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# Disgusting? No, just deviating from internalized norms. Understanding consumer skepticism toward sustainable food alternatives

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## ABSTRACT

In recent years, edible insects, lab-grown meat, and vertically farmed produce have been praised as potential sustainable food alternatives to the increasingly unsustainable Western diet. Although these sustainable food alternatives offer considerable benefits, consumers typically reject them without much consideration. When prompted to explain their rejection, consumers often report specific concerns regarding these foods. Edible insects, for instance, are argued to carry “diseases,” lab-grown meat is seen as “unhealthy,” and vertically farmed produce is perceived to be “less natural.” Addressing these self-reported concerns has, however, proven insufficient in fully overcoming consumers’ rejection.

The results of the three empirical studies presented in this manuscript offer a new explanation as to why. Specifically, we argue that consumers’ self-reported concerns regarding sustainable food alternatives may not per se convey the root cause of their rejection. Instead, we argue that people may also report such concerns as the result of an underlying problem: sustainable food alternatives may elicit disgust because they typically deviate from what consumers have internalized to be normal food, causing consumers to intuitively reject them. Importantly, in an attempt to appear rational, disgusted consumers may consequently rationalize their intuitive rejection with seemingly reasonable concerns, such as “insects carry diseases.”

Rather than exclusively addressing consumers’ self-reported concerns, our results suggest that marketers seeking to promote sustainable food alternatives should consider a subtle, less mentioned cause of consumers’ rejection: the perception that these foods deviate from people’s internalized norms.

## 1. Introduction

The production of food is associated with a large environmental impact. The livestock industry alone accounts for 14.5% of all greenhouse gas emissions induced by humans (Gerber et al., 2013). In response to the world’s growing population and the environmental consequences of existing production and consumption systems, marketers and researchers are turning to sustainable food alternatives as a savior.

Despite the dire need for a more environmentally sustainable diet, the most prominently discussed sustainable food alternatives of recent years—edible insects, lab-grown meat, and vertically farmed produce—are falling short of being accepted by consumers. When prompted to explain their rejection, consumers claim that edible insects, for instance, carry “diseases” (Ruby et al., 2015, p. 221) and look unpalatable (Tan et al., 2015), lab-grown meat is “unhealthy” (Verbeke et al., 2015, p. 52), and vertically farmed produce is “less natural” (Coyle & Ellison,

2017, p. 4). These self-reported concerns, we argue, may not be the only drivers of rejection. First, such concerns equally apply to other foods without equally affecting consumers’ reactions. For instance, pigs can carry diseases that are arguably more harmful to humans than any diseases insects could carry (Van Huis 2013) and food additives are considered to be unnatural, too (Rozin et al., 2012)—yet consumers rarely use these concerns to reject bacon. Moreover, Gmuer et al. (2016) have shown that directly addressing consumers’ self-reported concerns—such as, for instance, that edible insects look unpalatable by hiding their unpalatable visuals—does not fully overcome consumers’ hesitation to eat insects.

If indeed consumers’ self-reported concerns are *not* the only drivers of rejection, the question remains: where do these concerns come from, and what *is* driving consumers to reject these sustainable food alternatives instead?

Rather than being definitive barriers preventing the acceptance of sustainable food alternatives, we argue that consumers’ self-reported

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concerns may also be rationalizations triggered by an intuitive, disgust-based rejection. We posit that consumers' rejection of sustainable foods may be fueled by disgust that is elicited by the perception that consuming these foods would require people to violate internalized norms. This reasoning explains why attempts to allay self-reported concerns may not increase the acceptance of sustainable food alternatives—these attempts may be addressing a symptom, not necessarily the root cause of consumers' rejection.

Edible insects, lab-grown meat, and vertically farmed produce are seen as potential sustainable food alternatives because they critically differ from established foods in terms of the resources required, their production processes, and thus the resulting environmental footprint. While these qualities benefit the sustainability goal, we argue that they also link to the reason why consumers reject these foods. Being intended to replace common foods with a larger environmental impact, most sustainable food alternatives—almost by definition—deviate from what consumers have internalized to be normal food. We argue that, insofar that these foods deviate from this internalized norm, they may elicit disgust and thus may be rejected intuitively. Importantly, we argue disgusted consumers may be motivated to rationalize their intuitive rejection post-hoc by reporting concerns, such as “insects carry diseases.” In sum, we argue that one central feature of sustainable food alternatives is that they are deviant. This perception, in turn, elicits disgust and thus may make consumers intuitively reject them. Accordingly, instead of exclusively being a barrier causing rejection, consumers' self-reported concerns could arise as a consequence of people having intuitively rejected a sustainable food alternative.

Milk offers a good illustration of the proposed process. Cow milk is part and parcel of many Western diets (Faye & Konuspayeva, 2012). This preference, however, may not solely stem from its nutritional qualities alone but likely was affected by a historical interplay between the time spent gathering it and its caloric output (Smith et al., 1983). Providing more fat and protein per liter than cow milk (Iverson, 2007), dog milk could have been a superior choice. However, dogs may have been too difficult to farm or served other purposes better. Ultimately, possibly based on nothing more than convention, the human consumption of cow milk became a norm that was consequently internalized, to a point where today cow milk is synonymous with the term milk for most people. On the other hand, dog milk is not internalized as being a normal source of food and drinking dog milk thus would be perceived as deviant by consumers. The reaction dog milk receives was displayed in PETA's 2016 “Could You Stomach This?” campaign, in which a focus group of unsuspecting Londoners tasted a new dairy brand and liked it until the fictitious brand's spokesperson informed them that what they had consumed was dog milk (actually, it was soy milk). While deception certainly played a part in their reaction, the belief that they had consumed dog milk—something that was completely foreign to them—left consumers utterly disgusted (despite the typical disgust indicators such as a foul taste being absent). In in-depth interviews which we conducted ourselves to explore this phenomenon, we replicated this basic pattern: most of our participants refused to sample camel milk or dog milk, arguing, for instance, that camel milk is “not ethical” and that dog milk “should be for [the] puppy” or citing other ethical and health-related concerns. While our attempts to alleviate these concerns made participants reevaluate their argumentation, the overall verdict remained unchanged: consumers who rejected camel milk or dog milk kept rejecting it, regardless of the counterarguments we offered, and their acceptance of these counterarguments. Thus, these self-reported concerns seemed unlikely to be the only drivers of rejection (a more detailed description of this study can be found in Appendix A).

We argue that sustainable food alternatives such as edible insects, lab-grown meat, and vertically farmed produce may suffer the same fate as dog milk: instead of being a reasoned, deliberate choice—the assumption underlying current attempts to promote sustainable food alternatives—the rejection of these foods may be a more intuitive decision. In as far as they deviate from internalized norms, sustainable food

alternatives may elicit disgust (Hypothesis 1a), causing consumers to intuitively reject them (Hypothesis 1 b). To appear rational, consumers who intuitively reject these foods based on disgust may recruit seemingly rational justifications, such as the argument that “insects carry diseases” or “lab-grown meat is unhealthy” (Hypothesis 2).

Across a set of three studies involving actual consumption opportunities for participants, we tested these hypotheses.

## 2. Conceptual background and hypotheses development

### 2.1. Why deviant food elicits disgust

*Internalizing norms.* Social norms—a society's implicit rules of behavior—coordinate most, if not all, of people's behaviors. The ways in which people dress, work, interact, and eat are all affected by social norms (Cialdini & Trost, 1998). People follow norms because they shape the perception of what constitutes common, accepted, and moral behavior (Lindström et al., 2018). This, however, does not mean that norms are universally valid rules of behavior. Instead, what is normal in one society (e.g., eating dog meat) may be considered outrageous and unacceptable in another.

Regardless of the specific norm, repeated exposure to any salient norm facilitates the internalization of that norm (Villatoro et al., 2015). Norm internalization means that the motivation to follow the norm transitions from being external (e.g., following norms to avoid sanctions) to becoming a goal in itself (Villatoro et al., 2015). This internalization reduces the mental effort of deliberating whether to adhere to the norm or risk social sanctions (Villatoro et al., 2015). For instance, although chicken and dog meat each offer nutritional value, Western societies would perceive chicken to be a normal source of protein and dog not. Constantly weighing the costs and benefits of following the norm and eating *normal* food against the costs and benefits of eating food outside of the norm would be tedious. Instead, the process of norm internalization triggers a more effective unconditional, automatic compliance that is retained even without other people being present. Ultimately, internalized norms become convictions of what is right and wrong (Manstead, 2000), therefore acting as a personal moral compass—an internal yardstick of proper behavior that one uses to measure oneself against.

Food norms, in particular, are likely to be internalized as they are highly salient in any society (Kelly, 2011; Sobal, 1998) as society dictates what is and what is not considered food (Joy, 2011; Rozin, 1997; Sobal, 1998). For instance, restaurant menus, supermarket offerings, and cookbooks prominently display the norm that Western cultures deem the consumption of cows, pigs, chicken, tuna, and crabs to be accepted and *normal*. There is, to our knowledge, no dog meat sold at Western supermarkets and no turtle soup available in Western restaurants. While perfectly edible and regularly consumed in various Eastern cultures, these foods oppose what consumers in Western societies have internalized to be normal food. Having internalized society's food norms, consumers sense whether a given food is normal to them or not—whether a food is to be considered normal or deviant. Following the similarity heuristic (Read & Grushka-Cockayne, 2011), even previously unknown foods may be judged accordingly. If a food shares significant characteristics with other foods normal to them, consumers perceive the food to be consistent with their internalized norms too. However, if a food does not share significant characteristics with normal foods, consumers perceive it to violate their internalized norms and thus intuitively avoid it as the thought of consuming such foods elicits *disgust*.

*Disgust.* So why would the notion of consuming a deviant food elicit disgust? From its primal function of protecting a person's physical health through the rejection of potentially harmful food (Rozin & Singh, 1999), disgust has evolved into a multi-faceted emotion. Disgust makes people intuitively refrain from behaviors that could jeopardize their survival (Tybur et al., 2009). In addition to pathogens which threaten one's physical survival and specific sexual acts and partners

jeopardizing one's genetic survival, violating group norms can threaten the cohesion of a society and thus threaten life in the group and the individual's chance of survival. Thus, disgust steers people away from violating group norms (Tybur et al., 2009; Van Kleef et al., 2015).

Having internalized society's norms, we argue that the thought of consuming sustainable food alternatives (e.g., lab-meat), in as far as they are perceived to deviate from those internalized norms, may elicit disgust and is therefore intuitively rejected. In other words, we argue that the root cause of rejection of sustainable food alternatives such as lab-meat and edible insects may not just be that these foods are "unnatural" or "unhealthy" (as suggested by consumers themselves when prompted to explain their rejection), but that they require people to violate internalized norms, which elicits disgust.

**H1a.** The more a food is perceived to deviate from consumers' internalized norm, the more it will elicit disgust.

**H1b.** The effect of deviance from an internalized norm on rejection is mediated by disgust.

## 2.2. Why intuitive rejection elicits concerns

*Rationalizing rejection.* Having explained that sustainable food alternatives can be intuitively rejected because they elicit disgust, the question remains: where do consumers' self-reported concerns come from?

Consumers desire to maintain the image of being rational decision-makers (Haidt, 2001; Mercier & Sperber, 2011). Thus, when rejecting an alternative that has obvious benefits—insects, for instance, have a significantly lower environmental impact per kilogram than beef—individuals need to be able to justify to themselves and to others why they reject this alternative. However, when the rejection is based on disgust—meaning that the rejection is intuitive and beyond consumers' awareness—an obvious rational justification is lacking. Consequently, disgusted consumers may be tempted to develop justifications, a process known as post-hoc reasoning (Haidt, 2001) or rationalizing (Piazza et al., 2015). In this process, people construct plausible arguments that "would persuade a dispassionate observer" (Kunda, 1990, p. 482). Participants in moral judgment studies followed a similar pattern, intuitively condemning harmless but abnormal acts and subsequently rationalizing their judgment with seemingly logical but ultimately flawed arguments (Haidt, 2012). For instance, one disgusted participant argued that a woman cutting up and using an American flag as a rag to clean the bathroom could have offended a neighbor, even though the act was done in private without any observers (Haidt, 2012).

Analogously, rather than being a root cause preventing consumers' acceptance of sustainable food alternatives, we argue that self-reported concerns about, for instance, "unhealthiness" may also be rationalizations triggered by consumers' intuitive, disgust-based rejection of sustainable food alternatives perceived to be deviant. This reasoning also explains why previous attempts to allay self-reported concerns, such as the unpalatable look of edible insects, may not increase the acceptance of sustainable food alternatives—these attempts merely address a symptom, not the root cause of consumers' rejection.

**H2.** After having rejected a food based on disgust, people are more likely to agree with any concern that substantiates their decision to reject.

## 3. The current research

Across a set of three empirical studies, we systematically tested our conceptual model (Fig. 1): when sustainable food alternatives are perceived to deviate from consumers' internalized norms, they elicit disgust (H<sub>1a</sub>). Further, the perception of a food deviating from an internalized norm will cause rejection via disgust (H<sub>1b</sub>). Finally, people who intuitively rejected a product due to experiencing disgust are motivated to rationalize their rejection by voicing post-hoc concerns (H<sub>2</sub>).

Rather than testing this causal chain in one study, we tested each step separately. Study 1 finds correlational evidence that the more a food is perceived to deviate from internalized norms, the more disgust it elicits, which subsequently increases the likelihood that the food is rejected for consumption (H<sub>1a</sub>). Study 2 offers converging causal support for this notion; when it is positioned as coming from a source that people have not internalized to be suitable as food (i.e., as "ant eggs" instead of "crab eggs"; H<sub>1b</sub>), the same ambiguously looking food item is rejected more because it elicits more disgust. Finally, in Study 3, we confirm our second hypothesis that self-reported concerns can also emerge as a consequence of people having intuitively (based on disgust) rejected a food. To test this prediction directly, we manipulated disgust. Disgusted participants, relative to participants in the control condition, are more likely to reject the food offered to them, and the act of rejecting the food increases the likelihood of participants agreeing with any concern that discredit that food (e.g., "camels are not made to produce milk, they have a different purpose"). This finding confirms that concerns can indeed be recruited post-hoc in an attempt to rationalize their intuitive, disgust-based rejection (H<sub>2</sub>).

In the following discussion of the individual studies, please note that, unless otherwise mentioned, all significance tests were two-sided, the assumptions for the statistical tests were met, and no outliers were excluded from the analysis.

### 3.1. Study 1: deviant food, disgust, and rejection intertwined

Attendees of a health-related fair were offered the opportunity to consume several types of food: camel milk, seaweed salad, insects, and horse meat. These products are not part of a common Western diet—they are outside of the norm, and the thought of consuming them requires participants to deviate from their internalized social norms. While attendees of this health-related fair may be more open-minded than the average consumers and thus the overall levels of disgust may be lower, consistent with our theorizing, we expected that the more participants perceive each food to deviate from their internalized norms, the more likely they are to experience disgust and thus to intuitively reject the notion of consuming that product.

## 4. Method

*Participants.* As Study 1 was a field study, the sample size was determined by the number of people visiting the health-related fair in the Netherlands. A distinct sample of 44 mostly Dutch participants was recruited at the entrance of the fair, with each participant being offered two food items, thus totaling 88 observations. Two participants had one missing observation, as dietary restrictions or allergies prevented these

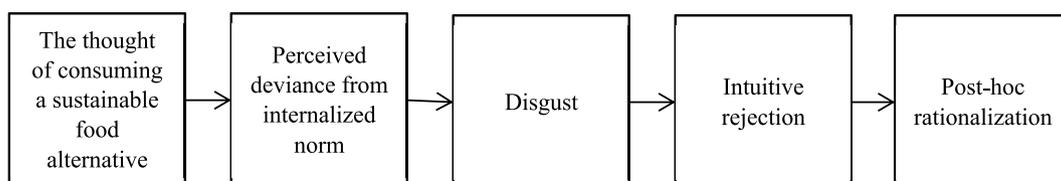


Fig. 1. Conceptual model displaying the rejection of sustainable food alternatives and the ensuing rationalizations.

participants from sampling one of the products, leaving a total of 86 observations. Sensitivity power analysis (power = 80%,  $\alpha = 0.05$ ) indicated  $r = 0.29$  as the minimal detectable effect size for this sample ( $N = 86$ ). To minimize intrusion, we recorded no demographics.

**Design and procedure.** Two research assistants, positioned at the entrance of the fair, invited randomly selected attendees to taste “novel sources of protein.” Willing participants individually entered one of two randomly selected, closed-off corridors. Next, participants were presented with the first food item and asked whether they would want to taste it. Then, participants were led to the second food item and again asked whether they would want to taste it. Finally, participants answered to what extent each food was perceived to deviate from their internalized norms and to what extent it elicited disgust.

The two available corridors offered distinct food items: one corridor served camel milk followed by horse meat ( $N = 23$ ); the other served a grasshopper followed by seaweed salad ( $N = 21$ ). These food items were chosen based on local availability.

**Dependent measure.** To minimize effort and intrusion for participants and to maximize the number of walk-ins, participants answered only two questions per food item: the perceived degree to which each food deviates from their internalized norm (“How normal is eating this food to you?”; 1 = “Very abnormal”; 5 = “Very normal”; later reverse-coded,  $M = 2.67$ ,  $SD = 1.45$ ) and disgust (“When you think about eating this food, how much disgust do you feel?”; 1 = “No disgust”; 5 = “A lot of disgust”;  $M = 1.85$ ,  $SD = 1.18$ ). The research assistant additionally noted whether the participants tasted either of the foods they were presented with (yes/no).

## 5. Results

Participants’ consumption of the product varied significantly across the four products: all participants exposed to the seaweed salad tasted it (100%), 90.9% tasted the camel milk, 57.1% the grasshopper, and 45.5% the horse meat ( $\chi^2 = 22.63$ ,  $p < .001$ ).

Collapsing the data from the four separate food items, we find that the individual differences in deviance perception significantly correlate with disgust ( $r_s = 0.65$ ,  $p < .001$ ). The feeling of disgust, in turn, significantly correlates with the likelihood of consuming the food item ( $\tau_b = -0.37$ ,  $p < .001$ ). We find a similar pattern of results when analyzing the correlations for each of the four products separately (see Appendix B). Participants who perceive the same product (e.g., camel milk) to deviate from their internalized norms more, experience more disgust, and disgusted participants are less likely to taste the product.

## 6. Discussion

Consistent with our Hypothesis 1a, Study 1 demonstrates that deviance and disgust go hand in hand: the more a food is perceived to violate participants’ internalized norms, the more disgusting it is perceived to be, and the less willing participants are to taste it.

As the two questions measuring the perceived degree of deviance and disgust were sequential, the correlation could, however, reflect common method variance (Podsakoff et al., 2003). Moreover, correlation does not equate to causation, leaving room for reversed causality: possibly disgusted participants saw the same product as being more deviant.

Study 2 tackled both of these issues. We now manipulated (rather than measured) the perceived degree of deviance of the food and subsequently examined the ensuing effect on disgust. Specifically, we showed a picture of an ambiguously looking dish and positioned it either as “ant eggs” or “crab eggs.” We expected participants in the “ant egg” condition would report more disgust—since the “ant eggs” do not share characteristics with foods they normally eat (e.g., crab meat), participants may perceive it to violate their internalized norms more and thus would experience higher levels *disgust*.

### 6.1. Study 2: deviance elicits disgust and causes rejection

Escamoles is a traditional Mexican dish made of ant larvae and pupae (DeFoliart, 1999). We varied how we introduced this ambiguously looking dish to participants by changing the name under the picture. In one condition, the picture of escamoles (available upon request) is labeled as “ant eggs.” In contrast, in the other condition, the same picture is labeled as “crab eggs.” With the foods’ taste, looks, and general description kept the same across conditions, the only difference between the two is that, described as ant eggs, the food deviates from what consumers have internalized to be normal Western food, whereas it does less so when described as “crab eggs.” Ants are not considered food in Western cultures, and thus ant eggs should not be considered food either. Crabs, on the other hand, are food. Given the similarity (Read & Grushka-Cockayne, 2011) with crabs, crab eggs may be more likely to be perceived as food than ant eggs. As a result of this association, we expected the same picture of the escamoles to be perceived as less disgusting when positioned as “crab eggs” instead of (the more truthful) “ant eggs.”

## 7. Method

**Participants.** The sample comprised 292 students of a large Dutch university who received financial compensation or course credit for their participation in the study. Prior to the analyses, 42 participants were removed for being unable to recall what food they were shown, leaving 250 participants ( $N = 250$ , 43.6% female,  $M_{Age} = 20.78$ ,  $SD = 3.06$ ). Sensitivity power analysis (power = 80%,  $\alpha = 0.05$ ) indicated  $f^2 = 0.04$  as the minimal detectable effect size for this sample ( $N = 250$ ) to test the effect of the manipulation on rejection via disgust using mediation analysis. Including the participants who failed the attention check did not alter the pattern of results, as shown in Appendix C.

**Design and procedure.** Participants were invited to take part in a study allegedly examining evaluations of food-related products. Upon arrival, they were guided into a closed-off cubicle and randomly assigned to one of two conditions: escamoles labeled as either “ant eggs” ( $N = 124$ ) or “crab eggs” ( $N = 126$ ). The description, identical between conditions except for the label, stated that this dish is a Mexican delicacy used as a filling for tacos and comparable to caviar. The taste was described as buttery and salty and the texture resembling that of cottage cheese.

**Dependent measure.** We asked participants whether they would be willing to consume escamoles, using an 11-point Likert-type item, ranging from 0 (“Definitely would not be willing to consume”) to 10 (“Definitely would be willing to consume”; later reverse-coded to reflect rejection,  $M = 6.39$ ,  $SD = 3.26$ ). To test our hypothesis that the picture of escamoles elicits more disgust when it was positioned as “ant eggs,” we administered the “emotions related to object properties” (Robinson, 2008). The three items of key interest among the 15 randomized items (“Please evaluate how you feel towards the dish you just saw”; 1 = “Does not describe my feelings”; 5 = “Clearly describes my feelings”) were one item directly measuring “disgust” ( $M = 2.43$ ,  $SD = 1.36$ ) and two other items which measuring related emotions, namely “aversion” ( $M = 2.28$ ,  $SD = 1.25$ ) and “revulsion” ( $M = 2.06$ ,  $SD = 1.11$ ) (the full scale can be found in Appendix C). Additionally, one of these items measured “familiarity” ( $M = 1.69$ ,  $SD = 0.92$ ). Finally, to verify that ants, compared to crabs, are indeed less internalized as a source of food, we asked participants “How normal is including ants (crabs) in your diet to you?” (1 = “Very abnormal”; 5 = “Very normal”; later reverse-coded,  $M = 3.77$ ,  $SD = 1.12$ ).

## 8. Results

We selected escamoles assuming that this product would be unknown to participants and thus could be credibly introduced as either “ant eggs” or “crab eggs”. Indeed, the ant eggs ( $M = 1.68$ ,  $SD = 0.92$ ) and crab eggs ( $M = 1.71$ ,  $SD = 0.93$ ,  $t(1, 248) = -0.22$ ,  $M_{Difference} = -0.03$ ,

95% CI [-0.26, 0.20], Cohen's  $d = 0.03$ ,  $p = .826$ ) were both considered quite unfamiliar. Participants perceived including ants into their diet to deviate more from their internalized norms ( $M = 4.15$ ,  $SD = 0.86$ ) than including crabs into their diet ( $M = 3.40$ ,  $SD = 1.22$ ) ( $t(1, 225.34) = 5.60$ ,  $M_{\text{Difference}} = 0.75$ , 95% CI [0.48, 1.01], Cohen's  $d = 0.71$ ,  $p < .001$ ). Participants in the ant egg condition reported feeling more disgust ( $M = 2.64$ ,  $SD = 1.39$ ) than those in the crab egg condition ( $M = 2.23$ ,  $SD = 1.30$ ) ( $t(1, 248) = 2.40$ ,  $M_{\text{Difference}} = 0.41$ , 95% CI [0.074, 0.74], Cohen's  $d = 0.31$ ,  $p = .017$ ) as measured with the single disgust item. There was, however, no significant difference between the two conditions for the related items of "aversion" ( $M_{\text{Ant Eggs}} = 2.37$ ,  $SD = 1.30$ ,  $M_{\text{Crab Eggs}} = 2.20$ ,  $SD = 1.21$ ,  $t(1, 248) = 1.11$ ,  $M_{\text{Difference}} = 0.18$ , 95% CI [-1.36, 0.49], Cohen's  $d = 0.14$ ,  $p = .27$ ) and "revulsion" ( $M_{\text{Ant Eggs}} = 2.05$ ,  $SD = 1.11$ ,  $M_{\text{Crab Eggs}} = 2.07$ ,  $SD = 1.12$ ,  $t(1, 248) = -0.14$ ,  $M_{\text{Difference}} = -0.02$ , 95% CI [-0.30, 0.26], Cohen's  $d = 0.02$ ,  $p = .89$ , 95% CI [-0.2970, 0.2581]). Participants in the ant egg condition were more likely to reject ( $M = 7.00$ ,  $SD = 3.26$ ) than those in the crab eggs condition ( $M = 5.79$ ,  $SD = 3.15$ ) ( $t(1, 248) = 2.98$ ,  $M_{\text{Difference}} = 1.21$ , Cohen's  $d = 0.38$ , 95% CI [0.41, 2.01],  $p = .003$ ).<sup>1</sup> Finally, differences in experienced feelings of disgust significantly correlated with rejection; the more disgusted participants were, the more likely they were to reject the escamoles ( $r_s = 0.61$ ,  $p < .001$ ).

We tested for mediation using the PROCESS macro (Hayes, 2013), model 4, with 10,000 bootstrapped samples and a 95% confidence interval. As predicted, we found that the deviance manipulation (ant eggs vs. crab eggs labeling) significantly increased the disgust participants experienced ( $b = 0.41$ , 95% CI [0.074, 0.74]), and more disgusted participants, in turn, were more likely to reject the food ( $b = 1.56$ , 95% CI [1.33, 1.78]). The indirect effect of the deviance manipulation on rejection through the mediator disgust was significant ( $b = 0.64$ , 95% CI [0.12, 1.17]). The deviance manipulation's total effect on rejection was also significant ( $b = 1.21$ , 95% CI [0.41, 2.01]).

In sum, when a food is perceived as violating internalized norms, it is more likely to elicit disgust, which, in turn, increases the likelihood that consumers will reject that food item (Fig. 2). When including familiarity as a covariate in the mediation, we still find that the effect of the deviance manipulation on rejection is mediated by disgust.

## 9. Discussion

We find that participants consider the same unknown product—escamoles—to be more disgusting when it is positioned as coming from a source that consumers have not internalized to be food (ants instead of crabs). It must be noted, however, that our deviance manipulation did not produce significant differences in the measures of "aversion" and "revulsion." Possibly participants regard these items more as a bodily rejection which the deviance manipulation did not elicit.

Study 2 complements the findings of Study 1, thus offering converging support for  $H_{1b}$ : a food perceived to deviate from consumers' internalized norms will be intuitively rejected due to disgust.

Having established that sustainable food alternatives that are perceived to deviate from consumers' internalized norms may elicit disgust and thus be intuitively rejected, in Study 3, we test whether disgust-based rejection motivates people to come up with rationalizations to justify their intuitive rejection. Specifically, since consumers desire to appear rational, consumers who intuitively reject a food offered to them may be tempted to recruit concerns as a way to justify

<sup>1</sup> Despite Shapiro Wilk's test indicating that the data for deviance ( $p < .000$  for both conditions), disgust ( $p < .000$  for both conditions), aversion ( $p < .000$  for both conditions), revulsion ( $p < .000$  for both conditions) and rejection ( $p < .000$  for both conditions) were not normally distributed, the analyses were carried out further as the independent-samples  $t$ -test is fairly robust against violating this assumption.

their decision ( $H_2$ ). In other words, self-reported concerns about, for example, "unhealthiness" can arise as a *consequence* of disgust-based rejection.

### 9.1. Study 3: why consumers rationalize

Sustainable food alternatives can be faced with consumers' self-reported concerns such as insects carry "diseases" (Ruby et al., 2015, p. 221) or lab-grown meat is "unhealthy" (Verbeke et al., 2015, p. 52). We argued that such concerns are not just barriers making people reject sustainable food alternatives but can also arise as a consequence of people having intuitively rejected sustainable food alternatives. Accordingly, in Study 3, we sought to elicit disgust and thereby provoke participants to intuitively reject a food item. We opted for a standard disgust-eliciting procedure (Han et al., 2012) to directly manipulate the experienced levels of disgust and thus test the causal effect of disgust on rejection and rationalizations. Thus, after eliciting disgust, we measured participants' willingness to consume a food product (e.g., Jersey milk) and thereafter presented them with concerns (e.g., "Jersey milk is only for baby Jersey cows") akin to those we found in the interviews we initially conducted to explore this phenomenon. We expected that disgusted participants would be more likely to intuitively reject the food presented to them. Subsequently, seeking to rationalize their intuitive rejection, we also expected disgusted participants to be more likely to agree with any seemingly plausible concern in favor of them rejecting that food.

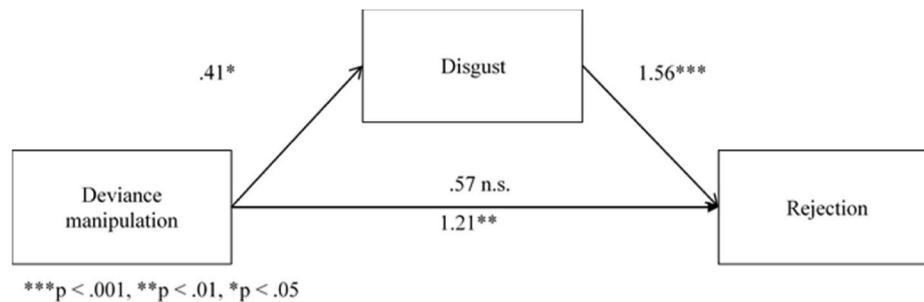
## 10. Method

**Participants.** Using Amazon Mechanical Turk, we recruited a distinct sample of 498 participants (52.6% female,  $M_{\text{Age}} = 39.45$ ,  $SD = 11.20$ ) pre-screened for a liking of milk, who participated for financial compensation. Sensitivity power analysis (power = 80%,  $\alpha = 0.05$ ) indicated  $f^2 = 0.02$  as the minimal detectable effect size for this sample ( $N = 498$ ) to test the effect of disgust on the rationalizations via rejection using mediation analysis.

**Design and procedure.** We employed a 2 (disgust vs. control) by 2 (camel milk vs. Jersey milk) between-subjects design. Participants engaged in a sequence of allegedly unrelated studies. The first study was introduced as a test of how both the time passed and a cognitive load affected participants' ability to recall emotions experienced earlier. In reality, this description was a cover for our disgust manipulation. Randomly assigned to conditions, participants either saw a video clip portraying a disgust-eliciting scene (from the movie *Trainspotting*;  $N = 246$ ) or a neutral video clip (a *National Geographic* special on the Great Barrier Reef;  $N = 252$ ). The scene from the movie *Trainspotting* had previously been used effectively to manipulate incidental disgust (Han et al., 2012).

After watching either video clip, participants were directed to a purported next study about new dairy products. To reinforce the belief that the two studies were unrelated, participants were explicitly warned not to let the videos of the "previous study" interfere with the subsequent study, as done in prior work (Han et al., 2012).

Next, participants were randomly presented with either a picture of a container of camel milk ( $N = 251$ ) or a picture of a container Jersey milk ( $N = 247$ ). We used two different types of milk to explore the extent to which incidental disgust can facilitate rejection and rationalizations—whether it would only hold for the more deviant product (i.e., camel milk) or also the less deviant product (i.e., Jersey milk). Both types of milk were described as containing the same amounts of fat, more protein, but less sugar than regular cow milk. The taste was described as comparable to regular cow milk, and repeat customers were said to prefer the milk over regular cow milk. Hence, each type of milk was positioned to be the superior choice compared to regular cow milk, forcing participants to recruit plausible reasons that could justify their rejection.



**Fig. 2.** Unstandardized regression coefficients for the relationship between the deviance manipulation and rejection with the mediator disgust. The indirect effect of the deviance manipulation clip on rejection via disgust is significant ( $b = .64$ , 95% CI [0.12, 1.17]) and so is the total effect ( $b = 1.21$ , 95% CI [0.41, 2.01]). The direct ( $b = 0.57$ , 95% CI [-0.04, 1.19]) is not significant.

**Dependent measure.** After scoring the willingness to consume (0 = “Definitely would not be willing to consume”, 10 = “Definitely would be willing to consume”); later reverse-coded to reflect rejection,  $M = 4.66$ ,  $SD = 2.93$ ), participants were asked how much they agreed (1 = “Strongly disagree”, 7 = “Strongly agree”) with seven pre-listed concerns in favor of rejecting the milk, presented in random order. These concerns were based on commonly offered justifications we found in the interviews discussed in the introduction and presented plausible arguments that “would persuade a dispassionate observer” (Kunda, 1990, p. 482). For instance, some participants in our interviews argued Jersey milk being “only for baby Jersey cows” or camels not being “made to produce milk.” Such concerns are, on the surface, plausible arguments. Thus, agreeing with such concerns can help people rationalize their rejection.

Participants in the follow-up study were presented with the following concerns: “People should not drink Jersey/camel’s milk because ...” (1) “Jersey cows (camels) are not made to produce milk, they have a different purpose” ( $M = 2.92$ ,  $SD = 1.49$ ), (2) “Jersey (camel’s) milk is only for baby Jersey cows (camels)” ( $M = 2.69$ ,  $SD = 1.49$ ), (3) “drinking Jersey (camel’s) milk is less natural than drinking regular cow’s milk” ( $M = 2.53$ ,  $SD = 1.46$ ), (4) “it has to be imported and therefore is bad for the environment” ( $M = 2.98$ ,  $SD = 1.50$ ), (5) “regular milk is available, so there is no reason to drink Jersey (camel’s) milk” ( $M = 2.94$ ,  $SD = 1.56$ ), (6) “Jersey cows (camels) are not known for their milk, so it will not be any good” ( $M = 2.64$ ,  $SD = 1.47$ ), and (7) “it is unethical” ( $M = 2.30$ ,  $SD = 1.21$ ).

The mean of all seven concerns was taken to create a single new variable that was subsequently used as a measure of agreement with rationalizations ( $M = 2.72$ ,  $SD = 1.12$ ; Cronbach’s Alpha = .89).

As a manipulation check, participants identified the emotions elicited by the video clip by responding to parts of the Discrete Emotion Questionnaire (Harmon-Jones et al., 2016). The mean of the four items measuring disgust ( $M_{GrossedOut} = 3.44$ ,  $SD = 2.61$ ;  $M_{Nausea} = 2.59$ ,  $SD = 2.09$ ;  $M_{Sickened} = 3.12$ ,  $SD = 2.42$ ;  $M_{Revulsion} = 3.09$ ,  $SD = 2.42$ ) was used to create a new variable to employ as a measure of disgust ( $M = 3.06$ ,  $SD = 2.27$ , Cronbach’s Alpha = .96). Finally, participants answered the “importance of rationality scale” (Ståhl et al., 2016), which was speculated to but did not ( $p = .52$ ) moderate the effect of rejection on the agreement with rationalizations. As it did not moderate the relationship, this scale was not used for further analysis.

We expected that participants who intuitively rejected the milk due to disgust would more strongly agree with *any* reasons that would allow them to justify their rejection—including the list of concerns we offered to them. In other words, we expected to find mediation: the effect of the disgust manipulation on the agreement with the rationalizations would be mediated by rejection.

## 11. Results

Participants in the disgust condition remembered feeling

significantly more disgusted when watching the movie ( $M_{Disgust} = 5.00$ ,  $SD = 1.59$ ) than participants in the control condition ( $M_{Control} = 1.16$ ,  $SD = 0.63$ ;  $t(319.364) = -35.337$ ,  $M_{Difference} = 3.84$ , 95% CI [3.63; 4.06], Cohen’s  $d = 3.20$ ,  $p < .001$ ), implying our disgust manipulation was successful.<sup>2</sup>

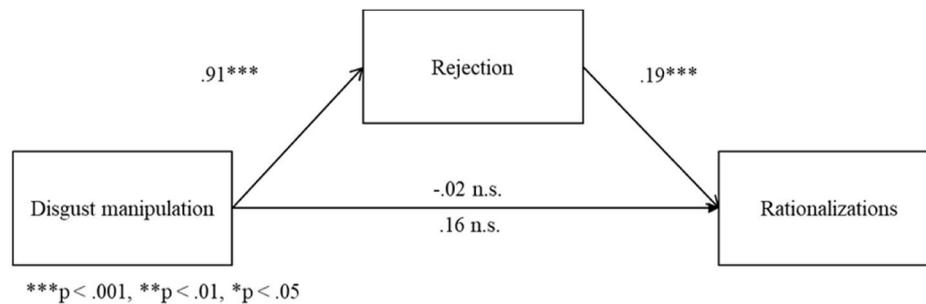
Participants in the disgust condition ( $M = 5.12$ ,  $SD = 3.02$ , 95% CI [4.74, 5.51]) were more likely to reject the milk than those in the control condition ( $M = 4.21$ ,  $SD = 2.78$ , 95% CI [3.86, 4.54]); ( $F(1, 494) = 12.17$ , partial  $\eta^2 = 0.024$ ,  $p = .001$ ). Participants were much more likely to reject milk from camels ( $M = 5.53$ ,  $SD = 3.10$ , 95% CI [5.14, 5.89]) than from Jersey cows ( $M = 3.78$ ,  $SD = 2.45$ , 95% CI [3.47, 4.09]); ( $F(1, 494) = 49.35$ , partial  $\eta^2 = 0.091$ ,  $p < .001$ ). The interaction effect between the disgust manipulation and the type of milk on rejection was not statistically significant ( $F(1, 494) = 0.15$ , partial  $\eta^2 < 0.000$ ,  $p = .699$ ).<sup>3</sup> As there was no significant interaction between the disgust manipulation and the type of milk, we collapsed the data across both types of milk.

To test whether rejection would mediate the relationship between the disgust manipulation and agreement with the rationalizations, we ran a mediation analysis using model 4 of Hayes’ PROCESS macro (2013) with 10,000 bootstrapped samples. Consistent with our prediction, we found that participants who saw the disgusting video clip were more likely to reject the milk ( $b = 0.91$ ,  $p = .005$ , 95% CI [0.40, 1.42]), and a higher likelihood of rejection, in turn, increased the agreement with the rationalizations ( $b = 0.19$ ,  $p < .001$ , 95% CI [0.16, 0.22]). The confidence interval of the indirect path from the disgust manipulation on rationalizations via rejection did not contain zero ( $b = 0.17$ , 95% CI [0.08, 0.28]). In other words, the data pattern is consistent with our prediction: disgust makes people intuitively reject foods, and rejection, in turn, motivates people to rationalize their decision, by agreeing with pre-listed concerns.

Although the rationalizations appealed more to participants in the disgust condition ( $M = 2.80$ ,  $SD = 1.11$ ) than to participants in the control condition ( $M = 2.64$ ,  $SD = 1.13$ ), the total effect was not significant ( $b = 0.16$ , 95% CI [-0.04, 0.35]). This pattern of results (i.e., an indirect effect in the absence of a total effect) suggests an “indirect-only mediation” (see Fig. 3): while the effect of disgust on rationalizations is mediated by rejection, there is potentially a third, unmeasured variable at play that counteracts the total effect (Rucker et al., 2011; Zhao et al., 2010).

<sup>2</sup> Despite the data not being normally distributed, as assessed by Shapiro-Wilk’s test ( $p < .000$  for both conditions), the analysis was carried out further.

<sup>3</sup> Despite Shapiro-Wilk’s tests ( $p < .000$  for all conditions) indicating that the data were not normally distributed and Levene’s test ( $p < .000$  for all four conditions) indicating that the assumption of homogeneity of variances was not met, the analyses were carried out as the two-way ANOVA is fairly robust against violating these assumptions.



**Fig. 3.** Unstandardized regression coefficients for the relationship between the disgust manipulation and agreement with rationalizations with the mediator rejection. While the indirect effect of the disgusting video clip on rationalizations via rejection is significant ( $b = .17$ , 95% CI [0.08, 0.28]), neither the direct ( $b = -0.02$ , 95% CI [-0.19, 0.16]) nor the total effect ( $b = 0.16$ , 95% CI [-0.04, 0.35]) are significant.

## 12. Discussion

Study 3 was designed to test the causal role of intuitive rejection in the onset of rationalizations. Using a video clip, we made some participants experience disgust. Relative to control participants, disgusted participants were more likely to reject the product presented to them. The act of rejecting made them subsequently more likely to agree with the concerns that were listed in the questionnaire—they rationalized their intuitive rejection post-hoc. In other words, it seems that experiencing disgust can make participants intuitively reject a food and thereby motivate participants to discredit that specific food. Thus, this study suggests that consumers' self-reported concerns can indeed be a consequence of an underlying problem—consumers feeling disgusted may intuitively reject foods (Hypothesis 2).

### 12.1. General discussion

Sustainable food alternatives are needed to minimize the detrimental impact of human food consumption on the environment. Edible insects, however, are seemingly rejected for carrying “diseases” (Ruby et al., 2015, p. 221), lab-grown meat for being “unhealthy” (Verbeke et al., 2015, p. 52), and vertically farmed produce for being “less natural” (Coyle & Ellison, 2017, p. 4). Research has explained how such concerns may facilitate both disgust and rejection (e.g., Siegrist et al., 2018) and how different ways of framing sustainable food alternatives may offer a solution to alter their acceptance (e.g., Geipel, et al., 2018).

The current research takes a step back to investigate the elicitation of disgust from a different perspective—the idea that sustainable food alternatives are intuitively rejected because they elicit disgust for deviating from consumers' internalized norms. Seeking to substantiate their intuitive rejection, consumers may subsequently rationalize their rejection post-hoc. In other words, concerns about “unhealthiness” may not just be *causing* people to reject sustainable food alternatives, but such self-reported concerns may also arise as a consequence of people having rejected those foods based on disgust.

Study 1 gave participants the opportunity to sample food and found correlational support for our theory: the more participants perceived a specific food to deviate from their internalized norm, the more disgusting they perceived the food to be, and the less likely they were to consume it. In Study 2, we presented participants with the image of an ambiguously looking food item—escamoles—and demonstrated that the food elicited more disgust and was rejected more when we positioned it as deviating from internalized norms (“ant eggs” instead of “crab eggs”). Finally, in Study 3, we investigated the source of consumers' self-reported concerns. To this end, we successfully manipulated disgust using a clip from the 1996 movie *Trainspotting*. We found that disgusted participants were more likely to reject the milk presented to them and that rejection subsequently drove participants to agree with *any* concern supporting rejection, including concerns such as “Jersey milk is only for baby Jersey cows.”

As such, the present research combines two previously unconnected streams of literature—deviance leads to disgust and intuitive rejection may be rationalized post-hoc—to offer a novel explanation as to why current attempts to increase the demand for sustainable food alternatives may be destined to fail. Across three studies, we demonstrate that sustainable food alternatives, in as far as they deviate from consumers' internalized norms, can elicit disgust. This disgust response triggers consumers to intuitively reject sustainable food alternatives, which, in turn, motivates consumers to rationalize their decision—to agree with seemingly plausible concerns that disqualify the food. Together, these results imply that previously documented concerns regarding diseases (Ruby et al., 2015), health (Verbeke et al., 2015), or naturalness (Coyle & Ellison, 2017; Siegrist et al., 2018) may not just be a barrier for sustainable food alternatives to overcome. Instead, our research suggests such concerns can also arise as a *consequence* of a rejection that already occurred.

## 13. Implications

These findings expand and complement previous research within the field of sustainable food alternatives. While gathering consumers' initial reaction toward sustainable food alternatives may be insightful and could lead to new strategies to overcome rejection (e.g., Coyle & Ellison, 2017; Ruby et al., 2015; Verbeke et al., 2015), researchers and policy-makers alike need to consider the alternative possibility that consumers may simply try to voice seemingly reasonable concerns to support their intuitive rejection. Guided by disgust, consumers may reject such foods and rationalize this rejection post-hoc.

Accordingly, previous attempts to promote sustainable food alternatives may have been ineffective because they merely addressed the symptoms of rejection rather than the cause thereof. This perspective also suggests important implications for the positioning of sustainable food alternatives. In particular, when based on an incomplete understanding of post-hoc rationalizations as the driver of consumers' skepticism, marketing strategies and consumer policies trying to address these rationalizations will not be effective in speeding up the societal uptake of these foods. In theory, such strategies could even sidetrack alternative efforts and thus hinder acceptance.

For instance, consumers' concerns that edible insects carry “diseases” may influence producers to introduce stringent hygiene standards and communicate these to alleviate consumers' concerns. However, these efforts may be ill-fated as the problem may not lie with the hygiene of the product itself but with the mindset of the Western consumer, who simply is not used to regard insects as a normal type of food. Other strategies that have been promoted, such as increasing the culinary appeal of sustainable food alternatives food (Deroy, 2015), likely face the same problem: even the tastiest insect burger needs to overcome the problem that it requires consumers to violate internalized norms—insects are not food. As our studies have shown, regardless of taste, appearance, or other characteristics, food perceived to deviate

from consumers' internalized norms will likely be met with disgust.

The results of this investigation point to potential interventions. When deviance elicits disgust that causes rejection, a promising strategy would be to change the perception that the product deviates from consumers' internalized norms in the first place. That is, norm change offers a solution. Norm change may occur without external interference. Over time, some products are embraced by a minority and, after repeated exposure, may spontaneously come to be seen as more normal by the majority, as was the case for the gradual acceptance of sushi in the United States (Hsin-I Feng 2012). However, as sustainability is a growing concern, timely solutions might require interference to speed up the societal uptake of sustainable food alternatives. Thus, instead of solely focusing on improving sustainable food alternatives, marketers also need to think about how they can normalize (Rettie et al., 2012) such products proactively.

### 13.1. Limitations and future directions

While our studies offer empirical support for the proposed framework, we acknowledge some limitations that deserve further research in the future. For example, Studies 1 and 2 both use highly uncommon food items and show the effect as hypothesized. However, these foods do not allow us to pinpoint the amount of exposure required for a food to be perceived to be normal. Thus, research could investigate what it takes for a formerly deviant food to become internalized as normal and thus outline potential interventions.

While the data of Study 3 support the notion that disgust, via making people intuitively reject foods, can trigger rationalizations (agreeing with, for instance, "Camel's milk is only for baby camels"), we note that the disgust manipulation did not lead to direct increase in rationalizations. In other words, we found support for a hypothesized indirect effect in the absence of a total effect. The absence of a total effect does not preclude researchers from testing mechanisms (Rucker et al., 2011), but this pattern does call for additional research: it signals there may be a third, unmeasured variable that counteracts the total effect of the disgust manipulation. Participants in the control condition watched a video of the Great Barrier Reef. Although intended as a non-disgusting, neutral baseline, watching nature is known to increase people's soft fascination—a state of effortless mental stimulation that leaves space for reflection (Basu et al., 2019). Being in this mental state, participants in the control condition possibly questioned the need to consume animal products at all, and thus, for an entirely different reason, *also* agreed more with the listed concerns. As we did not measure soft fascination, so cannot test this. We thus recommend future studies to also measure these and potential other suppressor variables, or avoid using nature as a control condition.

Future research could also expand the scope of this research to different cultures and different products. Using foods that have predominately been consumed in Western cultures, such as fermented cheeses or raw meat, one may find similar disgust reactions in Eastern cultures, as such foods may violate internalized norms in cultures not accustomed to them. Moreover, foods are a category of products that are presumably easily internalized; food norms are extremely salient, food consumption is a frequent and often public behavior, and food consumption is vital. All of these factors make foods an ideal candidate for internalization and thus an interesting case in point, but perhaps not the only one. Our theory argues that any product or behavior that is perceived as deviant, that is perceived to conflict with the "values and

ideals [...] of the in-group" (Cottrell & Neuberg, 2005, p. 773) may elicit disgust. As such, products and behaviors that are strong markers of an out-group could elicit the same response: vaccinations could elicit disgust for vaccination-opponents, or electric cars may elicit the same intuitive response among so-called petrol-heads. As food is quite literally internalized (i.e., ingested), any other products and behaviors might not elicit as strong of a disgust response as food, nevertheless, research in this area could further the applicability of our model.

If the concern that "insects carry diseases" is not the only barrier preventing consumers from consuming edible insects, it stands to reason that other products and behaviors that are intuitively rejected may not be helped by focusing on consumers' self-reported concerns—if they are rationalizations too, they are not necessarily the root cause of rejection. When rejecters point out that the risks of GMOs do not outweigh the benefits—against the overwhelming scientific consensus (Blancke et al., 2015)—it is possible that, at least partly, such worries are symptoms of the same underlying process. Specifically, as the rejection of GMOs can be driven by disgust (Clifford & Wendell, 2016) and thus can be intuitive and GMOs offer benefits that are hard to ignore, rejecters have a motivation to come up with plausible arguments that would justify their unwillingness to support GMOs: they are "dangerous" (Clifford & Wendell, 2016, p. 156). Similar concerns have been used to reject mandatory vaccinations (Plotkin et al., 2009) and to oppose calls for reducing meat consumption (Macdiarmid et al., 2016). At this point, however, these thoughts are just speculation, so they merit further research: using a similar methodology as in our manuscript, one could revisit such concerns to examine to what extent they are true barriers, or symptoms of an underlying intuitive, disgust-based rejection.

Finally, edible insects might be an interesting case to study how the perception of the norm could reduce disgust. Edible insects are much more common in our diets than most consumers would care to know. For instance, carmine, also known as E120, is an EU- and FDA-approved colorant used in foods and cosmetics made from cochineal—a scale insect (EU Commission, 2011; U.S. Food & Drug Administration, 2017). The color is authorized for use in various food items, including cheese, jam, meat, and wine. Relatedly, natural products are allowed to contain a certain number of defects, such as insect particles (U.S. Food & Drug Administration, 2018). Thus, consumers are already consuming insects, albeit to a small degree, and are unaware of it. Future research could study whether resolving the misperception that insects' consumption constitutes deviant behavior would decrease the associated disgust and thus increase the acceptance of insect-based foods.

### Ethical compliance and ethical committee statement

All ethical regulations were complied with and all studies have been approved by the Research Ethics Committee of the home university of the first author; participants gave informed consent.

### Author statement

**Jan Andre Koch:** Conceptualization, Methodology, Validation, Formal Analysis, Investigation, Data Curation, Writing – Original Draft, Writing- Reviewing and Editing, Visualization, Project administration, **Jan Willem Bolderdijk:** Conceptualization, Methodology, Writing- Reviewing and Editing, Validation, Supervision. **Koert van Ittersum:** Conceptualization, Methodology, Writing- Reviewing and Editing, Validation, Supervision.

## Appendix A

The interviews held to gather the rationalizations used in Study 3, were conducted as follows. Sixty-five university students participated for financial compensation or course credit. The data of five participants were discarded because they either did not follow the instructions (N = 1) or had a dietary constraint against consuming milk (N = 1) or because no audio file was obtained owing to technical difficulties (N = 3), leaving a sample of

60 participants (63.3% female,  $M_{Age} = 21.9, SD = 2.85$ ). Participants were individually led into a room equipped with a laptop and a cooling box. The laptop displayed a questionnaire. The cooling box contained a clear, sealed plastic cup filled with either camel milk or goat milk (along with a description of the milk as either camel milk or dog milk, respectively). Participants first indicated their liking of cow milk on a seven-point Likert-type item (1 = “Dislike it a great deal”; 7 “Like it a great deal”;  $M = 4.62, SD = 1.55$ ), thus establishing a baseline liking the researcher could use as a reference during the interview. Next, the questionnaire instructed participants to take the milk and its description out of the cooling box, read the description, decide whether to consume the milk, and afterward invite the researcher back into the room. The researcher then conducted and audio-recorded a brief interview. In the interview, the researcher asked the participant which milk was in the box and whether the participant consumed it. Next, the researcher asked the participant for the reasons underlying the decision to consume the milk or not. This was the key part of the study: we expected rejecters would spontaneously rationalize their decision not to consume the camel and dog milk. The researcher, to the best of his abilities, sought to effectively alleviate the concerns of rejecters.

For instance, if a participant indicated to have rejected dog milk because “dogs do not produce a lot of milk,” the researcher reminded the participant of the milk’s description indicating that these specific dogs are livestock serving this one purpose and thus could be assumed to effectively produce milk, similar to goats or sheep. Thus, if a participant’s only concern was that dogs do not produce sufficient amounts of milk, this concern should no longer be relevant and the milk should be acceptable. The researcher would continue mitigating participant’s concerns in this way until each participant (1) changed the initial decision and accepted the milk, (2) stuck to the initial decision lacking any supportable concerns, or (3) used a non-falsifiable concern, such as “I’m not ready at lunchtime to drink milk.”

**Appendix B**

Between-subjects results.

Consumption and perceived deviance:

Camel milk ( $\tau_b = -0.22, p = .266$ ), horse meat ( $\tau_b = -0.39, p = .051$ ), grasshopper ( $\tau_b = -0.57, p = .005$ ), seaweed salad (cannot be computed, consumption is a constant).

Consumption and perceived disgust:

Camel milk ( $\tau_b = -0.09, p = .658$ ), horse meat ( $\tau_b = -0.20, p = .316$ ), grasshopper ( $\tau_b = -0.53, p = .009$ ), seaweed salad (cannot be computed, consumption is a constant).

Perceived deviance and perceived disgust:

Camel milk ( $r_s = 0.30, p = .169$ ), horse meat ( $r_s = 0.61, p = .003$ ), grasshopper ( $r_s = 0.68, p = .001$ ), seaweed salad ( $r_s = 0.42, p = .059$ ).

**Appendix C**

Study 2.

Full Sample Analyses.

Full sample:  $N_{Ant\ Eggs} = 146, N_{Crab\ Eggs} = 146$ .

Deviance:  $M_{Ant} = 4.14, SD_{Ant} = 0.84, M_{Crab} = 3.44, SD_{Crab} = 1.20$ ;

$t(1, 259.39) = 5.78; M_{Difference} = 0.70, Cohen's\ d = 0.69, p < .001, 95\% CI [0.46, 0.94]$ .

Disgust:  $M_{Ant\ Eggs} = 2.61, SD_{Ant\ Eggs} = 1.37, M_{Crab\ Eggs} = 2.25, SD_{Crab\ Eggs} = 1.32$ ;

$t(1, 290) = 2.25; M_{Difference} = 0.35, Cohen's\ d = 0.26, p = .025, 95\% CI [0.04, 0.66]$ .

Aversion:  $M_{Ant\ Eggs} = 2.35, SD_{Ant\ Eggs} = 1.27, M_{Crab\ Eggs} = 2.16, SD_{Crab\ Eggs} = 1.20$ ;

$t(1, 290) = 1.25; M_{Difference} = 0.18, Cohen's\ d = 0.15, p = .211, 95\% CI [-0.10, 0.47]$ .

Revulsion:  $M_{Ant\ Eggs} = 2.04, SD_{Ant\ Eggs} = 1.09, M_{Crab\ Eggs} = 2.00, SD_{Crab\ Eggs} = 1.08$ ;

$t(1, 290) = 0.328; M_{Difference} = 0.04, Cohen's\ d = 0.04, p = .743, 95\% CI [-0.21, 0.29]$ .

Rejection:  $M_{Ant\ Eggs} = 7.04, SD_{Ant\ Eggs} = 3.18, M_{Crab\ Eggs} = 5.82, SD_{Crab\ Eggs} = 3.07$ ;

$t(1, 290) = 3.34; M_{Difference} = 1.22, Cohen's\ d = 0.39, p = .001, 95\% CI [0.50, 1.94]$ .

Antecedent	M (Disgust)			Y (Rejection)		
	Coeff.	SE	p	Coeff.	SE	p
X (Deviance manipulation)	.35	.16	.0251	.70	.59	.0153
M (Disgust)	-	-	-	1.48	.11	<.001
Constant	1.90	.25	<.001	1.79	.49	<.001
	$R^2 = .017. F(1, 290) = 5.07, p = .0251$			$R^2 = .43. F(2, 290) = 108.08, p < .001$		

Interest:  $M = 3.00, SD = 1.26$ .

Attraction:  $M = 2.17, SD = 1.01$ .

Alarm:  $M = 1.87, SD = 1.04$ .

Aversion:  $M = 2.28, SD = 1.25$ .

Indifference:  $M = 2.34, SD = 1.12$ .

Surprise:  $M = 2.96, SD = 1.19$ .

Curiosity:  $M = 3.21, SD = 1.24$ .

Desire:  $M = 2.00, SD = 1.08$ .

Admiration:  $M = 1.94, SD = 0.99$ .

Amusement:  $M = 2.47, SD = 1.13$ .

Panic:  $M = 1.50, SD = 0.79$ .

Disgust:  $M = 2.43, SD = 1.36$ .

Revulsion:  $M = 2.06, SD = 1.11$ .

Familiarity:  $M = 1.69$ ,  $SD = 0.91$ .

Habituation:  $M = 1.80$ ,  $SD = 0.91$ .

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