

1 Food safety myths consequences for health: A study of reported  
2 gastroenteritis incidence and prevalence in UK, Norway and Germany

3

4 **Abstract**

5 Food safety beliefs are not always science based. In this study, we aim to contribute to the  
6 state of the art of food safety knowledge by investigating unscientific beliefs consequences for  
7 gastroenteritis. After collecting food safety myths across Europe, we conducted a web-based  
8 survey on a representative sample of consumers from UK, Germany and Norway (N=3110) to  
9 investigate what food safety myths people believe to be true, and if these beliefs influence  
10 gastroenteritis incidences and prevalence.

11 The results show that a large share of the population believe in food safety myths, in the worst  
12 cases more than 70% report to believe myths to be facts and believing in many of these myths  
13 correlates positively with gastroenteritis incidences and prevalence. The largest correlations  
14 are observed for unscientific beliefs about eggs (such as storing eggs at room temperature and  
15 eating raw eggs to cure hangover), bacteria inactivation (that a wooden cutting board, and  
16 chili, wasabi and marinades kills bacteria), that vegetarians don't get food poisoning, and that  
17 eating dirt and having a diarrhea is good since it cleans up the stomach. In the discussion, we  
18 explain the negative consequences by linking the food safety myths to science- based food  
19 safety knowledge.

20 This is the first study linking unscientific beliefs to gastroenteritis. Future studies need to  
21 investigate the mechanisms explaining why beliefs in food safety myths correlate with  
22 gastroenteritis incidences and prevalence. Studies investigating behavior change methods,  
23 including but not limited to correcting false beliefs are also needed.

24

25 **1. Introduction**

26 False beliefs, the widespread prevalence and persistence of misinformation, are likely to  
27 influence people’s lives negatively. A catchy food story, a story with all the right ingredients  
28 may have a stronger ability to stick and thereby to influence behavior, than a story with more  
29 balanced and scientifically correct information (Olsen, Røssvoll, Langsrud, & Scholderer,  
30 2016). If a majority believe in something that is factually incorrect, and base their decisions  
31 on this, the consequences may not be in the best interest for them, their families, or society  
32 (Lewandowsky, Ecker, Seifer, Schwarz, & Cook, 2012).

33 Many strange beliefs exist both for food safety and for all other aspects of life. Through all  
34 times people have tried to make sense of what they cannot understand. Thunder and lightning  
35 were in Norse mythology explained by Thor (the god of thunder) riding his sledge over the  
36 sky while crashing his hammer down on his foes. All religions explain how to understand the  
37 world and how to behave (e.g., do not eat pork; eat only fish on Fridays etc.). Also today,  
38 when people are more informed and better educated than ever, people hold strange  
39 unscientific beliefs (Saher & Lindeman, 2005). Some people believe in the law of contagion,  
40 stating that things that have been in contact continue to have an effect when separated. They  
41 believe that energy from a source, such as a crystal, a hand or a color can cure, and that  
42 purification rituals can help to wash out toxic waste from the body. Especially, non-  
43 observable phenomena, such as viruses and bacteria can easily lead to magic beliefs. Others  
44 believe in the law of similarity, implying that superficial similarity can cure (e.g., that eating a  
45 diet that has approximately 70% water content is good for us since our bodies are 70% water).  
46 In this paper, we label these misinformation beliefs as “Beliefs in myths,” which refer to  
47 commonly held beliefs with no base in scientific fact. While previous studies have  
48 investigated the effect of food safety knowledge and attitudes on food safety practices, no one

49 has to our knowledge, been looking at how beliefs in food safety myths may influence health.  
50 That is the aim of this study.

51 Previous studies have investigated how food safety knowledge influence food safety attitudes  
52 and food safety practices in different countries, such as China (Wang, Huang, Liang, & Bai,  
53 2021; Gong, Wang, Yang, & Bai, 2016), India (Sudershan, Rao, Rao, Rao, & Polasa, 2008),  
54 Malaysia (Sani & Siow, 2014), Taiwan (Kuo & Weng, 2021), the Republic of Ireland (Moreb,  
55 Priyadarshi, & Jaiswal, 2017), Slovenia (Ovca, Jevsnik, & Raspor, 2014), and US  
56 (Charlesworth, Mullan, & Moran, 2021), and for different segments, such as school children  
57 (Kuo & Weng, 2021; Ovca et al., 2014), parents (Charlesworth, Mullan, & Moran, 2021;  
58 Sudershan et al 2008), pregnant woman (Mateus, Maia, & Teixeira, 2014), and food handlers  
59 (Sani & Siow, 2014). In all of these studies, food safety knowledge is operationalized as  
60 knowledge about scientific food safety information, often inspired by the study of Byrd-  
61 Bredbenner, Wheatley, Schaffner, Bruhn, Blalock, and Maurer (2007) and focusing on  
62 knowledge about correct food handling, such as how to clean, chill, cook and separate food.  
63 Taken together, all of these studies find that food safety knowledge correlates positively with  
64 food safety handling. The more science-based food safety knowledge both children, parents  
65 and professional food handlers have, the more correct and safe food handling. However, none  
66 of these studies investigate paranormal or mythical beliefs. According to the last EFSA report  
67 on risk communication (EFSA, 2021), false news is a problem that future studies need to  
68 address. In information consumption, confirmation bias, the human tendency to look for  
69 information that is coherent to one's system of beliefs is a problem. Immersed in communities  
70 of like-minded people, so called echo chambers, users listen to information consistent with  
71 what they believe, even when false, and tend to ignore dissenting information.

72 We agree with EFSA that false news is a problem and that the consequences of believing in  
73 unscientific food safety information need to be investigated.

74 While Wang et al. (2021) found that food-safety knowledge influenced both handling of food  
75 and the perceived health and economic threats of their actions, none of the previous studies  
76 looked at the health consequences of lacking science-based food safety knowledge. In this  
77 study, we aim to contribute to the state of the art of food safety knowledge by investigating  
78 unscientific beliefs and their consequences for health.

79 Two research questions are stated:

- 80 1. What food safety myths does UK, German and Norwegian citizens believe to be true?
- 81 2. How does belief in food safety myths influence gastroenteritis incidences and prevalence?

82

## 83 **Materials and Methods**

### 84 2.1 Participants

85 Data was generated as an add-on to the SafeConsume Household survey conducted in 2019  
86 (Scholderer, et al. 2019), where the fieldwork was sub-contracted to the professional research  
87 provider Dynata. In total, 3110 households (consisting of 7366 individuals) participated in  
88 this part of the survey (UK: 1080, Germany: 1024, Norway: 1006) (Table 1). The target  
89 respondent in each household was the person with main or shared responsibility for food  
90 shopping for the household. Sampling was based on a stratified random design, with the  
91 NUTS2 statistical regions of UK, Germany and Norway and the education level of the target  
92 respondent as stratum variables.

93 *Table 1: Frequency of age and gender distribution across countries*

Gender	Age	UK	Germany	Norway	Total
Female (50.7%)	16 to 24	73	57	72	202
	25 to 34	83	68	81	232
	35 to 44	92	82	90	264
	45 to 54	88	90	82	260

	55 to 64	83	80	74	237
	65 to 75	112	138	91	341
	More than 75	15	11	14	40
Male (49.3%)	16 to 24	74	58	76	208
	25 to 34	88	69	82	239
	35 to 44	94	84	94	272
	45 to 54	91	88	86	265
	55 to 64	72	78	76	226
	65 to 75	98	109	82	289
	More than 75	17	12	6	35
		1080	1024	1006	3110

94

## 95 2.2 Measures

### 96 2.2.1 Unscientific food safety beliefs

97 A process of collecting food safety myths, where all the partners of SafeConsume  
98 (<https://www.safeconsume.eu/>) were asked to bring forward commonly held unscientific food  
99 safety beliefs from their home country, resulting in a list of more than 150 beliefs from across  
100 Europe. These beliefs were categorized, synthesized, and reframed for consistency before a  
101 shortlist was evaluated at a multi-disciplinary workshop of experts in microbiology,  
102 sociology, marketing, communication, and economics at the general assembly of  
103 SafeConsume in Porto 2019. Here the scientific proof of the food safety beliefs was  
104 evaluated, and a decision was made on what beliefs to include in the survey. Before the  
105 workshop, all participants got a list of food safety beliefs to evaluate at home. The results  
106 from these individual evaluations were distributed to all the workshop participants. At the  
107 workshop, the participants were divided into cross-functional teams that worked with  
108 evaluating a small sample of the beliefs. After the workshop, all the teams' evaluations were  
109 merged into a document describing the scientific grounds for all the beliefs. This document  
110 became the basis for selecting what statements to include in the food safety myth survey (See  
111 Table 2). The myths were evaluated according to 1) content (if not related to food handling

112 they were removed), and 2) overlap (if the content of the myths was the same, they were  
113 merged and reworded). The statements cover both food safety and more general health issues,  
114 since consumers often do not distinguish between what is healthy and what is safe. The  
115 statements also vary in level of scientific support. Some are clearly unscientific, while others  
116 are more questionable. In the survey, the statements were presented in a randomized order and  
117 the respondents asked to indicate if they disagree or agree with the statement on a bipolar  
118 scale (1: I disagree, 2: I agree).

119 *Table 2: Measures of Food Safety Beliefs*

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*Read the statements below and indicate if you disagree or agree*

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1. Fresh food is always safer than frozen food
2. Home-made food is safer than industry processed food
3. If the food smells and tastes fine, it is safe to eat
4. Organic food is safer than conventionally farmed food
5. Eggs with brown shells are safer than those with white shells
6. Cooked meat is safer than smoked meat
7. Nationally (UK) produced food is safer than imported food
8. Desserts last a long time because they contain sugar
9. Eggs stored in the refrigerator are less safe than eggs stored at room temperature
10. Hot food will be spoiled and less safe to eat if refrigerated before cooling to room temperature
11. All food should be kept at 2 °C.
12. Freezing kills all bacteria
13. Lemon kills bacteria
14. Chili kills bacteria
15. Wasabi kills bacteria
16. Marinades kill bacteria
17. Bacteria do not survive on wooden cutting boards
18. Salt kills everything dangerous
19. A few drops of vinegar or lemon juice disinfect salads
20. Plastic cutting boards are safer than wooden ones.
21. An iron pan is best not cleaned
22. Pesticides are not cleaned off when you wash vegetables, only dirt and insects
23. Chicken should be washed before preparation
24. Eggs should be washed before storage
25. Washing your kitchen too often creates a sterile environment that is bad for building up a good immune system
26. Being too clean is the cause of allergies
27. Exposure to bacteria keeps our immune system strong
28. Eggs should not be washed as the bacteria on the outside will then get more easily inside the porous shell.
29. Fruit and vegetables that will be peeled don't have to be washed

30. Rice should never be reheated
  31. The old traditional way of making food is better than the modern way
  32. It is best to cook poultry and vegetables separately before mixing, as bacteria from raw poultry may go inside vegetables if cooked together
  33. Only poultry meat needs to be well done, to be safe to eat.
  34. Microwaves kill bacteria and make the food safe to eat
  35. Once food has been cooked, all bacteria have been killed and the food is safe to eat
  36. Vitamins are not heat-stable. If you treat healthy foods with too much heat they lose their healthiness
  37. Raw food is healthier than cooked food
  38. A small amount of alcohol is good to avoid food poisoning
  39. It is OK to eat a piece of bread that has fallen to the ground as long as you give it a kiss after you catch it
  40. If you eat dirt, it is cleaning up your stomach
  41. Any food that has fallen to the floor and did not stay there longer than 5 seconds, is still edible
  42. The best hangover breakfast is a raw egg
  43. The thin mold layer on the top of the jam does not pose a risk as long as you remove it before eating the jam
  44. Only eat oysters if there is an 'r' in the name of the month
  45. Vegetarians don't get food poisoning
  46. Fasting detoxifies the body
  47. Diarrhea from time to time is good because it cleans our body
- 

120

### 121 2.2.2 Consequence for health

122 Consequences for health were assessed with two standard epidemiological risk assessment  
123 endpoints: prevalence and incidence of acute infectious gastroenteritis (WHO, 2018). We  
124 measured health burden as gastroenteritis incidences per household reported in the  
125 SafeConsume Household Survey. The following question was asked: In the last year, how  
126 many times has someone in your household had a bad stomach bug (with vomiting and/or  
127 diarrhoea)? The scale went from 0 to 30+ days. Prevalence was operationalized as a binary  
128 yes or no variable to gastroenteritis incidences in the household the last year.

129

### 130 2.3 Analyses

131 After descriptive analysis of the sample and the food safety belief statements were conducted,  
 132 the gastroenteritis incidences data were log transformed. This transformation was necessary to  
 133 get the data from a ratio scale to an interval scale. To investigate how beliefs in different food  
 134 safety myths correlates with measures for health consequences, Pearson correlations analysis  
 135 were conducted on the data from the acceptance of the food safety belief statements and the  
 136 prevalence and incidence of gastroenteritis episodes reported. To investigate the underlying  
 137 structure of the belief statements, a factor analyses with Maximum Likelihood estimation and  
 138 Direct Oblimin rotation was conducted on the belief statements that had a significant effect on  
 139 at least one of the dependent variables (gastroenteritis incidences and prevalence). All  
 140 analysis was conducted in SPSS version 27.

141

### 142 3. Results

#### 143 4.1. Mythical Food Safety Beliefs

144 The percentage of agreement reported in Table 3 shows differences according to level of  
 145 agreement between the statements (from 10% to 81%) and that the level of agreement on the  
 146 same statements varies across the countries studied (as much as 20% for some statements).

147

148 *Table 3: Percentage Food Safety Belief agreement per country in descending order of the*  
 149 *mean*

<i>Belief statements</i>	<i>Mean</i>	<i>UK</i>	<i>Germany</i>	<i>Norway</i>
Exposure to bacteria keeps our immune system strong	67%	69%	62%	69%
It is best to cook poultry and vegetables separately before mixing, as bacteria from raw poultry may go inside vegetables if cooked together	67%	69%	63%	67%
Vitamins are not heat-stable. If you treat healthy foods with too much heat they lose their healthiness	65%	56%	81%	57%
Once food has been cooked, all bacteria have been killed and the food is safe to eat	63%	51%	80%	58%
Chicken should be washed before preparation	62%	51%	74%	61%



If the food smells and tastes fine, it is safe to eat	60%	53%	55%	74%
Home-made food is safer than industry processed food	58%	63%	48%	62%
Pesticides are not cleaned off when you wash vegetables, only dirt and insects	57%	56%	61%	55%
Being too clean is the cause of allergies	56%	54%	62%	53%
Nationally (UK) produced food is safer than imported food	55%	57%	45%	63%
Hot food will be spoiled and less safe to eat if refrigerated before cooling to room temperature	51%	56%	43%	55%
Plastic cutting boards are safer than wooden ones.	51%	55%	51%	49%
Fasting detoxifies the body	50%	39%	67%	43%
Cooked meat is safer than smoked meat	46%	46%	41%	52%
Rice should never be reheated	45%	58%	19%	57%
Washing your kitchen too often creates a sterile environment that is bad for building up a good immune system	43%	40%	47%	42%
The old traditional way of making food is better than the modern way	43%	54%	39%	38%
A few drops of vinegar or lemon juice disinfect salads	41%	39%	40%	44%
Eggs should not be washed as the bacteria on the outside will then get more easily inside the porous shell.	40%	44%	43%	32%
Fruit and vegetables that will be peeled don't have to be washed	39%	43%	37%	36%
Only poultry meat needs to be well done, to be safe to eat.	39%	33%	48%	38%
Microwaves kill bacteria and make the food safe to eat	36%	42%	35%	30%
Desserts last a long time because they contain sugar	35%	36%	26%	41%
Freezing kills all bacteria	34%	33%	29%	39%
The thin mold layer on the top of the jam does not pose a risk as long as you remove it before eating the jam	33%	41%	26%	33%
Fresh food is always safer than frozen food	32%	37%	30%	30%
Organic food is safer than conventionally farmed food	32%	37%	28%	32%
All food should be kept at two degrees C.	32%	40%	26%	30%
Any food that has fallen to the floor and did not stay there longer than 5 seconds, is still edible	32%	35%	30%	31%
Lemon kills bacteria	30%	37%	34%	19%
An iron pan is best not cleaned	29%	25%	31%	31%
Eggs should be washed before storage	29%	32%	32%	24%
Only eat oysters if there is an 'r' in the name of the month	29%	26%	38%	25%
Raw food is healthier than cooked food	25%	25%	24%	26%
A small amount of alcohol is good to avoid food poisoning	23%	25%	16%	29%
Diarrhea from time to time is good because it cleans our body	22%	23%	22%	20%
Chili kills bacteria	20%	19%	25%	15%
Eggs stored in the refrigerator are less safe than eggs stored at room temperature	20 %	28 %	15 %	17%
It is OK to eat a piece of bread that has fallen to the ground as long as you give it a kiss after you catch it	19%	20%	18%	19%
Salt kills everything dangerous	16%	21%	15%	13%
Eggs with brown shells are safer than those with white shells	15%	20%	12%	12%
Wasabi kills bacteria	15%	18%	17%	10%
If you eat dirt, it is cleaning up your stomach	15%	17%	20%	9%
The best hangover breakfast is a raw egg	15%	19%	14%	13%

Bacteria do not survive on wooden cutting boards	14%	17%	13%	13%
Marinades kill bacteria	13%	18%	13%	10%
Vegetarians don't get food poisoning	12%	16%	10%	10%

150

151 4.2. Mythical Food Safety Beliefs Consequences for Health

152 The results presented in Table 4 show that close to 80% of the beliefs correlate significantly  
 153 with gastroenteritis incidence and prevalence. The largest correlations are observed for  
 154 unscientific beliefs about eggs (such as storing eggs at room temperature and eating raw eggs  
 155 to cure hangover), bacteria inactivation (that a wooden cutting board, and chili, wasabi and  
 156 marinades kills bacteria), that vegetarians do not get food poisoning, and that eating dirt and  
 157 having diarrhea is good since it cleans up the stomach.

158

159 *Table 4: Pearson correlations of beliefs effect on incidence and prevalence of gastroenteritis,*  
 160 *in descending order of the coefficient values*

	Incidence of gastroenteritis per household, log transformed	Prevalence of gastroenteritis incidences per household
Vegetarians don't get food poisoning	<b>.243**</b>	<b>.182**</b>
Bacteria do not survive on wooden cutting boards	<b>.232**</b>	<b>.195**</b>
Eggs with brown shells are safer than those with white shells	<b>.229**</b>	<b>.191**</b>
Marinades kill bacteria	<b>.229**</b>	<b>.195**</b>
Diarrhea from time to time is good because it cleans our body	<b>.225**</b>	<b>.189**</b>
The best hangover breakfast is a raw egg	<b>.218**</b>	<b>.184**</b>
Wasabi kills bacteria	<b>.216**</b>	<b>.181**</b>
If you eat dirt, it is cleaning up your stomach	<b>.215**</b>	<b>.167**</b>
Salt kills everything dangerous	<b>.198**</b>	<b>.159**</b>
Washing your kitchen too often creates a sterile environment that is bad for building up a good immune system	<b>.090**</b>	<b>.064**</b>
Vitamins are not heat-stable. If you treat healthy foods with too much heat they lose their healthiness	<b>-.044*</b>	<b>-.050**</b>
The thin mold layer on the top of the jam does not pose a risk as long as you remove it before eating the jam	<b>.096**</b>	<b>.058**</b>
Raw food is healthier than cooked food	<b>.129**</b>	<b>.104**</b>
Organic food is safer than conventionally farmed food	<b>.160**</b>	<b>.132**</b>
Only poultry meat needs to be well done to be safe to eat.	<b>.082**</b>	<b>.064**</b>
Only eat oysters if there is an 'r' in the name of the month	<b>.089**</b>	<b>.060**</b>
Nationally produced food is safer than imported food	<b>.048**</b>	<b>.055**</b>
Microwaves kill bacteria and make the food safe to eat	<b>.094**</b>	<b>.077**</b>
Lemon kills bacteria	<b>.124**</b>	<b>.104**</b>
It is OK to eat a piece of bread that has fallen to the ground as long as you give it a kiss after you catch it	<b>.182**</b>	<b>.146**</b>

Hot food will be spoiled and less safe to eat if refrigerated before cooling to room temperature	<b>.049**</b>	<b>.052**</b>
Fruit and vegetables that will be peeled don't have to be washed	<b>.061**</b>	<b>.045*</b>
Fresh food is always safer than frozen food	<b>.140**</b>	<b>.117**</b>
Freezing kills all bacteria	<b>.099**</b>	<b>.091**</b>
Fasting detoxifies the body	<b>.057**</b>	0.027
Eggs stored in the refrigerator are less safe than eggs stored at room temperature	<b>.185**</b>	<b>.149**</b>
Eggs should not be washed as the bacteria on the outside will then get more easily inside the porous shell.	<b>.056**</b>	0.034
Eggs should be washed before storage	<b>.121**</b>	<b>.092**</b>
Desserts last a long time because they contain sugar	<b>.095**</b>	<b>.071**</b>
Cooked meat is safer than smoked meat	<b>.076**</b>	<b>.065**</b>
Chili kills bacteria	<b>.171**</b>	<b>.154**</b>
Chicken should be washed before preparation	<b>.045*</b>	0.027
Any food that has fallen to the floor and did not stay there longer than 5 seconds, is still edible	<b>.107**</b>	<b>.081**</b>
An iron pan is best not cleaned	<b>.078**</b>	<b>.047**</b>
All food should be kept at two degrees C.	<b>.087**</b>	<b>.061**</b>
A small amount of alcohol is good to avoid food poisoning	<b>.187**</b>	<b>.157**</b>
A few drops of vinegar or lemon juice disinfect salads	<b>.087**</b>	<b>.086**</b>
Rice should never be reheated	0.021	0.026
Once food has been cooked, all bacteria have been killed and the food is safe to eat	-0.020	-0.014
Plastic cutting boards are safer than wooden ones.	0.020	0.013
Pesticides are not cleaned off when you wash vegetables, only dirt and insects	0.017	0.008
If the food smells and tastes fine, it is safe to eat	0.013	0.003
Exposure to bacteria keeps our immune system strong	0.012	-0.002
Home-made food is safer than industry processed food	0.008	0.014
It is best to cook poultry and vegetables separately before mixing, as bacteria from raw poultry may go inside vegetables if cooked together	-0.005	-0.005
The old traditional way of making food is better than the modern way	0.005	-0.007
Being too clean is the cause of allergies	-0.001	0.010

161 Pearson correlation (2-tailed), \*\* significant at the 0.01 level, \* significant at the 0.05 level; N=3110

162

#### 163 4.3 The underlying factor structure of the mythical food safety beliefs

164 The unrestricted factor analyses of mythical beliefs show many factors with high degree of  
 165 cross loading. An investigation of the factors made us identify eight subcategories of belief:

166 1) beliefs about heating (e.g., cooking and microwave heating kills all bacteria),

167 2) beliefs about what food is the safest (e.g., fresh, home-made, organic, and  
 168 nationally produced food is the safest),

169 3) beliefs about what kills bacteria (e.g., lemon, chili, wasabi, marinades, salt, and  
 170 vinegar),

- 171 4) beliefs about health (vegetarians do not get food poisoned, raw food is  
 172 healthier than cooked food, and diarrhea cleans up your body),  
 173 5) beliefs about storage (e.g., freezing kills all bacteria),  
 174 6) beliefs about cleaning (e.g., cleaning of eggs and chicken before storage)  
 175 7) beliefs about hygiene (e.g., that being too clean is the cause of allergies and  
 176 that exposure to bacteria keeps our immune system strong)  
 177 8) superstitious mythical beliefs (e.g., brown eggs are safer than white, and a  
 178 small amount of alcohol hinders food poisoning)

179 After removing all cross loadings, a two-dimensional underlying structure occurs: The  
 180 hygiene hypotheses and a general mythical beliefs factor that covers many of the beliefs.

181

182 *Table 5: The underlying two- dimensional belief structure, the structure matrix resulting from*  
 183 *the factor analyses after removing statements with cross loadings.*

	Factor	
	1 Beliefs in food safety myths	2 Beliefs in the hygiene hypothesis
Eggs with brown shells are safer than those with white shells	<b>.613</b>	.044
Lemon kills bacteria	<b>.417</b>	.168
Being too clean is the cause of allergies	.168	<b>.537</b>
Exposure to bacteria keeps our immune system strong	.103	<b>.525</b>
A small amount of alcohol is good to avoid food poisoning	<b>.532</b>	.171
It is OK to eat a piece of bread that has fallen to the ground as long as you give it a kiss after you catch it	<b>.614</b>	.139
If you eat dirt, it is cleaning up your stomach	<b>.649</b>	.121
Any food that has fallen to the floor and did not stay there longer than 5 seconds, is still edible	<b>.415</b>	.213
The best hangover breakfast is a raw egg	<b>.673</b>	.091
Vegetarians don't get food poisoning	<b>.699</b>	.067
Diarrhea from time to time is good because it cleans our body	<b>.539</b>	.173

Maximum Likelihood with Promax Rotation Method with Kaiser Normalization. Chi-Square Sig< .000

184

#### 185 **4. Discussion**

186 Although belief in some food safety myths will not have a significant impact on people's  
 187 health, believing in some others will put individuals at high risk of contracting a foodborne  
 188 illness.

189 *Formation of beliefs*

190 All the time, people try to make sense of all the sensory stimuli they are exposed to. They  
191 look for and find patterns in what they see, read, hear, taste, smell, and touch, and then infuses  
192 those patterns with meaning. People have evolved to connect the dots of their world into  
193 meaningful patterns that explain why things happen. This happens for both meaningful and  
194 meaningless data (Shermer, 2011).

195 People form beliefs first and then, afterwards, look for evidence in support of those beliefs.  
196 They try to reinforce their beliefs, and what they believe becomes their reality. Most people  
197 arrive at their beliefs by filtering the facts of the world through their lenses of worldviews,  
198 theories, hunches, and prejudices they have accumulated over time. They sort the facts and  
199 select those that confirm what they already believe and ignore or rationalize away the rest  
200 (Shermer, 2011).

201 The associative-propositional model of evaluation (APE) (Gawronski & Bodenhausen, 2006;  
202 Gawronski & Bodenhausen, 2007), explains belief formation well (Scholderer, 2010). APE is  
203 based on the two systems view of the human mind (Sloman, 1996) and consists of the  
204 associative system that process information fast, in parallel, automatic, and effortless, and the  
205 reasoning system that processes information in a slow, serial, controlled and effortful manner.  
206 The associative system responds directly to the input stimuli in the surroundings. It  
207 automatically activates a pattern of evaluative associations that might create impulse  
208 behavior. The reasoning system might stop this impulse by making people reflect. It can  
209 evoke memories or facts that may, again, trigger the associated system that can generate  
210 emotions such as pleasure, fear, disgust, shame or guilt. While the associative system  
211 generates immediate affective reactions that do not separate right from wrong, our reasoning  
212 system can monitor these gut feelings by checking the validity and appropriateness of these  
213 reactions. It translates the affective outcome of the associative system into propositional

214 formats such as “I like...” or “I want...” and checks if these propositions fit with everything  
215 else that we find valid at this time (Scholderer, 2010). While the associative system is  
216 unconscious, the reasoning system is clearly conscious.

217 The reasoning system might overrule the associative system to secure consistency in the belief  
218 structure. Such inconsistencies can also result in an attempt to come up with an explanation,  
219 an excuse for why the original belief is best. However, the APE model assumes that the  
220 reasoning system will only attempt to overrule the associative system if inconsistent  
221 information is considered.

222 According to the APE model, beliefs are constantly in flux. Both new associations formed via  
223 associative learning, reasoning around these associations and/ or considering new facts can  
224 change beliefs. A slightly different context might also activate a slightly different pattern of  
225 existing associations and thereby result in different beliefs. While different cognitive  
226 processes are at play in the associative system and the reasoning system, they can both  
227 mutually provide input to each other. It is important, however, to remember that we first  
228 formulate associated beliefs, and then later we may validate them by the reasoning system. It  
229 is also so that our perception of reality depends on our beliefs. Although reality exists  
230 independent of the human mind, people's understanding of it depends upon the beliefs they  
231 hold at any given time (Shermer, 2011). Accordingly, unscientific mythical beliefs may shape  
232 people's understanding of reality. Mythical beliefs are part of many consumers' food safety  
233 knowledge, a part that if considered may have a negative influence on food handling  
234 practices.

### 235 *Scientific explanations*

236 Campylobacteriosis and salmonellosis, respectively, have been the first and second most  
237 reported foodborne bacterial gastroenteritis in the European Union in the last years (EFSA &

238 ECDC, 2021). While *Campylobacter* spp. in poultry is ranked as the leading pathogen-food  
239 combination (handling raw poultry, eating raw or undercooked poultry meat or cross-  
240 contamination of raw to cooked foods) causing human infection, the most common sources of  
241 salmonellosis are eggs and egg products (Domingues, Pires, Halasa & Hald, 2012; EFSA &  
242 ECDC, 2021; Luber, 2009).

243 Three of the beliefs that can be linked with *Campylobacter*/chicken (“bacteria do not survive  
244 on wooden cutting boards”, “salt kills everything dangerous” and “chicken should be washed  
245 before preparation”) correlate significantly with gastroenteritis incidences and/or prevalence  
246 and there is scientific evidence to support these results. When handling raw chicken  
247 consumers touch it with their hands and very often, they do not wash them before continuing  
248 with other tasks, including seasoning with salt (Borda et al., 2020). Santos-Ferreira et al.  
249 (2021) demonstrated that this can result in salt contamination and subsequent cross-  
250 contamination of ready-to-eat salads with *Campylobacter* spp.

251 Despite several campaigns warning of the risks of this practice, many consumers continue to  
252 wash chicken meat before cooking it and this was confirmed in this study as more than half of  
253 the respondents agree that “chicken should be washed before preparation.” The reasons  
254 behind this belief are not clear. In a study conducted in Portugal, cleanliness, hygiene, and  
255 food safety were the main reasons why people washed their chicken meat (Cardoso, Ferreira,  
256 Truninger, Maia & Teixeira, 2021). A study in the USA revealed that the ambition to control  
257 the food preparation process, the lack of confidence in poultry processing, and the habitual  
258 nature of this behavior in daily life were the most common factors contributing to the washing  
259 of chicken (Gilman, Henley & Quinlan, 2021). Vatrál, Gilman and Quinlan (2021) reported  
260 that in the United States a large part of consumers do not know what the right behavior is.  
261 Rinsing the poultry before cooking may contaminate the sinks where vegetables are also  
262 frequently washed and may become contaminated (Cardoso et al., 2021; Møretreth et al., 2021).

263 Transfer of *Campylobacter* spp. from raw chicken to cutting boards, used both for handling  
264 chicken and for preparing salads, has been demonstrated in both laboratory (Tang, Nishibuchi,  
265 Nakaguchi, Ghazali, Saleha & Son, 2011) and real scenarios (Cardoso et al., 2021; Møretrø et  
266 al., 2021) and this transfer was not correlated with the type of material of these utensils.

267 Concerning the survival of bacteria on wood surfaces, some studies suggest that some types of  
268 wood show antimicrobial activity (Boursillon & Riethmüller, 2007; Munir, Belloncle, Aviat,  
269 Federighi, Pailhoriès & Eveillard, 2021). However, according to Munir et al. (2020), the lack  
270 of standard methods for such determinations may lead to misinterpretation of results.

271 This study provided evidence that some beliefs related to eggs are also correlated with  
272 gastroenteritis incidences. On average 15% of the respondents to the survey agree that “The  
273 best hangover breakfast is a raw egg”. Consumption of raw eggs/products with raw eggs is a  
274 relevant risk factor for salmonellosis, despite the prevalence of *Salmonella* spp. in commercial  
275 eggs being low in most developed countries (reviewed by Cardoso et al., 2021). Some  
276 countries, including Norway, have received special guarantees from the European  
277 Commission as a recognition of a low prevalence of *Salmonella* in eggs and of strict national  
278 control programs (European Commission, n.d.). In the United Kingdom the risk of  
279 salmonellosis posed by eggs produced under the British Lion Code of Practice is very low and  
280 consumers were advised by the Food Standards Agency that “infants, children, pregnant  
281 women and elderly people can now safely eat raw or lightly cooked eggs that are produced  
282 under the British Lion Code of Practice” IFST (n.d.). Considering that a high percentage of  
283 consumers believe that “Organic food is safer than conventionally farmed food” and the  
284 different concepts of “organic” (FAO, 2021) we may wonder if backyard foods are included  
285 in the consumers’ concept of “organic food”. Prevalence of *Salmonella* spp. in eggs from  
286 backyard chickens and acquired in small local suppliers is expected to be higher than in  
287 industrially produced eggs (reviewed by Cardoso et al., 2021).



288 Without any scientific basis, 20% of the respondents believe that eggs stored in the  
289 refrigerator are less safe than eggs stored at room temperature. As *Salmonella* grows in the  
290 range of 7 to 45 °C (International Commission on Microbiological Specifications for Food,  
291 1996), storing eggs refrigerated will prevent the growth of the pathogen. However, if the egg  
292 yolk is contaminated at the time of laying, refrigeration will only be effective in warm months  
293 if eggs are kept cold immediately after laying, as *Salmonella* will multiply rapidly at room  
294 temperature.

295 The highest correlation with gastroenteritis incidence was observed for “Vegetarians don't get  
296 food poisoning”. Driven by different motivations including health, animal welfare and  
297 environmental concern, there has been an increase in the consumption of fruits and  
298 vegetables. As recently reported, fruit and vegetables top the list of products that consumers  
299 trust for their safety and quality. On the contrary, animal products (eggs, meat, and fish) are  
300 ranked at the bottom of this list (YouGov, 2021). Although most foodborne outbreaks are  
301 caused by the consumption of contaminated foods of animal origin (Felício et al., 2015), the  
302 number of outbreaks associated with fruits and vegetables has been increasing in parallel with  
303 the increase in the consumption of fresh produce (Carstens, Salazar& Darkoh, 2019; Macieira,  
304 Barbosa & Teixeira, 2021).

305 Senses can be used to evaluate alterations in sensory characteristics of foods after the “best  
306 before” date but cannot be used to monitor safety after the “use by” date. In general, the  
307 microbes that cause spoilage are not the same as those that cause foodborne diseases, and the  
308 latter rarely cause significant changes in the food's characteristics. In an attempt to achieve the  
309 UN food loss and waste reduction target - Sustainable Development Goal 12 – “halve food  
310 waste by 2030”, several initiatives have been launched in different countries. For example,  
311 “Look, Smell, Taste, Don't Waste” is a campaign launched by the company Too Good To Go  
312 aiming “to end misunderstandings about date labels, and the food waste that they cause”.

313 Although the aim of this and other similar campaigns is to reduce waste by avoiding throwing  
314 away food that is past its “best before” date and poses no risk to the consumer, it is difficult to  
315 ensure that the information is not misinterpreted. In fact, it is recognized that consumers have  
316 difficulty in perceiving the “use by” or “best before” dates (Samotyja & Sielicka-Różyńska,  
317 2021).

318 A strong belief in hygiene-related myths (43% to 67%) was observed and this correlates  
319 significantly with gastroenteritis incidences. In the light of the “hygiene hypothesis,” the  
320 decreasing incidence of infections in early life is at the origin of the increasing incidence of  
321 both autoimmune and allergic diseases. This hypothesis has been popularized by the media  
322 over the years, leading many to wonder about domestic cleanliness and hygiene care as  
323 reflected in the findings of the present study. At the same time, nearly 40% of foodborne  
324 outbreaks occur at household (EFSA & ECDC, 2021), and food handling has been identified  
325 as one of the nine moments when hygiene can break the chain of infection by gastrointestinal  
326 pathogens (*Salmonella* spp., *Campylobacter* spp., *Listeria monocytogenes*, and norovirus)  
327 (Rook & Bloomfield, 2021).

## 328 5. Conclusions

329 This is the first study linking unscientific beliefs to gastroenteritis. The main conclusion of the  
330 findings from this study is that mythical beliefs may influence incidences and prevalence of  
331 gastroenteritis. We find that unscientific beliefs are quite common and that peoples’ beliefs  
332 vary from UK, Germany and Norway. Future studies need to investigate the mechanisms  
333 explaining why beliefs in food safety myths correlate with gastroenteritis incidences and  
334 prevalence. Studies investigating behavior change methods, including but not limited to  
335 correcting false beliefs are also needed.

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341 **References**

- 342 Borda, D., Didier, P., Dumitraşcu, L., Ferreira, V., Foden, M., Langsrud, S., Maître, I.,  
343 Martens, L. Møretrø, T., Nguyen-The, C., Nicolau, A. I. Nunes, C., Rosenberg, T. G.,  
344 Skuland, S. E., Teigen, H. M., Teixeira, P., & Truninger, M. (2020). European food safety:  
345 Mapping critical food practices and cultural differences in France, Norway, Portugal,  
346 Romania and the UK. Silje Elisabeth Skuland. Oslo Metropolitan University, 884 p., 2020,  
347 978-82-7063-506-1.
- 348 Boursillon, D., & Riethmüller, V. (2007). The safety of wooden cutting boards:  
349 Remobilization of bacteria from pine, beech, and polyethylene. *British Food Journal*, 109,  
350 315–322. <https://doi.org/10.1108/00070700710736561>
- 351 Byrd-Bredbenner, C., Wheatley, V., Schaffner, D., Bruhn, C., Blalock, L., & Maurer, J.  
352 (2007). Development and implementation of a food safety knowledge instrument. *Journal of*  
353 *Food Science Education*, 6(3), 46–55. <https://doi.org/10.1111/j.1541-4329.2007.00029.x>
- 354 Cardoso, M. J., Ferreira, V., Truninger, M., Maia, R. & Teixeira, P. (2021). Cross-  
355 contamination events of *Campylobacter* spp. in domestic kitchens associated with consumer  
356 handling practices of raw poultry, *International Journal of Food Microbiology*, 338, Article  
357 108984. <https://doi.org/10.1016/j.ijfoodmicro.2020.108984>.
- 358 Cardoso, M. J., Nicolau, A. I., Borda, D., Nielsen, L., Maia, R. L., Møretrø, T., Ferreira, V.,  
359 Knøchel, S., Langsrud, S., & Teixeira, P. (2021) *Salmonella* in eggs: From shopping to  
360 consumption—A review providing an evidence-based analysis of risk factors. *Comprehensive*  
361 *Reviews in Food Science and Food Safety*, 20, 2716-2741. [https://doi.org/10.1111/1541-](https://doi.org/10.1111/1541-4337.12753)  
362 [4337.12753](https://doi.org/10.1111/1541-4337.12753)

363 Carstens, C. K., Salazar, J. K., & Darkoh, C. (2019). Multistate outbreaks of foodborne illness  
364 in the United States associated with fresh produce from 2010 to 2017. *Frontiers in*  
365 *Microbiology*, *10*, Article 2667. <https://doi.org/10.3389/fmicb.2019.02667>.

366 Charlesworth, J., Mullan, B., & Moran, A. (2021): Investigating the predictors of safe food  
367 handling among parents of young children in the USA. *Food Control*, *126*, 1-9.  
368 <https://doi.org/10.1016/j.foodcont.2021.108015>

369 Da Silva Felício, M. T., Hald, T., Liebana, E., Allende, A., Hugas, M., Nguyen-The, C.,  
370 Johannessen, G.S., Niskanen, T., Uyttendaele, M., & McLauchlin, J. (2015). Risk ranking of  
371 pathogens in ready-to-eat unprocessed foods of non-animal origin (FoNAO) in the EU: Initial  
372 evaluation using outbreak data (2007–2011). *International Journal of Food Microbiology*,  
373 *195*, 9-19. <https://doi.org/10.1016/j.ijfoodmicro.2014.11.005>

374 Domingues, A. R., Pires, S. M., Halasa, T., & Hald, T. (2012). Source attribution of human  
375 salmonellosis using a meta-analysis of case-control studies of sporadic infections.  
376 *Epidemiology and Infection*, *140* (6), 959–969. <https://doi.org/10.1017/S0950268811002172>

377 EFSA (2021). Technical assistance in the field of risk communication, European Food Safety  
378 Authority (EFSA), Ed. Maxim, L., Mazzocchi, M., Broucke, S. V., Zollo, F., Robinson, T.,  
379 Rogers, C., Vrbos, D., Zamariola, G. and Smith, A., *EFSA Journal*, 1-113. doi:  
380 [10.2903/j.efsa.2021.6574](https://doi.org/10.2903/j.efsa.2021.6574)

381 EFSA and ECDC (European Food Safety Authority and European Centre for Disease  
382 Prevention and Control), 2021. The European Union One Health 2020 Zoonoses Report.  
383 *EFSA Journal*, *19* (12):6971, 324 pp. <https://doi.org/10.2903/j.efsa.2021.6971>

384 European Commission. (n.d.). Control of *Salmonella*.  
385 [https://ec.europa.eu/food/safety/biosafety/food\\_borne\\_diseases/salmonella\\_en](https://ec.europa.eu/food/safety/biosafety/food_borne_diseases/salmonella_en)

386 FAO. 2021. Organic foods – Are they safer? Food safety technical toolkit for Asia and the  
387 Pacific No. 6. Bangkok. (<https://www.fao.org/3/cb2870en/cb2870en.pdf>)

388 Gawronski, B., & Bodenhausen, G.V. (2007). Unraveling the processes underlying  
389 evaluation: Attitudes from the perspective of the APE model. *Social Cognition*, 25, 687–717.  
390 <https://doi.org/10.1521/soco.2007.25.5.687>

391 Gawronski, B., & Bodenhausen, G. V. (2006). Associative and propositional processes in  
392 evaluation: An integrative review of implicit and explicit attitude change. *Psychological*  
393 *Bulletin*, 132, 692–731. <https://doi.org/10.1037/0033-2909.132.5.692>

394 Gilman, A., Henley, S.C. & Quinlan, J. (2021). Understanding barriers to consumers to stop  
395 washing raw poultry through in-depth interviews, *British Food Journal*,  
396 <https://doi.org/10.1108/BFJ-07-2021-0837>

397 Gong, S., Wang, X., Yang, Y., & Bai, L. (2016). Knowledge of food safety and handling in  
398 households: A survey of food handlers in Mainland China. *Food Control*, 64, 45-53.  
399 <https://doi.org/10.1016/j.foodcont.2015.12.006>

400 IFST (n.d.). *New advice on eating runny eggs – FSA*. Retrieved from  
401 <https://www.ifst.org/news/new-advice-eating-runny-eggs-fsa-0>. Accessed May 9, 2022

402 International Commission on Microbiological Specifications for Foods (1996). *Salmonellae*.  
403 *In Microorganisms in foods 5 - Microbiological specifications of food pathogens* (pp. 217–  
404 264). Springer, US

405 Kuo, S.-C. & Weng, Y.-M. (2021). Food safety knowledge, attitude, and practice among  
406 elementary schoolchildren in southern Taiwan. *Food Control*. 122.  
407 <https://doi.org/10.1016/j.foodcont.2020.107818>

408 Lewandowsky, S., Ecker, U.K.H., Seifer, C.M., Schwarz, N., & Cook, J. b(2012).  
409 Misinformation and its correction: Continued influence and successful debiasing.  
410 *Psychological Science in the Public Interest*, 13(3), 106-131.  
411 <https://doi.org/10.1177/1529100612451018>

412 Luber, P. (2009). Cross-contamination versus undercooking of poultry meat or eggs - Which  
413 risks need to be managed first? *International Journal of Food Microbiology*, 134(1–2), 21–28.  
414 <https://doi.org/10.1016/j.ijfoodmicro.2009.02.012>

415 Macieira, A., Barbosa, J., & Teixeira, P. (2021). Food safety in local farming of fruits and  
416 vegetables. *International Journal of Environmental Research and Public Health*, 18(18),  
417 9733. <https://doi.org/10.3390/ijerph18189733>

418 Mateus, T., Maia, R. L., & Teixeira, P. (2014). Awareness of listeriosis among Portuguese  
419 pregnant women. *Food Control*, 46, 513-519. <https://doi.org/10.1016/j.foodcont.2014.06.012>

420 Moreb, N. A., Priyadarshini, A., & Jaiswal, A. K. (2017). Knowledge of food safety and food  
421 handling practices amongst food handlers in the Republic of Ireland. *Food Control*, 80, 341-  
422 349. <https://doi.org/10.1016/j.foodcont.2017.05.020>

423 Møretrø, T., Nguyen-The, C., Didier, P., Maître, I., Izsó, T., Kasza, G., Skuland, S. E.,  
424 Cardoso, M.j., Ferreira, V.B., Teixeira, P., Borda, D., Dumitrascu, L., Neagu, C., Nicolau, A.  
425 I., Anfruns-Estrada, E., Foden, M., Voysey, P. & Langsrud, S. (2021). Consumer practices  
426 and prevalence of *Campylobacter*, *Salmonella* and norovirus in kitchens from six European  
427 countries. *International Journal of Food Microbiology*, 347, Article 109172,  
428 <https://doi.org/10.1016/j.ijfoodmicro.2021.109172>.

429 Munir, M.T., Belloncle, C., Aviat, F., Federighi, M., Pailhoriès, H., & Eveillard, M. (2021).  
430 Antimicrobial activity of oak wood against nosocomial *Acinetobacter baumannii* of human  
431 and animal origin: A One Health Approach. In: Ksibi M, Ghorbal A, Chakraborty S, Chaminé

432 HI, Barbieri M, Guerriero G, et al., ed. Recent Advances in Environmental Science from the  
433 Euro-Mediterranean and Surrounding Regions (2nd Edition). Cham: Springer International  
434 Publishing; 2021. p. 2413–7. (Environmental Science and Engineering).  
435 [https://doi.org/10.1007/978-3-030-51210-1\\_377](https://doi.org/10.1007/978-3-030-51210-1_377)

436 Munir, M.T., Pailhories, H., Eveillard, M., Irle, M., Aviat, F., Dubreil, L., Federighi, M., &  
437 Belloncle, C. (2020). Testing the antimicrobial characteristics of wood materials: A review of  
438 methods. *Antibiotics*, 9, Article 225. <https://doi.org/10.3390/antibiotics9050225>

439 Olsen, N.V., Røssvoll, E., Langsrud, S., & Scholderer, J. (2014). Hamburger hazards and  
440 emotions, *Appetite*, 78, 95-101. <https://doi.org/10.1016/j.appet.2014.03.007>

441 Ovca, A., Jevšnik, M., & Raspor, P. (2014). Food safety awareness, knowledge and practices  
442 among students in Slovenia. *Food Control*, 42, 144-151.  
443 <https://doi.org/10.1016/j.foodcont.2014.01.036>

444 Rook, G.A.W., & Bloomfield, S.F. (2021). Microbial exposures that establish  
445 immunoregulation are compatible with targeted hygiene. *The Journal of Allergy and Clinical*  
446 *Immunology*, 148(1), 33-39. <https://doi.org/10.1016/j.jaci.2021.05.008>

447 Saher, M., & Lindeman, M. (2005). Alternative medicine: A psychological perspective.  
448 *Personality and Individual Differences*, 39 (6), 1169-1178.  
449 <https://doi.org/10.1016/j.paid.2005.04.008>

450 Samotyja, U. & Sielicka-Różyńska, M. (2021). How date type, freshness labelling and food  
451 category influence consumer rejection. *International Journal of Consumer Studies*, 45, 441-  
452 455. <https://doi.org/10.1111/ijcs.12634>



453 Sani, N. A., & Siow, O. N. (2014). Knowledge, attitudes and practices of food handlers on  
454 food safety in food service operations at the Universiti Kebangsaan Malaysia. *Food control*,  
455 37, 210-217. <https://doi.org/10.1016/j.foodcont.2013.09.036>

456 Santos-Ferreira, N., Alves, Â., Cardoso, M.J., Langsrud, S., Malheiro, A.R., Fernandes, R.,  
457 Maia, R., Truninger, M., Junqueira, L., Nicolau, A.I., Dumitraşcu, L., Skuland, S. E., Kasza,  
458 G., Izsó, T., Ferreira, V., & Teixeira, P. (2021). Cross-contamination of lettuce  
459 with *Campylobacter* spp. via cooking salt during handling raw poultry. *PLoS ONE*, 16(5),  
460 Article e0250980. <https://doi.org/10.1371/journal.pone.0250980>

461 Scholderer, J. (2010). Attitudes and attitude change. In K.M. Ekström (Ed.), *Consumer*  
462 *behaviour: A Nordic perspective* (pp. 215-236). Lund: Studentlitteratur.

463 Scholderer, J., Almli, V., Veflen, N., Ueland, Ø., Vose, D., Maitre, I., Kühn, J., Mylord, T.,  
464 Kasza, G., Izsó, T., Teixeira, P., Nicolau, A., & Martens, L. (2019). Deliverable D3.1: Survey  
465 questionnaire and standardised measurement protocol. SafeConsume report.

466 Shermer, M. (2011). *The Believing Brain: From Ghosts and Gods to Politics and*  
467 *Conspiracies. How to construct Beliefs, and Reinforce Them as Truths.* Times Books, Henry  
468 Holt and Company, New York.

469 Sloman, S. A. (1996). The empirical case for two systems of reasoning. *Psychological*  
470 *Bulletin*, 119, 3–22. <https://doi.org/10.1037/0033-2909.119.1.3>

471 Sudershan, R. V., Rao, G. S., Rao, P., Rao, M. V. V., & Polasa, K. (2008). Food safety related  
472 perceptions and practices of mothers—A case study in Hyderabad, India. *Food control*, 19(5),  
473 506-513. <https://doi.org/10.1016/j.foodcont.2007.05.017>

474 Tang, J.Y., Nishibuchi, M., Nakaguchi, Y., Ghazali, F.M., Saleha, A.A., & Son, R. (2011).  
475 Transfer of *Campylobacter jejuni* from raw to cooked chicken via wood and plastic cutting

476 boards, *Letters in Applied Microbiology*, 52(6), 581-588. <https://doi.org/10.1111/j.1472->  
477 [765X.2011.03039.x](https://doi.org/10.1111/j.1472-765X.2011.03039.x)

478 Vatrál, C., Gilman, A., & Quinlan, J. (2021) Consumers awareness of the message not to  
479 wash raw poultry, current practices, and barriers to following that message. *Journal of Food*  
480 *Protection*, Epub ahead of print. PMID: 34935942. <https://doi.org/10.4315/JFP-21-324>.

481 Wang, M., Huang, L., Liang, X., & Bai, L. (2021). Consumer knowledge, risk perception and  
482 food-handling behaviors—A national survey in China. *Food Control*, 122, Article 107789.  
483 <https://doi.org/10.1016/j.foodcont.2020.107789>

484 Weng, S., López, A., Sáez-Orviz, S., Marcet, I., García, P., Rendueles, M., & Díaz, M.  
485 (2021). Effectiveness of bacteriophages incorporated in gelatine films against *Staphylococcus*  
486 *aureus*. *Food Control*, 121, Article 107666. <https://doi.org/10.1016/j.foodcont.2020.107666>

487 World Health Organization (WHO) (2018). WHO methods and data sources for global burden  
488 of disease estimates 2000-2016. Geneva: WHO.

489 YouGov (2021). *The UK's trust in food index*. Retrieved from [https://redtractor.org.uk/wp-](https://redtractor.org.uk/wp-content/uploads/2021/10/HL_UKTIFI_landscape_pr13_final-1.pdf)  
490 [content/uploads/2021/10/HL\\_UKTIFI\\_landscape\\_pr13\\_final-1.pdf](https://redtractor.org.uk/wp-content/uploads/2021/10/HL_UKTIFI_landscape_pr13_final-1.pdf). Accessed May 9, 2022.