



HAL
open science

A horse on your plate? A cluster analysis of French consumers hippophagy acceptance

Maxime Sebbane, Céline Vial, Arnaud Lamy

► To cite this version:

Maxime Sebbane, Céline Vial, Arnaud Lamy. A horse on your plate? A cluster analysis of French consumers hippophagy acceptance. *Meat Science*, 2023, 203, pp.109220. 10.1016/j.meatsci.2023.109220 . hal-04095090

HAL Id: hal-04095090

<https://hal.inrae.fr/hal-04095090>

Submitted on 12 May 2023

HAL is a multi-disciplinary open access archive for the deposit and dissemination of scientific research documents, whether they are published or not. The documents may come from teaching and research institutions in France or abroad, or from public or private research centers.

L'archive ouverte pluridisciplinaire **HAL**, est destinée au dépôt et à la diffusion de documents scientifiques de niveau recherche, publiés ou non, émanant des établissements d'enseignement et de recherche français ou étrangers, des laboratoires publics ou privés.



Distributed under a Creative Commons Attribution - NonCommercial - NoDerivatives 4.0 International License

A horse on your plate?

A cluster analysis of French consumers hippophagy acceptance

Maxime SEBBANE^{1,3}, Céline VIAL^{1,2}, Arnaud LAMY^{1,3},

¹ MoISA, Univ Montpellier, CIRAD, CIHEAM- IAMM, INRAE, Institut Agro, IRD, Montpellier, France

² Institut Français du Cheval et de l'Équitation, pôle Développement Innovation Recherche, Saumur, France.

³ Centre de recherche de l'Institut Paul Bocuse, Ecully, France

Maxime SEBBANE ORCID : 0000-0001-6867-3058

Céline VIAL ORCID : 0000-0002-5442-4015

Arnaud LAMY ORCID : 0000-0002-1128-5465

CORRESPONDENCE

Maxime Sebbane, MoISA, Univ Montpellier, CIRAD, CIHEAM- IAMM, INRAE, Institute Agro, IRD, 2 Place Pierre Viala, 34060 Montpellier Cedex 1 France. maxime.sebbane@supagro.fr

FUNDING

This research was grand funded by the French Institute for Horse and Riding (IFCE).

ACKNOWLEDGMENTS

All authors of this paper confirm that:

- This manuscript is original and that neither the manuscript nor any parts of its content are currently under consideration or published in another journal,
- All authors have approved the manuscript and agree with its submission to *International Journal of Consumer Studies*,
- The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

DATA AVAILABILITY STATEMENT

Data available on request from the authors

1 **A horse on your plate?**

2 **A cluster analysis of consumers hippophagy acceptance**

3

4 **Abstract**

5 Hippophagy is a practice that is far from being consensual, even among meat eaters. Horse
6 meat consumption remains limited or is even strongly declining in some countries such as
7 France. However, the nutritional, organoleptic and environmental benefits of this meat invite
8 us to consider horse meat products as a valuable alternative source of protein. This research
9 therefore aims to identify and characterize different profiles of consumers and non-consumers
10 of horse meat in terms of personal values, attitudes, motivations and behaviors. Based on data
11 from a quantitative survey among 482 French meat consumers, we distinguish 4 categories of
12 individuals: "Enthusiast", "Distant", "Aversive" and "Potential". While "Distant" and
13 "Aversive" show a low level of acceptability towards horse meat, "Enthusiast" and "Potential"
14 reveal characteristics that are favorable to horse meat consumption. Targeted strategies to
15 support the horse meat market are proposed and discussed in light of these results that also
16 provide insight into the future for meat in general.

17

18 **KEYWORDS:** Consumer behavior, Cluster analysis, Horse meat consumption

19

20 1 Introduction

21 Humans' relationship with meat is particularly complex and ambivalent. Meat is a valuable
22 source of protein and a sought-after palatable food associated with symbolic representations
23 of strength, power and masculinity (Dowsett et al., 2018; Ruby & Heine, 2011). Yet, loving
24 animals and killing them for food poses a moral dilemma that creates a cognitive dissonance,
25 also called "meat paradox". (Benningstad & Kunst, 2020; Dowsett et al., 2018; Lin-Schilstra
26 & Fischer, 2020). More recently, the consumption and production of meat arouses
27 increasingly pressing questions about the sustainability of our food models (e.g., Willett *et al.*,
28 2019). In particular, the central place of red meat from intensive feedlots in the diets of
29 Westerners is being challenged due to its detrimental impacts on the planet, animal welfare,
30 and human health (Westhoek et al., 2014; Wiart et al., 2022; Willett et al., 2019).

31 Changing consumer behavior towards beef may provide a consumption opportunity for
32 unfamiliar red meats from alternative animal species such as game, elk, kangaroo, ostrich, or
33 horses (Popoola et al., 2020). Among these, horse meat represents a niche market that offers
34 opportunities to develop supplementary high-quality red meat with less impact on the
35 environment than beef (Balji et al., 2020; Jastrzębska et al., 2019; Lorenzo et al., 2014;
36 Rzekęć et al., 2020).

37 Compared to cattle, equines are non-ruminant herbivores that emit five times less methane
38 into the atmosphere, making their meat production a more climate-friendly source of food
39 (Franz et al., 2010; Moss et al., 2000; Rzekęć et al., 2020). In terms of biodiversity, the
40 breeding of draught horses for slaughter enables the conservation of several local breeds
41 threatened with extinction and therefore helps to preserve the genetic diversity and the
42 resilience of domestic species (Belaunzaran et al., 2015). In addition, extensive horse farms in
43 Europe contribute to the maintenance of grasslands and sensitive areas and to the touristic
44 appeal of rural landscapes, while ensuring high standards of animal welfare (Insausti et al.,
45 2021; Rzekęć et al., 2020). Finally, when sanitary conditions allow, the slaughtering and

46 human consumption of horses from sport, leisure, or racing sectors is an interesting
47 alternative to euthanasia, which avoids meat wastage, ensures an economic residual value to
48 horses until the end of their life, and is an improvement for the horse's welfare compared to
49 abandonment and starving (Jez et al., 2013; Whiting, 2007).

50 Nutritionally, horse meat, compared to pork, beef, or poultry, is characterized by low levels of
51 fat and cholesterol, higher concentrations of heme iron, polyunsaturated fatty acids (omega 3
52 and 6) and proteins, making this meat a particularly healthy food (Balji et al., 2020;
53 Belaunzaran et al., 2015, 2017; Lorenzo et al., 2014; Poławska et al., 2013). Finally, the
54 sensory profile of horse meat differs little from beef in terms of aroma and flavor (Popoola et
55 al., 2019; Rødbotten et al., 2004) and its dark red color, extreme tenderness and slightly sweet
56 taste are potentially attractive organoleptic properties for red meat consumers (Balji et al.,
57 2020; Lorenzo et al., 2014; Oh et al., 2009).

58 Despite the benefits of this meat, worldwide production of horse meat represents only 0.25%
59 of the global meat market; and the average available consumption is about 0.10 kg per capita
60 (Belaunzaran et al., 2015).

61 While extensive literature has closely examined beliefs, attitudes, and practices associated
62 with commonly consumed categories of meat, such as beef, chicken, and pork, horse meat as
63 a specific category of alternative red meat is poorly documented. The aim of the present
64 research is to address this gap. More precisely, we investigate the individual characteristics of
65 consumers and non-consumers of horse meat in France. Within Europe, France is the only
66 country, along with Spain, to produce, export, slaughter, and consume horse meat on its
67 territory (FranceAgriMer, 2015). France is one of the main importers and exporters of horse
68 meat on the global market, and one of the countries where the mean consumption of horse
69 meat per capita is higher than the world average (Belaunzaran et al., 2015). However, French
70 horse meat consumption has fallen by a factor of 20 over the last 50 years going from 1.73kg
71 per capita per year in 1970 to 0.09kg per capita per year in 2020 (IFCE 2011, 2021). Half of

72 the distribution of this meat is equally split between specialized butchers and supermarkets
73 and hypermarkets, with direct sales representing a very small share (Cazes-Valette, 2008).
74 The number of horse butchers in France is steadily decreasing, with 750 counted in 2014 by
75 the Federation of French horse butchers¹. This dramatic drop suggests that some French
76 people no longer consider horse as meat edible and even for those who are likely to consume
77 it, barriers such as lack of knowledge or low availability contribute to the disappearance of
78 this meat from their food repertoire.

79 Several levers and barriers of acceptance and consumption of horse meat can be considered.
80 At a macro level, socio-technical and cultural factors like religion and public policy have
81 influenced the relationship that humans have with horses, and has governed the acceptance
82 and consumption of horse meat throughout the centuries (Whiting, 2007). In the 19th century,
83 considered as inexpensive, healthy and nutritious, horse meat was progressively legally
84 authorized for human consumption in several European countries (Belaunzaran et al., 2015;
85 Digard, 2012; Lamy & Vial-Pion, 2020; Lizet, 2010). Nowadays, hippophagy faces different
86 socio-technical and economic changes inducing a reduction in its consumption (Jez et al.,
87 2013). Access to meat in general has become more democratic and the price of beef has
88 decreased while that of horse meat has increased to become the most expensive meat product
89 (IFCE, 2021). It has also become increasingly difficult to source and buy horse meat (Bigot et
90 al., 2018; Jez et al., 2013; Leteux, 2005). Moreover, throughout the 20th century, the
91 evolution of the uses of the horse in Western societies - from a working and breeding animal
92 to a sporting and recreation animal - has considerably modified the representations of humans
93 towards horses, switching from an edible animal for human consumption to a pet
94 inappropriate for it (Lizet, 2010; Jaskari, Leipämaa-Leskinen and Syrjälä, 2015).

¹ <https://france3-regions.francetvinfo.fr/auvergne-rhone-alpes/2014/10/03/quel-avenir-pour-la-consommation-de-viande-de-cheval-564274.html>

95 At a micro level, two main types of considerations can shape the acceptability of a food
96 product (Font-i-Furnols & Guerrero, 2014; Köster, 2009a; Verbeke & Viaene, 1999). First,
97 ethical and moral considerations refer to a set of variables with affective and emotional
98 components. A general negative or ambivalent representation of meats and animals, negative
99 feelings such as guilt, worry or disgust are generally associated with meat avoidance. For
100 example, Lamy et al. (2022) show that a high level of affective attachment to horses interferes
101 with individuals' representations of horse meat and limits the intention to consume this
102 product. Popoola and colleagues (2021), in a quantitative survey that compared the
103 perceptions of three red meats - beef, bison and horse meat – among Canadian consumers,
104 showed that horse meat was associated to a pet that is cruel, unethical and socially
105 unacceptable to eat, and that people tend to express a feeling of disgust towards horse meat.
106 The second type of acceptability factors refer to the perceived characteristics of the meat,
107 ranging from the intrinsic properties in terms of sensory and organoleptic qualities, nutritional
108 or environmental benefits, to extrinsic attributes such as production organization, price,
109 availability and market positioning (Font-i-Furnols & Guerrero, 2014; Verbeke, Sans, et al.,
110 2015). Thus, consumer attitudes influence individuals' partiality for a set of different meat
111 attributes, moving towards or away from it (Verbeke, Marcu, et al., 2015). For example,
112 although individuals do not tend to distinguish between the sensory characteristics of beef and
113 horse meat, for consumers of the latter, tenderness, juiciness and flavor are inherent positive
114 factors that drive preference and taste for this meat (Popoola et al., 2020) while safety, price,
115 origin and leanness have been identified as critical attributes of horse meat among Korean
116 consumers (Oh et al., 2009).

117 However, consumer attitudes towards food products are usually formed based on prior
118 experience and habits (Verbeke & Vackier, 2004). The evaluation of meat attributes therefore
119 varies according to the level of familiarity with the meat and the willingness to try unfamiliar
120 products. In particular, with respect to horse meat consumption, it is worth highlighting that

121 individuals are largely unfamiliar with this product and the lack of availability in the market
122 environment limits their exposure and in turn the opportunities to encourage them to try it
123 (Lamy et al., 2022; Popoola et al., 2020, 2021b).

124 A better understanding of consumer and non-consumer profiles is therefore needed. What
125 motivates people to consume horse meat or not? Who are the current French consumers of
126 horse meat? Among the non-consumers, are there profiles that would consider adding horse
127 meat to their diet? Guided by these questions, we present the results of a cluster analysis that
128 aims to identify and characterize different profiles of consumers and non-consumers in terms
129 of personal values, attitudes, motivations and behaviors. In doing so, this work sheds light on
130 the potential levers and obstacles to horse meat consumption in order to develop marketing
131 strategies designed for the different consumer segments.

132 The following sections outline the methodology and results of the study before discussing the
1331 theoretical and managerial implications of the research.

3
3

1341
3
4

135 2 Materials and methods

136 The results reported here were obtained in the course of a larger study about consumer
137 motives and barriers regarding horse meat consumption, including qualitative (see Lamy *et*
1381 *al.*, 2022) and quantitative studies.

3
8

1391
3
9

140 2.1 Sample

141 Thanks to the first results of the program based on qualitative interviews among consumers
142 and non-consumers of horse meat (Lamy et al., 2022), a questionnaire was created to conduct

143 a survey among meat consumers. The questionnaire was disseminated in France in 2020,
144 online via social networks (Facebook, LinkedIn) and mail shots. Prior to the survey itself,
145 participants were asked to give their consent to participate in the study and were informed that
146 they could stop at any time. They were also informed that the study was anonymous and that

147 the data would be analyzed at the group level. The study was conducted in accordance with
148 the regulation of the EU General Data Protection Regulation.

149 A total of 482 valid questionnaires were analyzed. Table 1 presents the characteristics of the
150 sample. Distributions of gender, age, education, and family composition show that the sample
151 covers a wide range of respondents, though without being statistically representative of the
152 French population.

153153

154 **Table 1. Characteristics of the valid sample (% of respondents, n=482)**

155155

156 2.2 Measurements

157 **Meat and horse meat consumption** were measured by asking participants to answer the
158 following questions « How often do you eat meat? » and « How often do you eat horse
159 meat? » on a 5-point frequency scale ranging from 0 'never' to 4 'every day'. Vegetarians
160 were excluded from the study. In the analysis, the variable regarding horse meat consumption
161 was dichotomized in order to distinguish individuals who do not currently eat horse meat
162 (value =0) from individuals who eat horse meat more or less regularly (value =1). For
163 individuals who reported never eating horse meat, an additional question asked them whether
164 they had ever tasted it and if so, if it was during childhood or adulthood. Finally, horse meat
165 consumers were also asked where they usually purchase their horse meat.

166 **Personal norm** is generally understood as personal values that result in a sense of moral
167 obligation to act in a certain way (Schwartz, 1977). Personal norm towards horse meat
168 consumption was measured using three items: "Eating horse meat is in line with my values",
169 "In my opinion, eating horse meat is not moral," "I would feel guilty if I ate horse meat," on a
170 5-point scale from 1 'strongly disagree' to 5 'strongly agree' and middle anchor 3 'neither
171 agree nor disagree'. The last two items were reverse coded prior to calculating the mean of the

172 three items ($\alpha=.90$). The closer the mean value to 5, the less individuals report a personal
173 norm opposed to horse meat consumption.

174 The **meat attachment** scale reflects the multi-dimensional components that characterize the
175 psychological place of meat consumption in food practices. In the present study, we use the
176 MAQ (Circus & Robison, 2019; Lentz et al., 2018) to characterize consumers based on
177 individual differences in consumer appraisal of meat in general, and thus take into account the
178 broader psychological relationship that people have with meat. A scale was included to
179 measure to what extent people feel attached to meat products in terms of hedonism, affinity,
180 entitlement and dependence (Circus & Robison, 2019; Graça et al., 2015). Participants were
181 asked to rate 15 statements, on a scale from 1 ‘strongly disagree’ to 5 ‘strongly agree’, and
182 middle anchor 3 ‘neither agree nor disagree’. The hedonism subscale comprised four
183 statements including “You can’t beat a good steak” and “Eating meat is one of life’s simple
184 pleasures”. The affinity subscale comprised four statements, which were all reverse coded for
185 analyses such as “I feel bad when I think of eating meat” and “Eating meat is disrespectful
186 towards life and the environment”. The entitlement subscale was comprised of three
187 statements: “According to our position in the food chain, we have a right to eat meat”, “To eat
188 meat is an unquestionable right”, and “Eating meat is a natural and indisputable practice”.

189 Lastly, the dependence subscale was made up of four statements including “Meat is
190 irreplaceable in my diet”, “I would feel fine with a meatless diet” (item reversed for analysis).

191 Since the four subscales, hedonism ($\alpha=.88$), affinity ($\alpha=0.80$), entitlement ($\alpha=0.79$) and
192 dependence ($\alpha=0.79$) show high internal consistency, each group of statements was averaged
193 to create a subscale score.

194 The **disgust** scale developed by Rozin and Fallon (Rozin & Fallon, 1980) has been adapted to
195 examine whether horse meat products generate aversion and may vary among consumer
196 segments. In line with the authors, 8 statements including “The thought of eating horse meat
197 makes me nauseous”, and “I dislike horse meat because of the idea of what it is or where it

198 comes from” were evaluated on a 5-point scale from 1 ‘strongly disagree’ to 5 ‘strongly
199 agree’ and middle anchor 3 ‘neither agree nor disagree’ ($\alpha = .92$).

200 **Objective knowledge** characterizes the stored information and its organization in the
201 memory, that is, what the consumer actually knows about the product (Banović et al., 2012).
202 To assess consumers’ knowledge of horse meat, we developed a knowledge questionnaire
203 derived from previous exploratory interviews with 23 consumers and exchanges with experts
204 in the equine sector. People were asked to answer "true", "false" or "don't know" to nine
205 statements about the horse meat industry, including on livestock, environmental benefits and
206 nutritional properties of horse meat (see appendix 1). For each respondent, the total number of
207 correct responses was calculated to generate a 9-point knowledge score.

208 **Attitude** was studied through a consumer evaluation of meat attributes, adapted from prior
209 published studies on attitude towards fresh meat (Banović et al., 2009; Verbeke & Viaene,
210 1999). Some of the items identified in the above-mentioned papers were removed because
211 respondents found them confusing during the test questionnaire. In the final version,
212 participants were asked to rate 8 horse meat attributes: quality, taste, health benefit, presence
213 of harmful substances, trust in the product, respect for animal welfare, ease of cooking and
214 safety on a 7-point semantic differential scale (Osgood, Suci & Tannenbaum, 1957) with end
215 points associated with bipolar labels from -3 to +3. In the analysis, the score of each attribute
216 and an aggregate score of attitude equal to the average of all attributes ($\alpha = .84$) has been used
217 to describe consumer segments. In terms of interpretation, the more the responses tend
218 towards a value of 3, the more the respondent reports a favorable attitude towards horse meat.

219 **Social norm**, (Ajzen, 1991) or the subjective feeling of peer pressure regarding horse meat
220 consumption has been obtained through responses to three items: ” My family approves of me
221 eating horse meat”, “My friends approve of me eating horse meat” and “People who are
222 important to me think I should not eat horse meat”. They have been scored on a 5-point scale
223 from 1 ‘strongly disagree’ to 5 ‘strongly agree’ with middle anchor 3 ‘neither agree nor

224 disagree'. The last item was reverse coded prior to calculating the mean of the 3 items
225 ($\alpha=.72$). Thus, the closer individuals are to 5, the more they express a subjective social norm
226 supportive of horse meat consumption.

227 **Purchase facility** captured the extent to which individuals are able to source and buy horse
228 meat in their market environment. Respondents were asked to evaluate the following 3 items
229 on a 5–point scale from 1 'very easy' to 5 'very difficult' : "Sourcing horse meat near where I
230 live" "Sourcing horse meat in my usual shopping areas", "Sourcing horse meat in
231 restaurants". Sufficient internal reliability ($\alpha=.73$) allowed us to use the average score of the
232 three items to identify differences among consumer profiles.

233 Finally, the questionnaire included relevant sociodemographic characteristics like age, gender,
234 education and presence of children in the household as presented in Table 1.

2352 The questionnaire was pre-tested and refined before being disseminated online.

3
5

2362
3
6

237 2.3 Classification

238 3 variables were used to classify individuals: the frequency of meat consumption, consumer
239 or non-consumer of horse meat, and personal norm towards horse meat consumption².

240 To classify the respondents, a two-step cluster analysis procedure (Chiu et al., 2001) available
241 in SPSS (V25) was applied. This mixed-method approach involves creating a pre-grouping of
242 observations into a large number of classes using a partitioning algorithm similar to K-Means,
243 and then performing a hierarchical aggregation of these pre-classes using a log-likelihood
244 based measure (Mooi & Sarstedt, 2011, p. 259). Less commonly used than hierarchical or
245 dynamic clustering methods, this approach offers the advantage of dealing simultaneously

² This choice is based on the following reasoning. Attitude towards a food product is the result of past experiences and consumption habits (Köster, 2009b). Therefore, a segmentation that takes into account the frequency of meat consumption (as a food category) and of horse meat (as a specific product within the meat category) is relevant to

explore attitudinal differences towards horse meat. In addition to these two behavioral variables, taking into account moral conviction allows us to distinguish between individuals morally opposed to horse meat consumption and those for whom it remains morally acceptable.

246 with qualitative and quantitative variables (Mooi & Sarstedt, 2011, p. 259), which is
247 appropriate in our case study. Furthermore, the classification results are accompanied by a
248 silhouette measure of intra-group cohesion and inter-group distance to guide the often delicate
249 choice of the number of classes to retain (Mooi & Sarstedt, 2011).
250 The classification being sensitive to the order of the observations, the procedure was repeated
251 5 times by randomly modifying the order of the subjects.
252 A 4-class typology was considered the optimal solution in terms of group size, and
253 interpretability. The silhouette measure, with an average value of 0.5, indicates that intra-class
254 cohesion and inter-class distance are of good quality (Rousseeuw, 1987). In order to detect
255 differences on key dimensions among segments, a set of ANOVA and χ^2 tests was conducted
256 on classification and illustrative variables. In all tests, the statistical significance was
2572 considered significant at $p < 0.05$.

5
7

2582
5
8

259 3 Results

260 Firstly, we present meat and horse meat consumption among the sample, which allows us to
261 subsequently categorize it into four segments. Within each segment, psychological and then
262 external factors related to horse meat acceptance are then analyzed, followed by motivations
263 and finally by sociodemographic profiles.

264 3.1 Meat and horse meat consumption among the sample

265 The consumption frequencies of meat and horse meat among respondents are presented in
266 table 1.

267 Among the sample, 44.2% claimed to eat meat on a daily basis and 41.9% several times a
268 week. A majority of the respondents (83.8%) reported never eating horse meat. Nevertheless,
269 among these non-consumers, 54% have already tasted horse meat, most during their

271 Horse meat consumers totaled 16.2% of the sample. 14.2% stated eating horse meat less than
272 once a month while only 2.0% reported a more frequent consumption. For consumers,
273 preferred points of purchase were horse butcher shops (44.9%) and general butcher shops
2742 (33.3%), followed by supermarkets (30.4%) and direct purchase from producers (17.7%).
7
4

2752
7
5

276 3.2 Description and characterization of the segments

277 Cluster analysis based on meat and horse meat consumption along with personal norm makes
278 it possible to class respondents into four relatively homogeneous groups. Table 2 describes
279 the segments based on these three classification variables. Mean scores to meat attachment are
280 also presented to further characterize the four profiles in terms of psychological relation to
281 meat in general.

282282

283 Table 2. Description and characterization of the Segments (S) based on the classification variables and
284 meat attachment scales

285285

286 The **first segment** (16.2% of the sample) totaled the 78 respondents who reported eating
287 horse meat on a more or less regular basis. With the highest mean score on personal norm
288 towards horse meat (M=4.38), these consumers consistently expressed moral convictions that
289 are not opposed to hippophagy. Compared to the other segments, they reported a significantly
290 higher frequency of consumption of meat in general (3.60) as well as a greater psychological
291 attachment to meat products (3.96). The other three segments included only non-consumers of
292 horse meat who nevertheless presented distinct behavioral and psychological profiles. Non-
293 consumers in **segment 2** were the largest cluster accounting for 36.2% of the sample. They
294 were not morally opposed to hippophagy despite a slightly lower score on personal norm
295 (4.00) than consumers in segment 1. With regards to meat in general, they reported a lower

296 frequency of meat consumption (3.49) than segment 1, but higher than segment 3 and

297 comparable to segment 4. Individuals of this group showed overall lower psychological
298 attachment to meat (3.74) than segment 1, despite similar scores on affinity and entitlement
299 subscales. Non-consumers in **segment 3** constitute the smallest group with 13.3% of
300 participants. Their average personal norm score (2.69), slightly below the scale's neutral point,
301 indicated a relatively moderate moral opposition to horse meat consumption. This segment is
302 clearly distinct from the other three segments in the relationship to meat. It showed the lowest
303 frequency of meat consumption (1.91) and the lowest psychological attachment to meat in
304 general (2.71). **Segment 4** was the second largest group with 34.2% of the participants. With
305 the lowest mean score on personal norm (1.79), these non-consumers expressed an obvious
306 moral opposition to hippophagy, stronger than those in Segment 3. At the same time, their
307 frequency of meat consumption (3.44) was similar to that of Segment 2, while mean meat
308 attachment scores (3.34) were above the neutral point as for Segments 1 and 2.
309 Based on these first elements, the 4 segments were named as follows. "Enthusiast" for
310 segment 1, consisting of the largest meat consumers, who morally accept and actually
311 consume horse meat. "**Potential**" for the second segment, which is composed of consistent
312 meat consumers who morally accept the consumption of horse meat but do not actually eat it.
313 "**Distant**" for segment 3, which includes the lowest meat consumers, who are neither for nor
314 against the consumption of horse meat but do not consume it. Finally, segment 4, composed
315 of consistent meat consumers who are morally opposed to horse meat and do not consume it,
3163 has been named "**Aversive**".

1
6

3173
1
7

318 3.3 Factors related to horse meat acceptance

319 Means of the factors related to horse meat acceptance are presented in Table 3. In addition,
320 Appendix 1 and 2 provides the distribution of the answers to knowledge questions for the

321 overall sample and Figure 1 and Appendix 3 illustrate the average ratings of each attitudinal
322 attribute across segments.

323 3.3.1 Disgust

324 Disgust towards horse meat significantly varied among segments ($F=140.86$; $p<.001$). Both
325 *Enthusiast* (1.30) and *Potential* (1.97) showed a rather clear absence of disgust towards horse
326 meat. Although less marked, with an average rating just below the neutral point 3, *Distant*
327 tended to express low disgust (2.76). Only the *Aversive* segment recorded a mean score
328 slightly above the neutral point (3.20) revealing a rather moderate form of disgust.

329 3.3.2 Knowledge

330 On 7 of the 9 knowledge questions, most participants answered "don't know" or gave an
331 incorrect answer (see appendix 1). Although individuals know the color of horse meat (Q.6),
332 nutritional properties (Q.3, 7 and 8), purchasing and consumption modalities (Q.1, 2, 4),
333 environmental benefits (Q.9), as well as the origin of the meat (Q.9) are broadly unknown.
334 This translated into a relatively low mean knowledge score (3.99) among the whole sample
335 (Table 4). Nevertheless, compared to the other three groups, a significantly higher number of
336 correct answers among the *Enthusiast* segment is found ($F = 20.12$; $p<.001$). This suggests
337 that the lack of knowledge is a little less marked among consumers who are familiar with
338 horse meat products.

339 3.3.3 Attitude

340 Respondent attitude towards horse meat was assessed through consumer perception on 8
341 horse meat attributes. First, the average score of all attributes (table 4) differs significantly
342 between some of the groups ($F=43.36$, $p<.001$). *Enthusiast* garnered clear overall positive
343 scores, *Potential* showed a slightly positive rating, while *Distant* and *Aversive* were similarly
344 positioned on the neutral point of the scale. This means that, overall, the respondents tended
345 to have a fairly positive or neutral attitude towards horse meat. However, significant
346 differences in the evaluation of each attribute and between segments are noted (Fig 1.).

347347

348 Figure 1. Attitude towards horse meat on 7-point semantic differential scale (from -3 to +3)

350 For all segments, “animal friendly” recorded the lowest score, indicating a shared concern for
351 horse welfare and breeding conditions. Besides a negative attitude on the animal welfare
352 attribute, *Distant* and *Aversive* also assessed negatively on the “trust” attribute. For
353 *Enthusiast*, the highest rating was for "taste". It is also the attribute that illustrates the biggest
354 difference between *Enthusiast* and the other groups, and the lowest attribute for *Potential*.
355 This emphasizes that current consumers of horse meat appreciate its taste and poses the
356 hypothesis that those in the *Potential* segment may change their opinion of the taste of horse
357 meat if they were to try it. To develop this question further, we analyzed the attribute ‘taste’
358 within the *Potential* group, differentiating individuals who have never eaten horse meat from
359 those who have already tried it. The mean comparison test revealed that within the *Potential*
360 group, those who have tasted horse meat at least once in their life tend to have a more
361 favorable evaluation of the taste attribute (.761) than individuals who have never tasted it
362 (.032) ($t=-3.038$; $p<.005$).

363 For *Potential* and *Distant*, the highest attribute is ‘quality’ (it is the second highest for
364 *Enthusiast* and *Aversive*). ‘Healthy’ is the highest attribute for *Aversive* and is also well
365 scored (second or third) for the other groups. This illustrates that, despite a lack of precise
366 knowledge of horse meat properties, its qualities and nutritional attributes are reasonably
367 recognized among all groups.

368 3.3.4 Social norm and purchase facility

369 Social norm and purchase facility have been analyzed to assess to what extent external factors
370 could favor or impede the acceptance and consumption of horse meat, and whether it differs
371 among the four profiles.

372 Regarding social norm, none of the segments stated a high degree of peer pressure against
373 horse meat consumption. *Distant* (3.00) and *Aversive* (2.87) scored close to the neutral point
374 meaning relatively weak peer pressure surrounding horse meat consumption. *Enthusiast* and

375 *Potential* reported higher mean values above the threshold 3 ($F=29.98$, $p<.001$). For
376 *Enthusiast* (4.05), social norm was clearly perceived as supporting horse meat consumption,
377 while *Potential* (3.64) seemed to feel a more moderate supportive peer pressure.
378 In terms of purchase facility it appears that all segments expressed difficulty in finding outlets
379 for horse meat, with more widely expressed barriers among *Enthusiast*, *Potential*, and *Distant*
380 than among *Aversive* ($F=4.23$, $p<.001$). This clearly reflects the limited supply of horse meat
381 products on the common market place. This result is in line with previous research that
382 showed the lack of visibility and availability of horse meat as a main reason for non-
383 consumption (Lamy *et al.*, 2020; Lamy *et al.*, 2022).

384 3.3.5 Differences in motivations between the segments

385 Consumption intention within the next 6 months has been assessed to distinguish whether
386 motivations to eat horse meat vary among people according to different contexts.

387 Unsurprisingly, the average intention to eat horse meat differs significantly between the
388 segments ($F=121.21$, $<.001$). We consistently found higher intention for *Enthusiast*, weak
389 intention among *Potential* and no stated intention at all for *Distant* and *Aversive*. More
390 interestingly, we observed differences according to the context. First, for all segments,
391 canteens appeared to be the less motivating environment. For *Enthusiast*, home appeared to
392 be the most favorable setting (4.12), followed by restaurants (3.74) and peers' homes (3.58).
393 In contrast, for *Potential*, intention to eat at home was weak (2.18) but scored slightly higher
394 in a relative's home (2.94) or restaurant (2.64). These results suggest that out-of-home
395 situations could be a conducive environment for persuading certain non-consumers to
3963 experience and taste horse meat products.

9
6

3973
9
7

398 3.4 Sociodemographic profile of the segments

3993 Table 4 presents the sociodemographic characteristics of the segments.

9

9

4004

0

0

401 **Table 4. Sociodemographic characteristics of the segments**

402402

403 There were no significant age differences across the segments. However, as compared to the
404 distribution in the total sample, there were significantly more men among *Enthusiast* and
405 *Potential*, and significantly more women in *Distant* and *Aversive* clusters. In addition, we
406 observed that among *Potential* the proportion of individuals without children in their
407 household is significantly higher than the distribution of the sample, unlike the *Aversive* group
408 that has a higher proportion of households with children than the overall sample. In terms of
409 education, *Enthusiast* shared a lower level of tertiary education (post-secondary and higher)
410 compared to other segments as well as a lower proportion of students and a higher proportion
411 of self-employed and business owners. These results are in line with previous research that
412 studied French horse meat eaters' profiles and chiefly defined them as old men living in the
4134 North of France (Lamy *et al.*, 2020).

1
3

4144
1
4

415 4 Discussion and conclusion

416 This study provides insights about horse meat consumption in France. In particular, we
417 investigated whether consumers and non-consumers of this particular meat can be segmented
418 based on their personal norms, attitude, motivations and behavior and on which aspects these
419 segments differ. Our results have numerous implications for actors in the equine industry,
420 retailers, marketers and researchers.

421 Among the sample, a significant proportion of individuals had already tasted horse meat, at
422 least once in their lives, but only a minority includes this particular meat in their diet, and then
423 only occasionally. This result is consistent with national data, which indicate that the
424 consumption of horse meat in 2021 concerns approximately 7% of French households and
425 represents 0.1% of meat purchases (Drapeau, 2022).

426 Among horse meat consumers, a vast majority favor horse butcher's shops and traditional
427 butcher's shops for their supplies. However, to date, there are less than 750 specialized
428 butcher shops in France and only 3.7% of traditional butchers offer horse meat (Lizet, 2010).
429 It is therefore not surprising that individuals express difficulties in finding outlets for this
430 meat. The weak availability is a major obstacle for actual consumers that are limited in their
431 ability to purchase horse meat products, and also for non-consumers who, in the absence of a
432 visible offer, do not consider this meat when shopping. Developing alternative distribution
433 channels such as online sales or direct purchase from producers could favorably meet the
434 needs of current consumers. Stimulating demand is also crucial to maintaining and supporting
435 the horse meat market. Our results highlight a lack of knowledge about the horse meat
436 industry and lower scores on attitudinal attributes such as trust and animal welfare. A first
437 lever of action would therefore be to develop communication campaigns to inform about the
438 benefits of this meat especially in terms of environment, breeding conditions and nutritional
439 properties. However, by identifying 4 distinct profiles, our analysis shows that targeted
440 strategies must be developed according to the individuals and their relationship with both
441 meat in general and with horse meat.

442 *Aversive* and *Distant* are characterized by low acceptance of horse meat and thus appear as
443 non-priority targets. *Aversive* are meat lovers, but they tend to consider horse meat as a
444 separate meat category. For *Aversive*, hippophagy is opposed to their moral values and is
445 associated with an increased feeling of disgust compared to the other groups. These results are
446 consistent with traditional approaches to moral reasoning and emotion which claim that
447 conceptualizing meat eating as immoral creates an opportunity and an incentive to view meat
448 as disgusting (Rozin et al., 1997). It seems difficult to overcome this psychological barrier
449 even by presenting horse meat as a more sustainable option to beef or by emphasizing good
450 farming conditions. For the *Aversive* segment the aim is therefore to avoid hostile reactions
451 that could damage the image of the product. Similarly, *Distant* is not a promising segment.

452 The profile of these respondents suggests that horse meat is part of an overall more distant
453 attachment with meat in general. For this group, it can be assumed that the promotion of other
454 sources of protein such as plant-based foods would strike more of a chord than the promotion
455 of a meat with a low carbon impact.

456 *Enthusiast* and *Potential* are the two priority segments for the development of the horse meat
457 market. For *Enthusiast*, who are already consumers, their level of knowledge about the
458 product and their positive attitude towards it suggest that a communication strategy alone may
459 not be sufficient. For these individuals, the main obstacle is the characteristics of the offer and
460 more precisely its accessibility. Promoting the presence and visibility of the product in
461 distribution channels is a priority in order to increase consumption opportunities.

462 The *Potential* segment does not eat horse meat but is not morally opposed to hippophagy.
463 Interestingly, among this group, those who have already consumed this meat at least once
464 tend to evaluate its taste more favorably. This supports the idea of increasing the frequency of
465 horse meat exposure and experimental tasting. In the light of the consumption intentions
466 stated by this group, the context of commercial catering appears to be a privileged space to
467 incite the (re)discovery of this product. In a very competitive catering market, offering horse
468 meat can be an element of differentiation capable of arousing the curiosity of potential
469 consumers while meeting the expectations of current horse meat lovers. For actors of the
470 horse meat sector, this implies a Business to Business strategy addressed to catering
471 professionals, with the main target being brands positioned on meat such as steakhouses.
472 In order to avoid possible controversies and to encourage the choice of the product within the
473 menu, it would be interesting to test the effects of different information content (origin of the
474 product and rearing conditions, environmental benefits, nutritional and organoleptic qualities)
475 and distribution methods (information delivered by the waiter versus posted on the menu) on
476 the acceptance of the product and the intention to consume it in the restaurant. In addition,
477 insofar as the restaurant sector seems to be a promising distribution channel, it would be

478 advisable to conduct investigations among chefs and cooks in order to take into account their
479 motivations and barriers with respect to the product.

480 This work sheds light on the different profiles of consumers and non-consumers of horse
481 meat. However, the size of the sample, its low representativeness of the French population,
482 and the over-representation of women, younger people and individuals from higher
483 professions, suggest caution in generalizing the results obtained. Indeed, since these three
484 profiles are traditionally associated with lower horse meat consumption (Lamy *et al.*, 2020),
485 it is reasonable to believe that our results could underestimate the number of *Enthusiasts* and
486 *Potentials*. Therefore, a new data collection from a representative sample of the French
487 population would be useful.

488 Nevertheless, the focus on horse meat offers an original perspective for several reasons.
489 Firstly, it makes it possible to analyze the acceptance of an alternative source of protein that
490 has environmental and health benefits. Secondly, horse meat is an ambivalent food that for the
491 most part remains unexamined and is associated with strong emotional and moral issues. It is
492 consequently an extreme case that can shed light on common issues for other meat: alternative
493 new meat such as kangaroos or ostriches, meat from production animals that are also pets
494 (e.g., rabbits), meat from animals that arouse emotional attachment (e.g., lamb) and
495 uncommon meat (e.g, snails, frogs). More generally, in the current trend in western societies
496 of controversy surrounding animal welfare and meat consumption, these results provide
497 insight into the future for meat in general. In a perspective of sustainable diet, the
498 diversification of protein sources is a major challenge. This will only be possible by adapting
499 the products on offer to the various population targets, improving product availability and
500 visibility, and by adapting communication, which highlights the benefits of these products in

501 5 2

0
1

502 5
0

terms
of
health,
environ
ment,
and
animal
welfare
.

503 **References**

504

505 Balji, Y., Knicky, M., & Zamaratskaia, G. (2020). Perspectives and safety of horsemeat
506 consumption. *International Journal of Food Science & Technology*, 55(3), 942- 952.
507 <https://doi.org/10.1111/ijfs.14390>

508 Banović, M., Fontes, M. A., Barreira, M. M., & Grunert, K. G. (2012). Impact of Product
509 Familiarity on Beef Quality Perception : IMPACT OF PRODUCT FAMILIARITY ON
510 BEEF QUALITY PERCEPTION. *Agribusiness*, 28(2), 157- 172.
511 <https://doi.org/10.1002/agr.21290>

512 Banović, M., Grunert, K. G., Barreira, M. M., & Fontes, M. A. (2009). Beef quality perception
513 at the point of purchase : A study from Portugal. *Food Quality and Preference*, 20(4),
514 335- 342. <https://doi.org/10.1016/j.foodqual.2009.02.009>

515 Belaunzaran, X., Bessa, R. J. B., Lavín, P., Mantecón, A. R., Kramer, J. K. G., & Aldai, N.
516 (2015). Horse-meat for human consumption—Current research and future
517 opportunities. *Meat Science*, 108, 74- 81.
518 <https://doi.org/10.1016/j.meatsci.2015.05.006>

519 Belaunzaran, X., Lavín, P., Barron, L. J. R., Mantecón, A. R., Kramer, J. K. G., & Aldai, N.
520 (2017). An assessment of the fatty acid composition of horse-meat available at the retail
521 level in northern Spain. *Meat Science*, 124, 39- 47.
522 <https://doi.org/10.1016/j.meatsci.2016.10.014>

523 Benningstad, N. C. G., & Kunst, J. R. (2020). Dissociating meat from its animal origins : A
524 systematic literature review. *Appetite*, 147, 104554.
525 <https://doi.org/10.1016/j.appet.2019.104554>

526 Bigot, G., Vial, C., Fleurance, G., Heydemann, P., & Palazoni, R. (2018). Productions et
527 activités équinés en France : Quelles contributions à la durabilité de l'agriculture? *INRA*
528 *Productions Animales*, 31(1), 37- 50.

529 Cazes-Valette, G. (2008). *Les déterminants du rapport à la viande chez le mangeur français*
530 *contemporain* [These de doctorat, Paris, EHES].
531 <https://www.theses.fr/2008EHES0315>

532 Circus, V. E., & Robison, R. (2019). Exploring perceptions of sustainable proteins and meat
533 attachment. *British Food Journal*, 121(2), 533- 545. [https://doi.org/10.1108/BFJ-01-](https://doi.org/10.1108/BFJ-01-2018-0025)
534 2018-0025

535 Digard, J.-P. (2012). Hippophagie. In J.-P. Poulain (Éd.), *Dictionnaire des cultures*
536 *alimentaires* (Presses Universitaires de France, p. 689- 695). Presses Universitaires de
537 France.

538 Dowsett, E., Semmler, C., Bray, H., Ankeny, R. A., & Chur-Hansen, A. (2018). Neutralising
539 the meat paradox : Cognitive dissonance, gender, and eating animals. *Appetite*, 123,
540 280- 288. <https://doi.org/10.1016/j.appet.2018.01.005>

541 Drapeau, C. (2022). *Les chiffres sur la viande chevaline* (p. 5). Institut français du cheval et de
542 l'équitation,.

543 Font-i-Furnols, M., & Guerrero, L. (2014). Consumer preference, behavior and perception
544 about meat and meat products : An overview. *Meat Science*, 98(3), Article 3.
545 <https://doi.org/10.1016/j.meatsci.2014.06.025>

546 FranceAgriMer. (2015). *La production de viande chevaline des années 50 à aujourd'hui-2015*.
547 [https://www.franceagrimer.fr/fam/content/download/36805/document/SYN-VRO-20-](https://www.franceagrimer.fr/fam/content/download/36805/document/SYN-VRO-20-La%20production%20de%20viande%20chevaline%20des%20ann%C3%A9es%2050%20%C3%A0%20aujourd%27hui-2015.pdf?version=5)
548 [La%20production%20de%20viande%20chevaline%20des%20ann%C3%A9es%2050](https://www.franceagrimer.fr/fam/content/download/36805/document/SYN-VRO-20-La%20production%20de%20viande%20chevaline%20des%20ann%C3%A9es%2050%20%C3%A0%20aujourd%27hui-2015.pdf?version=5)
549 [%20%C3%A0%20aujourd%27hui-2015.pdf?version=5](https://www.franceagrimer.fr/fam/content/download/36805/document/SYN-VRO-20-La%20production%20de%20viande%20chevaline%20des%20ann%C3%A9es%2050%20%C3%A0%20aujourd%27hui-2015.pdf?version=5)

550 Franz, R., Soliva, C. R., Kreuzer, M., Steuer, P., Hummel, J., & Clauss, M. (2010). Methane
551 production in relation to body mass of ruminants and equids. *Evolutionary Ecology*
552 *Research*, 12(6), 727- 738. Scopus.

553 Graça, J., Calheiros, M. M., & Oliveira, A. (2015). Attached to meat? (Un)Willingness and
554 intentions to adopt a more plant-based diet. *Appetite*, 95, 113- 125.
555 <https://doi.org/10.1016/j.appet.2015.06.024>

556 IFCE. (2021). *Annuaire ECUS 2021 : Bilan statistique de la filière équine française, données*
557 *2020* (p. 104). Institut français du cheval et de l'équitation,.
558 [https://equipedia.ifce.fr/fileadmin/bibliotheque/6.Statistiques/6.1.Ecus-](https://equipedia.ifce.fr/fileadmin/bibliotheque/6.Statistiques/6.1.Ecus-depliant/ECUS-2021-WEB.pdf)
559 [depliant/ECUS-2021-WEB.pdf](https://equipedia.ifce.fr/fileadmin/bibliotheque/6.Statistiques/6.1.Ecus-depliant/ECUS-2021-WEB.pdf)

560 Insausti, K., Beldarrain, L. R., Lavín, M. P., Aldai, N., Mantecón, Á. R., Sáez, J. L., & Canals,
561 R. M. (2021). Horse meat production in northern Spain : Ecosystem services and
562 sustainability in High Nature Value farmland. *Animal Frontiers*, 11(2), 47- 54.
563 <https://doi.org/10.1093/af/vfab003>

564 Jaskari, M.-M., Leipämaa-Leskinen, H., & Syrjälä, H. (2015). Revealing the paradoxes of
565 horsemeat – The challenges of marketing horsemeat in Finland. *Nordic Journal of*
566 *Business*, 64(2), 17.

567 Jastrzębska, E., Daszkiewicz, T., Górecka-Bruzda, A., & Feliś, D. (2019). Current situation and
568 prospects for the horse meat market in Poland and the world. *Medycyna Weterynaryjna*,
569 75(02), 6203- 2019. <https://doi.org/10.21521/mw.6203>

570 Jez, C., Coudurier, B., Cressent, M., & Méa, F. (2013). Factors driving change in the French
571 horse industry to 2030. *Advances in Animal Biosciences*, 4, 66- 105.
572 <https://doi.org/10.1017/S2040470013000368>

573 Köster, E. P. (2009a). Diversity in the determinants of food choice : A psychological
574 perspective. *Food Quality and Preference*, 20(2), Article 2.
575 <https://doi.org/10.1016/j.foodqual.2007.11.002>

576 Köster, E. P. (2009b). Diversity in the determinants of food choice : A psychological
577 perspective. *Food Quality and Preference*, 20(2), Article 2.
578 <https://doi.org/10.1016/j.foodqual.2007.11.002>

579 Lamy, A., Costa, S., Lanauze, G. S. de, Vial, C., & Sirieix, L. (2022). When the product was
580 an animal. The role of representations and affective ties to the animal in relationships
581 with meat products and their consumption. *Decisions Marketing*, 107(3), 269- 289.

582 Lamy, A., & Vial-Pion, C. (2020). *Histoire de la consommation de viande chevaline* (p. 7)
583 [Note thématique]. IFCE. [https://equipedia.ifce.fr/economie-et-filiere/culture-et-](https://equipedia.ifce.fr/economie-et-filiere/culture-et-patrimoine/histoire-de-la-consommation-de-viande-chevaline.html)
584 [patrimoine/histoire-de-la-consommation-de-viande-chevaline.html](https://equipedia.ifce.fr/economie-et-filiere/culture-et-patrimoine/histoire-de-la-consommation-de-viande-chevaline.html)

585 Lentz, G., Connelly, S., Miroso, M., & Jowett, T. (2018). Gauging attitudes and behaviours :
586 Meat consumption and potential reduction. *Appetite*, 127, 230- 241.
587 <https://doi.org/10.1016/j.appet.2018.04.015>

588 Leteux, S. (2005). L'hippophagie en France : La difficile acceptation d'une viande honteuse
589 (archives). *Terrains & travaux*, n° 9(2), 143. <https://doi.org/10.3917/tt.009.0143>

590 Lin-Schilstra, L., & Fischer, A. R. H. (2020). Consumer Moral Dilemma in the Choice of
591 Animal-Friendly Meat Products. *Sustainability*, 12(12), Article 12.
592 <https://doi.org/10.3390/su12124844>

593 Lizet, B. (2010). Le cheval français en morceaux. Statut de l'animal, statut de sa viande.
594 *Anthropozoologica*, 45(1), 137- 148. <https://doi.org/10.5252/az2010n1a9>

595 Lorenzo, J. M., Sarriés, M. V., Tateo, A., Polidori, P., Franco, D., & Lanza, M. (2014). Carcass
596 characteristics, meat quality and nutritional value of horsemeat : A review. *Meat*
597 *Science*, 96(4), 1478- 1488. <https://doi.org/10.1016/j.meatsci.2013.12.006>

598 Mooi, E., & Sarstedt, M. (2011). *A Concise Guide to Market Research*. Springer Berlin
599 Heidelberg. <https://doi.org/10.1007/978-3-642-12541-6>

600 Moss, A. R., Jouany, J.-P., & Newbold, J. (2000). Methane production by ruminants : Its
601 contribution to global warming. *Animal Research*, 49(3), 231- 253. Scopus.
602 <https://doi.org/10.1051/animres:2000119>

603 Oh, W. Y., Lee, J. W., Lee, C. E., Ko, M. S., & Jeong, J. H. (2009). Analysis of consumers'
604 preferences and behavior with regard to horse meat using a structured survey

605 questionnaire : ANALYSIS OF CONSUMERS' PREFERENCES AND BEHAVIOR
606 ON HORSE MEAT. *Animal Science Journal*, 80(6), Article 6.
607 <https://doi.org/10.1111/j.1740-0929.2009.00672.x>

608 Poławska, E., Cooper, R. G., Józwik, A., & Pomianowski, J. (2013). Meat from alternative
609 species – nutritive and dietetic value, and its benefit for human health – a review. *CyTA*
610 - *Journal of Food*, 11(1), 37- 42. <https://doi.org/10.1080/19476337.2012.680916>

611 Popoola, I. O., Anders, S., Feuereisen, M. M., Savarese, M., & Wismer, W. V. (2021a). Free
612 word association perceptions of red meats; beef is 'yummy', bison is 'lean game meat',
613 horse is 'off limits'. *Food Research International*, 148, 110608.
614 <https://doi.org/10.1016/j.foodres.2021.110608>

615 Popoola, I. O., Anders, S., Feuereisen, M. M., Savarese, M., & Wismer, W. V. (2021b). Free
616 word association perceptions of red meats; beef is 'yummy', bison is 'lean game meat',
617 horse is 'off limits'. *Food Research International*, 148, 110608.
618 <https://doi.org/10.1016/j.foodres.2021.110608>

619 Popoola, I. O., Bruce, H. L., McMullen, L. M., & Wismer, W. V. (2019). Consumer Sensory
620 Comparisons Among Beef, Horse, Elk, and Bison Using Preferred Attributes Elicitation
621 and Check-All-That-Apply Methods. *Journal of Food Science*, 84(10), Article 10.
622 <https://doi.org/10.1111/1750-3841.14780>

623 Popoola, I. O., Soladoye, P. O., Gaudette, N. J., & Wismer, W. V. (2020). A Review of Sensory
624 and Consumer-related Factors Influencing the Acceptance of Red Meats from
625 Alternative Animal Species. *Food Reviews International*, 1- 20.
626 <https://doi.org/10.1080/87559129.2020.1860084>

627 Rødbotten, M., Kubberød, E., Lea, P., & Ueland, Ø. (2004). A sensory map of the meat
628 universe. Sensory profile of meat from 15 species. *Meat Science*, 68(1), 137- 144.
629 <https://doi.org/10.1016/j.meatsci.2004.02.016>

- 630 Rousseeuw, P. J. (1987). Silhouettes : A graphical aid to the interpretation and validation of
631 cluster analysis. *Journal of Computational and Applied Mathematics*, 20, 53- 65.
632 [https://doi.org/10.1016/0377-0427\(87\)90125-7](https://doi.org/10.1016/0377-0427(87)90125-7)
- 633 Rozin, P., & Fallon, A. (1980). The psychological categorization of foods and non-foods : A
634 preliminary taxonomy of food rejections. *Appetite*, 1(3), 193- 201.
635 [https://doi.org/10.1016/S0195-6663\(80\)80027-4](https://doi.org/10.1016/S0195-6663(80)80027-4)
- 636 Rozin, P., Markwith, M., & Stoess, C. (1997). Moralization and Becoming a Vegetarian : The
637 Transformation of Preferences Into Values and the Recruitment of Disgust.
638 *Psychological Science*, 8(2), Article 2. [https://doi.org/10.1111/j.1467-](https://doi.org/10.1111/j.1467-9280.1997.tb00685.x)
639 [9280.1997.tb00685.x](https://doi.org/10.1111/j.1467-9280.1997.tb00685.x)
- 640 Ruby, M. B., & Heine, S. J. (2011). Meat, morals, and masculinity. *Appetite*, 56(2), 447- 450.
641 <https://doi.org/10.1016/j.appet.2011.01.018>
- 642 Rzekęć, A., Vial, C., & Bigot, G. (2020). Green Assets of Equines in the European Context of
643 the Ecological Transition of Agriculture. *Animals*, 10(1), Article 1.
644 <https://doi.org/10.3390/ani10010106>
- 645 Verbeke, W., Marcu, A., Rutsaert, P., Gaspar, R., Seibt, B., Fletcher, D., & Barnett, J. (2015).
646 ‘Would you eat cultured meat?’ : Consumers’ reactions and attitude formation in
647 Belgium, Portugal and the United Kingdom. *Meat Science*, 102, 49- 58.
648 <https://doi.org/10.1016/j.meatsci.2014.11.013>
- 649 Verbeke, W., Sans, P., & Van Loo, E. J. (2015). Challenges and prospects for consumer
650 acceptance of cultured meat. *Journal of Integrative Agriculture*, 14(2), 285- 294.
651 [https://doi.org/10.1016/S2095-3119\(14\)60884-4](https://doi.org/10.1016/S2095-3119(14)60884-4)
- 652 Verbeke, W., & Vackier, I. (2004). Profile and effects of consumer involvement in fresh meat.
653 *Meat Science*, 67(1), Article 1. <https://doi.org/10.1016/j.meatsci.2003.09.017>

654 Verbeke, W., & Viaene, J. (1999). Beliefs, attitude and behaviour towards fresh meat
655 consumption in Belgium : Empirical evidence from a consumer survey. *Food Quality
656 and Preference, 10*(6), 437- 445. [https://doi.org/10.1016/S0950-3293\(99\)00031-2](https://doi.org/10.1016/S0950-3293(99)00031-2)

657 Westhoek, H., Lesschen, J. P., Rood, T., Wagner, S., De Marco, A., Murphy-Bokern, D., Leip,
658 A., van Grinsven, H., Sutton, M. A., & Oenema, O. (2014). Food choices, health and
659 environment : Effects of cutting Europe’s meat and dairy intake. *Global Environmental
660 Change, 26*, 196- 205. <https://doi.org/10.1016/j.gloenvcha.2014.02.004>

661 Whiting, T. L. (2007). The United States’ prohibition of horsemeat for human consumption : Is
662 this a good law? *The Canadian Veterinary Journal, 48*(11), Article 11.

663 Wiart, L., Özçağlar-Toulouse, N., & Shaw, D. (2022). Maintaining market legitimacy : A
664 discursive-hegemonic perspective on meat. *Journal of Business Research, 144*,
665 391- 402. <https://doi.org/10.1016/j.jbusres.2022.02.024>

666 Willett, W., Rockström, J., Loken, B., Springmann, M., Lang, T., Vermeulen, S., Garnett, T.,
667 Tilman, D., DeClerck, F., Wood, A., Jonell, M., Clark, M., Gordon, L. J., Fanzo, J.,
668 Hawkes, C., Zurayk, R., Rivera, J. A., Vries, W. D., Sibanda, L. M., ... Murray, C. J.
669 L. (2019). Food in the Anthropocene : The EAT–Lancet Commission on healthy diets
670 from sustainable food systems. *The Lancet, 393*(10170), 447- 492.
6716 [https://doi.org/10.1016/S0140-6736\(18\)31788-4](https://doi.org/10.1016/S0140-6736(18)31788-4)
7
1

6726
7
2

6736
7
3

674 **Table 1. Characteristics of the valid sample (% of respondents, n=482)**

| | | |
|--|----------------------------------|-------------|
| Gender | Male | 29.4 |
| | Female | 70.5 |
| | Gender diverse | 0.1 |
| Age | 18-25 years | 19.7 |
| | 26-35 years | 27.2 |
| | 36-45 Years | 17.6 |
| | 46-55 years | 17.2 |
| | 56-64 years | 11.0 |
| | >65 years | 7.3 |
| | Mean | 40.0 |
| | (S.D) | (15.1) |
| Education | Upper secondary and lower | 13.7 |
| | Post-secondary and higher | 86.3 |
| Employment status | Student | 16.2 |
| | Self-employed and business owner | 5.4 |
| | Employed | 22.0 |
| | Executive and higher profession | 46.7 |
| | Retired | 7.9 |
| | Unemployed | 1.9 |
| Frequency of meat consumption | Less than once a month | 1.5 |
| | More than once a month | 12.4 |
| | More than once a week | 41.9 |
| | Daily | 44.2 |
| Frequency of horse meat consumption | Less than once a month | 14.2 |
| | More than once a month | 1.0 |
| | More than once a week | 1.0 |
| | Never | 83.8 |
| | <i>Never but already tasted</i> | <i>54.0</i> |
| | <i>During childhood</i> | <i>77.0</i> |
| | <i>During adulthood</i> | <i>23.0</i> |

675

676

677 **Table 2. Description and characterization of the Segments (S) based on the classification variables and**
 678 **meat attachment scales**

| | Sample | | S.1 Enthusiast | | S.2 Potential | | S.3 Distant | | S.4 Aversive | | F-Value | p-Value |
|--------------------------------|--------|-------|----------------|--------|---------------|--------|-------------|--------|--------------|--------|---------|---------|
| | M | S.E | M | S.E | M | S.E | M | S.E | M | S.E | | |
| Sample size (%) | 482 | (100) | 78 | (16.2) | 175 | (36.3) | 64 | (13.3) | 165 | (34.2) | | |
| Number of horse meat consumers | 78 | | 78 | | 0 | | 0 | | 0 | | | |
| Personal norm ¹ | 3.13 | 1.29 | 4.38 a | 0.70 | 4.00 b | 0.64 | 2.69 c | 1.06 | 1.79 d | 0.56 | 386.66 | <.001 |
| Meat consumption ² | 3.29 | 0.74 | 3.64 a | 0.6 | 3.49 b | 0.5 | 1.91 c | 0.29 | 3.44 b | 0.5 | 193.49 | <.001 |
| Meat attachment ¹ | 3.5 | 0.85 | 3.96 a | 0.85 | 3.74 b | 0.68 | 2.70 d | 0.73 | 3.33 c | 0.82 | 40.35 | <.001 |
| <i>Hedonism</i> | 3.65 | 1.01 | 4.19 a | 0.85 | 3.88 b | 0.84 | 2.69 d | 0.93 | 3.54 c | 0.98 | 37.1 | <.001 |
| <i>Affinity</i> | 4.02 | 0.91 | 4.42 a | 0.76 | 4.33 a | 0.68 | 3.39 c | 1.02 | 3.74 b | 0.9 | 32.59 | <.001 |
| <i>Entitlement</i> | 3.35 | 1.12 | 3.70 a | 1.2 | 3.55 a | 0.99 | 2.75 c | 1.09 | 3.20 b | 1.1 | 12.3 | <.001 |
| <i>Dependence</i> | 2.94 | 1.05 | 3.43 a | 1.1 | 3.17 b | 0.93 | 2.02 d | 0.81 | 2.83 c | 0.98 | 30.33 | <.001 |

679 ¹ 5-point Likert scale (from 1 to 5) ; ² 5-point frequency scale (from 0 'never' to 4 'every day') ; a; b; c, d, Scores in one row
 680 with a different superscript are significantly different at p < 0:05 (one-way ANOVA and post hoc Tukey multiple comparison
 681 test).

682

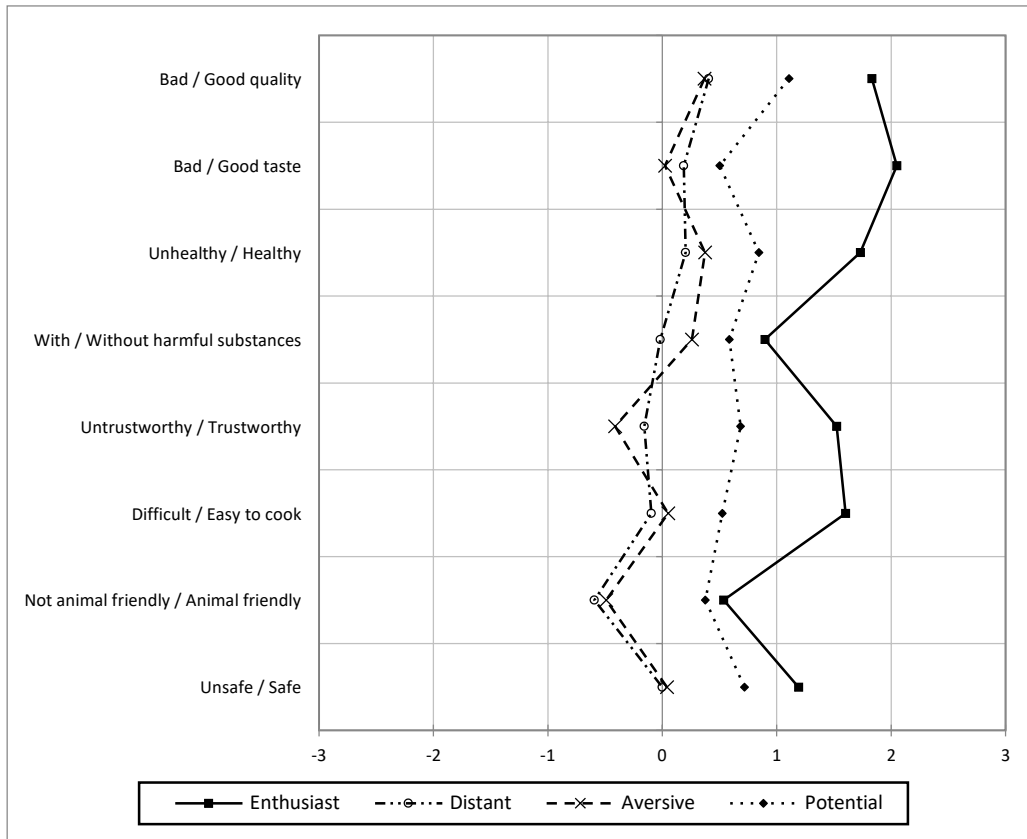
683 **Table3. Factors related to horse meat acceptance**

| | Sample | | Enthusiast | | Potential | | Distant | | Aversive | | F-Value | p-Value |
|--------------------------------|--------|------|------------|------|-----------|------|---------|------|----------|------|---------|---------|
| | M | S.E | M | S.E | M | S.E | M | S.E | M | S.E | | |
| Disgust ¹ | 2.39 | 1.03 | 1.30 d | 0.46 | 1.97 c | 0.76 | 2.76 b | 1.00 | 3.20 a | 0.75 | 140.86 | <.001 |
| Knowledge ² | 3.99 | 2.34 | 5.68 a | 2.01 | 3.96 b | 2.25 | 3.23 c | 1.87 | 3.52 bc | 2.35 | 20.12 | <.001 |
| Attitude ³ | 0.48 | 1.10 | 1.42 a | 1.17 | 0.67 b | 0.88 | -0.01 c | 1.17 | 0.03 c | 0.90 | 43.36 | <.001 |
| Social norm ¹ | 3.36 | 1.05 | 4.05 a | 0.12 | 3.64 b | 0.08 | 3.00 c | 0.13 | 2.87 c | 0.08 | 29.98 | <.001 |
| Purchase facility ¹ | 3.82 | 0.96 | 4.04 a | 0.81 | 3.89 a | 0.90 | 3.94 a | 0.82 | 3.60 b | 1.08 | 4.23 | 0.001 |
| Intention ¹ | 2.10 | 1.22 | 3.52 a | 1.00 | 2.45 b | 1.20 | 1.57 c | 0.84 | 1.27 d | 0.56 | 121.21 | <.001 |
| Home | 2.05 | 1.47 | 4.12 a | 1.29 | 2.18 b | 1.35 | 1.40 c | 0.91 | 1.20 c | 0.63 | 134.69 | <.001 |
| Relatives, Friends and family | 2.41 | 1.50 | 3.58 a | 1.33 | 2.94 b | 1.46 | 2.03 c | 1.36 | 1.43 d | 0.90 | 66.25 | <.001 |
| Restaurant | 2.22 | 1.44 | 3.74 a | 1.30 | 2.64 b | 1.41 | 1.67 c | 1.13 | 1.27 d | 0.66 | 94.77 | <.001 |
| Canteen | 1.57 | 1.06 | 2.27 a | 1.43 | 1.86 b | 1.23 | 1.12 c | 0.38 | 1.10 c | 0.41 | 34.19 | <.001 |

684 ¹ 5-point Likert scale (from 1 to 5) ; ² average number of correct responses to 9 knowledge questions; ³average score derived
 685 from the 8 average attributes rated on 7-point semantic differential scale (from -3 to +3) a; b; c, d, Scores in one row with a
 686 different superscript are significantly different at p < 0:05 (one-way ANOVA and post hoc Tukey multiple comparison test).

687

689 **Figure 1. Attitude towards horse meat on 7-point semantic differential scale (from -3 to +3)**



690

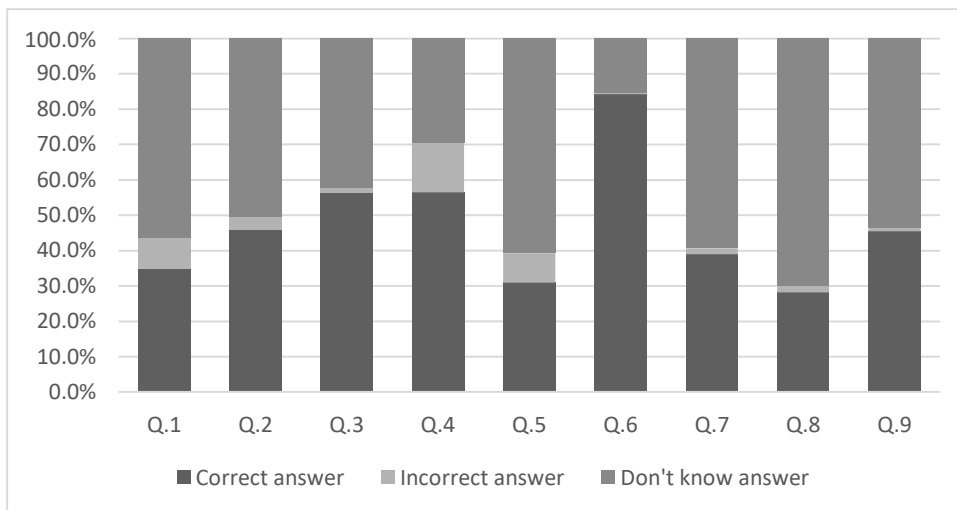
691 **Table 4. Sociodemographic characteristics of the segments**

| | Sample | Enthusiast | Potential | Distant | Aversive | F-Value ¹ /χ ² | p- Value |
|---|--------|--------------|--------------|--------------|--------------|---|-------------|
| Age (Mean) ¹ | 40.1 | 42.64 a | 40.82 ab | 37.28 b | 39.36 ab | 1.73 | .16 |
| Gender (%) | | | | | | 37.35 | <.001 |
| Female | 70.8 | 50.0* | 64.0* | 82.3* | 83.6* | | |
| Male | 29.2 | 50.0* | 36.0* | 17.7* | 16.4* | | |
| Presence of children in the household (%) | | | | | | 9.245 | .026 |
| NO | 68 | 62.8 | 73.7 | 76.6 | 61.2* | | |
| YES | 31 | 37.2 | 26.3* | 23.4 | 38.8* | | |
| Education (%) | | | | | | 10.97 | .012 |
| Upper secondary and lower | 13.7 | 24.4* | 10.9 | 17.2 | 10.3 | | |
| Post-secondary and higher | 86.3 | 75.6* | 89.1 | 82.8 | 89.7 | | |
| Employment status (%) | | | | | | 28.88 | .017 |
| Student | 16.2 | 9.0* | 18.3 | 25.0 | 13.9 | | |
| Self-employed and business owner | 5.4 | 11.5* | 5.1 | 3.1 | 3.6 | | |
| Employed | 22.0 | 23.1 | 15.4* | 18.8 | 29.7* | | |
| Executive and higher profession | 46.7 | 44.9 | 49.7 | 43.8 | 45.5 | | |
| Retired | 7.9 | 10.3 | 10.3 | 7.8 | 4.2* | | |
| Unemployed | 1.9 | 1.3 | 1.1 | 1.6 | 3.0 | | |

| Questions | Correct answer |
|---|----------------|
| Q1.Horse meat can be eaten raw | TRUE |
| Q2.Horse meat is allowed in traditional restaurants | TRUE |
| Q3.Horse meat is more fatty than beef | FALSE |
| Q4.Horse meat is only sold in horse butcher shops | FALSE |
| Q5.Horse meat consumed in France is mostly of foreign origin | TRUE |
| Q6.Horse meat is a white meat | FALSE |
| Q7.Horse meat is less rich in iron than beef | FALSE |
| Q8.Horse meat contains more good fats than beef (more omega 3 and 6 and a better proportion of unsaturated fatty acids) | TRUE |
| Q9.A horse emits more greenhouse gases than a bovine | FALSE |

693

694 **Appendix 2.** Proportion of correct, incorrect and “don’t know” answers among the sample



695

696 **Appendix 3.** Attitude towards horse meat on 7-point semantic differential scale (from -3 to
697 +3)

| | Sample | | Enthusiast | | Potential | | Distant | | Aversive | | F-Value | p-Value |
|--|--------|------|------------|------|-----------|------|---------|------|----------|------|---------|---------|
| | M | S.E | M | S.E | M | S.E | M | S.E | M | S.E | | |
| Attitude | 0.48 | 1.10 | 1.42 a | 1.17 | 0.67 b | 0.88 | -0.01 c | 1.11 | 0.03 c | 0.91 | 43.36 | <.001 |
| <i>Bad / Good quality</i> | 0.88 | 1.48 | 1.83 a | 1.44 | 1.11 b | 1.24 | 0.41 c | 1.42 | 0.37 c | 1.46 | 23.96 | <.001 |
| <i>Bad / Good taste</i> | 0.55 | 1.70 | 2.05 a | 1.52 | 0.50 b | 1.55 | 0.19 bc | 1.62 | 0.02 c | 1.45 | 32.89 | <.001 |
| <i>Unhealthy / Healthy</i> | 0.74 | 1.56 | 1.73 a | 1.71 | 0.85 b | 1.45 | 0.20 c | 1.35 | 0.38 c | 1.44 | 17.98 | <.001 |
| <i>With / Without harmful substances</i> | 0.45 | 1.55 | 0.90 a | 1.82 | 0.59 a | 1.52 | -0.02 b | 1.40 | 0.26 b | 1.43 | 5.50 | 0.001 |
| <i>Untrustworthy / Trustworthy</i> | 0.33 | 1.64 | 1.53 a | 1.71 | 0.69 b | 1.37 | -0.16 c | 1.57 | -0.41 c | 1.46 | 35.9 | <.001 |
| <i>Difficult / Easy to cook</i> | 0.46 | 1.47 | 1.60 a | 1.64 | 0.53 b | 1.25 | -0.09 c | 1.39 | 0.05 c | 1.30 | 26.79 | <.001 |
| <i>Not animal friendly / Animal friendly</i> | -0.02 | 1.53 | 0.54 a | 1.60 | 0.38 a | 1.32 | -0.59 b | 1.50 | -0.49 b | 1.52 | 16.97 | <.001 |
| <i>Unsafe / Safe</i> | 0.47 | 1.52 | 1.19 a | 1.55 | 0.72 b | 1.43 | 0.00 c | 1.63 | 0.04 c | 1.36 | 14.98 | <.001 |

698

a; b; c, d. Scores in one row with a different superscript are significantly different at p < 0:05 (one-way ANOVA and post hoc Tukey multiple

699

comparison test).

Author statement

FUNDING

This research was grand funded by the French Institute for Horse and Riding (IFCE).

ACKNOWLEDGMENTS

All authors of this paper confirm that:

- This manuscript is original and that neither the manuscript nor any parts of its content are currently under consideration or published in another journal,
- All authors have approved the manuscript and agree with its submission to *International Journal of Consumer Studies*,
- The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

DATA AVAILABILITY STATEMENT

Data available on request from the authors