

Food Habits and Knowledge Related with Meat on a Sample of Portuguese Consumers [†]

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[†] Presented at the 2nd International Electronic Conference on Foods—“Future Foods and Food Technologies for a Sustainable World”, Online, 15–30 October 2021. Available online: <https://foods2021.sciforum.net/>.

Abstract: This research was based on a questionnaire applied to a sample of Portuguese consumers. Most participants agreed that the influence of meat consumption on human health depends on the amount consumed, while practically none believed that meat is bad for health. Regarding knowledge, it was observed that 33% did not believe that cattle production is harmful to the environment; 51% believed that red meat contributes to an increase in blood cholesterol; 31% thought that red meat is richer in protein than white meat; and 30% did not believe that pork meat is harmful to health. As for the preferences for meat in Portugal, chicken was the most preferred, followed by turkey, and then pork. The least preferred meats are horse, goat and sheep. We concluded that white meat is preferred by the participants who tend to reduce the consumption of red meats.

Keywords: questionnaire survey; environmental impact; food habits; health



Citation: Guiné, R.P.F.; Gonçalves, A.; Lemos, E.T. Food Habits and Knowledge Related with Meat on a Sample of Portuguese Consumers. *Biol. Life Sci. Forum* **2021**, *6*, 2. <https://doi.org/10.3390/Foods2021-10987>

Academic Editors: Han-Seok Seo and Katarzyna Świader

Published: 14 October 2021

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1. Introduction

Meat is mostly made up of proteins, lipids and water and contains vitamins and minerals. However, meat composition varies according to the type of animal and production conditions, such as feed [1]. Meat contains proteins of high biological value, having a large amount of essential amino acids, supplying about 50% of the human being's daily protein needs. White meat has a lower fat content compared to red meat. The main lipids present in chicken are unsaturated fatty acids, around 67.3%, while in sheep meat the saturated lipids are around 57.7% [2]. Meat is rich in minerals, phosphorus and potassium, being quantitatively the most important, while at the level of trace elements, iron and zinc are the most available in meat. It is important to notice that the iron in meat is more bioavailable than that in vegetables, due to the composition of amino acids and antinutritional factors [2]. Meat has vitamins of B complex, and pork is one of the most important in terms of vitamin B₁, while vitamins A and D are found in higher amounts in the liver [2,3].

Meat is one of the most consumed food products by the Portuguese population; according to the Portuguese Institute of Statistics [4], meat consumption in 2019 was 119.1 kg/inhabitant, with poultry meat being the most consumed, followed by pork. A smaller amount relates to the consumption of beef, then sheep and goat.

The Portuguese Health Board [5] recommends a weekly ingestion of red meat up to 500 g (about 70 g per day), because when in excess it can increase the risk of colon cancer [6]. Some meat is high in fat, such as pork, which, when eaten in large quantities, can increase blood cholesterol levels, thus increasing the risk of heart disease [7,8]. The fat can be reduced, depending on the cooking method used. For example, fried meat will increase its fat absorbed from the oil while grilling will reduce its fat through dripping.

Excessive consumption of red meat is directly related to the environment, and there is an increasing concern to reduce these impacts. In a study carried out by researchers from

the ICS (Institute of Social Sciences) of the University of Lisbon, meat continues to be a staple of food in the Portuguese population, but respondents said they were willing to change their eating habits due to the impact on health, namely to reduce the consumption of red meat, as it is seen as the most harmful and also due to the impact it has on the environment [9].

The consumption of meat has been increasing over the years worldwide, with greater consumption in richer countries, such as the United States of America, Australia and Argentina, where consumption exceeds 100 kg per year per person. On the other hand stand the poorest countries such as Ethiopia and Nigeria, where consumption is between 7 to 9 kg of meat per year [10]. Studies have shown that people are trying to reduce their consumption, due to the impact that meat production has on the environment and also because there is an increasing concern for the welfare of animals. Still, it appears that the consumption of meat remains high, with the United States of America reaching in 2018 its peak in decades [10]. Other factors that can contribute to a decrease in meat consumption are related with the health implications. Over the years there has been a concern to reduce the consumption of red meat due to the health problems it can bring to human beings, although its moderate consumption also brings nutritional benefits, especially in countries where incomes are lower, because their diets are not so varied, and the consumption of meat provides a high amount of protein [10]. The attempt to reduce meat consumption is mainly for the case of red meat, as this has an environmental impact three to ten times higher on the environment than white meat [10].

This study aimed at investigating the meat consumption habits and knowledge about some facts related with meat consumption and production, namely the effects for human health and for the environment.

2. Materials and Methods

2.1. Research Study

This study was based on a questionnaire survey, made through online platforms, with data collection between March and May 2020. Only adult Portuguese participants were included, and all ethical issues were considered in collecting and treating the data. The questionnaire included parts referring to consumption habits related to different types of meat and others related to knowledge about meat and its effects on health and on the environment. For data treatment, Excel 2016 was used.

2.2. Sample Characterization

The sample comprised of 100 participants, mostly female (66%), single (52%) and with a university degree (82%). The average age was 38 ± 17 years, with younger women in relation to men (38 ± 17 years and 42 ± 16 years, respectively). Almost half of participants have an income below 750 EUR (46%), while only 11% have a net monthly income from 2000 EUR to 3000 EUR. Regarding the dietary regime, the majority of respondents, 91% did not follow any specific diet, 4% followed a vegetarian diet, 1% followed a vegan diet, and 4% followed other types of diet.

3. Results

3.1. Shopping Practices

More than 50% of participants buy their own food, while only in 6% of the cases is the husband or wife who purchases food. Regarding the frequency of food purchase, we found that 63% buy once a week, 25% buy 2–3 times a week, 10% buy every two weeks and 3% buy monthly. Most people usually buy meat at the butcher's, 49%, then the supermarket with 50% and small shops only 1%.

When buying meat, the Portuguese consumers value more the aspect (most important for 71% of participants), the colour (38%), amount of fat (32%), price (31%) and texture (10%).

3.2. Preferences and Consumption

Table 1 presents the participants' preferences regarding the type of meat, with chicken being the most preferred (33%), followed by turkey (27%) and pork (18%). The least liked meats are horse (2%), followed by goat (4%) and sheep (6%).

Table 1. Preferences for different types of meat.

	Totally Dislike	Like Very Little	Like Little	Like Much	Like Very Much	Never Tasted
Beef	7%	7%	19%	51%	16%	0
Pork	9%	6%	15%	52%	18%	0
Chicken	0	1%	7%	59%	33%	0
Turkey	5%	5%	12%	49%	27%	1%
Sheep	35%	9%	17%	31%	6%	2%
Goat	37%	7%	16%	33%	4%	3%
Rabbit	33%	9%	22%	25%	9%	1%
Horse	41%	3%	5%	5%	2%	43%
Boar	31%	3%	11%	28%	8%	19%

Table 2 shows how many times per week the participants usually consume the different types of meat, the most consumed being consumed five or more times per week: chicken (3%), pork (2%) and turkey (2%). The meats that are rarely consumed are rabbit (44%), goat (43%) and sheep (43%). Horse and wild boar types of meat are not consumed by a great majority of respondents.

Table 2. Weekly meat consumption.

	Five or More Times	Four Times	Three Times	Twice	Once	Seldom	Never
Beef	0%	3%	9%	23%	28%	27%	8%
Pork	2%	6%	8%	32%	31%	17%	4%
Chicken	3%	11%	31%	38%	15%	3%	0%
Turkey	2%	3%	8%	26%	21%	34%	5%
Sheep	1%	0	3%	6%	8%	43%	38%
Goat	0%	0	2%	3%	5%	43%	46%
Rabbit	0%	0	2%	4%	15%	44%	35%
Horse	0%	0	2%	3%	0%	19%	76%
Boar	0%	0	2%	3%	1%	41%	53%

Presented in Table 3 are frequently used meat cooking methods by the participants. The results show that the most consumed are grilled pork (selected by 42 participants) followed by stewed beef (selected by 30 participants), roasted chicken and turkey (29 and 28, respectively) and grilled chicken (27).

Table 3. Cooking methods used for meat.

	Stewed	Roasted	Fried	Boiled	Grilled	Total
Beef	30	17	6	4	24	81
Pork	17	11	5	12	42	87
Chicken	25	29	3	8	27	92
Turkey	10	28	8	4	31	81
Sheep	14	19	2	6	11	52
Goat	11	18	0	3	12	44
Rabbit	25	15	1	6	2	49
Horse	9	1	2	1	14	27
Boar	17	7	2	1	12	39

3.3. Knowledge

When questioned about the influence of meat on health, 80% agree that it depends on the amount consumed, 12% believe that it is beneficial, 1% think that meat is harmful and 7% did not have an opinion.

Figure 1 presents the respondents' opinions about some statements aimed at measuring the knowledge about meat. Regarding the statement about cattle production being harmful to the environment, people believe it is not (57% were against it). People are generally informed that chicken skin has more fat content (58%), although the possibility of pork meat being bad for health is not consensual (39% voted for it and 33% against). A high percentage believe that red meat is bad for cholesterol (71%) and that white meat has less fat (73%). Again, there is no consensus about red meat being richer in protein than white meat (44% believe this is true and 33% do not). A total of 84% know that cooking affects the meat composition and 81% agree that white meat is healthier.

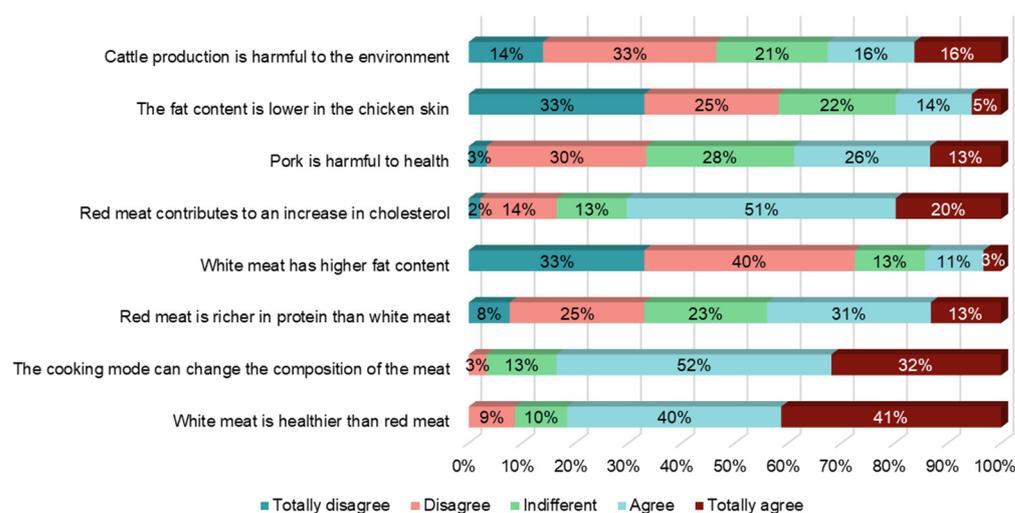


Figure 1. Level of agreement of the participants with different statements related to meat.

4. Discussion

Most Portuguese consumers purchase meat usually on a weekly basis rather than monthly. This might be related to the preference to consume fresh meat products rather than frozen ones, as the buyers would have to freeze if they shopped within a long time interval (over one week). The purchase of meat is mostly made in supermarkets and butchers. Although the monthly net income is low for most participants (under 750 EUR), the main reason considered when purchasing meat is its appearance, showing that quality is more important than price. Regarding the factors that influence the decision, colour and the amount of fat are also essential when purchasing meat. These results are in line with those from a study carried out by Oliveira [11] on meat Mirandesa PDO (Protected Designation of Origin), according to which most people consider the colour and appearance the most important characteristics.

Most people follow a regular diet with all kinds of food, without restrictions, but adherence to vegetarianism and veganism has increased over the years. These trends impact and will influence greatly the consumption of meat in the near future [12,13].

People's knowledge about meat is good, as most of the respondents answered the questions correctly. When questioned whether pork is harmful, most people disagreed, but if it is in excess it can impact health, such as the accumulation of fat in the arteries and liver, as well as an increase in cholesterol. Participants also knew that chicken skin has a higher amount of fat. As for the question of whether cattle production is harmful to the environment, the majority disagreed (33%). However, scientists have been discussing the effect of beef production on the environment, arguing that it is much more harmful than other meats, particularly due to the generation of higher amounts of GHG (greenhouse

gases) that cause climate change. Additionally, the use of resources is much higher for beef production than for other meats [14].

We found that the meat preferred by the Portuguese is white meat (chicken and turkey), which is in line with the Portuguese statistics data from 2019, in which the most consumed meat was white meat, followed by pork [4]. The meats with less preferences are horse, goat, sheep and rabbit. Horse meat may be less consumed due to the population's view of the horse as a domestic animal [15]. Additionally, rabbit is considered a domestic animal and for many people it is difficult to consume its meat. In what concerns goat and sheep meats, they are associated with Easter and Christmas celebrations because their price is higher [16].

The characteristics and nutritional value of meat vary according to the type of animal and production factors, as well as with the way it is cooked. Most people cook white meat by stewing, grilling or roasting, which will make the meat retain its flavour, as the cooking mode is slow and progressive, until it reaches the central point of the meat portion. On the other hand, for red meat (beef) and rabbit meat, the most used cooking method is stew, for which the cooking is carried out with fat and water over a slow fire, thus resulting in a mixture of flavours [17].

5. Conclusions

This study allowed a better understanding about the consumption of meat by the Portuguese, showing that white meat is more consumed than pork, and there is also a trend to reduce the consumption of red meat.

Price is not the main factor to take into account when purchasing meat, but the appearance and colour are the main quality attributes valued by consumers. This confirms that people care more about the appearance than the price itself, being willing to pay more for a meat that looks better. Regarding cooking methods, people prefer methods that preserve the flavour and eventually contribute to reduce the amount of fat.

Finally, it was concluded that people are informed about meat and are concerned about the type of meat they buy and the effects it might have on human health, as well as on the environment.

Supplementary Materials: The following supporting information can be downloaded at: <https://foods2021.sciforum.net/>. Poster: Food Habits and Knowledge Related to Meat on a Sample of Portuguese Consumers.

Author Contributions: Conceptualization, R.P.F.G., A.G. and E.T.L.; methodology, R.P.F.G.; formal analysis, R.P.F.G. and A.G.; investigation, A.G.; data curation, R.P.F.G.; writing—original draft preparation, A.G.; writing—review and editing, R.P.F.G.; supervision, R.P.F.G. All authors have read and agreed to the published version of the manuscript.

Funding: This research was funded by FCT-Foundation for Science and Technology, Portugal, (Project Ref^a UIDB/00681/2020).

Institutional Review Board Statement: The study was approved by the Ethics Committee of the Polytechnic Institute of Viseu, with reference 12SUB2020.

Informed Consent Statement: Informed consent was obtained from all subjects involved in the study.

Data Availability Statement: The data are available from the corresponding author upon reasonable request.

Acknowledgments: This work was supported by National Funds through the FCT-Foundation for Science and Technology, I.P., within the scope of the project Ref^a UIDB/00681/2020. Furthermore, we would like to thank the CERNAS Research Centre and the Polytechnic Institute of Viseu, for their support.

Conflicts of Interest: The authors declare no conflict of interest.

References

1. Sousa, A.A.; Nora, L.; Lopes, D.L.A.; Petrolli, T.G.; Furlan, V.J.M.; Wagner, R.; Giacomelli, C.M.; Baldissera, M.D.; Da Silva, A.S. Vegetable choline in feed for Nile tilapia (*Oreochromis niloticus*) raised in a biofloc technology system (BFT): Biofloc composition, chemical composition, and fatty acid profiles in meat. *Aquaculture* **2021**, *545*, 737174. [CrossRef]
2. Roça, R.O. *Composição Química da Carne*; UNESP: São Paulo, Brasil, 2020.
3. Wang, J.; Mazza, G. Inhibitory effects of anthocyanins and other phenolic compounds on nitric oxide production in LPS/IFN- γ -activated RAW 264.7 macrophages. *J. Agric. Food Chem.* **2002**, *50*, 850–857. [CrossRef] [PubMed]
4. INE. *Estatísticas Sobre o Consumo da Carne*; Instituto Nacional de Estatística: Lisboa, Portugal, 2020.
5. DGS. *Notas Sobre Alimentação e Cancro*; Direção Geral de Saúde: Lisboa, Portugal, 2015.
6. Kruger, C.; Zhou, Y. Red meat and colon cancer: A review of mechanistic evidence for heme in the context of risk assessment methodology. *Food Chem. Toxicol.* **2018**, *118*, 131–153. [CrossRef] [PubMed]
7. Baila-Rueda, L.; Mateo-Gallego, R.; Pérez-Calahorra, S.; Lamiquiz-Moneo, I.; de Castro-Orós, I.; Cenarro, A.; Civeira, F. Effect of different fat-enriched meats on non-cholesterol sterols and oxysterols as markers of cholesterol metabolism: Results of a randomized and cross-over clinical trial. *Nutr. Metab. Cardiovasc. Dis.* **2015**, *25*, 853–859. [CrossRef] [PubMed]
8. Delgado, J.; Ansorena, D.; Van Hecke, T.; Astiasarán, I.; De Smet, S.; Estévez, M. Meat lipids, NaCl and carnitine: Do they unveil the conundrum of the association between red and processed meat intake and cardiovascular diseases?_Invited Review. *Meat Sci.* **2021**, *171*, 108278. [CrossRef] [PubMed]
9. Schmidt, L.; Truninger, M.; Guerra, J.; Prista, P. *Primeiro Grande Inquérito sobre Sustentabilidade—Relatório Final*; Universidade de Lisboa: Lisboa, Portugal, 2016.
10. Ritchie, H.; Roser, M. Meat and Dairy Production. Available online: <https://ourworldindata.org/meat-production#:~:text=The%20world%20now%20produces%20more%20than%20three%20times%20the%20quantity,slaughtered%20each%20year%20for%20meat> (accessed on 12 November 2021).
11. Oliveira, E.M.S. Perfil, hábitos e atitudes do Consumidor de Carne Mirandesa DOP. Master's Thesis, Instituto Politécnico de Bragança, Bragança, Portugal, 2010.
12. Rosenfeld, D.L.; Tomiyama, A.J. Gender differences in meat consumption and openness to vegetarianism. *Appetite* **2021**, *166*, 105475. [CrossRef] [PubMed]
13. Plohl, U.; Petritz, H.; Stern, T. A social innovation perspective on dietary transitions: Diffusion of vegetarianism and veganism in Austria. *Environ. Innov. Soc. Transit.* **2020**, *36*, 164–176. [CrossRef]
14. Guiné, R.P.F.; Correia, P.; Coelho, C.; Costa, C.A. The role of edible insects to mitigate challenges for sustainability. *Open Agric.* **2021**, *6*, 24–36. [CrossRef]
15. Gameiro, A.M.G.F. A Segurança da Carne de Cavalo em Portugal. Master's Thesis, Instituto Superior de Saúde Egas Moniz, Lisboa, Portugal, 2014.
16. Nielsen. *Estudo Sobre a Oferta e Procura de Carnes de Suínos, Caprinos e Ovinos*; CIM-TTM: Trás-os-Montes, Portugal, 2019.
17. Lopes, A.F. Efeito de Diferentes Métodos de Confeção no Valor Nutricional da Carne de Bovino—Estudo Experimental nas Carnes Barrosa e Mertolenga. PH.D. Thesis, Universidade de Lisboa, Lisboa, Portugal, 2015.