


The effect of different claims on the expected quality of products produced in novel production systems.



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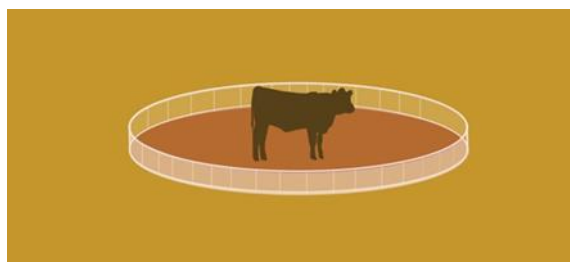
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ABSTRACT

In vitro meat has recently returned to the attention of the general public. Currently, the development of techniques to produce meat in laboratories is in a very early stage. However, despite possible advantages, the risks and uncertainty surrounding products such as in vitro meat often deter consumers from trying the product. By providing additional information on labels (a claim, a product cue) consumers may be informed about the benefits of in vitro produced meat even if they cannot observe them directly. However, many different factors such as the subject, format and believability of the claim can influence the effect the claim may have on the consumers' expectations and willingness to try. In this research paper we look at the effects of three different claims on the topics 'Food safety', 'Animal Welfare' and 'Environmental Friendliness' on the expectation of various product attributes and the willingness to try an in-vitro meat product amongst a small group of consumers in the Netherlands (N=76). In addition to the three claim subjects, the claim format was also varied by providing a comparative and non-comparative version in order to investigate the effect of claim format on the claim subject and the claims' believability. Unfortunately, the amount of respondents was lower than expected. While there was a weak effect of claims on two of the product attributes, other factors besides the claim subject and format proved to be as strong or a stronger influence on expected product attributes and willingness to try. Comparativeness had a small influence on the effect of claims on two of the attributes, but this was not consistent. Furthermore, while the claims did influence the product attributes, compared to a control which gave just a little bit of information, they negatively influenced expectations for expected Taste and Texture.

INTRODUCTION

In vitro meat, or meat that is produced in a laboratory from growing cells in culture, has recently come under the attention of the general public once more [A, B]. Currently, the development of techniques to produce meat in laboratories is in a very early stage. However, it is not difficult to imagine that this way of obtaining meat for human consumption may become viable in the future [1]. With a growing demand for meat due to the rising population and the increasing wealth of large portions of that population, in vitro meat may become an efficient way of producing animal protein products for consumption. Growing animal proteins inside a controlled environment may also have other possible advantages compared to conventional methods. Hygienic conditions can be monitored more closely during production, a better conversion rate of raw material to edible product can be realized, and it becomes possible to produce a more uniform end product that can be customized easily to the needs of the consumer [1].

However, despite possible advantages, the risks and uncertainty surrounding products such as in vitro meat often deter consumers from trying the product [2]. Consumers have negative associations with agro-biotechnology (such as in vitro produced meat) in general [3]. Food applications are also often expected to be more risky and having less benefit than using similar techniques in medical applications, further increasing any concerns consumers may already have about in vitro animal proteins [2, 4, 5]. Not only are the perceived risks of such novel production systems larger, but consumers associate conventional production methods with safe and healthy products [2]. Combined, this means that consumers are very likely to choose conventional products over new products, such as in vitro animal proteins. The bias towards the traditional product is further increased when the benefits of the novel product are not directly visible to the consumer. When there are no direct tangible benefits present, consumers are even willing to pay a price premium for the non-altered product [3]. Many of the advantages of in vitro meat are advantages in the production of in vitro meat over conventional meat production. These advantages are not directly observable to the consumer and thus must be conveyed through other means if in vitro meat is to stand a chance when competing with its traditional counterpart.

By providing additional information on labels (a claim, a product cue) consumers may be informed about the benefits of in vitro produced meat even if they cannot observe them directly. This approach has been successful before for GM products (another agro-biotechnology product). Providing additional information in this case was found to reduce the expected risk and increase acceptance of the product [3, 6]. The exact wording in which this information is presented also has an impact on consumer response [7, 8]. Changing the way a claim is phrased can also alter other attributes of the claim, for example, the believability and ease by which the claim is understood [9]. If the information is not perceived to be particularly believable, it influences the effect of the claim [10]. You can also change the claim by comparing the product to another product or brand from the same category. Since for in vitro meat, the major competition will be animal protein products produced by conventional means, a comparative claim (a claim that compares the product to another product) is an option. When a comparison is made, the claim is found to be more informative, and may increase the expected similarity between conventional and the novel product [11]. A comparative claim may thus lead to different results than a non-comparative one.

In order for label information (claims) to be used successfully, research is needed to determine which format works for claims that can help increase acceptance of agro-biotechnology products. Using claims on the favorable (but invisible in the final product) attributes, consumers may be swayed to perceive the quality of the novel product more favorably than they normally would.

AIM

The aim of this paper is to investigate how the content and form of claims influences the expected quality of an animal protein product produced in novel production systems. Using this information, we can start to answer the questions if and how label information can be a possible solution to ease the introduction of in vitro meat. Other 'foods of the future' will also benefit from this. Non-tangible benefits will be more important to consumers and producers alike, and understanding how these benefits can be successfully wielded to improve the competitive position of animal protein products produced in novel production systems will be useful during future introductions.

In this paper, the following **research question** will be answered;

'What is the effect of different claims on consumers' quality expectations of animal protein products produced in novel production systems and their willingness to try such products?

This research question is further split this up into 4 sub questions, each dealing with a specific subject that may influence the expected quality of a product.

Sub questions:

Q1: When provided with additional information (claims on animal welfare, environmental impact and health) are there changes in the expected quality of a product compared to when consumers do not have this information?

Q2: Is there a difference in the expected quality of a product when the claim is presented comparatively as compared to non-comparatively?

Q3: Does making the claim comparative negatively influence the believability?

Q4: Does the believability of the claim have an effect on the total expected quality of the product?

THEORY

In order to investigate our research questions, a model as shown in Figure 1 (next page) is proposed. For animal proteins produced in vitro to be able to compete with conventional animal protein products, its benefits must be made visible to the consumer [12]. These benefits that are hard to observe or verify on the final product are credence attributes [13]. Credence attributes influence among other factors, the expected quality of a product, which in turn influences intention to buy and finally the purchase of a product [4]. Credence attributes, such as safety, health, environmental factors and ethical factors are becoming increasingly important in this process [14, 15]. Providing a claim (a piece of information stating a benefit of the product) may make these credence attributes visible to the consumer. But the form of the claim is important; how the claim is phrased and what information is given changes the effect the claim has on the customers' perception of the product.

EFFECT OF CLAIMS

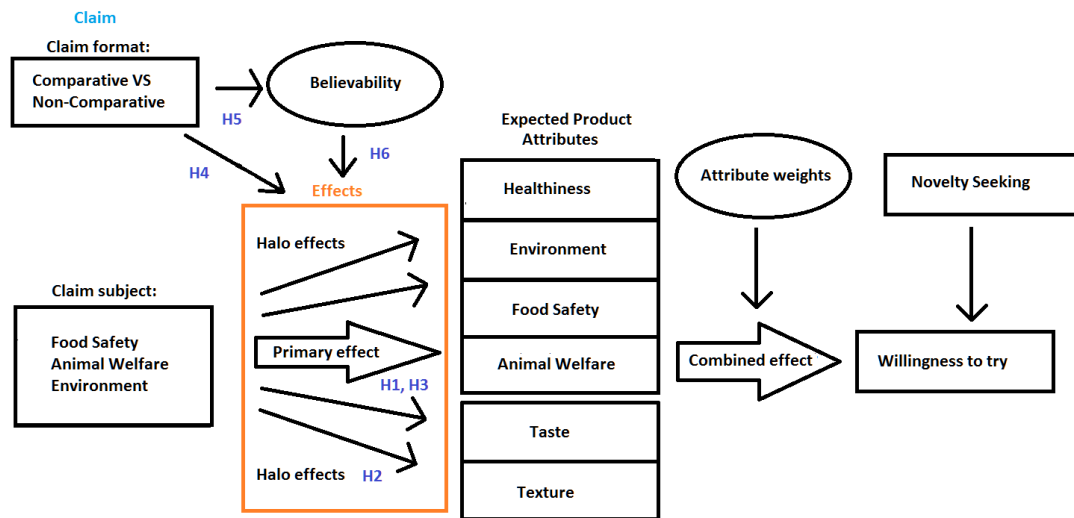


Figure 1: Proposed model for the effect of claims on the willingness to try.

In this model, the product claim becomes a 'cue' for a consumer; a piece of information about a (credence) product attribute. But consumers get more information from the claim than just the information on the label. When presented with a cue (in this case, the claim), it activates a schema of associations. This schema is built up out of many different cues, past experiences, and other associations they may have with the product [4]. This schema of different associations leads to certain expected product qualities of the product in the mind of the consumer. The process of identifying the given cue and the mental associations that follow is categorization, placing the product into a schema, so that it will easily trigger a set of relevant associations which will help in decision-making. Logically, a claim on a topic (such as the topic animal welfare) will have an effect on the related product attribute (such as the product attribute animal welfare). This leads us to Hypothesis 1:

Hypothesis 1: 'A claim topic has a direct positive effect on the expected product attribute that matches that claim topic.'

But because not just a single piece, but a whole schema is activated when processing such information, it will not only influence the attribute directly related to the claim but also others through associations. This change can be both positive and negative and depends on the individual associations of the consumer with that particular claim [16]. This happens, for example, when a customer believes that an animal protein product produced under good animal welfare conditions is tastier. When a cue is presented indicating good animal welfare conditions, the expected taste of the product also becomes positively influenced. It is also possible that a consumer assumes that because extra attention has gone into animal welfare, other attributes may not be cared for as much, leading to a negative association for other attributes created by the same cue. This leads to Hypothesis 2:

Hypothesis 2: 'A claim on one topic has a (positive or negative) halo effect on (some of) the expected product attributes the claim is not directly linked to.'

This halo effect is expected to be less strong than the direct effect, giving us Hypothesis 3:

Hypothesis 3: 'The effect of a claim is stronger on the expected quality attribute directly linked to it than on the other expected product attributes.'

The expected product attributes combined determine the total expected quality of the product, each weighed by the individual importance a customer gives that specific attribute (Even if an expected product attribute is rated very positive but does not play an important role in the consumer's decision-making process, it will not have a strong effect on the consumers' perception of the product). However, the total quality of a product is determined by many product attributes and associations, not only the ones included in the model. Therefore, we include Willingness to try in the model. The expected quality of the product is one of the factors that influences whether or not someone is willing to try and thus to buy the product is [4]. By also investigating the willingness to try of a product, it becomes possible to investigate the effect of the claim on not only of the consumer's opinion of the product, but also if this changes their behavior, i.e., if it makes them more likely to try or buy the product which would be the purpose of the claim.

Lastly, novelty seeking is added to the model. Novelty seeking is also a consumer trait that can have an effect on the willingness to try new products [17, 18]. It is included in the model because it is expected to play a large role in the consumers' willingness to try, independent of the claim used.

COMPARATIVE CLAIMS AND BELIEVABILITY

The effect of the claim may be changed by the phrasing of the claim. For in vitro meat, but also for any other known product produced by novel means, the major competition will be products produced by conventional means. Because of this a comparative claim (a claim that compares the product to another product) is an option. When a comparison is made, the claim is found to be more informative, and may increase the expected similarity between conventional and the novel product[11]. Reducing the expected differences between products produced in a novel way and products produced in the traditional way can help reduce the negative associations consumers may have. Furthermore, comparative claims may directly positively influence the opinion of the consumer, since future purchasing intention and purchasing behavior are both increased by comparative claims [19]. This gives us hypothesis H4:

Hypothesis 4: *'By changing the phrasing of the claim to be comparative, there is stronger effect of the claim on the product attributes.'*

But there are also downsides to comparative advertising. Compared to non-comparative advertising, comparative advertising can lead to reduced believability and a negative attitude towards the information given [11]. This leads to Hypothesis 5:

Hypothesis 5: *'Comparative claims have a lower believability than non-comparative claims.'*

If a claim is perceived to be not very believable, i.e. the consumer does not believe the claim to be true, or come from a trustworthy source, the effect of the claim may be diminished. When the consumer does not believe the claim is truthful, the claim will not be as likely to change the expected product quality for that consumer. Thus, the believability moderates the effects of the claim (both primary and halo effects) to be lessened when believability is low. This leads to our final Hypothesis 6:

Hypothesis 6: *'When the believability of a claim is low(er), the effect of that claim on the expected product attributes is reduced.'*

METHOD AND MATERIALS

In order to investigate our hypotheses, a questionnaire is used to get consumers' opinions on their meat consumption and expectations of in vitro meat. The setup is experimental, with 3x2 different conditions. Three different claims on three different subjects will be provided, as well as using comparative and non-comparative phrasing. The control (0, 0) will not give a claim and will therefore never be comparative.

In the questionnaire 3 different topics on which claims are provided, as well as a control condition in which only the text is provided. These claims are as follows for the different conditions:

Food safety: 'Labgrown meat is produced in more hygienic conditions.'

Environment: 'Labgrown meat production has lower CO2 emissions.'

Animal welfare: 'Labgrown meat production reduces the amount of animals killed for consumption'

This claim is either presented as-is, or instead of the period a comparison is added at the end. In case of a comparison, the claim is followed by '*compared to conventional meat products.*'. 'Conventional meatproducts' were chosen as comparative product, because it covers a wide range of products leaving room for associations by the consumer.

An example of the information with a comparative claim about 'Environment';

'By taking cells from animals and allowing them to multiply, meat products can be produced in a laboratory. This way of producing meat is still being developed, but such meat products are getting closer to being available to consumers such as yourself. Labgrown meat production has lower CO2 emissions than conventional meat products'

See appendix C and D for a complete document on all the different claims used and their translations.

SETUP

For this experiment, the online service QUALTRICS will be used to create the questionnaires and gather responses. We intended to create the most homogenous sample possible, because food preferences vary greatly between different cultures and countries. By only using people from a single geographical region or country, it will be easier to distinguish small effects of the claim from the natural occurring variation in our sample. Especially as it is expected the amount of respondents per condition will not be very large, this will help to increase the chance of finding good results. Dutch questionnaires were used to achieve this, as this restricts the respondents to those in the (local) Dutch population. See Appendix A and Appendix B for a complete Dutch version and an English translation of the questionnaire.

Respondents were approached in person by the author, including relatives and colleagues from the university, as well as over social networks online. This included fellow students, as well as family and coworkers.

The aim is to get at least 20 respondents per treatment. The conditions will be spread out evenly over the respondents. This is done using a setting in Qualtrics that equally distributes conditions. In total, there will be 7 treatments, a 3x2 design of claims and comparativeness and a control that receives neither.

QUESTIONNAIRE:

The first set of questions are about meat consumption. The first two questions of this set are to get a better idea of the respondents' meat consumption and if the respondent is the one making the purchasing decisions for their household. These questions are mostly there to introduce the respondent to the topic, and also to ease the consumer into the questionnaire with some easy to answer questions. These questions were also used to make sure there was no disproportionate amount of vegetarians or individuals who do not do any grocery shopping for themselves at all. This is followed by a series of questions (Q3 to Q8) on a seven point scale (not important – very important) to determine which attributes are used by the consumer to make his choices regarding the purchase of meat.

After the initial set of questions, an introduction on the topic follows. Because we do not wish to influence the previous set of questions in any way this will be provided after the initial questions are filled in on a different page of the online survey.

'By taking cells from animals and allowing them to multiply, meat products can be produced in a laboratory. This way of producing meat is still being developed, but is getting closer to being available to consumers such as yourself. [Claim]'

After this introduction a claim is provided. For the controls, there is no claim provided. After the claim, a second set of questions is given. The consumer is asked about their expectations of in-vitro meat, given the information provided (a seven point scale; very poorly – very good). These expectations will be compared between different claim topics and their comparativeness. The second section of questions also includes questions on the believability of the text and the understandability of the given information. If the text is too hard to understand the claim may not have the desired effect simply because it was not understood. Because the topic of in-vitro meat is slightly more technical, it is useful to see if the participant understood the text to allow us to later correct for this. We also check how believable they think the claim is. All questions are on a seven point scale (strongly disagree – strongly agree).

After the questions on in vitro meat, general questions follow on age, gender and if they are students. These questions will be used to see if there are any other general trends to take into account when analysing the final results.

NOVELTY SEEKING QUESTIONS

To test for novelty seeking behavior, we use the scale for food neophobia as used by Pliner and Hobden [20]. Neophobia is the aversion to new food items, so the opposite of novelty seeking. A high neophobia score would indicate a low novelty seeking score, and vice versa. The neophobia scale includes the following 10 questions on food preferences and willingness to try new foods (Table 1). Questions indicated with (R) are reverse scored. The questions are scored on a 5 point scale between strongly agree and strongly disagree.

Table 1: Neophobia questions. Questions indicated with (R) are reverse-scored.

1. I am constantly sampling new and different foods (R)
2. I don't trust new foods.
3. If I don't know what is in a food, I won't try it.
4. I like foods from different countries. (R)
5. Ethnic food looks too weird to eat.
6. At dinner parties, I will try a new food. (R)
7. I am afraid to eat things I have never had before.
8. I am very particular about foods I will eat.
9. I will eat almost anything. (R)
10. I like to try new ethnic restaurants. (R)

For the Dutch translation, we will be using the version as used by the Dutch national knowledge center for Child and youth psychiatrics [C].

ANALYSIS

In order to analyze the results we will be using the statistical program SPSS. ANOVA will be used to check for the effects of the claim topics (Control vs. scores with claim) and comparativeness, as well as including any other factors and covariables that may have an effect. This includes Novelty seeking and Believability. An alpha of 0.05 or 0.10 will be used in most cases, with any significance over 0.1 indicated in the results Tables. Believability was mean-centered and is a covariate that will be tested through an ANCOVA with the other two main effects. To test for internal consistency, SPSS will be used to calculate Cronbach's alpha for the 10 novelty seeking questions.

RESULTS

In total, we had 78 respondents. Two incomplete replies (more than half of the questions not answered) were removed from the sample, leaving 76 useable results. The mean age of our replies was 41, with the youngest person being 19 and the oldest 75. We had more women (48) than men (28). There were not as many Wageningen students in the sample as expected, as only N=3 was from Wageningen.

Unfortunately, we had less replies than we hoped for. In the end, we had only N=12 for the control and the following samples per manipulation (see Table 2). This results in 23 questionnaires with the food Safety claim subject, N=22 for the animal welfare claim subject, and N=19 for the environmental friendliness claim subject. In total, N=46 received a comparative claim, and N=30 received a non-comparative claim.

Table 2: Total N of questionnaires receiving specific combinations of claim and comparativeness.

Claim subject	Claim format		Total
	Non comparative	Comparative	
Control	12	-	12
Safety	12	11	23
Animal Welfare	11	11	22
Environment	11	8	19
Total	46	30	76

RESULTS – ATTRIBUTE SCORES

To test the first hypotheses an ANOVA was fitted with the claim subject and the claim format as fixed factors and believability as a covariable. Believability was centered, so that the results would reflect average believability. The results from the full analysis are shown in Table 3. A summary of the data used can be found in Table 4.

Table 3: results from full model with manipulation and comparativeness as fixed factors and believability as a covariable. Results with P < 0.1 are indicated in **bold** and **blue**. Expected attributes were scored on a 7-point scale.

	Dependent Variable	Df *	F	Sig.	Partial Eta Squared
Claim subject	FoodSafety	3	.688	.562	.031
	Environment	3	3.047	.035	.123
	Animal Welfare	3	3.580	.018	.142
	Taste	3	.187	.905	.009
	Healthiness	3	.969	.413	.043
	Texture	3	.724	.541	.032
Claim format	FoodSafety	1	.007	.933	.000
	Environment	1	.160	.690	.002
	Animal Welfare	1	.176	.676	.003
	Taste	1	1.763	.189	.026
	Healthiness	1	1.004	.320	.015
	Texture	1	.471	.495	.007
Believability	FoodSafety	1	5.496	.022	.078
	Environment	1	8.918	.004	.121
	AnimalWelfare	1	2.218	.141	.033
	Taste	1	3.495	.066	.051
	Healthiness	1	2.434	.124	.036
	Texture	1	1.972	.165	.029
Claim Subject * Claim format	FoodSafety	2	.189	.828	.006
	Environment	2	2.435	.096	.070
	Animal Welfare	2	.585	.560	.018
	Taste	2	.151	.861	.005
	Healthiness	2	.056	.946	.002
	Texture	2	.479	.621	.015
Claim Subject * Believability	FoodSafety	3	.689	.562	.031
	Environment	3	3.667	.017	.145
	Animal Welfare	3	3.994	.011	.156
	Taste	3	.465	.708	.021
	Healthiness	3	1.267	.293	.055
	Texture	3	1.524	.217	.066

*Error df= 65

Table 4: Means and standard deviations for all Claim formats and claim subjects for all product attributes. Attributes were scored on a 7-point scale.

Claim Subject	Claim Format									
	Comparative			Non Comparative			Total			
	Mean	SD	N	Mean	SD	N	Mean	SD	N	
Food Safety	Control	-	-	-	5.25	1.288	12	5.25	1.288	12
	Food Safety	5.45	1.036	11	5.17	1.337	12	5.30	1.185	23
	Animal Welfare	5.27	1.272	11	5.36	1.433	11	5.32	1.323	22
	Environment	5.00	1.309	8	5.27	1.849	11	5.16	1.608	19
	Total	5.27	1.172	30	5.26	1.437	46	5.26	1.330	76
Environment	Control	-	-	-	5.33	1.371	12	5.33	1.371	12
	Food Safety	5.91	1.136	11	5.25	1.215	12	5.57	1.199	23
	Animal Welfare	5.45	1.214	11	6.00	.894	11	5.73	1.077	22
	Environment	5.63	1.302	8	5.64	1.433	11	5.63	1.342	19
	Total	5.67	1.184	30	5.54	1.242	46	5.59	1.213	76
Animal Welfare	Control	-	-	-	6.58	.900	12	6.58	.900	12
	Food Safety	6.09	1.375	11	6.33	.778	12	6.22	1.085	23
	Animal Welfare	6.36	1.027	11	6.18	1.168	11	6.27	1.077	22
	Environment	6.00	1.773	8	6.00	1.897	11	6.00	1.795	19
	Total	6.17	1.341	30	6.28	1.223	46	6.24	1.264	76
Taste	Control	-	-	-	4.67	1.670	12	4.67	1.670	12
	Food Safety	4.09	1.300	11	3.67	1.073	12	3.87	1.180	23
	Animal Welfare	4.73	1.618	11	4.09	1.136	11	4.41	1.403	22
	Environment	4.25	.886	8	3.55	1.695	11	3.84	1.425	19
	Total	4.37	1.326	30	4.00	1.445	46	4.14	1.402	76
Healthiness	Control	-	-	-	4.83	1.467	12	4.83	1.467	12
	Food Safety	4.36	1.027	11	4.08	1.730	12	4.22	1.413	23
	Animal Welfare	4.82	1.168	11	4.36	1.027	11	4.59	1.098	22
	Environment	3.88	1.126	8	3.45	1.695	11	3.63	1.461	19
	Total	4.40	1.133	30	4.20	1.544	46	4.28	1.391	76
Texture	Control	-	-	-	4.58	1.730	12	4.58	1.730	12
	Food Safety	3.73	1.104	11	3.75	.754	12	3.74	.915	23
	Animal Welfare	4.45	1.036	11	3.64	1.502	11	4.05	1.327	22
	Environment	3.75	.886	8	3.45	1.572	11	3.58	1.305	19
	Total	4.00	1.050	30	3.87	1.455	46	3.92	1.304	76

The first question to be answered is **Hypothesis 1**: 'A claim topic has a direct positive effect on the expected product attribute that matches that claim topic.' Looking Table 3, there is a significant effect of claim subject on expected Environmental friendliness and expected Animal Welfare of the product (P= 0.035 and P=0.018). However looking at the boxplot (Figure 2) and the contrast (Table 5), it seems this is an overall effect of the three claims against the control, which scores worse overall. None of the claim subjects have a significant effect on the expected product attribute linked to it (see the green boxes in Table 5). Thus, Hypothesis 1 was rejected.

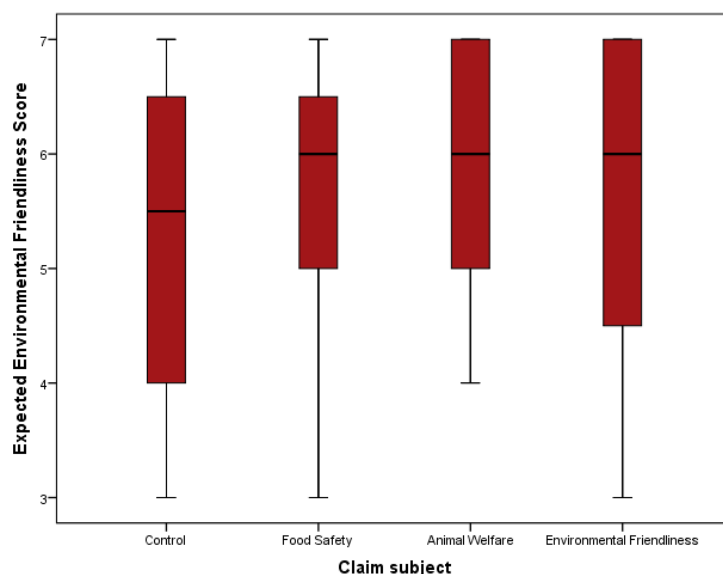


Figure 2: Boxplot showing the effect of manipulation on expected Environmental friendliness score.

Table 5: Simple contrasts for control versus the three manipulations for all 6 attributes tested for. Results with P<0.1 are indicated in **bold** and **blue**. The results for direct effects (see **hypothesis 1**) are indicated in green. Believability was not included in the model for this analysis.

		Food Safety	Environ-ment	Animal Welfare	Taste	Healthiness	Texture
Food Safety vs. Control	Contrast Estimate	.197	.252	-.371	-1.140	-.820	-.992
	Sig.	.738	.633	.504	.058	.163	.075
Animal Welfare vs. Control	Contrast Estimate	.205	.400	-.311	-.610	-.453	-.686
	Sig.	.730	.451	.578	.309	.441	.218
Environment vs. Control	Contrast Estimate	.023	.303	-.583	-1.121	-1.379	-1.129
	Sig.	.969	.558	.286	.058	.018	.040

The second question asked is **Hypothesis 2**: 'A claim on one topic has a (positive or negative) halo effect on (some of) the expected product attributes the claim is not directly linked to.'. While the claim subject may not have a direct effect on its matching expected attributes, it may have an effect on the other expected attributes. Since claim subject was significant for two attributes, the contrasts (Table 5) again provide clues. While none of the attributes directly linked to the claim subjects are significant, there seems to be an effect of the food safety and the environmental friendliness claim compared to the control group. There seems to be a negative effect of the claim about Food safety on expected taste and texture, and a negative effect of the Environmental friendliness claim on expected taste, healthiness and texture of the product.

These results lead to **Hypothesis 3**: 'The effect of a claim is stronger on the expected quality attribute directly linked to it than on the other expected product attributes.'. There appears to be a halo effect of two claim subject, as there is a significant negative effect of two claim subject on other product attributes. However, because there is no direct effect of the claims on the linked expected product attributes, the hypothesis is rejected. In order for the direct effect to be stronger than any halo effect, it needs to exist in the first place.

To answer Hypothesis 4: 'By changing the phrasing of the claim to be comparative, there is stronger effect of the claim on the product attributes.' the interaction between claim subject and claim format was investigated (Table 3). While no claim was one-sided significant (As a 'stronger' effect may be both positive and negative), one claim came close. The interaction between subject and format was two-sided significant on the expected Environmental friendliness. Looking at a graph of this interaction (figure 3) it becomes clear that for the first claim (food safety), the comparative claim is much more effective than the non-comparative claim, but that this effect is opposite for the second claim. For the third claim, it seems that Claim format has no effect. However, for this question we expected a positive effect of claim format (comparativeness) on the claim subjects. That does not seem to be the case for all three subjects. The positive effect of comparative claims only holds true for the claim subject Food Safety.

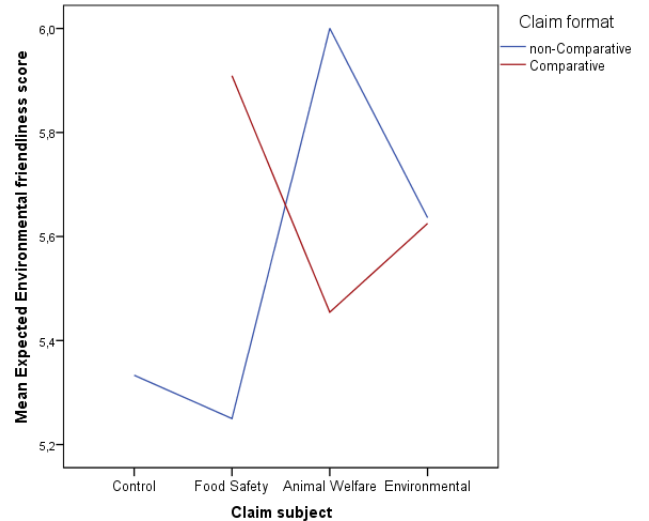


Figure 3: Interaction between claim format and subject on mean expected environmental friendliness score.

Looking further at the comparativeness, **Hypothesis 5** states 'Comparative claims have a lower believability than non-comparative claims.'. To test if believability was influenced by claim format, believability was fitted in an ANOVA with claim format as explaining variable. With Df= (1, 74) and F= 0.327, this proved not significant (P=0.569). There is no effect of comparativeness on the believability of the claim.

Finally, this brings us to **Hypothesis 6**: 'When the believability of a claim is low(er), the effect of that claim on the expected product attributes is reduced.'. This hypothesis states there is an interaction between believability and claim subject. There are two significant interactions between claim subject and believability, for environmental friendliness and Animal welfare (Figure 3A and 3B).

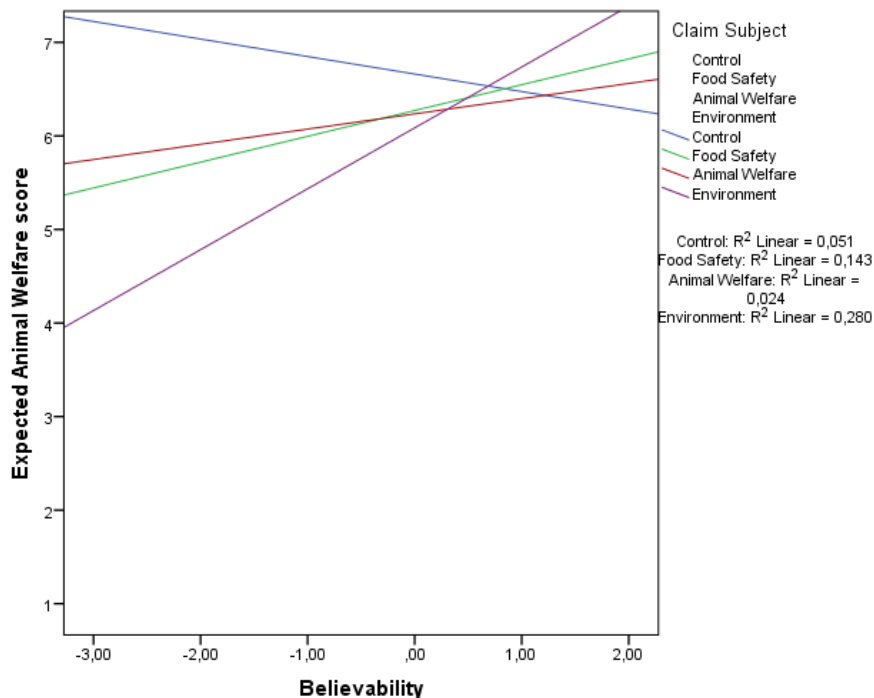


Figure 3A: The interaction between claim subject and centered believability for the expected environmental friendliness score.

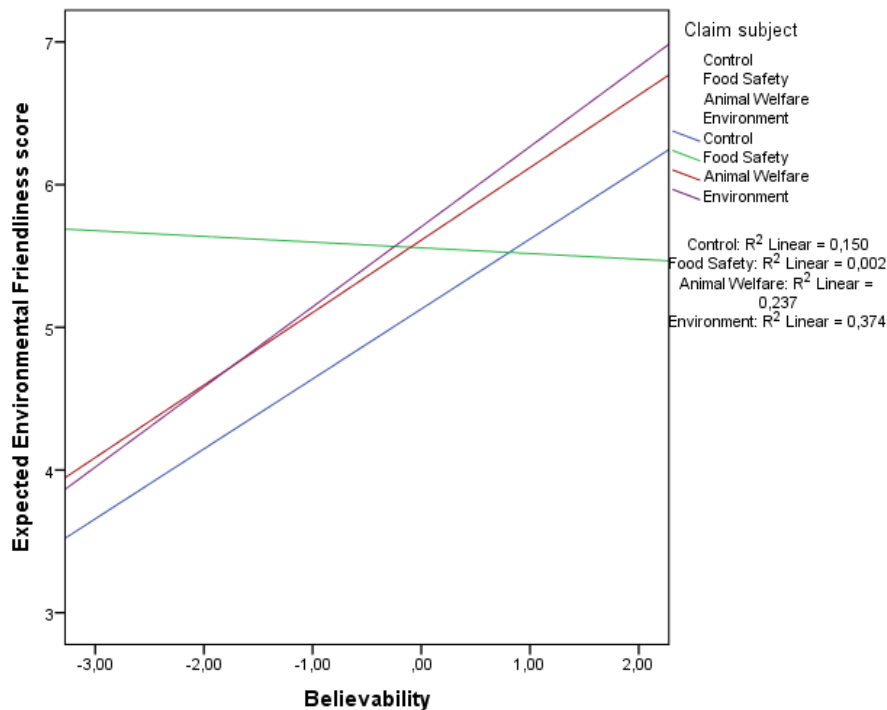


Figure 3B: The interaction between claim subject and centered believability for the expected environmental friendliness score.

Looking at Table 3 once more, there seems to be two interactions between believability and claim subject, for the expected product attributes ‘Animal Welfare’ and ‘Environmental Friendliness’. It appears that while overall, there is a relation between lower scores for believability and lower expected attribute scores. The strength (or slope of the curve) of this effect seems to vary, and is even reversed for one of the claims for animal welfare scores. For Expected environmental friendliness, the effect seems to be absent for the Food safety claim. Overall, reduced believability does seem to have a negative effect on attribute scores, but not for every claim.

Other than the interaction with claim subject, it appears that believability of the claim also directly influences some of the expected product attributes (Table 3). Both expected attributes Food Safety ($P=0.022$) and Environmental friendliness ($P=0.004$) had a significant influence from believability. The expected product attribute taste was at $P=0.066$ almost significant as well. The claim subject itself did not alter the believability of a claim. It appears that a consumers innate beliefs about the believability of the claim as a whole, independent of the claim itself or its subject, influences how well they expect in vitro meat to perform on those two expected attributes.

EFFECTS ON WILLINGNESS TO TRY

Our initial hypothesis (Figure 1) was that the effects of claim subject and format would significantly influence expected product attributes. The combined effect of the expected performance of a product on a number of product attributes could be used to predict a consumers’ willingness to try a novel food product. When checking to see if the proposed model of the attributes influencing willingness to try was correct we regressed all six expected product attributes from the model on willingness to try. The results are shown in Table 7 on the next page. Only two of the six proved significant; Animal Welfare ($P= 0.02$) and texture ($P=0.029$).

Table 6: Effects of attribute scores on willingness to try. Results with P < 0.1 are indicated in **bold** and **blue**.

	t	Sig.	95.0% Confidence Interval	
			Lower	Upper
Food Safety	1.074	.287	-.148	.492
Environment	-1.413	.162	-.610	.104
Animal Welfare	3.182	.002	.195	.849
Taste	-.091	.928	-.451	.411
Healthiness	.687	.494	-.243	.499
Texture	2.225	.029	.049	.905

Willingness to Try was also placed in the full model with claim subject and format as factors, with believability again as covariable. One of the attribute scores that influences willingness to try is also influenced by claim subject, so it is possible that claim subject may indeed also influence willingness to try. Furthermore, this analysis was done mainly to check if there was no other unforeseen pathway by which the conditions may have still influenced willingness to try (Table 7).

Novelty seeking was also included in the model as it was suspected this might play a role in determining willingness to try. Because of the limited number of respondents, the neophobia scale scores (between 10 and 50) used to test for novelty seeking were sorted into 6 categories of 5 points each. A low neophobia score indicates high novelty seeking, and a high score on the neophobia scale indicates low novelty seeking. The internal consistency was checked as well. The Cronbach's alpha was high (.803 at 10 items) which is an indication the scale is reliable [20, 21].

Table 7: Willingness to try as dependent in a full model with factors claim subject claim format and neophobia, with believability as covariable. Results with P < 0.1 are indicated in **bold** and **blue**.

	dof	F	Sig.	Partial Eta
				Squared
Claim subject	3	1.273	.292	.060
Claim format	1	.464	.498	.008
Novelty seeking	5	2.357	.051	.164
Believability	1	4.996	.029	.077
Claim subject * Believability	3	1.292	.285	.061
Claim subject * Claim format	2	.300	.742	.010
Error	60			

Believability and Novelty seeking had a significant effect on the Willingness to try (Table 7). If the respondents scored the text more believable, the willingness to try the novel product goes up. High neophobia (thus low novelty seeking) scores, on the other hand, lead to lower willingness to try, possibly because of lower novelty seeking in those respondents. It was expected neither claim subject nor format had a significant effect, as none of the traits that were influenced by the claim had a significant effect on Willingness to try.

It is possible the claims did not have a strong effect because they may have been too difficult to understand. Lastly, it was checked to see if respondents were able to properly understand the claims. Most respondents rated the claims moderately high to very highly understandable. The average comprehensibility was a score of 6.2 out of 7, very high. In order to investigate if there were any big differences between the different conditions, claim subject and format were added to a model to predict Comprehensibility. This was done to rule out that one subject or format has lower comprehensibility which could influence its attribute scores, even if the average is high. Neither result was significant (Table 8). There was very little difference between the claims in comprehensibility.

Table 8: Analysis of variance for the effect of Claim subject and Claim format on comprehensibility. Results with $P < 0.1$ are indicated in **bold** and **blue**.

	df	F	Sig.	Partial Eta Squared
Claim subject	3	1.384	.255	.057
Claim format	1	.436	.511	.006
Claim subject * Claim format	2	1.488	.233	.041
Error	69			

CONCLUSION

When looking at the effect of claims on consumers' expected quality of animal protein products produced in novel production systems, it appears that providing a claim on a product can indeed change the expected attributes of some products. In this case, the Environment claim and the Animal friendliness claim had an effect on the expected product attributes. Furthermore, while some positive effects were found, two claims, on Food Safety and Environmental Friendliness had strong negative halo effects on (non-) credence attributes. Changing the claim format to comparative had an effect depending on the claim. For the Food Safety claim, changing the claim format to comparative had a beneficial effect. This was the opposite for the Animal Welfare claim, and for the Environmental friendliness claim changing the format did not have any effect at all. Claim format had no effect on the believability. Believability and Novelty seeking, despite both not being influenced by the claim subject or format, also had strong effects on attribute scores and willingness to try. For believability, because neither the claim or the comparativeness of the claim had much effect, it is possible that the text as a whole, regardless of claim or manner in which it was presented was scrutinized by the consumer as being believable or not. While the intention was to make the initial few lines of text every questionnaire displayed as neutral as possible, this might mean those lines of text still had an effect on the perceived believability of the text as a whole. Novelty seeking proves that while claims may alter some of the expectations of a consumer, the general attitude of a consumer towards novel food products may still prove a stronger force than a claim can overcome.

In conclusion, while there was a weak effect of claims on two of the product attributes, other factors besides the claims proved to be as strong or a stronger influence on willingness to try. Comparativeness had a small influence on the effect of claims on two of the attributes, but this was not consistent. Furthermore, while the claims did influence the product attributes, compared to a control which gave just a little bit of information, they negatively influenced expectations for non-credence attributes, such as taste and texture.

DISCUSSION

While this study may provide some answers about how information may be used to increase the chances of success for a product produced in a novel setting, there were some issues with the results, accidental as well as consequences of the experimental design chosen. One of the main problems was the lower than expected sample size. Unfortunately, only between eight and twelve replies per condition were obtained, while the expectations were for at least twenty replies per condition. Low sample sizes means that for factors with naturally high variability, effects may have been missed because of the high error. The low estimates for the effect sizes (rarely over 0.2) may also have been a consequence of this. Another potential effect of a low sample size is the potential for disruptive effects, as with only twelve people per condition it is possible there may have been disruptive influences on the result of that specific group. This means that only a handful individuals may skew the results in an unexpected way, because there were too few respondents to get a good average for the population. In our case, for example, because of the circles in which the respondents were selected, it is possible that most of the respondents had at least some form of higher(university) education, which might influence their acceptance and exposure to agro-technological products.

In this study we attempted to gain insight in the thoughts and resulting behavior of consumers when presented with a meat product produced in a novel production system. However, while some results were obtained, one must make note that the setting in which they were obtained was not very realistic. In reality, consumers base their purchases on other factors next to expected quality, such as price, convenience and brand familiarity [22]. This means that even if the claims had an effect on one of these factors, to see if it truly has an impact on their purchasing behavior other factors such as convenience and price should be included in the study. This is especially true because in our case a questionnaire was used that relies on self-reporting. When asked about certain topics consumers are likely to give what they perceive as socially acceptable answers, thus for example giving a higher importance to animal welfare than other attributes, while in practice in a supermarket other

factors are more important for their purchasing decision [23]. This seems to occur often for credence attributes, dealing with topics that do not influence a consumer directly, but do play a role in society as a whole.

Some of the above mentioned limitations are a result of choosing to study Willingness to try instead of another variable. Willingness to try, while having an effect on product purchasing [4], also has its limitations. It was chosen for this study because the product used as an example as a known food product produced in a novel production system is still at the very early stages of development, and thus it was impossible to get the actual product or other relevant information, such as an estimate of the price or the form it might take to use in a different kind of study. While studies on willingness to try often do give good indications of which effects may be important, it is only a first step in the process towards the successful sale of a product. A side-effect of the choice for willingness to try may be that the willingness to try is higher in this experiment than it would be in more realistic settings (on average 4.88 on a scale ranging from 1-7, lowest value was N = 4 for a score of 1).

RECOMMENDATIONS

Future studies, next to a larger sample size, should aim to take another step forward towards a realistic setting for the consumer. This means including attributes such as cost and time in the analysis, as well as providing an example of the product, for example. One could also think about other factors that influence how well a claim is received by a consumer that were not included in this experiment, such as replication and design of the packaging and claim. Being able to provide an actual product, or range of products to choose from, may reduce variability (as consumers will have a much clearer idea of what 'in-vitro meat' may be if they can look and hold the product) as well as allow for results that are a more accurate sample of how consumers may act in a supermarket if such a product is provided. Including a possible purchasing element in the study would also remove some of the limitations associated with using a questionnaire that relies on self-reporting, again leading to more realistic results.

In future experiments these early results could perhaps provide clues which kind of claims might be used to influence consumers favorably towards a novel meat product, which attributes and other factors are important in the decision-making process. It also proves that while claims may be used to an advantage, investigating those claims properly is very important, as there may be unexpected negative associations as there were in this study.

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LITERATURE

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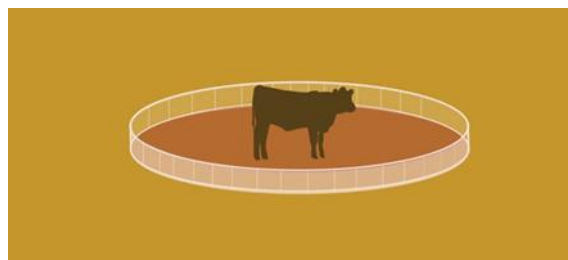
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APPENDIX

APPENDIX A: QUESTIONNAIRE EXAMPLE [NL]

Now follows an example questionnaire as one of the respondents may have gotten during the online survey. The icon with '>>' indicates a page break, respondents had to click this button to see the next set of questions.

Dank u dat u de tijd neemt om deze vragenlijst in te vullen en te helpen met mijn onderzoek. Deze vragenlijst kost ongeveer 5 tot 10 minuten om in te vullen en bevat vragen over uw verwachtingen over een nieuw voedselproduct en uw voedselvoorkeur. Er zijn geen goede of foute antwoorden.

De resultaten worden anoniem verwerkt.

Hoe vaak eet u vleesproducten?
(Denk hierbij aan vlees bij de hoofdmaaltijd, maar ook aan broodbeleg of snacks)
Kruis het antwoord aan dat het dichtst bij uw situatie in de buurt komt.

- elke dag
- 3-6 dagen per week
- ongeveer één of twee keer per week
- ongeveer één keer per twee weken
- ongeveer één keer per maand of minder

Koopt u zelf de boodschappen voor uw huishouden?

- altijd
- meestal
- ongeveer de helft van de tijd
- soms
- nooit

Hoe belangrijk zijn de volgende onderwerpen voor u als u een vleesproduct koopt of zou kopen?

	Ze er on be lang rij k		Ne u t r a a l			Ze er be lang rij k	
Voedselveiligheid	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Milieuvriendelijkheid	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Diervriendelijkheid	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Smaak	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Gezondheid	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Textuur	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Productiemethode	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

>>

Heeft u wel eens wat gehoord of gelezen over de mogelijkheid om vlees in een laboratorium te kweken?

- Ja
 Nee

>>

U krijgt nu een alinea met informatie over in-vitro vlees. Dit is vlees dat in een laboratorium geproduceerd wordt. Lees eerst de volgende informatie en beantwoordt daarna de vragen:

Door cellen van dieren te nemen en ze te laten vermenigvuldigen kunnen vleesproducten in een laboratorium geproduceerd worden. Deze productiemethode voor vlees is op dit moment nog in ontwikkeling, maar deze producten kunnen in de toekomst beschikbaar komen voor consumenten zoals uzelf.

De volgende vragen gaan over uw verwachtingen van in-vitro vleesproducten. Gegeven de informatie hierboven en uw eigen kennis, hoe verwacht u dat in-vitro vlees presteert op de volgende kwaliteiten?

	Zeerslecht			Neutraal			Zeergoed
Voedselveiligheid	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Milieuvriendelijkheid	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Diervriendelijkheid	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Smaak	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Gezondheid	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Textuur	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Zou u geïnteresseerd zijn om een in-vitro vleesproduct te proberen als dit voor u beschikbaar zou zijn?

	Totaal niet geïnteresseerd			neutraal			Zeergeïnteresseerd
Totaal niet geïnteresseerd	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Wat vond u van de bovenstaande informatie over in-vitro vlees?

	Niet mee eens			neutraal			Mee eens
De gegeven informatie was makkelijk te begrijpen.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
De gegeven informatie was geloofwaardig	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

>>

Dit zijn de laatste vragen. Deze vragen gaan over uw eetgedrag en we zouden als laatste graag enkele vragen willen stellen over uzelf.

De volgende vragen gaan over uw algemene mening over het proberen van nieuw voedsel. Geef aan of u het eens of oneens bent met de volgende stellingen:

	Niet mee eens		Neutraal		Mee eens	
Ik probeer constant nieuw en verschillend voedsel.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Ik vertrouw geen nieuw voedsel.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Als ik niet weet uit welk voedsel de maaltijd bestaat, probeer ik het niet.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Ik hou van voedsel uit diverse landen.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Buitenlands voedsel ziet er te vreemd uit om te eten.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Tijdens feestjes probeer ik nieuw voedsel.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Ik ben bang om voedsel te eten, dat ik nooit eerder heb gehad.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Ik ben erg kieskeurig over het voedsel dat ik eet.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Ik eet bijna alles.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Ik probeer graag nieuwe buitenlandse restaurants.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Bent u een man of een vrouw?

- Man
 Vrouw

Bent u een student aan de universiteit van Wageningen?

- Ja
 Nee

Wat is uw leeftijd?

Dit waren alle vragen! Heel erg bedankt voor het invullen.

Als u nog vragen of opmerkingen over de vragenlijst heeft, kunt u die hieronder invullen.



APPENDIX B: QUESTIONNAIRE EXAMPLE[ENG TRANSLATION]

Here follows the literal translation of the questionnaire as shown in appendix A. text in [] brackets indicates the range of possible replies given. >> indicates a page break, respondents had to click this button to see the next set of questions.

Questionnaire:

Thank you for taking the time to take this questionnaire and to help with my research. These questions will take approximately 5 to 10 minutes to answer and contains questions about your expectations about a novel food products and your food preferences. There are no right or wrong answers.

The results will be processed anonymously.

How often do you eat meat products? (Think for example about meat during the main meal of the day, but also as a sandwich topping or snack).

Choose the answer closest to your situation.

1. Every day
2. 3-6 days a week
3. Approximately once or twice a week.
4. Approximately once per two weeks
5. Approximately once per month or less

Do you do the grocery shopping in your household?

1. Always
2. Usually
3. Roughly 50% of the time
4. Sometimes
5. never

How important are the following subjects to you when choosing to buy a meat product?

[answer 1-7, not important at all → very important]

1. Food safety
2. Environmentfriendliness
3. Animalfriendliness
4. Taste
5. Healthiness
6. Texture
7. Productionmethod

>>

Have you ever heard or read about the possibility of growing meat in a laboratory?

1. Yes
2. No

>>

Next follows a short text providing some information about in-vitro meat. This is meat that has been produced in a laboratory. Please read the following text, then reply to the questions.

[claim, see Appendix C]

The next questions are about your expectations of in-vitro meatproducts. Given the above information and anything you may already know about this subject, how do you expect in-vitro meat to perform on the following topics?

[answer 1-7, very poorly → very good]

1. Food safety
2. Environmentfriendliness
3. Animal friendliness
4. Taste
5. Healthiness
6. Texture

Would you be interested in trying an in-vitro meatproduct if this would become available to you?

[answer 1-7, not at all → very much so]

What did you think about the given information about in-vitro meat?

[answer 1-7, strongly disagree → strongly agree]

1. The given information was easy to understand.
2. The given information was believable.

>>

These are the final sets of questions. These questions are about your behavior regarding food and several questions about yourself.

These questions are about your general opinion about trying new types of food. Please indicate if you agree or disagree with the following statements:

[answer 1-5, strongly disagree → strongly agree]

1. I am constantly sampling new and different foods (R)
2. I don't trust new foods.
3. If I don't know what is in a food, I won't try it.
4. I like foods from different countries. (R)
5. Ethnic food looks too weird to eat.
6. At dinner parties, I will try a new food. (R)
7. I am afraid to eat things I have never had before.
8. I am very particular about foods I will eat.
9. I will eat almost anything. (R)
10. I like to try new ethnic restaurants. (R)

Are you male or female?

1. Male
2. Female

Are you a Wageningen University student?

1. Yes
2. No

What is your age?

[open answer]

This was the last question! Thank you very much for completing the survey.

If you have any further questions or remarks about this questionnaire please leave them below.

APPENDIX C: TRANSLATIONS FOR CLAIMS

Below are the all translations to the claims and their conditions as presented to the Dutch subjects that took the tests.

Claim

In English:

'By taking cells from animals and allowing them to multiply, meat products can be produced in a laboratory. This way of producing meat is still being developed, but is getting closer to being available to consumers such as yourself. [claim]'

In Dutch:

'Door cellen van dieren te nemen en ze te laten vermenigvuldigen kunnen vleesproducten in een laboratorium geproduceerd worden. Deze productiemethode voor vlees is op dit moment nog in ontwikkeling, maar deze producten kunnen in de toekomst beschikbaar komen voor consumenten zoals uzelf. [claim]'

Conditions

In English:

- **Food safety:** 'Labgrown meat is produced in more hygienic conditions.'
- **Environment:** 'Labgrown meat production has lower CO2 emissions.'
- **Animal welfare:** 'Labgrown meat production reduces the amount of animals killed for consumption'

In Dutch:

- **Voedselveiligheid:** 'De productie van in-vitro vlees vindt plaats onder hygiënischere omstandigheden.'
- **Milieuvriendelijkheid:** 'de productie van in-vitro vlees produceert minder CO2 uitstoot.'
- **Diervriendelijkheid:** 'De productie van in-vitro vlees vermindert het aantal dieren die worden geslacht voor consumptie.'

Comparativeness

In English: 'compared to regular meat production.'

In Dutch: 'in vergelijking met reguliere vleesproductie.'

APPENDIX D ALL POSSIBLE CLAIMS [NL]

Below are all the different conditions (in Dutch) as they were presented to the subjects filling in the questionnaire.

Control 0,0:

Door cellen van dieren te nemen en ze te laten vermenigvuldigen kunnen vleesproducten in een laboratorium geproduceerd worden. Deze productiemethode voor vlees is op dit moment nog in ontwikkeling, maar deze producten kunnen in de toekomst beschikbaar komen voor consumenten zoals uzelf.

Condition 1,0: hygiëne, non

Door cellen van dieren te nemen en ze te laten vermenigvuldigen kunnen vleesproducten in een laboratorium geproduceerd worden. Deze productiemethode voor vlees is op dit moment nog in ontwikkeling, maar deze

producten kunnen in de toekomst beschikbaar komen voor consumenten zoals uzelf. De productie van in-vitro vlees vindt plaats onder hygiënischere omstandigheden.

Condition 2,0: milieu, non

Door cellen van dieren te nemen en ze te laten vermenigvuldigen kunnen vleesproducten in een laboratorium geproduceerd worden. Deze productiemethode voor vlees is op dit moment nog in ontwikkeling, maar deze producten kunnen in de toekomst beschikbaar komen voor consumenten zoals uzelf. De productie van in-vitro vlees produceert minder CO₂ uitstoot.

Condition 3,0:

Door cellen van dieren te nemen en ze te laten vermenigvuldigen kunnen vleesproducten in een laboratorium geproduceerd worden. Deze productiemethode voor vlees is op dit moment nog in ontwikkeling, maar deze producten kunnen in de toekomst beschikbaar komen voor consumenten zoals uzelf. De productie van in-vitro vlees vermindert het aantal dieren die worden geslacht voor consumptie.

Condition 1,1

Door cellen van dieren te nemen en ze te laten vermenigvuldigen kunnen vleesproducten in een laboratorium geproduceerd worden. Deze productiemethode voor vlees is op dit moment nog in ontwikkeling, maar deze producten kunnen in de toekomst beschikbaar komen voor consumenten zoals uzelf. De productie van in-vitro vlees vindt plaats onder hygiënischere omstandigheden in vergelijking met de reguliere vleesproductie.

Condition 2,1

Door cellen van dieren te nemen en ze te laten vermenigvuldigen kunnen vleesproducten in een laboratorium geproduceerd worden. Deze productiemethode voor vlees is op dit moment nog in ontwikkeling, maar deze producten kunnen in de toekomst beschikbaar komen voor consumenten zoals uzelf. De productie van in-vitro vlees produceert minder CO₂ uitstoot in vergelijking met reguliere vleesproductie.

Condition 3,1

Door cellen van dieren te nemen en ze te laten vermenigvuldigen kunnen vleesproducten in een laboratorium geproduceerd worden. Deze productiemethode voor vlees is op dit moment nog in ontwikkeling, maar deze producten kunnen in de toekomst beschikbaar komen voor consumenten zoals uzelf. De productie van in-vitro vlees vermindert het aantal dieren die worden geslacht voor consumptie in vergelijking met reguliere vleesproductie.