Acceptance of Insects and In Vitro Meat as a Sustainable Meat Substitute in Germany: In Search of the Decisive Nutritional-Psychological Factors

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Abstract

A further intensification of industrial agriculture alone cannot be a viable solution to sustainably feed a steadily growing world population in the future. Besides technical innovations, individual eating habits must become more sustainable. The production of insects and in vitro meat offers several advantages over the production of conventional meat, such as lower CO_2 emissions and land use as well as reduced water consumption. Due to the great sustainability potential, interest in both meat alternatives has not only increased significantly in the media and science in recent years, but also large companies in the food industry, such as Nestlé and Wiesenhof, have already recognized their economic potential. Whether the two meat alternatives will prevail in Germany in the future depends—apart from technical and legal factors—strongly on the acceptance of potential consumers. It has already been shown that disgust and fear of novel foods have a negative influence on the acceptance of insects and in vitro meat as food. In addition, it has already been investigated to what extent other nutritional and environmental psychological factors, such as attitudes towards edible insects and in vitro meat, sensation seeking or sustainability consciousness, might have an influence on the acceptance of both meat alternatives. In addition to an overview of selected sustainability and health indicators of both meat alternatives, the book chapter primarily focuses on the above-mentioned environmental and nutritional-psychological factors influencing the acceptance of edible insects and in vitro meat in Germany.

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D. Lanzerath et al. (eds.), *Bioeconomy and Sustainability*,
https://doi.org/10.1007/978-3-030-87402-5_6

Keywords

Edible insects · Entomophagy · Novel foods · Meat substitutes · Cultivated meat · Consumer acceptance

1 Increase in World Population and Meat Consumption

The world population is expected to grow from 7.6 billion people at present to 9.8 billion by 2050 and to 11.2 billion by 2100.[1] An increase in meat consumption is predicted to accompany this growth.[2] Meat consumption is already very high in industrialized nations compared to developing and emerging countries and will exceed the 100 kg/capita/year mark in 2030.[3] Global per capita consumption of meat is predicted to increase from 41.3 kg in 2015 to 49.4 kg in 2050, mainly due to population growth and higher per capita income in developing and emerging countries.[4] This "nutrition transition" in many parts of the world will require global food production to increase by approximately 60% by 2050. In Germany alone, more than two million animals are slaughtered each day to cover our meat consumption and to export meat; thus, a further intensification of agriculture cannot be the only solution to satisfy our hunger for animal proteins.[5]

2 Consequences of High Meat Consumption for the Environment and Health

Industrial animal husbandry is responsible for 18% of global CO_2 emissions, with some authors estimating a share of over 50%.[6] It also contributes significantly to the loss of biodiversity.[7] Besides the consequences for biodiversity and the climate, high consumption of meat has many negative effects on human health. For example, high meat consumption is associated with an increased risk of cancer and cardiovascular disease.[8] David Tilman and Michael Clark describe this phenomenon as the "food-environment-health trilemma".[9]

[1] Cf. United Nations (2017).

[2] Cf. Food and Agriculture Organization of the United Nations and Agricultural Development Economics Division (2012).

[3] Cf. Food and Agriculture Organization of the United Nations (2003).

[4] Cf. ibid.; Food and Agriculture Organization of the United Nations and Agricultural Development Economics Division (2012).

[5] Cf. ibid. and Fiebelkorn (2017).

[6] Cf. Livestock, Environment and Development Initiative and Food and Agriculture Organization of the United Nations (2006) and Goodland and Anhang (2009).

[7] Cf. Campbell et al. (2017).

[8] Cf. Micha et al. (2013), Campbell and Campbell (2017) and Willett et al. (2019).

[9] Tilman and Clark (2014).

3 Alternatives to Meat Production and Consumption

In order to reduce the environmental impact of conventional meat production, a wide range of different measures and strategies are proposed. In industrialized countries, where protein consumption far exceeds the nutritional requirements of the World Health Organization (WHO), a reduction in the consumption of animal products would be particularly effective in reducing negative environmental impacts.[10] Improving the efficiency of animal production systems (by optimizing feed production, for example) could also reduce negative environmental impacts.[11]

Another strategy would be to switch consumption to alternative sources of protein, such as mycoproteins, microalgae or protein-rich plants such as lentils and rapeseed.[12] These alternatives to animal protein are in many cases not only more sustainable in production than conventional meat, but also contain higher-quality nutrients and minerals.[13]

In addition to these plant alternatives, insects and in vitro meat have been discussed in recent years as sustainable alternatives to conventional meat.[14] The interest in both meat alternatives has increased immensely, not only in the media, but also in science and industry, due to their considerable ecological and economic potential.[15] For example, Germany's largest poultry breeder and processor, the PHW Group, better known under the brand name Wiesenhof, has already invested millions of euros in the development of food products made from insects and in vitro meat.[16]

According to the report "How will cultured meat and meat alternatives disrupt the agricultural and food industry?" by management consultants at A. T. Kearney, in vitro meat has a particularly high potential to change the global meat market.[17] The authors of the report estimate that in 2040, up to 35% of global meat consumption will be of in vitro meat, representing a market value of US$ 630 billion out of an estimated total market value for meat of US$ 1.8 trillion.[18] According to a market report by the Barclays Investment Bank, the global market for edible insects is estimated to reach a financial volume of up to US$ 8 billion by 2030.[19]

From a purely economic point of view, it is therefore not surprising that the world's largest food producer, Nestlé, in its study on the future "Wie is(s)t Deutschland 2030?",[20] also saw the consumption of insects and in vitro meat as a

[10] Cf. Poore and Nemecek (2018).
[11] Cf. Oonincx (2017).
[12] Cf. Nadathur et al. (2016).
[13] Cf. ibid.
[14] Cf. ibid. and Alexander et al. (2017).
[15] Cf. Zukunftsforum (2015), Verbeke (2015) and Verbeke et al. (2015).
[16] Cf. Ksienrzyk (2018).
[17] Cf. Gerhardt et al. (2019).
[18] Cf. ibid.
[19] Cf. Barclays Investment Bank (2019).
[20] Zukunftsforum (2015); "What will Germany be like/eat in 2030?" (own translation).

possible food trend to which German consumers, as members of a resource-saving and value-oriented society, can adapt by 2030 at the latest.[21] It should be kept in mind, however, that the different options for sustainable production of proteins are not mutually exclusive. Therefore, all statements about industrial production of insects and in vitro meat should be made not only in comparison with the production of conventional meat products, but also with other realistic, non-animal-alternatives.[22]

4 How Sustainable and Healthy Are Insect Foods?

Human consumption of insects—also known as entomophagy—is part of the traditional eating habits of more than 2 billion people in over 130 countries.[23] In contrast to countries like Belgium and the Netherlands, which have allowed the sale of insects as novel food already before 2018, in Germany, the sale of insects as a novel food has only been permitted since the Novel Food Regulation came into effect on 1 January 2018 (see section "Legal framework for the authorization of insects and in vitro meat as novel foods in Germany").[24] Various insect-based foods, such as muesli bars, pasta, chocolate, or insect burgers, are already available in German supermarkets.

The production of insects offers several advantages over the production of conventional meat, including the high feed conversion efficiency of insects and their ability to feed on a wide variety of food sources.[25] In addition, the production of many insect species requires much lower CO_2 emissions and water consumption per kg of food generated than that of pigs and cattle. Insects also require a much smaller area to produce the same amount of protein as conventional meat.[26] However, according to Dennis Oonincx and Imke de Boer, the energy required for insect production is comparable to the energy used in conventional livestock breeding.[27]

Nevertheless, given the large number of edible insect species—currently estimated at more than 2111 species—one should be careful about making generalizations about the sustainability of their production.[28] In order to assess the sustainability potential, specific measurements and calculations of selected sustainability indicators, such as CO_2 emissions or energy, land and water

[21] Zukunftsforum (2015).
[22] Cf. Gamborg et al. (2018).
[23] Cf. Fiebelkorn (2017).
[24] Cf. ibid.
[25] Cf. Food and Agriculture Organization of the United Nations (2013).
[26] Cf. Oonincx et al. (2010), Oonincx and de Boer (2012) and Oonincx (2017).
[27] Cf. Oonincx and de Boer (2012).
[28] Cf. Fiebelkorn (2017) and Jongema (2017).

consumption, must be determined in so-called "Life Cycle Assessments" (LCAs) for each edible insect species.[29]

For example, Oonincx and de Boer have carried out an LCA of greenhouse gas emissions, energy consumption and land use for mealworms (*Tenebrio molitor*) and compared the data with those from the production of conventional animal proteins such as cow's milk, poultry, pork, and beef.[30] The production of 1 kg of these animal proteins requires the same amount of energy, but produces more greenhouse gases and requires much more land area than the production of 1 kg of protein from mealworms.[31] Similar results were obtained in a study in Thailand, in which the production of crickets (*Acheta domesticus*) and field crickets (*Gryllus bimaculatus*) was compared with that of broilers.[32] Due to the high complexity of the investigations, detailed LCAs are only available for a few insect species, such as mealworms and crickets.[33]

In addition to the potential for sustainable production, many edible insect species have favourable nutritional values. They are rich in protein, provide sufficient amounts of essential amino acids, minerals, and vitamins and have a better ratio of saturated to unsaturated fatty acids than, for example, fish or poultry.[34] However, as with LCAs, detailed nutrient analyses are available for relatively few of the edible insect species, so the beneficial nutritional properties should not be generalized to all edible insect species.[35] Among the 12 insect species that, according to the European Food Safety Authority (EFSA), have the greatest potential to be used as food and feed in the EU are buffalo worms (*Alphitobius diaperinus*), mealworms, and crickets.[36]

5 How Sustainable and Healthy Is In Vitro Meat?

In the USA, Israel, Japan and the Netherlands, there are already several start-up companies specializing in the commercial production of in vitro meat.[37] The German PHW Group has invested in the Israeli start-up company SuperMeat, which specializes in the production of in vitro chicken meat.[38] Although information on

[29] Cf. Fiebelkorn and Kuckuck (2019).
[30] Cf. Oonincx and de Boer (2012).
[31] Cf. ibid.
[32] Cf. Halloran et al. (2017).
[33] Cf. Oonincx and de Boer (2012), Halloran et al. (2016) and Halloran et al. (2017).
[34] Cf. Belluco et al. (2013) and Rumpold and Schlüter (2013).
[35] Cf. Rumpold and Schlüter (2013) and Dossey et al. (2016).
[36] Cf. European Food Safety Authority (2015).
[37] Cf. German Bundestag (2018).
[38] Cf. ibid.

in vitro meat can already be found in the REWE online shop,[39] it is not yet sold in online shops, nor in German supermarkets or restaurants.[40]

In addition to challenges of introducing in vitro meat to markets and the technical challenges of scaling up its production, legal barriers remain: in vitro meat is not yet approved as a novel food in Germany (see section "Legal framework for the authorization of insects and in vitro meat as novel foods in Germany"). According to Mark Post, Professor of Vascular Physiology at Maastricht University, and his team, who have significantly advanced the development of in vitro meat, the cost of an in vitro meat burger has already been reduced to approximately 11 US dollars.[41] Post also predicted that by 2021, the development will have progressed enough and the price will have been reduced enough to bring in vitro meat burgers to the market.[42] Other experts estimate that in vitro meat will probably not be commercially available until 2025–2030.[43]

To what extent the production of in vitro meat is more sustainable than that of conventional meat is currently the subject of controversial debate.[44] As there are currently no industrial production facilities for in vitro meat, the LCAs available for evaluating the sustainability potential are mostly based on extrapolations from values obtained for the production of in vitro meat on a smaller scale under laboratory conditions.[45] These LCAs have shown that compared to conventional meat production, in vitro meat production requires less land area and emits less greenhouse gases.[46] However, the energy consumption for the production of in vitro meat appears to be much higher than that for beef, pork, sheep, and poultry meat.[47]

The nutrient composition of in vitro meat depends on the nutrients in the nutrient solutions of the bioreactors in which the muscle cells are grown. Detailed nutrient analyses of in vitro meat are not yet available, but they should be very similar to those of conventional fillet meat (without connective and fatty tissue).

[39] Cf. https://www.rewe.de/ernaehrung/in-vitro-fleisch/

[40] Cf. Böhm et al. (2017).

[41] Cf. ibid.

[42] Cf. Maastricht University.

[43] Cf. Office of Technology Assessment at the German Bundestag (2016).

[44] Cf. Hocquette (2016) and Post and Hocquette (2017).

[45] Cf. ibid.; Tuomisto and Teixeira de Mattos (2011) and Tuomisto et al. (2014).

[46] Cf. ibid.

[47] Cf. Tuomisto et al. (2014), Alexander et al. (2017). For a detailed presentation of bioethical arguments for and against in vitro meat, please see Beck (2022) in this volume.

6 Legal Framework for the Authorization of Insects and In Vitro Meat as Novel Foods in Germany

The European Commission, in cooperation with the EFSA, is responsible for the approval of novel foods in the EU and Germany. According to the Novel Food Regulation (EU 2015/2283), the term "novel foods" covers all foods that were not used for human consumption to any significant extent in the EU before 15 May 1997.[48] In addition, they must fall into at least one of the following categories mentioned in Article 3 of the Novel Food Regulation:

- Food with a new or specifically modified molecular structure,
- food consisting of, or isolated or produced from micro-organisms, fungi or algae,
- food consisting of, or isolated or produced from materials of mineral origin,
- food consisting of, or isolated or produced from plants or parts of plants,
- food consisting of, or derived from, animals or parts of animals,
- foodstuffs consisting of, or isolated or produced from cell or tissue cultures obtained from animals, plants, micro-organisms, fungi or algae,
- food consisting of engineered nanomaterials.

With the enactment of the amendment to the Novel Food Regulation on January 1, 2018, food from insects can be approved for the German market. In contrast, in vitro meat has not yet been approved as a novel food in Europe, which is why we can only speak of a *possible* legal framework.[49] However, it can be assumed that in vitro meat will also be approved as a novel food in the future in accordance with the Novel Food Regulation (Art. 3 para. 2 lit. a sublit. iv) and will therefore be subject to the same legal regulations as food from insects.

7 Nutritional-Psychological Factors Influencing the Acceptance of Insects and In Vitro Meat

Whether the two novel meat alternatives will prevail in Germany in the future will depend above all on consumer acceptance. Although the media coverage of insect-based food and in vitro meat has increased significantly in Europe and other Western countries, the willingness to consume the two meat alternatives is still relatively low in many European countries.[50]

Studies by Filiep Vanhonacker, Ellen Van Loo, Xavier Gellynck, and Wim Verbeke in Belgium showed that the willingness to consume food from insects has increased

[48] Cf. European Parliament and Council of the European Union (2015).

[49] Cf. German Bundestag (2019).

[50] Cf. Goodwin and Shoulders (2013), Hopkins (2015), Hartmann and Siegrist (2017), Shockley et al. (2017), Bryant and Barnett (2018) and Mancini et al. (2019).

from approximately 5% in 2013 to approximately 20% in 2015.[51] Similar results were found among consumers in Hungary, Switzerland, Poland, and the Netherlands.[52] Christina Hartmann et al. found that German residents are less likely to consume insects than residents of China are.[53] The willingness of consumers from Germany and Switzerland to consume processed insect-based products is higher than for unprocessed products.[54] Nonetheless, a study by Oliver Meixner and Leonhard Mörl von Pfalzen in Germany, Austria, and Switzerland concluded that only a quarter of the respondents were willing to eat insects.[55]

Consumer acceptance of in vitro meat has been investigated in four studies thus far, each with different results.[56] Jean-François Hocquette et al. found that a minority of respondents in France (5% to 11%) would recommend or accept eating in vitro meat instead of conventional meat.[57] In addition, they found that only a small percentage of respondents (9% to 19%) believed that in vitro meat will be accepted by consumers in the future. Despite these relatively low acceptance levels, 38% to 47% of respondents would support research on in vitro meat.[58] Peter Slade reported that only 11% of his Canadian subjects would choose an in vitro meat burger over a beef and/or veggie burger.[59] Wim Verbeke, Pierre Sans and Ellen Van Loo found that 51% of their Belgian subjects (mainly students) had never heard of in vitro meat.[60] After being informed about the technical production of in vitro meat, 23.9% were willing to try in vitro meat (and 66.7% responded that they might be willing to do so). After receiving additional information on the health and sustainability aspects of in vitro meat, 42.5% of the respondents were willing (and 51.4% perhaps willing) to try in vitro meat. Matti Wilks and Clive Phillips reported that 65.3% of their US sample would be willing to test in vitro meat.[61] Of these, 32.6% would be willing to eat it regularly and 31.5% would be willing to use it as a substitute for conventional meat. According to Christopher Bryant and Julie Barnett, the differences in the studies can probably be attributed to the different groups being used as study participants, the inconsistent description of in vitro meat and the study designs.[62] Overall, however, the results suggest that a relatively large number of consumers

[51] Cf. Vanhonacker et al. (2013) and Verbeke (2015).

[52] Cf. Schösler et al. (2012), Tan et al. (2015), Gmuer et al. (2016), Gere et al. (2017), Kostecka et al. (2017) and Schlup and Brunner (2018).

[53] Cf. Hartmann et al. (2015).

[54] Cf. ibid.; Gmuer et al. (2016).

[55] Cf. Meixner and Mörl von Pfalzen (2018).

[56] Cf. Verbeke et al. (2015), Hocquette et al. (2015), Wilks and Phillips (2017) and Slade (2018).

[57] Cf. Hocquette et al. (2015).

[58] Cf. ibid.

[59] Cf. Slade (2018).

[60] Cf. Verbeke et al. (2015).

[61] Cf. Wilks and Phillips (2017).

[62] Cf. Bryant and Barnett (2018).

would be willing to try in vitro meat, but a much smaller proportion would be willing to use it instead of traditional meat or other meat alternatives.[63]

According to the latest nutrition report of the Federal Ministry of Food and Agriculture, 31% of the German population can imagine buying insect-based food as an alternative to conventional meat in a supermarket or other grocery store. For in vitro meat—described as "meat from the test tube"—the willingness was 17%. Men (40%) were more willing to buy insect-based food than women (22%). Similar trends were observed for in vitro meat: 25% of men and 10% of women could imagine buying in vitro meat.[64] Younger subjects (14–29 years) were more likely to consider buying insect-based foods (43%) and in vitro meat (32%) than subjects over 60 years of age (insects 18%; in vitro meat 9%). Furthermore, 29% of the German population were of the opinion that the increased consumption of alternative meat types, such as in vitro meat or insect-based food, was an appropriate measure to ensure the nutrition of the growing world population. Again, men (36%) were more receptive to insect-based and in vitro meat foods than women (22%). Younger subjects aged 14–29 years, in particular, were much more likely to see the two meat alternatives as a sensible measure to feed the growing world population than subjects aged over 45 years (42% vs. 24%).[65]

The nutritional-psychological factors that play a role in the acceptance of consuming insects and in vitro meat are outlined below.[66]

1. ***Meat consumption:*** Hanna Schösler, Joop de Boer, and Jan J. Boersema showed that subjects with a lower meat consumption are more willing to accept meat substitutes such as seitan, tofu, or insects.[67] Meanwhile, subjects with a higher meat consumption showed a higher willingness to try in vitro meat.[68]
2. ***Reducing meat consumption:*** In the study by Verbeke, study participants who wanted to reduce their meat consumption showed a higher acceptance of insects as a meat substitute,[69] whereas Wilks and Phillips found that vegetarians and vegans are less willing to use in vitro meat as a meat substitute.[70]
3. ***Attitudes:*** It has already been shown that a positive attitude towards food from insects has a significantly positive effect on the willingness to consume insect-based foods.[71] For in vitro meat, it has been shown that a positive attitude of

[63] Cf. ibid.

[64] Cf. forsa Politik- und Sozialforschung GmbH (2018) and Federal Ministry of Food and Agriculture (2019).

[65] Cf. ibid.

[66] For a detailed description of selected influencing factors, please refer to the three review articles Hartmann and Siegrist (2017), Bryant and Barnett (2018) and Mancini et al. (2019).

[67] Cf. Schösler et al. (2012).

[68] Cf. Mancini and Antonioli (2019).

[69] Cf. Verbeke (2015).

[70] Cf. Wilks and Phillips (2017).

[71] Cf. Ruby et al. (2015) and La Barbera et al. (2020).

subjects towards the health, safety and nutritional aspects of in vitro meat is associated with a higher propensity to buy.[72]

4. ***Food Neophobia:*** Food neophobia is defined as a person's aversion to novel foods.[73] Many studies have documented a negative correlation between food neophobia and the willingness to consume insects and in vitro meat.[74]
5. ***Food Disgust:*** Food disgust describes a person's feeling of disgust caused by nutritional triggers. Studies have already shown that food disgust has a negative effect on both the willingness to eat insects and the willingness to consume in vitro meat.[75]

The factors that determine the acceptance of insects as food have already been investigated in several studies.[76] In particular, food neophobia and food disgust were important influencing factors.[77] Gender, attitudes towards the consumption of insects and the previous consumption of insects were also found to be significant predictors of acceptance.[78]

The predictors for the acceptance of in vitro meat as a food have also been investigated in several studies in recent years.[79] As with insects, food disgust and food neophobia have been shown to be significant factors influencing consumer willingness to eat in vitro meat.[80] Age and sex also showed an influence on acceptance with younger respondents and males being more likely to accept the consumption of in vitro meat.[81]

8 Current Research in Biology Didactics on the Acceptance of Insects and In Vitro Meat in the German Population

One of the main research priorities of the Department of Biology Didactics at the University of Osnabrück is the question of how the German population—especially the younger generation—accepts novel food products such as insects and in vitro meat. Several research projects have already addressed selected environmental and nutritional-psychological factors, such as sustainability consciousness, food neophobia,

[72] Cf. Gómez-Luciano et al. (2019).

[73] Cf. Pliner and Salvy (2006).

[74] Cf. Hartmann et al. (2015), Hartmann and Siegrist (2018), Lammers et al. (2019) and Wilks et al. (2019).

[75] Cf. Hartmann and Siegrist (2018), Lammers et al. (2019) and Wilks et al. (2019).

[76] Cf. Sogari et al. (2019).

[77] Cf. Hartmann et al. (2015), Verbeke (2015), Hartmann and Siegrist (2018) and Lammers et al. (2019).

[78] Cf. Hartmann et al. (2015), Ruby et al. (2015), Verbeke (2015) and Lammers et al. (2019).

[79] Cf. Hartmann and Siegrist (2017) and Bryant and Barnett (2018).

[80] Cf. Wilks et al. (2019).

[81] Cf. ibid.; Shaw and Mac Con Iomaire (2019).

and food disgust. As an example of the research activities, summaries of two master theses that have already been published are given below. Patrik Lammers' master thesis deals with the acceptance of food from insects by the German population. Jacqueline Dupont's master thesis focuses on the willingness of children and adolescents to consume insects and in vitro meat.

8.1 Case Study 1: Acceptance of Insects as Food in Germany—In Search of the Decisive Nutritional-Psychological Factors

The study by Patrik Lammers, Liza Ullmann and Florian Fiebelkorn examined the acceptance of insect-based foods among German consumers.[82] The nationwide online survey ($N = 516$; $M_{Age} = 47.07$ years, $SD = 16.06$; *female* = 51.6%) attempted to determine which factors have the greatest influence on the consumption of insect burgers and buffalo worms. In addition to sociodemographic factors, meat consumption and the "classical" variables in the field of entomophagy (familiarity, previous insect consumption, food neophobia and food technology neophobia, the fear of novel food technologies), the study focused on the variables sensation seeking, sustainability consciousness and food disgust, which had not yet been considered. In total, 41.9% of the participants were willing to consume an insect burger. In contrast, only 15.9% of the participants were willing to consume buffalo worms, a main ingredient of the insect burger. Using hierarchical multiple regressions, it was shown that food disgust was the most important predictor of the acceptance of edible insects, followed by previous insect consumption, food neophobia, gender, sensation seeking, and food technology neophobia. The high influence of food disgust shows that not only the explicit disgust of insects, but also the disgust of food in general, is decisive for the consumer acceptance of insect-based products. In contrast to food disgust, sustainability consciousness was not a significant predictor of the willingness to consume insects, despite the strong sustainability awareness of the study participants.

8.2 Case Study 2: Attitudes and Acceptance of Young People Towards the Consumption of Insects and Cultured Meat in Germany

The study by Jacqueline Dupont and Florian Fiebelkorn examined the willingness of children and adolescents ($N = 718$; $M_{Age} = 13.67$ years, $SD = 2.31$; *female* = 57.5%) from Germany to consume insects and in vitro meat.[83] One focus of the study was to compare attitudes towards insect and in vitro meat foods in general and in the form of a specific product, an insect or in vitro meat burger. Another focus of

[82] Cf. Lammers et al. (2019).

[83] Cf. Dupont and Fiebelkorn (2020).

the study was to analyse the influence of selected nutritional-psychological factors on the willingness of children and adolescents to consume these products. In addition to sociodemographic factors (age, gender) and meat consumption, familiarity, attitudes, food neophobia and food disgust were included in the analysis. The children and adolescents showed a significantly higher willingness to consume the in vitro meat burger, with no difference in attitude towards the two alternatives as food. Using a hierarchical multiple regression, it could be shown that the attitude towards the burger was the strongest predictor for the willingness to consume both burger alternatives. The negative influence of food neophobia was also confirmed in this study. In contrast, food disgust was not a significant predictor for the willingness to consume the two meat alternatives. This demonstrates that among children and adolescents, their attitude is the most decisive factor for the acceptance of food made from insects and in vitro meat.

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