro meat is if people would actually have the intention of buying in vitro meat. Therefore, a third factor was established which is believed to give additional value to people’s attitude, described as “willingness to try in vitro meat”.

Since it has been shown that attitude has a strong influence on someone’s behavioural intention, it is expected that these three factors are correlated and therefore summarized in one hypothesis that includes the two attitude-related factors “perception of in vitro meat” and “expected consequences of in vitro meat” as well as the behavioural intention “willingness to try in vitro meat”. Since attitude has however been shown to have a strong influence on behavioural intention, the factors have been summarized as “attitude” to simplify the hypothesis.

3. METHOD

The experiment that has been conducted in the course of this study was checked and approved beforehand by the Ethical Commission.

3.1 Design

To test the hypothesis and answer the research question, a quantitative approach has been used. Therefore, an experiment was employed in this study. To examine people's attitudes towards in vitro meat, a questionnaire was used which measured different aspects. The design that was employed in this study was a between-subjects design with two experimental conditions as well as one control condition. As independent variable, opinions of others regarding in vitro meat with two levels (positive or negative) was used. The dependent variables are perception of in vitro meat as compared to conventional meat, willingness to try in vitro meat and expected consequences of in vitro meat production.

3.2 Participants

Participants were recruited online by convenience sampling. The link that led to the online survey was posted on social media (Facebook) as well as shared on WhatsApp by the researcher. Participants were also asked to share the link with their friends as well and spread it further to reach more responses.

In total, 241 respondents took part in the study. However, part of the participants did not meet the requirements for the analyses and were therefore eliminated. Apart from agreeing with the informed consent, finishing the whole questionnaire and being over the age of 18, participants had to pass a manipulation check to make sure they actually read the Facebook-post. This was done by means of two control questions after presenting the Facebook-post in the two experimental conditions. These questions asked what the main subject of the post was (in vitro meat) and whether the post and the comment actually had the same opinion on the topic (they did). Participants who did not answer both of the questions right were excluded from the analyses as it was concluded they did not read the post attentively and the manipulation therefore could not work.

After eliminating every participant who did not meet the requirements, a number of 133 cases left for the analyses. 65.4% (=87) of the participants were female and 34.6% (=46) were male. The age of the participants ranged from 18 to 90 with a mean age of 34.75 ($SD=13.79$). In the positive condition, there were 23 females and 14 males whose age ranged from 20 to 90 with a mean age of 36.43 ($SD= 17.22$), in the negative condition there were 19 females and 7 males whose age ranged from 19 to 53 with a mean age of 30.92 ($SD= 11.05$) and in the control condition there were 45 females and 25 males whose age ranged from 18 to 57 with a mean age of 35.28 ($SD= 12.54$). Randomisation checks were executed using

ANOVAs and Chi-Square tests which showed that randomisation worked and participants were distributed evenly across the three conditions regarding gender [$X^2(2)=.88, p=.64$], age [$F(2, 129) = 1.33, p=.26$], eating behaviour [$X^2(2)=.88, p=.64$], political affiliation [$F(2, 120)=.86, p=.42$] and frequency of meat consumption [$X^2(10)=7.75, p=.65$].

There were a few requirements that had to be met in order for the participants to be eligible to take part in the study. First of all, respondents had to be 18 years or older. Furthermore, the study aimed at people living in Germany. Therefore, participants had to be fluent in the language, since the questionnaires were presented in German. To get a view as broad as possible, there were no further restrictions on the participation in the study. Participation was entirely voluntary and participants could withdraw at any time without indicating a reason. The names of the participants are kept anonymous due to privacy reasons.

3.3 Instruments

In all of the three conditions, the online experiment contained a questionnaire to measure people's general attitude towards in vitro meat. In the two experimental conditions, the survey also included a Facebook-post and a corresponding comment which showed either positive or negative opinions regarding in vitro meat. These Facebook-posts were included to represent the independent variable "opinions of others regarding in vitro meat".

The items that were used were based on the survey set up and tested by Wilks and Phillips in 2017. This questionnaire was mainly adopted in its original form. However, a few changes were made to adjust the survey to the goals of the study. First of all, the study aimed solely at the German population. To get a view as broad as possible of the society, it was therefore chosen to translate the whole questionnaire to German so that people of all ages and educational backgrounds were able to take part in the study. The items were translated in a way that assured the meaning to be as close as possible to the original items but also to be easily comprehensible for every participant.

Except for the open questions, the questions were summarized based on the three factors they were expected to measure. Furthermore, these questions were changed to statements and arranged in question blocks which measured people's answers by means of a 5-point Likert-type scale, ranging from "Strongly disagree" to "Strongly agree". The survey also included some demographic question as well as questions about participants' meat consumption habits. To present the survey more clearly and to ensure the possibility for each participant to complete the survey with full concentration entirely, as few items as possible

were used. Before participation, respondents had to agree with an informed consent which provided basic information about the background of the study but however did not reveal the actual research question to avoid any influence on the participants beforehand. Furthermore, the informed consent stated that participation was entirely voluntary and withdrawal from the study was possible at any time without the need to give any reasons. It was also ensured that the data was treated anonymously and would not be shared with anyone but the research team. The entire questionnaire is included in the Appendix.

3.3.1 Perception of in vitro meat compared to conventional meat

The first part of the questionnaire measured the factor “perception of in vitro meat as compared to conventional meat”. In the current study, the items in this subscale were exerted to assess people’s thoughts about in vitro meat, especially when it comes to a comparison with conventional meat. Examples of items from this subscale are “In vitro meat is healthier than conventional meat” or “In vitro meat is more appealing than conventional meat”. In total, this subscale consisted of eight items. Inter-item consistency was calculated for this subscale and was considered average (*Cronbach’s* $\alpha = .72$). It was decided to delete the item “The production of in vitro meat would be more expensive than conventional meat production” to improve the inter-item consistency (*Cronbach’s* $\alpha = .77$). Furthermore, the variable is normally distributed as shown by the Shapiro-Wilk-Test ($W=.970$; $p<.005$).

3.3.2 Expected consequences of in vitro meat production

The second part of the questionnaire measured the factor “expected consequences of in vitro meat production”. This factor aimed at assessing what consequences people expect of the production of in vitro meat regarding animal welfare, world hunger or agriculture. These are all factors that had been identified in earlier research as potential (positive and negative) outcomes of in vitro meat production (Wilks & Phillips, 2017). Some items from this subscale were “In vitro meat will improve animal welfare conditions” and “In vitro meat will be able to solve world famine problems”. In total, this subscale consisted of seven items. Inter-item consistency for this subscale was calculated and considered questionable (*Cronbach’s* $\alpha = .67$). The item „In vitro meat will encourage the possibility that humans could be eaten, i.e. cannibalism could occur” was deleted to improve inter-item consistency (*Cronbach’s* $\alpha = .73$). Furthermore, this variable is not normally distributed as shown by the Shapiro-Wilk-Test ($W=.98$; $p<.082$).

Lastly, the questionnaire contained some demographic questions to inquire the participants' gender, age, political affiliation, educational background and frequency of Facebook usage to be able to make sense of the collected data. This information was needed as background variables. The questionnaire also included two open questions asking why people would not be willing to try in vitro meat and lastly, if they have any concluding thoughts or comments regarding the study.

3.3.3 Willingness to try in vitro meat

The third part of the questionnaire measured the factor "willingness to try in vitro meat". This factor aimed at assessing to what extent people would be willing to try in vitro meat if it was accessible in supermarkets and butchers. Examples of items from this subscale are "I would be willing to eat in vitro meat regularly" or "I would be willing to eat in vitro meat as a substitute for conventional meat". In total, this subscale consisted of five items. Inter-item consistency for this subscale was calculated and considered very good (*Cronbach's* = .88). Furthermore, this variable is normally distributed as shown by the Shapiro-Wilk-Test ($W=.96$; $p<.001$).

3.3.4 Demographic variables

The demographic questions that were used to answer the explorative part of the research question were presented after participants filled in the attitude questionnaires. This was done because participants might be reluctant to the measuring instrument when being reminded of sensitive and personal items beforehand. Another issue might be that it does not allow participants to immediately start answering substantial items, which might reduce the response rate (Colton & Covert, 2007). The demographic part included questions about age, gender, educational background as well as political orientation. Educational background was measured by asking participants to indicate their highest level of completed education, presenting different German educational levels ranging from "no education" (1) to "university/college" (7) as well as the option "other" (8). Political affiliation was measured on a continuous scale ranging from "left" (1) to "right" (7), asking participants to indicate their political orientation.

3.4 Procedure

The questionnaire was generated with the online programme Qualtrics and then shared and spread via social media (Facebook and Whatsapp). This was done by using the anonymous link to the online survey that was provided by Qualtrics. It was chosen for this approach since the goal was to get a broad impression of the general opinions people have towards in vitro meat. By means of an online survey, the possibility of reaching a large amount of respondents is increased.

Participants clicked on the shared link to be directed to the survey. After agreeing with the terms provided in the informed consent, the questionnaire started. Participants were asked a few multiple choice questions about their meat consumption. Following this, participants were asked how familiar they are with in vitro meat and if they actually knew what in vitro meat is. Afterwards, a short explanation was provided to inform participants about the product regardless their previous knowledge before taking part in the actual experiment. After this short informative text, the Facebook-post (positive or negative) was provided in the experimental conditions. Participants were asked to read the post and the corresponding comment carefully. Afterwards, two control questions were asked to make sure that participants actually read the post. The Facebook-post and control questions were not included in the control condition.

Subsequently, the three subscales were presented in all of the conditions, measuring people's perception of in vitro meat compared to conventional meat, respondents' willingness to try in vitro meat as well as the consequences people expected from in vitro meat production in the future. Subsequently, participants had the chance to share any thoughts or comments on the topic or the questionnaire before answering some demographic questions. The last page included the debriefing. It revealed the background of the study as it was the aim to find out if other people's opinions that are shared on social media do have an influence on an individual's attitude towards in vitro meat. Furthermore, the e-mail address of the researcher was presented and participants were invited to establish contact in case they had any further questions.

The data was saved online automatically by the programme Qualtrics and downloaded after data collection was finished. In the following, the statistical programme SPSS was used to analyse the collected data.

3.5 Data analysis

Data was analysed by exporting the collected data from Qualtrics and then analysing it by using the statistical programme SPSS.

Before the actual analyses could be done to answer the research question, the variables that represent the three factors had to be defined. Therefore, the items of each of the three tables were merged together to create a measurement for each of the three variables. For example, the eight items of the first subscale that measured participants' perception of in vitro meat compared to conventional meat were merged to create the new variable "perception_of_IVM". This was done for each of the three factors. These new variables were then used for the analyses of the hypothesis. Some of the items also had to be recoded. Furthermore, it was tested for Normality with the Shapiro-Wilk-Test for all of the three variables. Even though the test showed that the sample was not normally distributed for the variable "expected consequences of in vitro meat production", a parametric test was used as well. This was done because the sample size of 136 participants seems to be sufficient to use parametric tests. Also, non-parametric tests have the issue of lacking test power.

To answer the first part of the research question and explore the general attitude of the German population towards in vitro meat, an independent samples t-test was first executed to test for differences between males and females. Furthermore, it was tested for differences in attitude regarding age and political affiliation of the participants. However, since it has been shown that age and political affiliation are often correlated (Cornelis, Van Hiel, Roets, & Kossowska, 2009), a multiple regression analysis was executed to control for interaction. Also, it was tested whether there was a difference in attitude based on how often participants ate meat. This was done by conducting a one way ANOVA. Lastly, it was investigated whether there were any differences regarding participants' educational background. Since it has been shown that educational background is often correlated with political affiliation (Lottes & Kuriloff, 1994), an analysis of covariance (ANCOVA) was conducted to control for any interaction effects.

To answer the second part of the research question, the hypothesis was tested that participants who see the positive Facebook-post will have a more positive attitude and participants who see the negative Facebook-post will have a more negative attitude towards in vitro meat compared to conventional meat than people who do not see any Facebook-post at all. Therefore, a One Way ANOVA with the condition as fixed factor and the three variables "perception of in vitro meat compared to conventional meat", "willingness to try in vitro meat" and "expected consequences of in vitro meat production" as dependent variables was

used to test the hypothesis by comparing the means across the positive, negative and control condition.

4. RESULTS

4.1 Answering the sub-question

To answer the question how German citizens view in vitro meat in general and how these views are distributed across the German population, some explorative analyses have been executed.

Firstly, it was tested whether the three variables differed based on participants' gender by conducting an independent samples t-test. The analyses showed that the mean scores for perception of in vitro meat were indeed significantly higher for males ($M=3.38$, $SD=.61$) compared to females ($M=3.12$, $SD=.59$); $t(131)=2.41$, $p=.017$. It was also shown that the mean scores for expected consequences were higher for males ($M=3.34$, $SD=.74$) than for females ($M=3.07$, $SD=.63$), $t(131)=2.18$, $p=.016$. However, the difference between males ($M=3.08$, $SD=1.03$) and females ($M=2.96$, $SD=1.04$) was not significant for participants' willingness to try [$t(131)=.60$, $p=.27$]. These values are presented in Table 1. It can therefore be concluded that overall males have a more positive perception of in vitro meat and expect the consequences of its production to be more positive.

Table 1

Descriptive statistics regarding Gender

Variable	Male		Female		t	p
	Mean	SD	Mean	SD		
Perception	3.38	.61	3.12	.59	2.41	.017
Expected consequences	3.34	.74	3.07	.63	2.18	.016
Willingness to try	3.08	1.03	2.96	1.04	.60	.27

Secondly, it was tested if age and political affiliation (left to right) of the participants were somehow related to the three variables. Therefore, a multiple regression analysis was conducted. In the course of this analysis, a non-significant regression equation was found for perception of in vitro meat [$F(2, 120)=1.67, p=.19$] with an R^2 of .03. It was shown that neither age ($\beta =.16, p=.08$) nor political affiliation ($\beta =.04, p=.66$) had any influence on participants' perception of in vitro meat. For the expected consequences of in vitro meat, also a non-significant regression equation was found [$F(2, 120)=.19, p=.83$] with an R^2 of .00. It was shown that neither age ($\beta =.01, p=.94$) nor political affiliation ($\beta =.06, p=.55$) had an influence on the expected consequences of in vitro meat production. The same analysis was executed for the third factor, willingness to try. In the course of this analysis, a non-significant regression equation was found for willingness to try in vitro meat [$F(2, 120)=1.02, p=.36$] with an R^2 of .02. It was shown that neither age ($\beta =.13, p=.16$) nor political affiliation ($\beta =-.02, p=.79$) had any influence on participants' willingness to try in vitro meat. The analyses indicated that there was no interaction effect between the demographic variables age and political affiliation.

Thirdly, to test if there were any differences in participants' attitudes based on how often they were eating meat, a one way ANOVA was conducted for each of the three variables. The analyses did not show any significant differences between the groups regarding participants' perception of in vitro meat [$F(5, 127)=.39, p=.85$] or the expected consequences of in vitro meat production [$F(5, 127)=.46, p=.80$]. However, the analysis showed that there was indeed a correlation between people's willingness to try in vitro meat, with people eating meat less than once a year or never being more willing to try it [$F(5, 127)=2.64; p=.026$]. It can therefore be concluded that participants who never or almost never eat meat were more willing to try the product if it was available for them.

Lastly, it was tested if participants' attitudes differed based on their educational background. To control for the interaction with political affiliation, an ANCOVA was conducted for every of the three variables with educational background being the fixed factor and political affiliation being the covariate. In the course of this analysis, no significant differences were found between the different levels of education regarding the perception of in vitro meat [$F(5, 116)=1.35, p=.24$]. The difference also was not significant regarding the expected consequences [$F(5, 116)=1.09, p=.36$] or participants' willingness to try in vitro meat [$F(5, 116)=1.96, p=.08$].

4.2 Testing the hypothesis

In the analyses, the dependent variable “attitude” was split and each of the three factors was tested separately. By doing so, it was possible to make assumptions for each of the variables independently.

4.2.1 First variable

To test if participants in the positive condition would have a more positive perception and participants in the negative condition would have a more negative perception of in vitro meat compared to conventional meat than people in the control condition, a One Way ANOVA was executed. It was found that there was no significant difference between the three groups [$F(130)=.069$; $p=.933$]. This means that neither did people who saw the positive Facebook-post have a more positive perception, nor did people who saw the negative Facebook-post have a more negative perception of in vitro meat compared to conventional meat than people in to the control condition. This part of the hypothesis was therefore rejected.

4.2.2 Second variable

To test if participants in the positive condition expected the consequences of in vitro meat production to be more positive and participants in the negative condition expect the consequences of in vitro meat production to be more negative than people in the control condition, a One Way ANOVA was executed. It was shown that there was no significant difference between the three groups [$F(130)=.087$; $p=.917$]. This means that neither did people who saw the positive Facebook-post expect the consequences of in vitro meat production to be more positive, nor did people who saw the negative Facebook-post expect the consequences to be more negative than people in the control condition. This part of the hypothesis was therefore rejected.

4.2.3 Third variable

To test if participants in the positive condition would be more willing and participants in the negative condition would be less willing to try in vitro than people in the control condition, a One Way ANOVA was executed. It was shown that there is no significant difference between the three groups [$F(130)=.519$; $p=.597$]. This means that neither were people who saw the positive Facebook-post more willing, nor were people who saw the

negative Facebook-post less willing to try in vitro meat than people in the control condition. This part of the hypothesis was therefore rejected.

Regarding these analyses, it can be seen that no significant differences were found for any of the three variables. The hypothesis was therefore rejected.

5. DISCUSSION

5.1 Answering the research question

5.1.1 Answering the sub-question

This study aimed at investigating how in vitro meat is perceived in Germany and to what extent social influence has an impact on people's attitudes. Therefore, the research question that formed the basis of this study was "*What are German citizens' general attitudes towards in vitro meat and how do other people's opinions that are shared on social media influence these attitude?*" The first part of this question was of explorative nature and aimed at finding out how German citizens view in vitro meat in general and how these views are distributed across the German population. Therefore, the differences regarding the variables gender, age, political affiliation and educational background were investigated. The results showed that the gender of the participants did indeed have a strong influence on attitudes towards in vitro meat. Males did not only have a more positive perception of in vitro meat compared to conventional meat than women, they also expected the consequences of in vitro meat production to be more positive than did female participants. This is in line with research of Wilks and Phillips (2017), who in their study also found that men were more receptive towards in vitro meat than females. This could possibly be explained by men having an overall more positive attitude towards meat in general because it is associated with being masculine and vegetarians or vegans are regarded as weaker (Ruby & Heine, 2011; Thomas, 2016). Another possible explanation could be that males are in general more open towards new technologies than are females (Elliott & Hall, 2005).

In a second account, the frequency of meat consumption of participants was shown to be a reliable predictor of their willingness to try in vitro meat. It was found that participants who ate meat only once a year or never were more willing to try in vitro meat if it

was commercially available. This is in line with findings of Wilks and Phillips (2017) who found that vegetarians and vegans perceived in vitro meat to be more natural and more appealing than conventional meat. Research of Mitte and Kämpfe-Hargrave (2007) has shown that ethical concerns are the reason for about 63% of the German vegetarians to choose for a meatless diet. This could be a possible explanation as to why vegetarians are willing to try in vitro meat: since the concern of reducing animal suffering is the most important factor for them.

Furthermore, it was tested whether there was a difference in people's attitudes based on of age, educational background and political affiliation of the participants. However, the results showed that neither of the three variables had any statistical influence on any of the three factors. This partly contradicts the findings of Wilks and Phillips (2017), of whom the original questionnaire used in this study is derived. They found that left-winged participants were more likely to regard in vitro meat as more ethical and more natural than did rather right-winged participants. However, their findings were in line with the results of this study regarding age and educational background, as they also did not find these two variables to be a reliable predictor of attitude towards in vitro meat. It was expected that political affiliation might interact with each of the other two factors since age and educational background have been shown to correlate with political affiliation (Cornelis, Van Hiel, Roets, & Kossowska, 2009; Lottes & Kuriloff, 1994). However, such interaction effects were not found.

5.1.2 Investigating the hypothesis

In the course of answering the research question, it was expected that participants who saw the positive Facebook-post would have a more positive attitude and participants who saw the negative Facebook-post would have a more negative attitude towards in vitro meat compared to conventional meat than people who did not see any Facebook-post at all.” Looking at the analyses, it is shown that there was not found any support for the hypothesis which was therefore rejected. It was shown that the opinions that were presented in the experimental manipulation did not have any influence on how positive or negative participants' attitudes towards in vitro meat were. This was contrary to what was expected since previous research has shown that social influence has a very strong impact on people's attitudes (Crano, 2008). Furthermore, Facebook was believed to be a strong transmitter of other people's opinions as it has been shown that most people use social media mainly as a source of information and to interact with others (Romero et al., 2016; Muntinga, Moorman & Smit, 2011).

5.2 Possible explanations

5.2.1 Intervention

One possible explanation that there was no support of the hypothesis found could be explained by a failed intervention. Norton et al. (2003) who stated that people mainly adopt the attitudes of members of groups that are important to them. In line with this, there has been research indicating that people tend to adopt beliefs and behaviours more if these are displayed by members of groups they identify with (Brewer, 2001). The Facebook-post that was used in this study however was created with fictive names that participants would not feel related to in any way. It is therefore possible that the manipulation has failed due to a lack of identification of participants with the creator and commentator presented in the Facebook-post. Possibly the manipulation would be strengthened if it was simulated to be a post created by someone the participants can identify with so that they would be more likely to adopt that person's attitude.

5.2.2 Research

Another possible explanation of why there was no support found for the hypothesis could be that questionnaire had some weaknesses. Some of the items were formulated ambiguously and therefore made it difficult for participants to choose an answer. Most of the people who gave a comment on the questionnaire criticised that they sometimes did not know what to answer because they were not sure how to interpret the question. An example for a possibly ambiguous question is "In vitro meat will increase the amount of happy animals in the future". One could think that since less animals would have to suffer due to a possible reduction of conventional meat production, one would agree on this statement. However, since the reduction of conventional meat production would mean that less animals are needed, this would lead to less animals at all and therefore also to less happy animals. Inconsistencies like this seem to have made it difficult for people to answer and therefore made them choose the middle between two extreme possible answers.

Another striking issue that has to be discussed is the rather high mortality rate that has been reported in this study. From originally 241 participants, only the data of 136 could actually be included in the analyses. The high mortality rate in the control conditions lead to very small groups, which goes at the expense of the reliability of the results. Even though some of these participants were eliminated from the research due to being underage or

because they did not finish the whole survey, most of them were excluded because the control questions were not answered correctly. This raises some concerns about to what extent the content of the control questions was appropriate for the participants. The two control questions were included to check if participants in the experimental conditions had actually read the Facebook-post. Testing this is essential to make sure the manipulation is actually understood correctly.

One possible explanation why a large amount of respondents could not answer them correctly is that the multiple choice answers were ambiguous. In the first question it was asked what the main topic of the Facebook-post was. The right answer was *in vitro* meat, but the other possible answers (health, agriculture and animal welfare) were also mentioned in the post. It might therefore have confused people since all of the subjects were mentioned in the post to some extent.

The second question asked if the ones who created and who commented the post actually had the same opinion. A fair amount of participants indicated to be not sure if they were, indicating that the formulations were not clear enough for people to realize they were actually representing the same opinion.

However, it was decided to still exclude participants who answered the questions wrong from the analyses to make sure everyone who was included actually read the post and therefore received the manipulation. In a future research, it would be advisable to place the Facebook-post and the control questions on the same page so that people have the chance to reread the post when they realise they did not fully understand it while trying to answer the control questions.

5.2.3 Theory

A third aspect that has to be taken into consideration is that the theory might not have worked as expected. The theory of planned behaviour, based on which the research was conducted, states that people's attitudes are a strong predictor of their intention to perform a certain behaviour, and therefore ultimately have an influence on said behaviour. In the course of this study it was explored that attitude and behavioural intention however did not always showed the same picture of participants' attitudes. With regards to for example gender and frequency of meat consumption, the behavioural intention (*willingness to try in vitro meat*) was rather different from the two factors that accounted directly for people's attitude (*perception of in vitro meat* and *expected consequences of in vitro meat production*). It might therefore be the case that attitude as a proximal determinant and the intention to perform a

certain behaviour are not as strongly correlated as the theory of planned behaviour suggests.

However, since in vitro meat is not commercially available, the actual purchasing and eating behaviour regarding in vitro meat cannot be assessed yet. It should therefore be the goal of future research based on the theory of planned behaviour to investigate to what extent people's attitude towards in vitro meat actually will influence their purchasing and eating behaviour.

5.3 Generalization issues

When analysing the results, it should also be taken into account that the sample was not representative for the average German population. This is especially pointed out by the fact that there are a lot more women than men and that almost all of the participants had a high educational background (Abitur or higher). Furthermore, most participants were between 18 and 30. This was the case since the study was executed by Bachelor students who mainly spread the online survey among people in their environment, which were therefore also mainly young and had a high educational background. It has been shown in the past that people with a high educational background are rather sceptical towards artificial meat (Hocquette et al., 2015). Even though this could not be proven in the present study, it would be interesting in the future to recruit a more representative sample so that the attitude towards in vitro meat can be examined across different levels of education.

Another factor that had an influence on the sample's representation was the frequency of Facebook usage due to the fact that the link to the online experiment was mainly shared on Facebook. This is however a strong aspect since the study aimed at measuring the influence of a Facebook-post. By spreading it on Facebook it was made sure that especially people who would come in contact with such a post in their everyday life are reached.

5.4 Conclusion/Recommendations for further research

Since the production of in vitro meat is quite a new technology, there has not been a lot of research on this topic. This study therefore makes a step forward to form a broader basis of research on in vitro meat and provide a deeper insight into its image and acceptance in public.

However, this study has to deal with a few issues that were previously discussed to help optimize further research on in vitro meat. It is of special importance to employ a strong manipulation that is sure to actually represent the research question and to make sure it is

clearly understood by participants. This could for example be done by creating an online post that has been written by someone that participants can actually relate to and identify with rather than some unfamiliar user. However, since it raises the concern of to what extent participants should be deceived in the course of a study. Furthermore, the questionnaire that was used has to be slightly changed to make some of the items less ambiguous and clearer to answer. This could be done by reformulating some of the items so that it is clear which side they point to. This would make it easier to form an opinion about the item and would prevent participants from systematically picking the middle answer. However, since it was shown that the variables that were measured were well represented by the scales that have been formed, it is recommended to adapt the survey in the presented form.

This study provides new insights on the topic and contributes to a broad basis for studies with regards to in vitro meat. Since society's view on in vitro meat production and consumption is an important factor for a possible implementation in our diet, further research on this topic is highly recommended. Investigating the possibility of in vitro meat to satisfy the growing demand for meat as well as to account for severe problems concerning conventional meat production is an important step towards optimizing a sustainable food production in the future.

REFERENCES

- Ajzen, I. (1991). The theory of planned behaviour. *Organizational behaviour and human decision processes*, 50(2), 179-211. doi: 10.1016/0749-5978(91)90020-T
- Ajzen, I., & Fishbein, M. (1977). Attitude-behavior relations: A theoretical analysis and review of empirical research. *Psychological bulletin*, 84(5), 888. doi:10.1037/0033-2909.84.5.888
- Bhat, Z. F., Kumar, S., & Bhat, H. F. (2017). In vitro meat: A Future animal-free harvest. *Critical reviews in food science and nutrition*, 57(4), 782-789. doi:10.1080/10408398.2014.924899
- Bhat, Z. F., Kumar, S., & Fayaz, H. (2015). In vitro meat production: Challenges and benefits over conventional meat production. *Journal of Integrative Agriculture*, 14(2), 241-248. doi:10.1016/S2095-3119(14)60887-X
- Brewer, M. B. (2001). Ingroup identification and intergroup conflict. *Social identity, intergroup conflict, and conflict reduction*, 3, 17-41.
- Colton, D., & Covert, R.W. (2007). *Designing and constructing instruments for social research and evaluation*. San Francisco, CA: John Wiley and Sons, Inc.
- Cornelis, I., Van Hiel, A., Roets, A., & Kossowska, M. (2009). Age differences in conservatism: Evidence on the mediating effects of personality and cognitive style. *Journal of personality*, 77(1), 51-88. doi:10.1111/j.1467-6494.2008.00538.x
- Crano, W. D. (2008). *Attitudes and attitude change*. R. Prislin (Ed.). Psychology.
- Duggan, M., & Brenner, J. (2013). *The demographics of social media users, 2012* (Vol. 14). Washington, DC: Pew Research Center's Internet & American Life Project. Retrieved from http://www.nwnjsbdc.com/upload/PIP_SocialMediaUsers%20Demographics%202012.pdf
- Edelman, P. D., McFarland, D. C., Mironov, V. A., & Matheny, J. G. (2005). Commentary: In

- vitro-cultured meat production. *Tissue engineering*, 11(5-6), 659-662. doi: 10.1089/ten.2005.11.659
- Elliott, K. M., & Hall, M. C. (2005). ASSESSING CONSUMERS' PROPENSITY TO EMBRACE SELF-SERVICE TECHNOLOGIES: ARE THERE GENDER DIFFERENCES?. *Marketing Management Journal*, 15(2).
- Fiala, N. (2008). Meeting the demand: An estimation of potential future greenhouse gas emissions from meat production. *Ecological Economics*, 67(3), 412-419. doi:10.1016/j.ecolecon.2007.12.021
- Hocquette, A., Lambert, C., Siquin, C., Peterloff, L., Wagner, Z., Bonny, S. P., ... & Hocquette, J. F. (2015). Educated consumers don't believe artificial meat is the solution to the problems with the meat industry. *Journal of Integrative Agriculture*, 14(2), 273-284. doi: 10.1016/S2095-3119(14)60886-8
- Lenhart, A., Purcell, K., Smith, A., & Zickuhr, K. (2010). Social media and young adults. *Pew Internet & American Life Project*, 3. Retrieved from <https://pdfs.semanticscholar.org/129a/0f41c36f09edf863c664abb3e445070e5fc5.pdf>
- Lottes, I. L., & Kuriloff, P. J. (1994). The impact of college experience on political and social attitudes. *Sex Roles*, 31(1), 31-54. doi:10.1007/BF01560276
- McLeod, A. (2011). *World livestock 2011-livestock in food security*. Food and Agriculture Organization of the United Nations (FAO). Retrieved from <https://www.cabdirect.org/cabdirect/abstract/20113401059>
- Mitte, K., & Kämpfe-Hargrave, N. (2007). Vegetarierstudie der Friedrich-Schiller-Universität Jena.
- Mosel, A. (2001). What about Wilbur-Proposing a Federal Statute to Provide Minimum Humane Living Conditions for Farm Animals Raised for Food Production. *U. Dayton L. Rev.*, 27, 133. Retrieved from <https://www.animallaw.info/article/what-about-wilbur-proposing-federal-statute-provide-minimum-humane-living-conditions-farm>

- Muntinga, D. G., Moorman, M., & Smit, E. G. (2011). Introducing COBRAs: Exploring motivations for brand-related social media use. *International Journal of advertising*, 30(1), 13-46. doi:10.2501/IJA-30-1-013-046
- Norton, M. I., Monin, B., Cooper, J., & Hogg, M. A. (2003). Vicarious dissonance: attitude change from the inconsistency of others. *Journal of personality and social psychology*, 85(1), 47. doi:10.1037/0022-3514.85.1.47
- Povey, R., Wellens, B., & Conner, M. (2001). Attitudes towards following meat, vegetarian and vegan diets: an examination of the role of ambivalence. *Appetite*, 37(1), 15-26. Retrieved from http://fewd.univie.ac.at/fileadmin/user_upload/inst_ethik_wiss_dialog/Povey_R_2001_Atitudes..._meat__vegetarian__vegan.pdf
- Raven, B. H. (1964). *Social influence and power*. CALIFORNIA UNIV LOS ANGELES.
- Romero, D. M., Galuba, W., Asur, S., & Huberman, B. A. (2011, March). Influence and passivity in social media. In *Proceedings of the 20th international conference companion on World wide web* (pp. 113-114). ACM. doi:10.1007/978-3-642-23808-6_2
- Ruby, M. B., & Heine, S. J. (2011). Meat, morals, and masculinity. *Appetite*, 56(2), 447-450.
- Thomas, M. A. (2016). Are vegans the same as vegetarians? The effect of diet on perceptions of masculinity. *Appetite*, 97, 79-86.
- Tuomisto, H. L., & Teixeira de Mattos, M. J. (2011). Environmental impacts of cultured meat production. *Environmental science & technology*, 45(14), 6117-6123. doi:10.1021/es200130u
- Walker, P., Rhubart-Berg, P., McKenzie, S., Kelling, K., & Lawrence, R. S. (2005). Public health implications of meat production and consumption. *Public health nutrition*, 8(04), 348-356. doi:10.1079/PHN2005727
- Wilks, M., & Phillips, C. J. (2017). Attitudes to in vitro meat: A survey of potential consumers in the United States. *PLoS One*, 12(2), e0171904. doi:10.1371

/journal.pone.0171904

Wood, W. (2000). Attitude change: Persuasion and social influence. *Annual review of psychology*, 51(1), 539-570. doi:10.1146/annurev.psych.51.1.539

APPENDIX

Questionnaire

Attitudes towards in vitro meat

Q52 Vielen Dank für Ihre Teilnahme an meiner Studie. Ich studiere Psychologie im dritten Jahr an der University of Twente (Niederlande) und schreibe zurzeit meine Bachelorarbeit zum Thema Fleischproduktion. Der Zweck dieser Studie Diese Studie hat das Ziel herauszufinden wie Fleischkonsum im Allgemeinen und insbesondere eine neue Fleischproduktionsmethode in der Gesellschaft wahrgenommen werden. Nutzen und Risiken bei der Teilnahme Dadurch dass Sie an dieser Studie teilnehmen helfen Sie der Wissenschaft besser zu verstehen, wie die Öffentlichkeit neue potenzielle Methoden der Fleischproduktion wahrnimmt. Es gibt keine Risiken bei der Teilnahme dieser Studie, die über die des Alltags hinausgehen. Teilnahme und Abbruch Die Teilnahme an dieser Umfrage ist gänzlich freiwillig und anonym. Außerdem können Sie ohne Angabe von Gründen zu jeder Zeit aufhören. Was umfasst diese Studie? Die Teilnahme erfordert Antworten auf Online-Fragen und dauert ungefähr 5 - 10 Minuten. Da diese Umfrage sich mit Meinungen beschäftigt, gibt es keine richtigen oder falschen Antworten. Ich bitte Sie daher, die Umfrage so ehrlich wie möglich auszufüllen und bei Unsicherheiten so gut wie möglich zu schätzen. Datenschutz und Sicherheit Alle Informationen die in dieser Studie gesammelt werden sind selbstverständlich vertraulich. Sie werden nicht aufgefordert, Ihren Namen oder irgendwelche anderen Daten anzugeben mit denen Sie identifiziert werden können. Alle Fragebögen werden nummeriert, wobei diese Nummern in keiner Weise mit den Teilnehmern dieser Umfrage verbunden sind. Die Daten werden nur durch das Forschungsteam eingesehen und werden nicht verfügbar gestellt für irgendeine Person außerhalb dieses Teams. Die Daten aus dieser Studie werden ausschließlich zu Forschungszwecken benutzt.

Q4 Ich habe die Bedingungen der Studie gelesen und verstanden. Ich verstehe, dass die Teilnahme zu 100% freiwillig und anonym ist und ich zu jeder Zeit aufhören kann.

- Ja (1)
- Nein (2)

Condition: Nein Is Selected. Skip To: End of Survey.

Q45 Bitte lesen Sie sich den folgenden Facebook-Post und den dazugehörigen Kommentar sorgfältig durch.



The image shows a screenshot of a Facebook post. At the top, there is a profile picture of a person and the name **Linda Bußkamp**. The post text reads: "Hey Leute! Habt ihr schon mal was von In-Vitro-Fleisch gehört? Ich finde, dass das eine total gute Alternative zu "normalem" Fleisch ist. Es hat viel weniger negative Auswirkungen auf unsere Gesundheit und ist viel umweltschonender. Außerdem ist es ethisch vertretbarer, weil dafür keine Tiere getötet werden. Was haltet ihr davon?". Below the text are the interaction options: "Like · Comment · 30 minutes ago · [share icon]". Underneath the post, it says "22 people like this.". Below that is a comment from **Michael Heine** with the text: "Ja, das stimmt! In-Vitro-Fleisch ist eine viel gesündere, tier- und umweltfreundlichere Alternative zu konventionellem Fleisch. Ich hoffe, es ist bald im Handel erhältlich!". The comment has "11 minutes ago · Like · [like icon] 7". At the bottom, there is a text input field with the placeholder "Write a comment ...".

Q39 Worum ging es in dem gezeigten Facebook-Post hauptsächlich?

- Landwirtschaft (1)
- Gesundheit (2)
- In-Vitro-Fleisch (3)
- Tierschutz (4)

Q40 Waren diejenige, die den Post online gestellt hat, und derjenige, der geantwortet hat, einer Meinung?

- Ja (1)
- Nein (2)
- Ich bin mir nicht sicher (3)

Q46 Bitte lesen Sie sich den folgenden Facebook-Post und den dazugehörigen Kommentar sorgfältig durch.



Linda Bußkamp

Hey Leute! Habt ihr schon mal was von In-Vitro-Fleisch gehört? Ich finde, dass das einfach nicht richtig ist. Es verstößt gegen die Natur und ist bestimmt auch nicht so ansprechend wie normales Fleisch. Außerdem würde die Produktion von In-Vitro-Fleisch nur der Landwirtschaft schaden. Was haltet ihr davon?

Like · Comment · 30 minutes ago · 🌐

👍 22 people like this.



Michael Heine Ja, das stimmt! Es ist weder gesund noch irgendwie ansprechend und schadet nur unseren Landwirten.

11 minutes ago · Like · 👍 7



Write a comment ...

Q50 Worum ging es in dem gezeigten Facebook-Post hauptsächlich?

- Landwirtschaft (1)
- Gesundheit (2)
- In-Vitro-Fleisch (3)
- Tierschutz (4)

Q51 Waren diejenige, die den Post online gestellt hat, und derjenige, der geantwortet hat, einer Meinung?

- Ja (1)
- Nein (2)
- Ich bin mir nicht sicher (3)

Q53 Es folgen jetzt einige Fragen zu In-Vitro-Fleisch. Bitte lesen Sie sich die Aussagen sorgfältig durch und geben Sie jeweils an, inwieweit Sie ihnen zustimmen.

Q12 Haben Sie schon einmal von In-Vitro-Fleisch gehört?

- Ja (1)
- Nein (2)
- Ich bin mir unsicher (3)

Q13 Wissen Sie, was In-Vitro-Fleisch ist?

- Ja, definitiv (1)
- Ja, ich denke schon (2)
- Ich bin mir unsicher (3)
- Nein, ich denke nicht (4)
- Nein, definitiv nicht (5)

Q10 Wie ernähren Sie sich momentan?

- Ich esse Fleisch (1)
- Ich esse nur weißes Fleisch (Geflügel) (2)
- Pescetarisch (kein Fleisch, aber Fisch) (3)
- Vegetarisch (kein Tier) (4)
- Vegan (keine tierischen Produkte) (5)
- Anders, nämlich (6) _____

Q11 Wie oft essen Sie Fleisch?

- Täglich oder fast täglich (1)
- 2-3 Mal in der Woche (2)
- Maximal 1 Mal in der Woche (3)
- Maximal 1 Mal im Monat (4)
- Maximal 1 Mal im Jahr (5)
- Nie (6)

Q48 Bitte lesen Sie sich den folgenden Text sorgfältig durch. In-Vitro-Fleisch ist tierisches Fleisch, das niemals ein Teil eines lebenden Tieres war, sondern stattdessen im Labor aus Muskelstammzellen heranwächst. Diese Stammzellen werden den Tieren entnommen und im Labor vervielfacht (kultiviert). In-Vitro-Fleisch wird deshalb auch als kultiviertes Fleisch bezeichnet. Im August 2013 haben Wissenschaftler den ersten In-Vitro-Fleisch-Burgerpatty kreiert und probiert. Momentan ist In-Vitro-Fleisch nicht käuflich zu erwerben, doch es werden viele Studien durchgeführt, um es in Zukunft als Fleischproduktionstechnologie einzuführen.

Q41 Die nächsten Fragen beschäftigen sich mit Ihrer Wahrnehmung von In-Vitro-Fleisch und konventionell erzeugtem Fleisch. Seien Sie so ehrlich wie möglich, es gibt keine richtigen oder falschen Antworten!

	Ja, auf jeden Fall (1)	Ja, wahrscheinlich (2)	Unsicher (3)	Nein, wahrscheinlich nicht (4)	Nein, auf keinen Fall (5)
In-Vitro-Fleisch ist gesünder als konventionelles Fleisch. (1)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
In-Vitro-Fleisch ist natürlicher als konventionelles Fleisch. (2)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
In-Vitro-Fleisch ist umweltfreundlicher als konventionelles Fleisch. (3)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
In-Vitro-Fleisch ist ethisch vertretbarer als konventionelles Fleisch. (4)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
In-Vitro-Fleisch ist ansprechender als konventionelles Fleisch. (5)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
In-Vitro-Fleisch schmeckt besser als konventionelles Fleisch. (6)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
In-Vitro-Fleisch birgt ein geringeres Risiko auf vom Tier auf den Menschen übertragbare Krankheiten als konventionelles Fleisch. (7)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Die Produktion von In-Vitro-	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Fleisch wäre teurer als die konventionelle Fleischproduktion. (8)					
---	--	--	--	--	--

Q42 Für die nächsten Fragen stellen Sie sich bitte vor, dass In-Vitro-Fleisch kommerziell in Supermärkten und bei Metzgern erhältlich ist. Da dies (noch) nicht der Fall ist, geht es bei den folgenden Fragen lediglich um Ihre eigene Einschätzung. Wieder gibt es keine richtigen oder falschen Antworten!

	Ja, auf jeden Fall (1)	Ja, wahrscheinlich (2)	Unsicher (3)	Nein, wahrscheinlich nicht (4)	Nein, auf keinen Fall (5)
Ich wäre bereit, In-Vitro-Fleisch zu probieren. (1)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Ich wäre bereit, In-Vitro-Fleisch regelmäßig zu konsumieren, wenn es bezahlbar ist. (2)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Ich wäre bereit, In-Vitro-Fleisch als Ersatz für konventionelles Fleisch zu konsumieren. (3)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Ich würde In-Vitro-Fleisch anderen Fleischersatzprodukten (wie z.B. Soja) vorziehen. (4)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Wenn ich In-Vitro-Fleisch kaufen würde, wäre ich bereit, dafür einen höheren Preis zu zahlen als für konventionelles Fleisch. (5)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Q30 Warum würden Sie In-Vitro-Fleisch nicht probieren wollen? (Wenn Sie ohne Bedenken bereit wären In-Vitro-Fleisch zu probieren, können Sie diese Frage überspringen.)

Q31 Welche Sorten Fleisch essen Sie zurzeit? (mehrere Antworten möglich)

- Fisch und/oder Meeresfrüchte (1)
- Geflügel (2)
- Speck, Schinken und/oder Schwein (3)
- Rind (4)
- Pferd (5)
- Hund und/oder Katze (6)
- Andere, nämlich (7) _____
- Keine (8)

Q32 Welche Sorten Fleisch wären Sie bereit zu essen wenn es mit In-Vitro-Methoden hergestellt würde? (Mehrere Antworten möglich)

- Fisch und/oder Meeresfrüchte (1)
- Geflügel (2)
- Speck, Schinken und/oder Schwein (3)
- Rind (4)
- Pferd (5)
- Hund und/oder Katze (6)
- Andere, nämlich (7) _____
- Keine (8)

Q35 Die folgenden Fragen befassen sich mit den Konsequenzen der In-Vitro-Fleischproduktion. Auch hier geht es lediglich um ihre eigene Einschätzungen und es gibt daher keine richtigen oder falschen Antworten.

	Stimme sehr zu (1)	Stimme zu (2)	Teils/Teils (3)	Stimme nicht zu (4)	Stimme gar nicht zu (5)
In-Vitro-Fleisch wird die Anzahl glücklicher Tiere auf der Welt vergrößern. (1)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
In-Vitro-Fleisch wird die Möglichkeit fördern, dass Menschenfleisch gegessen werden kann (d.h. Kannibalismus könnte auftreten). (2)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
In-Vitro-Fleisch wird das Wohlergehen der Tiere verbessern. (3)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
In-Vitro-Fleisch	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

wird in der Lage sein, die Hungerprobleme auf der Welt zu lösen. (4)					
In Zukunft wird In-Vitro-Fleisch eine realisierbare Alternative zu konventionellem Fleisch darstellen. (5)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
In-Vitro-Fleisch wird die Auswirkungen der Landwirtschaft auf die globale Erwärmung reduzieren. (6)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Die Produktion von In-Vitro-Fleisch wird einen negativen Einfluss auf die traditionelle Landwirtschaft haben. (7)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Q36 Haben Sie abschließende Gedanken oder Anmerkungen zum Thema In-Vitro-Fleisch, die Sie uns gerne mitteilen würden?

Q38 Im Anschluss folgen noch einige kurze demographische Fragen.

Q8 Mein Geschlecht:

- Männlich (1)
- Weiblich (2)
- Andere, nämlich (3) _____

Q9 Mein Alter:

_____ Ich bin (1)

Q2 In der Politik wird in der Regel zwischen “Links” und “Rechts” unterschieden. Wo würden Sie sich einordnen?

	1 (1)	2 (2)	3 (3)	4 (4)	5 (5)	6 (6)	7 (7)	8 (8)	9 (9)
Links:Rechts (1)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Q5 In der Politik wird in der Regel zwischen liberalen und konservativen Werten unterschieden. Wo würden Sie sich einordnen?

	1 (1)	2 (2)	3 (3)	4 (4)	5 (5)	6 (6)	7 (7)	8 (8)	9 (9)
Liberal:Konservativ (1)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Q6 Was ist Ihr höchster beendeter (Schul-)Abschluss?

- Kein Schulabschluss (1)
- Grundschule (2)
- Hauptschulabschluss (3)
- Mittlerer Schulabschluss (Realschule oder vergleichbare Schulabschlüsse) (4)
- Fachhochschulreife (5)
- Abitur (6)
- Studium (7)
- Andere (8) _____

Q44 Wie oft nutzen Sie Facebook?

- Täglich oder fast täglich (1)
- 2-3 Mal in der Woche (2)
- Maximal 1 Mal in der Woche (3)
- Maximal 1 Mal im Monat (4)
- Maximal 1 Mal im Jahr (5)
- Nie (6)

Q37 Hintergrund dieser Studie Das Ziel dieser Umfrage war es, die allgemeine, öffentliche Wahrnehmung von In-Vitro-Fleisch herauszufinden. Des Weiteren soll getestet werden, ob die Meinung Anderer einen Einfluss auf die persönliche Haltung gegenüber In-Vitro-Fleisch hat. Wenn Sie einen Facebook-Post gesehen haben (mit positiven oder negativen Meinungen über In-Vitro-Fleisch) dann waren Sie in einer der experimentellen Gruppen. Haben Sie keinen Facebook-Post gesehen, dann waren Sie in der Kontrollgruppe. Durch ein gewisses Verständnis, wie die Öffentlichkeit denkt und wodurch dieses Denken beeinflusst wird, sollen eventuelle Barrieren identifiziert werden, die es verhindern, dass dieses Produkt zukünftig in die Gesellschaft integriert wird. Wenn Sie mehr über In-Vitro-Fleisch erfahren wollen oder Fragen bezüglich dieser Studie haben, wenden Sie sich gerne an n.brommelhaus@student.utwente.nl. Vielen Dank für Ihre Teilnahme!