

SLOVENSKÁ POĽNOHOSPODÁRSKA UNIVERZITA V NITRE

BEZPEČNOSŤ A KONTROLA POTRAVÍN

(Zborník prác z medzinárodnej vedeckej konferencie)

28. - 29. marec 2019



**KATEDRA HYGIENY
A BEZPEČNOSTI POTRAVÍN**

**FAKULTA BIOTECHNOLÓGIE
A POTRAVINÁRSTVA**



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(Zborník prác zo XVI. vedeckej konferencie s medzinárodnou účasťou online)



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THE CHEMICAL COMPOSITION OF TRADITIONAL EUROPEAN SAUSAGES

Władysław Migdał, Čedomir Radović, Vladimir Živković, Maria Walczycka, Marzena Zajęc, Joanna Tkaczewska, Piotr Kulawik, Ewelina Węsierska, Łukasz Migdał, Anna Migdał

Abstract: Central-Eastern Europe is famous of sausages production such delighted as: *kranjska klobasa, csabai kolbász, mangalica kolbász, slavonski kulen, kulenova seka, češnjovka, domaća kobasica, zlatiborski kulen, levačka kobasica, sremska kobasica, hauswurst*. The aim of work was the assessment of chemical composition of traditional European sausages (produced in Poland, Czech Republic, Slovakia, Serbia, Austria and Italy) obtained from meat of autochthonous pigs bred in a traditional way. The analysed sausages differed in chemical composition and it was caused by different recipes and differences in raw meat chemical composition originating from native pigs breeds. The highest differences were present in the fat content in sausages. All analysed sausages fulfilled the new requirements of the European Union concerning maximum PAH levels in the selected foodstuffs as considered in the Commission Regulation (EC) no 835/2011.

Keywords: traditional sausages, chemical composition, PAHs

INTRODUCTION

The raw materials originating from native animal breeds (Mangalica, Moravka, Black Slavonian, Pulawska, Zlotnicka White and Spotted pigs) are applied for production of the best quality traditional, local products. These products are produced and preserved with traditional methods. The most popular traditional product is a sausage produced of grinded meat with addition of fat and some spices. The name “sausage” originates the most probably from pra-Slavic word *klbasa – klbъ* – something coil, rolled and convex. Some authors do not exclude the borrowing from a Turkish word *külbastı* (grilled roast). In Polish language the word “*kiełbasa*” is known from Medieval ages. From XIV century Poland was famous for sausages production, mainly because of popular, at that time, royal hunting. The hunting events had the most often taken place during autumn and winter delivering the raw meats for smoked meats and sausages production. Nowadays sausages are produced from different kinds of meats and fat so they are divided into groups: pork, beef, horse, sheep, goat, nutria, game – sausages. They are stuffed into natural casings (guts) or in collagen, cellulose, polyamide casings; smoked in a natural smoke provided from combusting of dried deciduous trees wood and are a delicacy on the tables all over the world. In New Zealand are produced local *cabanossi*, latin Americans and Spaniards are specialists of *chorizo*, Swedish people are proud of beef-pork *falukorv* and Turkish produce the beef *sucuk*. There are the delicacy pickled sausages *isan* in Tajland; in Republic of South Africa beef-pork-lamb *boerewors* and *lap-cheong* in China.

Central-Eastern Europe is famous of sausages production. Poland is famous of pork and pork-beef sausages (*krakowska, lisiecka, żywiecka, śląska, tuchowska, jałowcowa, myśliwska, wiejska*) and of popular in XX century beef - *serwolotka*. Czech Republic have their *špekáčky, utopence* and *tatowe klobásy*, in Slovakia, there is popular *Kranjska klobasa*, in Hungary *csabai kolbász, mangalica kolbász, Gyulai pároskolbász*, in Croatia *Slavonski kulen, kulenova seka, Češnjovka, domaća kobasica* and in Serbia *Zlatiborski kulen, levačka kobasica, sremska kobasica*. These sausages are the traditional products produced from meat of native species of animals, according to traditional technology subjected to traditional smoking. Food smoking is one of the oldest food preservation techniques. Smoking is process of saturating with smoked food products which have been cured or salted and dried.

Traditional smoking is a process, performed in accordance with artistry and knowledge of local producers, which includes drying, cold, warm and hot smoking and hot smoking and baking, to receive pale, dark, brown, cherry etc. color, depending on centuries old local tradition, conducted in traditional smoke chambers, in which the smoke and temperature is generated from burning of thick deciduous tree wood, with proper humidity in a fireplace located directly inside the chamber and above which in a certain distance is located the smoked and processed product, hanging on the smoking sticks.

In the scope of project “*The ways of usage and the preservation of genetic resources of farm animals under sustainable development*” co-financed by the National Centre for Research and Development within the framework of the strategic R&D program “Environment, agriculture and forestry” – BIOSTRATEG, contract number: BIOSTRATEG2/297267/14/NCBR/2016 there were analyzed traditional products of animal origin. The product were purchased from different regions of Poland where there were produced of raw materials obtained from homeland breeds – the meat products of Pulawska, Zlotnicka Spotted and White pigs. Also, in scope of own scientific project, the traditional sausages from Czech Republik, Slovakia, Hungary, Austria and Italy were analyzed.

The aim of work was the assessment of chemical composition of traditional European sausages (produced in Poland, Czech Republic, Slovakia, Serbia, Austria and Italy) obtained from meat of native pigs breeds bred in a traditional way.

MATERIALS AND METHODS

The sausages samples were bought in local shops or directly from producers. The total sample of sausage type was at least 1kg and the minimum of primary bought samples amount was 3 (repetitions). The sausages were packed in aluminum foil and placed in a cooling container according to the Commission Regulation (EU) no nr 836/2011 issued at 19th August 2011 r. containing changes with reference to Commission Regulation (WE) nr 333/2007 concerning the sampling and analyses methods for official control of levels of cadmium, mercury, inorganic tin, 3-MCPD and of benzo(a) pyrene in food.

The total samples of sausages were minced to obtain the average samples which were subjected to chemical analyses. The following items were estimated in the traditional sausages samples:

- water content according to the standard *PN-ISO 1442:2000*,
- fat content according to the standard *PN-ISO 1444:2000*,
- protein content by Kjeldahl method *PN-75/A-04018*,
- total ash content according to the standard *PN-ISO 936:2000*,
- total carbohydrates content was calculated assuming that the all total solids and water stand for 100%
- PAHs content – with Quechers metod – extraction and homogenisation with acetonitryl and with mixture of specific reagents; the extract was analysed with technique of reverse phase-high performance liquid chromatography (RP-HPLC) method with fluorescent detector (FLD) in the laboratory of J.S. HAMILTON POLAND S.A

RESULTS AND DISCUSSION

The chemical composition of analyzed sausages is presented in Table 1. The analyzed sausages differed as chemical composition and it was caused by different recipes and differences in raw meat chemical composition originating from native pigs breeds. The highest differences were present in the fat content in sausages, at average – from 14.74% in jałowcowa sausage to 55.05% sausage from Mangalica pig meat. Makala et al. (2008) when analyzing 16 kinds of sausages, present on Warsaw market in 2006-2007, produced from

medium minced stuffing, also stated the discrepancies in chemical composition of these products. Daszkiewicz et al. (2015) analyzed pork meat products (of well known Polish brand), popular among consumers, bought at Olsztyn market and obtained that the chemical component with the largest spread of variability was fat and with the smallest water content. Similar tendency was revealed by Grześkowiak et al. (2011) analyzing medium comminuted sausages present at Polish market. Džinic et al (2016) showed that the level of fat between sausages of *čajna* ranged from 36.77% to 48.31%. Petrović et al. (2011) found similar values in *Petrovska klobasa*, traditional fermented sausage, where fat content ranged from 34.09% to 46.01%. Also similar results were obtained by Ikonić et al. (2010).

Table 1. The chemical composition of traditional European sausages

Country	Sausages	Chemical composition (%)				
		Dry matter	Protein	Lipids	Ash	Carbohydrate
Poland	sausage złotnicka (Złotnicka Spotted)	60.96	21.66	35.00	3.63	0.67
	Jałowcowa sausage (Złotnicka white)	49.26	28.76	14.74	5.14	0.62
	sausage nadwieprzańska Puławska	36.49	17.54	16.66	2.16	0.13
	Serwolotka (polish red cattle)	45.48	21.69	20.71	2.26	0.82
Slovakia	Mangalica klobasa	59.38	30.41	23.56	4.91	0.50
	Home produced sausage		29.50	27.10	3.86	0.62
Czech Republik	Tatova klobasa	45.50	26.67	13.56	4.35	0.92
	Kabanos Bublá	80.03	35.02	36.74	5.85	2.42
Hungary	Csabai Kolbasz	59.64	18.94	35.37	4.13	1.20
	Mangalica Kolbasz	60.85	19.20	37.01	3.79	0.85
Serbia	Mangalica klobasa	79.58	20.54	55.05	3.51	0.48
	Sremska klobasica	75.90	24.02	44.80	6.05	1.03
	Petrovska klobasa	73.20	26.20	39.90	4.22	2.88
Austria	Hauswurst	82.42	35.10	41.16	5.84	0.32
	Sausage with pumpkin seeds	85.14	29.47	49.03	5.79	0.85
Italy	Da Carlo	67.09	34.86	26.61	5.18	0.44

In Table 2 is presented the content of polycyclic aromatic hydrocarbons (PAHs) in sausages. All analyzed sausages were in accordance with new requirements of the European Union concerning maximum levels PAH in the selected foodstuffs as considered in the Commission Regulation (EC) no 835/2001. Dobriková and Světlíková (2007) revealed that from 10 841 food products of animal origin such as smoked meat products, canned meat products, poultry products, fish and fish products and animal fats to be sold on the Slovakian market and analyzed for the presence of benzo[*a*]pyrene (BaP) in accredited state control laboratories in

the frame of official controls and monitoring of food quality during 1994–2005 only 1.6% of all foods PAHs contents were above the limit in European Commission Regulation (EC) No 1881/2006.

Table 2. Content of polycyclic aromatic hydrocarbons in sausages ($\mu\text{g}/\text{kg}$)

Country	Sausages	Polycyclic aromatic hydrocarbons PAHs ($\mu\text{g}/\text{kg}$)				
		Benzo(a)pyrene	Benzo(b)fluoranthene	Benz(a)anthracene	Chrysene	Σ PAHs Benzo(a)pyrene, Benz(a)anthracene, Chrysene, Benzo(b)fluoranthene
Poland	sausage zlotnicka (Zlotnicka Spotted pigs)	0.2 \pm 0.1	< 0.5	0.5 \pm 0.2	7.8 \pm 1.2	8.4 \pm 2.5
	Jałowcowa (Zlotnicka white pigs)	0.7 \pm 0.1	0.5 \pm 0.1	2.3 \pm 0.2	5.5 \pm 3.2	9.0 \pm 2.7
	sausage nadwieprzańska (Pulawska pigs)	< 0.57	< 0.86	0.96 \pm 0.288	0.71 \pm 0.213	< 3.1
	Serwolotka (polish red cattle)	0.2 \pm 0.1	< 0.5	0.6 \pm 0.3	4.4 \pm 2.6	5.2 \pm 1.6
Slovakia	Mangalica klobasa	< 0.2	< 0.5	< 0.5	1.6 \pm 0.9	< 2.0
	Home produced sausage	< 0.5	< 0.6	< 0.5	< 0.8	< 2.4
Hungary	Csabai Kolbasz	< 0.2	< 0.5	< 0.5	< 0.8	< 2.0
	Mangalica Kolbasz	< 0.5	< 0.5	< 0.5	< 0.8	< 2.3
Serbia	Mangalica klobasa	1.90 \pm 0.57	2.40 \pm 0.72	4.40 \pm 1.32	2.10 \pm 0.63	10.8 \pm 1.32
	Sremska klobasica	< 0.2	< 0.2	< 0.7	< 0.96	< 2.1
	Petrovska klobasa	< 0.2	< 0.5	< 0.5	< 0.8	< 2.0
Austria	Hauswurst	< 0.2	< 0.5	< 0.5	2.8 \pm 1.6	< 2.8
	Sausage with pumpkin seeds	< 0.2	< 0.5	< 0.5	1.5 \pm 0.6	< 1.5
Italy	Da Carlo	< 0.2	< 0.5	< 0.5	< 0.8	< 2.0

Waszkiewicz –Robak et al.(2014) showed that the smoking process of meat products contributes in growth of levels of individual PAHs in amounts from, at about, 22 to 40 % in comparison to those before smoking. It was also shown that the kind of fat added to fatteners fodder used as raw meat material source for production of smoked meat products, influenced significantly on kind and amount of PAHs in the final products. Ciecierska and Obiedzinski (2007) revealed that the traditional method of smoking influenced on the higher level of pollution by PAHs in the most of analyzed them samples.

For all smoked products obtained in a traditional way and in an industrial way of smoking there was observed that the total sum of PAHs content and the levels of individual PAHs in the central part of products was significantly lower in comparison to the outer part of the same product. Kubiak et al. (2011) consider that for traditional way of smoking basing on natural air flow and/or convection, the critical point for diminishing PAHs presence in the final products is the experience and skills allowing to rule the pyrolysis reaction conditions.

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