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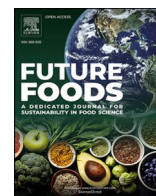
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On-site sensory experience boosts acceptance of cultivated chicken

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ABSTRACT

This study set out to assess if presenting cultivated chicken in the context of a familiar meal, in a familiar dining setting, would motivate repeat consumption and recommendation. A survey of 107 diners was conducted at Huber's Butchery and Bistro in Singapore – the world's first butchery to serve cultivated meat – from April to June 2023. The findings showed that eating cultivated chicken significantly boosted post-consumption acceptance levels. In addition, cultivated chicken's tastiness may be a more important factor than its integration into a familiar meal or dish in fostering repeat consumption. Implications for the cultivated meat industry, limitations, and suggestions for future research are addressed.

1. Introduction

Consumers tend to make choices based on what they are already familiar with (Pelchat and Pliner, 1995; Tuorila et al., 1998). In food consumption, familiarity plays the role of reducing suspicion and fostering certainty about the food consumed (Aldridge et al., 2009). More specifically, familiarization enables consumers to validate expectations about the food's appearance, texture, and chemosensory attributes – these are the very same sensory qualities that form the foundation of acceptance (Tuorila and Hartmann, 2020). Exposure to a food product is the basis of familiarity, with technical knowledge ranking only as a secondary factor (Rioux et al., 2018). It is through the process of familiarization that a food product becomes acceptable and is eventually integrated into a person's diet (Tuorila and Hartmann, 2020).

Familiar food products enjoy an advantage over novel ones (Tuorila et al., 2001; Nacef et al., 2019). For example, familiarity with food has been found to increase its liking (Borgogno et al., 2015; Raudenbush and Frank, 1999). In addition, product familiarity has been shown to influence consumers at different stages of consumption, including their attitude, intention to buy, and actual purchase (Choo et al., 2004). Familiarity is an especially significant factor when the product is novel for a consumer (Hoek et al., 2011). On the other hand, unfamiliarity may lead to concerns over negative long-term consequences, uncertainty (Marcu et al., 2015; Siegrist and Sütterlin, 2017), and a lack of trust (Siegrist and Sütterlin, 2017).

Familiarity also drives consumer acceptance of alternative proteins. This greater acceptance may be explained by consumers' reduced fear

(Schouteten et al., 2016) and increased hedonistic evaluation (Megido et al., 2016). On the other hand, a lack of familiarity with alternative proteins has been shown to negatively affect the willingness to consume them, even when the price is favorable (Van Loo et al., 2020). Research on previous food innovations such as nanotechnology, biotechnology, and irradiated foods suggests that poor familiarity contributes to general consumer reticence (eg., Gunes and Deniz Tekin, 2006; Bieberstein et al., 2013; Hocquette, 2016).

Several intervention studies revealed that incorporating alternative proteins into recognizable dishes and products and using familiar product preparations increased consumer acceptance (Lensvelt and Steenbekkers, 2014; Hartmann and Siegrist, 2016; Tan et al., 2017; Sogari et al., 2018; Barton et al., 2020). Furthermore, most meat alternatives were shown to benefit from a meal (vs. standalone product) framing (Possidônio et al., 2021). When meat substitutes were presented as part of a meal, consumers tended to explicitly choose them and not compare them directly to another standalone product such as conventional meat (Hoek et al., 2011). Together, this evidence suggests that offering cultivated meat within the context of a familiar meal may result in greater consumer acceptance of the product.

To date, research on the drivers of consumer acceptance of cultivated meat has been based on hypothetical consumption situations (Pakseresht et al., 2022). Moreover, studies thus far have focused on what drives acceptance instead of what encourages repeat purchase and consumption intentions (see Bryant and Barnett, 2020; Pakseresht et al., 2022). In December 2020, Singapore became the first country in the world to approve the sale of cultivated meat, thus offering researchers an

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unprecedented opportunity to study consumers' real-life choices. Since March 2022, the company *Eat Just* has been conducting periodic trials of its cultivated chicken with local eateries (Soh, 2022). These collaborations offer consumers the opportunity to interact with cultivated chicken in a familiar social setting. Sensory experiences play a crucial role in fostering acceptance of novel foods (Hartmann and Siegrist, 2017). Laboratory studies and gastronomic experience suggest that people's food choices tend to be driven by exposure and taste preferences (Deroy et al., 2015). For example, when insect matter was incorporated as part of a seven-course meal at a Mexican dining concept in London, public response was very positive, as it focused on the sensory appeal that insects can bring to a dish (Youssef and Spence, 2021). Sensory experience is especially salient for meat substitutes such as cultivated meat (Tucker, 2014), as consumers expect the latter to mimic conventional meat's sensory quality (Verbeke et al., 2015), which can help to overcome food neophobia (Stallberg-White and Pliner, 1999) (see Mancini and Antonoli, 2020).

RQ: Would presenting cultivated chicken in the context of a familiar meal in a familiar setting motivate repeat consumption and recommendation?

This study is significant, as it is possibly the first in the world to test in a real-life setting whether familiarity – i.e., presenting cultivated meat in the context of a familiar meal in a familiar social setting – is an important predictor of expected repeat consumption and recommendation of cultivated meat.

2. Methods

2.1. Participants

A total of 113 participants¹ who were 18 years old or above were recruited. They were diners at Huber's Butchery and Bistro in Singapore, the world's first butchery to serve cultivated meat (GOOD Meat, 2023). Diners had to first register in advance of their interest to try cultivated meat online (<https://www.goodmeat.co/butchery>). After the meal, diners had to pay for their food. The study took place from April to June 2023. The cultivated chicken meal was only served every Thursday during lunch over the three-month period. Only a maximum of 10 diners could be accommodated in each sitting. The menu had two cultivated chicken dishes, priced at SGD 18.50 each: (1) a cultivated chicken sandwich with fries and mixed greens, and (2) cultivated chicken with spring vegetable orecchiette. To enhance data quality, participants who failed the honesty check ($n = 1$), those who were not comfortable communicating in English ($n = 3$) and duplicate responses ($n = 2$) were excluded from our final analyses. This resulted in a final sample of 107 participants (see Supplementary Table S1 for participants' demographic characteristics).

2.2. Procedure

The online survey was administered on Qualtrics and took about 5 min to complete (see questionnaire in Supplementary Material). All participants were required to possess a mobile phone to access the survey online. We received ethics approval from the Singapore Management University's Institutional Review Board (IRB) and permission from *Eat Just* (the parent company of GOOD Meat) and Huber's Butchery and Bistro to conduct the study. All study procedures were performed in accordance with the university's IRB guidelines and regulations, and informed consent was obtained from all participants. The survey was split into the pre-consumption and post-consumption sections. Participants completed the pre-consumption section before their meal and the post-consumption section afterwards.

¹ There were a total of 119 diners at Huber's bistro who tried cultivated meat during the duration of the survey. Six diners did not participate in the survey.

Participants were first approached by our research assistants (RAs) and were briefed that the study investigated people's perceptions of cultivated meat in restaurant food. Next, they scanned a QR code which directed them to the pre-consumption section on Qualtrics. After providing informed consent, participants received a sticker containing a unique code (e.g., A1) for keying in at the start of the section. The unique codes were used to match the pre- and post-consumption responses. The RAs ensured that participants entered the correct code and guided them to complete the post-consumption section after finishing the dish. Upon the end of the study, participants were given \$5 cash as a participation incentive.

2.3. Measures

2.3.1. Pre-consumption

Participants were asked if they had ever eaten cultivated meat. Those who answered "yes" were then asked whether they had eaten cultivated meat at a GOOD Meat food trial, 1880 (a restaurant), or ordered cultivated meat through Foodpanda (a food delivery platform) (Soh, 2022; Phua, 2020; Foodpanda, 2021). Participants were then asked four questions that measured their familiarity with cultivated meat (1 = *not familiar at all*, 5 = *very familiar*), their knowledge about the production and benefits of cultivated meat (1 = *not knowledgeable at all*, 5 = *very knowledgeable*), and their acceptance of cultivated meat (1 = *not acceptable at all*, 5 = *very acceptable*). The scores of all items were mean aggregated to form a pre-consumption composite score, with higher scores indicating higher acceptance ($\alpha = 0.81$).

2.3.2. Post-consumption

This section included four questions that measured participants' perception of the taste of the cultivated chicken dish (1 = *not tasty at all*, 5 = *very tasty*), their willingness to eat cultivated chicken in a restaurant again, their willingness to recommend cultivated chicken to their friends or families, and their perception of the likelihood of other customers ordering cultivated chicken at restaurants (1 = *definitely not*, 5 = *definitely*). The scores of all items were aggregated to form a post-consumption composite measure, with higher scores indicating higher acceptance ($\alpha = 0.81$).

Participants were also asked two multiple response questions comprising reasons that would make them (1) more likely to eat cultivated chicken if it becomes available in more restaurants or (2) less likely to eat cultivated chicken if it becomes available in more restaurants. The eight reasons were: When it's part/not part of a familiar dish or meal, taste, texture, similarity to conventional chicken meat, price, safety, healthiness, and others. The options were randomized to prevent order effects.

2.4. Covariates

Demographic variables (age, gender, ethnicity, education, income) were entered as covariates in our analyses. Gender and ethnicity were dummy coded with males and non-Asians serving as the reference categories. Age, income, and education were treated as continuous variables.

3. Results

All analyses were conducted in IBM SPSS Statistics 28.0.

3.1. Descriptive statistics of acceptance scores

Overall, participants were quite accepting of cultivated meat by displaying high willingness to consume cultivated chicken in a restaurant again ($M = 4.41$, $SD = 0.85$) and recommending cultivated chicken to their friends or families ($M = 4.45$, $SD = 0.83$). 16.8 % of participants were more likely to eat cultivated chicken if it becomes available in

more restaurants when it's part of a familiar dish or meal (see Table 1).

3.2. Difference between Pre- and Post-consumption

A paired samples *t*-test with an α of 0.05 was conducted to compare participants' pre- ($M = 3.70, SD = 0.91$) and post-consumption ($M = 4.18, SD = 0.64$) scores (see Fig. 1). The assumption of normality was slightly violated; however, *t*-tests are considered robust against small to moderate violations of normality (Allen and Bennett, 2012). On average, participants' post-consumption acceptance was 0.49 points higher than their pre-consumption acceptance. This difference was statistically significant, $t(106) = -5.43, p < .001$, two-tailed, $d = 0.53$.

3.3. Relationship between presenting cultivated chicken in a traditional familiar meal and repeat consumption/recommendation

Linear regressions were conducted to test if there was an association between participants' likelihood of eating cultivated chicken if it becomes available in more restaurants as part of a familiar dish or meal and repeat consumption or recommendation. Demographic covariates (age, gender, income, ethnicity, education) were entered in the model. Ethnicity was consistently significant across both models – being Asian² predicted lower willingness to eat cultivated chicken in a restaurant again ($B = -0.62, SE = 0.17, p < .001$) and to recommend it to others ($B = -0.38, SE = 0.18, p = .033$). Participants' likelihood of eating cultivated chicken if it is part of a familiar dish was not significantly associated with their willingness to eat cultivated chicken in a restaurant again ($B = 0.11, SE = 0.23, p = .616$) or to recommend it to others ($B = -0.02, SE = 0.23, p = .915$; see Table 2).

3.4. Ethnicity and acceptance

We further examined the effect of ethnicity on acceptance by comparing the scores of Asians and non-Asians with an independent samples *t*-test (two-tailed; $\alpha = 0.05$).³ Welch's *t*-test would be used if the assumption of homogeneity of variance was violated. Again, the assumption of normality was slightly violated. Non-Asians had significantly higher pre- ($M = 4.11, SD = 0.70, t(87.74) = 3.82, p < .001, d = 0.71$) and post-consumption ($M = 4.44, SD = 0.43, t(99.51) = 3.41, p < .001, d = 0.60$) acceptance scores than Asians (pre: $M = 3.50, SD = 0.94$; post: $M = 4.06, SD = 0.70$). Non-Asians (vs. Asians) also displayed significantly higher knowledge about the production ($M = 3.91, SD = 0.89$ vs. $M = 3.29, SD = 1.23; t(89.57) = 2.99, p = .004, d = 0.55$) and benefits of cultivated chicken ($M = 4.11, SD = 0.83$ vs. $M = 3.25, SD = 1.25; t(95) = 4.24, p < .001, d = 0.76$), as well as displayed higher acceptance ($M = 4.57, SD = 0.74$ vs. $M = 4.00, SD = 0.92; t(105) = 3.21, p = .002, d = 0.66$) and perceived more tastiness ($M = 4.54, SD = 0.56$ vs. $M = 4.04, SD = 0.74; t(105) = 3.54, p < .001, d = 0.73$). In addition, non-Asians (vs. Asians) were more willing to eat cultivated chicken in a restaurant again ($M = 4.83, SD = 0.38$ vs. $M = 4.21, SD = 0.93; t(102.88) = 4.86, p < .001, d = 0.78$) and to recommend cultivated chicken to others ($M = 4.71, SD = 0.67$ vs. $M = 4.32, SD = 0.87; t(85.40) = 2.59, p = .011, d = 0.49$). There were no significant differences between non-Asians and Asians on their familiarity with cultivated meat ($M = 3.86, SD = 1.17$ vs. $M = 3.44, SD = 1.29; t(105) = 1.60, p = .112, d = 0.33$) and their perception of the likelihood of other customers ordering cultivated chicken at restaurants ($M = 3.66, SD = 0.80$ vs. $M = 3.68, SD = 0.87; t(105) = -0.13, p = .894, d = 0.03$).

² Asian ethnicities included Chinese, Indian, Korean, Indonesian, Japanese, Thai, and Vietnamese. Non-Asians consisted mostly of Caucasians.

³ Given the population composition in Singapore, Asians ($n = 72$) comprised the majority of the sample of this study while non-Asians ($n = 35$) comprised the minority.

Table 1
Descriptive statistics of key variables of the sample.

	Range	N = 107 n (%) M (SD)
Eaten cultivated meat before?		
Yes		19 (17.76 %)
No		88 (82.24 %)
Where have participants eaten cultivated meat at?		
GOOD Meat food trial		8 (42.11 %)
1880 (restaurant)		1 (5.26 %)
Foodpanda		3 (15.79 %)
Others (e.g., Huber's, Madame Fan)		7 (36.84 %)
Reasons that will make participant more likely to eat cultivated chicken if it becomes available in more restaurants		
When it's part of a familiar dish or meal		18 (16.82 %)
Taste		62 (57.94 %)
Texture		46 (42.99 %)
Similarity to conventional chicken meat		43 (40.19 %)
Price		54 (50.47 %)
Safety		38 (35.51 %)
Healthiness		53 (49.53 %)
Others (e.g., environmental, ethical, animal welfare reasons, availability)		21 (19.63 %)
Reasons that will make participant less likely to eat cultivated chicken if it becomes available in more restaurants		
When it's not part of a familiar dish or meal		13 (12.15 %)
Taste		32 (29.91 %)
Texture		27 (25.23 %)
Similarity to conventional chicken meat		13 (12.15 %)
Price		68 (63.55 %)
Safety		33 (30.84 %)
Healthiness		16 (14.95 %)
Others (e.g., environmental reasons)		7 (6.54 %)
Pre-consumption section		
Composite score (Mean)	1-5	3.70 (0.91)
Familiarity with cultivated meat		3.58 (1.26)
Knowledge about production of cultivated meat		3.50 (1.16)
Knowledge about benefits of cultivated meat		3.53 (1.20)
Acceptance of cultivated meat		4.19 (0.90)
Post-consumption section		
Composite score (Mean)	1-5	4.18 (0.64)
Tastiness of cultivated chicken dish		4.21 (0.72)
Willingness to eat cultivated chicken in a restaurant again		4.41 (0.85)
Willingness to recommend cultivated chicken to friends or families		4.45 (0.83)
Perception of likelihood of other customers ordering cultivated chicken at restaurants		3.67 (0.84)

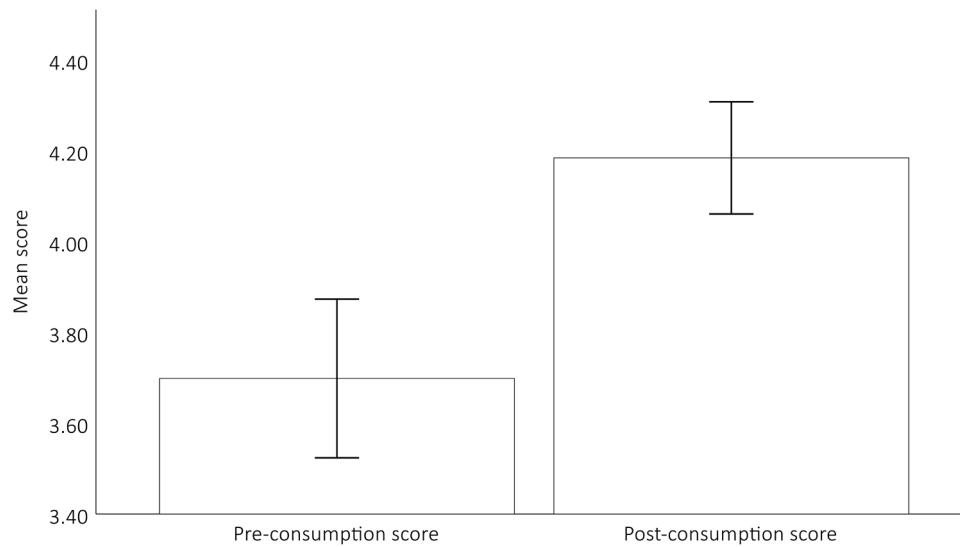


Fig. 1. Pre- and post-consumption scores (mean).
Note: Error bars represent 95 % CI

Table 2

Multiple regression model predicting repeat consumption/recommendation, accounting for the likelihood of eating cultivated chicken if it becomes available in more restaurants when it’s part of a familiar dish or meal.

	Repeat consumption		Recommendation	
	B (SE)	p	B (SE)	p
Age	0.00 (0.01)	.853	0.00 (0.01)	.853
Gender (ref= males)	-0.00 (0.17)	.994	-0.04 (0.17)	.815
Ethnicity (ref= non-Asian)	-0.62 (0.17)***	<.001	-0.38 (0.18)*	.033
Education	0.05 (0.11)	.611	0.00 (0.11)	.991
Income	-0.02 (0.05)	.630	-0.01 (0.05)	.782
Likelihood of eating cultivated chicken if it becomes available in more restaurants when it’s part of a familiar dish or meal	0.11 (0.23)	.616	-0.02 (0.23)	.915
Adjusted R ²	.071		-0.007	
F	2.345*		0.883	

*p < .05; ***p < .001.

4. Discussion

This study is possibly the first in the world to assess the acceptance of cultivated meat among consumers in a real-life consumption setting. First, it showed that post-consumption acceptance of cultivated chicken served as part of a familiar dish in a familiar setting was significantly higher than pre-consumption acceptance. Even though the cultivated chicken dishes were conventional Western dishes (i.e. pasta and sandwich), pasta and sandwich dishes are ubiquitous and familiar in Singapore. This finding is in line with previous studies, which showed that actual experience of a novel food can increase acceptance – by validating consumer expectations about the food’s appearance, texture, and chemosensory properties (e.g., [Tuorila and Hartmann, 2020](#)), and by reducing anxiety and fostering greater assurance about the food being consumed ([Aldridge et al., 2009](#)). In addition, it validates GOOD Meat’s strategy of socializing cultivated chicken to consumers through curated food trials at restaurants: eating is believing.

In addition, our study suggests that the tastiness of cultivated chicken may be a more important factor in fostering repeat consumption

than its integration into a familiar meal or dish. First, cultivated chicken scored high on tastiness (M = 4.21 on a 5-point scale). Second, cultivated chicken’s incorporation into a familiar dish or meal was not significantly related to participants’ willingness to eat cultivated chicken again in a restaurant – only 16.8 % of respondents indicated that they would be more likely to eat cultivated chicken again “when it’s part of a familiar dish or meal”.

4.1. Limitations

We acknowledge that there are some limitations in the current study. First, given the non-experimental design of our study, we cannot rule out the possibility that the post-consumption lift in consumer acceptance is not specific to cultivated chicken. That is, we may have derived the same results with conventional chicken (or other conventional meat products).

Second, given the nature of how the diners were recruited for the food trial (i.e., depending on the diners’ interest, success of registration, and availability), we were not able to control the sample size of the study, as well as how many Asians versus non-Asians were recruited prior to data collection. A post-hoc power analysis was conducted on G*Power to examine the effect size and power for the ethnicity comparisons. Likely due to the relatively small non-Asian sample size, only 6 out of 10 items (i.e. pre- and post-consumption scores, knowledge about benefits, acceptance, tastiness, and willingness to eat cultivated chicken in a restaurant again) on participants’ attitudes toward, and acceptance of cultivated meat have post-hoc power of more than 80 %. The effect size for the items that showed significant differences between Asians and non-Asians ranged from moderate to large (d = 0.49 to 0.78).

4.2. Research implications and conclusion

Our findings have practical implications for cultivated meat companies. First, they could benefit from conducting food-tasting trials with selected restaurants to socialize cultivated meat to innovators and early adopters such as food neophiles ([Latimer et al., 2015](#)) and social media influencers – the latter have been found to affect eating behaviors and diet ([Coates and Boyland, 2021](#)).

Second, they could target expatriates and well-traveled natives, who are likely to be more global and open in their outlook and consumption preferences. Third, they may wish to focus their brand messaging on the good taste of cultivated chicken (and other cultivated meat) – both on its

own as well as part of familiar meals and dishes. While a familiar meal preparation could increase willingness to try, the good taste (i.e. gustation) of a product is essential for fostering its regular consumption (Tan et al., 2017).

The study's respondents comprised individuals who proactively signed up to try cultivated chicken. Thus, they may be said to resemble innovators or early adopters (Rogers, 1995) – i.e., individuals who are already at least open to (or curious about) trying novel products. This may help to explain the relatively high overall pre-consumption score ($M = 3.70$). The potential positive bias and small sample size of this study can be addressed in future studies, when mass production of cultivated meat becomes a reality and cultivated chicken becomes more commonplace in restaurants and supermarkets. In addition, the role of ethnicity in predicting consumer acceptance of cultivated chicken can be validated using a nationally representative sample.

Ethical statement

Ethical approval for the involvement of human subjects in this study was granted by Singapore Management University Research Ethics Committee, Reference numbers IRB-21-188-E063-M2(322).

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CRedit authorship contribution statement

Mark Chong: Writing – original draft, Validation, Supervision, Methodology, Funding acquisition, Conceptualization. **Angela Leung:** Writing – review & editing, Validation, Methodology, Funding acquisition. **Tricia Marjorie Fernandez:** Writing – original draft, Project administration, Investigation, Formal analysis.

Declaration of competing interest

The authors declare no competing interests.

Data availability

Data will be made available on request.

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Supplementary materials

Supplementary material associated with this article can be found, in the online version, at [doi:10.1016/j.fufo.2024.100326](https://doi.org/10.1016/j.fufo.2024.100326).

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