Eating habits of Serbian consumers regarding content of fat and salt in meat products

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Abstract: In recent years, there is an increasing interest in developing meat products with healthier attributes. Consumers’ behavior and expectations about sensory evaluation of traditional meat products is becoming less predictable. This paper reviews consumers’ perception and acceptance of selected meat products from Serbia regarding content of fat and salt. Chicken and beef salami were sensory evaluated by consumers (n=3291) between 2014-2018. Sensory evaluation of the products was conducted according to a modified version of a DLG-5-points-scheme. The questionnaire started with general questions on demographic information about the respondents. Consumers rated the taste as good, satisfactory or unsatisfactory; the salt content as balanced, not salty enough or too salty; and the fat content as sufficient or too fatty. This investigation shows that Serbian consumers have become more interested in meat products with lower salt and fat contents. Consumers’ trust and eating habits have changed over the years, and consequently, their acceptance of the products has also changed. Since consumer perceptions have a direct influence on meat industry profitability, the meat industry needs to know which attributes of meat products are considered important by consumers.

1. Introduction

Food and nutrition have been studied for centuries, focusing on dietary guidelines, general scientific advances, or particular nutritional therapies [1], but also were the subject of some political speeches. In the context of the stress and turmoil of the German revolution in 1848, the German philosopher Ludwig Feuerbach (1804-1872) used the phrase “We are what we eat” [2]. Martin Luther (1483-1546), German theologian, professor, pastor and church reformer, said “I eat and drink what I like and I will die when God wills it” [3]. Although food and nutrition have been analyzed from different points of views, modern nutritional science is surprisingly young. The first vitamin was isolated in 1926 and research on the role of nutrition in the human diet, and consequently, on human health (cardiovascular disease, diabetes, obesity, and cancers) is even more recent, accelerating over the past two or three decades and especially after 2000 [1].

A high consumption level of meat and meat products with significant amounts of saturated fat, sodium and sugar could exceed nutritional needs and consequently contribute to high rates of chronic diseases [4]. The Working Group of the International Agency for Research on Cancer (IARC) published a summary of their findings, in which they concluded there is an association of cancer with consumption of red meat or processed meat [5]. It was concluded that red meat can be linked to human colorectal cancer, and they assigned red meat to Group 2A “probably carcinogenic to humans”. Most
developed countries are confronted with rising rates of diseases related to unhealthy eating habits, particularly the excessive consumption of salt, saturated fat and free sugars. In 2004, WHO adopted its global strategy on diet, physical activity and health as part of the global strategy to reduce chronic diseases [6]. The food industry was encouraged to limit and reduce the levels of trans fatty acids (FA) and saturated FA, salt, and free sugars in existing foods that are acceptable to consumers. The scientific EU projects such as PLEASURE [7] and TeRiFiQ [8] are helping industry to develop innovative processes and/or implement novel technologies to allow for the development and production of food products with low contents of harmful compounds (saturated and trans fatty acids, salt, and sugar).

The salt, fat and sugar contents of meat and meat products influence their structure, safety and nutritional quality. Salt ensures microbiological safety and affects biochemical reactions. On the other hand, fat in meat products is considered a valuable source of energy, fatty acids and vitamins. A TeRiFiQ study [8] showed that healthier dry sausages (with reduced salt and fat contents) can be manufactured with no adverse effect on the end-products’ physical-chemical and biochemical properties. However, reducing or substituting the salt, fat and sugar content of a meat product could affect some of its sensory properties [9]. Hence, sensory studies are necessary to investigate final texture properties and consumer’s acceptability of new, healthier meat products.

Smoked meat and meat product production and consumption in Serbia has been handed down over centuries, during which time, the tradition developed such that it has become a trademark. Although, these products are a significant part of the human diet in Serbia, in recent years, consumers in general have become more aware of the advantages of a healthy diet [9-11]. Consumers’ perception and acceptance of meat products are critical issues for the meat industry. Thus, ‘healthier’ meat could offer benefits for both public health and the meat industry, but only if such products are accepted by consumers. The objective of this study was to evaluate the eating habits of Serbian consumers regarding the content of fat and salt in different traditional meat products over time (2014-2018).

2. Materials and Methods
Sensory evaluations of selected traditional smoked meat products from Serbia were carried out in 2014, 2016, 2017 and 2018 year in large retail stores in Belgrade. Consumers ($n_{2014} = 85$; $n_{2016} = 1157$; $n_{2017} = 1018$; $n_{2018} = 1031$) were males and females older than 18 years of age. The questionnaire started with general questions about the consumers, referring to their age, number of family members, education levels and shopping habits. Thereafter, respondents were asked to evaluate different traditional smoked meat products concerning their taste, color, salt and fat content, smoke flavor, etc. The origin and market name of the products were unknown to the consumers. Production of the analyzed meat products has been standard for the study years (2014-2018); composition (raw material, meat, fat tissue, salt, species and additives) was the same each year. Sensory evaluation of the products was conducted according to a modified version of an examination scheme developed by professional panels of scientists and practitioners in Germany (DLG-5-points-scheme). DLG test (Deutsche Landwirtschafts-Gesellschaft, German Agricultural Society) [12] is a descriptive sensory analysis which included visual (appearance/exterior), haptic (consistence/texture), olfactory (odor) and gustative (taste) criteria of the meat products.

3. Results and Discussion
Some results of sensory evaluation as well as descriptions of the analyzed meat products were described in detail in our previous publications [13-18]. This paper evaluates changes of consumers’ attitudes towards taste, salt and fat content of the same meat products during four years of sensory evaluation. Consumers rated the taste as good, satisfactory or unsatisfactory; the salt content as balanced, not salty enough or too salty; and the fat content as sufficient or too fatty. Extracted results of sensory evaluations of different meat products are shown in Tables 1-2.

Table 1 shows sensory evaluation of taste and salt content for four types of salami as well as chicken cajna sausage in 2014 and 2016. Noticeably, chicken, beef and budim salami were evaluated
as too salty by a higher percentage of consumers in 2016 than in 2014. However, only the taste of budim salami and chicken cajna sausage was evaluated as good by a lower percentage of people in 2016 than in 2014. Consumers were more satisfied with both taste and salt content of homemade salami in 2016 than in 2014.

Table 1. Consumers’ attitudes (% of consumers) in relation to salt content (too salty) and taste (good) of five meat products over time, n=1242.

| Year | Answers     | Chicken salami | Beef salami | Homemade salami | Budim salami | Chicken cajna sausage |
|------|-------------|----------------|-------------|----------------|--------------|-----------------------|
| 2014 | too salty   | 6.0            | 2.4         | 14.1           | 9.5          | 7.1                   |
|      | taste - good| 69.1           | 55.3        | 62.4           | 63.5         | 69.1                  |
| 2016 | too salty   | 15.0           | 7.0         | 7.5            | 10.5         | 5.0                   |
|      | taste - good| 77.0           | 70.0        | 66.0           | 48.5         | 54.0                  |

Chicken, beef and royal salami were evaluated for taste, salt and fat content during 2017 and 2018 (Table 2). Sensory evaluation of all three types of salami showed that consumers’ acceptance of the analyzed products was significantly lower in 2018 than in 2017. Consumers were more dissatisfied with the salt and fat content as well as with the taste. For the analyzed salami, the salt content was evaluated as too salty by almost two and a half to four and a half fold greater percentages of consumers in 2018 than in 2017. Similarly, the fat content of beef salami was evaluated as too fatty by as much as a six fold greater percentage of consumers in 2018 than in 2017. Consequently, consumers evaluated the taste as good in 2018, a significantly lower percentage in comparison with a year before. Our earlier research [13] indicated that traditional smoked meat products from Serbia, from the DLG experts’ point of view, would enrich the West European market. High salt content and a too strong smoky flavor of the meat products were the main deficiencies. However, this investigation shows that Serbian consumers have become interested in foods with lower salt as well as fat content.

Table 2. Consumers’ attitudes (%) in relation to salt content (too salty), fat content (too fatty), and taste (good) of chicken, beef and royal salami over time, n=2049.

| Answers          | Chicken salami | Beef salami | Royal salami |
|------------------|----------------|-------------|--------------|
| 2017             |                |             |              |
| too salty        | 4.5            | 6.4         | 7.4          |
| too fatty        | 10.6           | 3.7         | 16.5         |
| taste - good     | 84.4           | 85.1        | 88.6         |
| 2018             |                |             |              |
| too salty        | 21.1           | 20.3        | 17.5         |
| too fatty        | 24.9           | 23.1        | 31.1         |
| taste - good     | 57.8           | 71.5        | 66.3         |

WHO Member States have agreed to reduce the global population’s intake of salt by a relative 30% by 2025 [19]. Reducing salt intake has been identified as one of the most cost-effective measures countries can take to improve population health outcomes. For example, the German Federal Ministry of Food and Agriculture recently presented a national reduction and innovation strategy for sugar, fats and salt in finished products as well as the National Action Plan for the prevention of poor dietary habits, lack of physical activity, overweight and related diseases [20]. Meat products with reduced fat levels, reduced sodium and nitrite contents, and enriched with functional ingredients are currently receiving much interest in the food industry and are well documented in scientific studies [21-23].

Proximate compositions of different smoked meat products from Serbia were analyzed in a few common studies [24-26]. The salt content of the analyzed meat products ranged between 3 and 6.1%. According to the literature data, the average salt content for these products is 4.5% [27]. In this paper,
the changes in consumers’ attitudes to the salt content and taste of chicken and budim salami, production of which has been standard for years (2014-2018), is noticeable (Figures 1-2).

Sensory evaluation showed that consumers had different attitudes in the relation to the salt content over time (Figure 1). The highest percentages of consumers were dissatisfied with the salt content of chicken and beef salami in 2018 (too salty: 21.1% and 20.3%, respectively). It should be noted that during all years of testing, the demographic characteristics of consumers (gender, age, education level and number of household members) was included in the questionnaires and statistical evaluation of the data obtained will be the subject of the next publication.

Changes in consumers’ attitudes towards the salt content had influence on the consumers’ taste assessment of the products (Figure 2). The taste of chicken and beef salami was evaluated as good by the lowest percentage of consumers in 2018 (57.8%) and in 2014 (55.3%), respectively.

The changes in Serbian consumers’ perception should be taken into account, as well as the main deficiencies, related to the meat products’ consistency, odor, and taste, as established by DLG experts [14]. Moreover, between 2009 and 2018, traditional meat products from Serbia passed the DLG tests...
and receive “DLG award winner” medals [14,17], even with the mentioned established deficiencies, which could be very helpful for meat producers.

4. Conclusion
This investigation shows that Serbian consumers have become more aware of the advantages of healthy foods with lower salt as well as fat contents, due to obvious advances in comprehending the relationship between diet and health. Consumers’ trust and eating habits have changed over time, and consequently, consumer acceptance of the products has also changed. Since the consumer perception of meat products has a direct influence on meat industry profitability, the meat industry should satisfy consumers’ needs and develop products that will be more acceptable to them.

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References
[1] D Mozaffarian, I Rosenberg and R Uauy 2018 B. M. J. 361 k2392
[2] Feuerbach, C M 1963 “Man is what he eats”: a rectification J. Hist. Ideas 24(3) 397–406
[3] Cargill Thompson W D J 1984 The Political Thought of Martin Luther ed P Broadhead (Totowa, NJ: Barnes & Noble Books)
[4] Smil V 2002 Food production In The Nutrition Transition: Diet and Disease in the Developing World ed B Caballero and Popkin B M (New York, 1st ed and San Diego: Academic Press) pp 25–50
[5] IARC, 2015 IARC Monographs Evaluate Consumption of Red Meat and Processed Meat (2015) https://www.iarc.fr/en/media-centre/pr/2015/pdfs/pr240_E.pdf
[6] Waxman A 2004 WHO global strategy on diet, physical activity and health Food Nutr. Bull. 25 292
[7] http://www.pleasure-fr7.com
[8] http://www.terifiq.fr
[9] Lilic S, Brankovic Lazic I, Karan D, Babic J, Lukic M, Nikolic D and Raseta M 2016 Meat Tech. 57 22
[10] Borovic B, Lilic S, Vranic D, Babic Milijasevic J, Lakicevic B, Velebit B and Nikolic A 2018 Meat Tech. 59 110
[11] Raseta M, Brankovic Lazic I, Lilic S, Katanic N, Parunovic N, Koricanac V and Jelena Jovanovic A 2018 Meat Tech. 59 114
[12] https://www.dlgtestservice.com/en/
[13] Djinovic-Stojanovic J, Ristic M, Troeger K, Knezevic N and Babic M 2015 4th Int. Cong. New Perspectives and Challenges of Sustainable Livestock Production, October 7-9, Belgrade, Serbia, Proc. p 630
[14] Djinovic-Stojanovic J, Troeger K, Ristic M, Knezevic N and Damnjanovic M 2017 J. Agr. Sci. Food Tech. 3 15
[15] Ristic M, Troeger K, Djinovic-Stojanovic J, Knezevic N and Damnjanovic M 2017 59th Int. Meat Industry Conf. MEATCON2017, October 1-4, Zlatibor, Serbia. IOP Conf. Series: Earth and Environ. Sci. 85 012072
[16] Ristic M, Troeger K, Djinovic-Stojanovic J, Knezevic N and Damnjanovic M 2017 59th Int. Meat Industry Conf. MEATCON2017, October 1-4, Zlatibor, Serbia. IOP Conf. Series: Earth and Environ. Sci. 85 012054
[17] Ristic M, Troeger K, Djinovic-Stojanovic J, Knezevic N and Vukasovic I 2018 4th Int. Cong. Food Technology Quality and Safety, October 23-25, Novi Sad, Serbia, Proc. p 414
[18] Ristic M, Troeger K, Djinovic-Stojanovic J, Knezevic N and Damnjanovic M 2018 15th Eur. Poultry Con., September 17-21, Dubrovnik, Croatia, Proc. p 598
[19] https://www.who.int/news-room/fact-sheets/detail/salt-reduction
[20] https://www.bmel.de
[21] Decker E A and Park Y 2010 Meat Sci. 86 49
[22] Weiss J, Gibis M, Schuc V and Salminem H 2010 Meat Sci. 86 196
[23] King S C and Meiselman H L 2010 Food Qual. Prefer. 21 168
[24] Troeger K, Dederer I, Ristic M, Turubatovic L, Beric M and Stojanovic A 2007 Fleischwirtschaft 87 95
[25] Djinovic J 2008 PhD thesis, Faculty of Chemistry, University of Belgrade.
[26] Troeger K, Veskovic-Moracanin S, Turubatovic L, Ristic M and Dederer I 2009 R. F. L. 61 386
[27] Vukovic I 2012 Osnove tehnologije mesa (Beograd: Veterinarska komora Srbije)