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Specificity of the production of traditional meat products and their safety using polish traditional cured meat products as example

Alicja Migowska-Calik^{1*}, Małgorzata Gomółka-Pawlicka¹, Jan Uradziński¹ and Tomasz Lachowicz²

¹Department of Veterinary Public Health, Faculty of Veterinary Medicine, University of Warmia and Mazury, Oczapowskiego 14, 10-957, Kortowo-Olsztyn, Poland.

²Department of Digitalization, Faculty of Law Administration, University of Warmia and Mazury in Olsztyn, Oczapowskiego 12B, 10-719 Olsztyn – Kortowo, Poland.

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Traditional meat products, particularly cured meat products, represent a specific group of products with large consumers in many countries of the world. The methods of producing them, depending on the country and region from which they originate, make them significantly different from their industrially produced equivalents; they may influence the microbiological quality of such products, making their health safety significant. The aim of this study is to determine the microbiological quality of polish traditional cured meat products manufactured in the North-eastern part of Poland (Warmia and Mazury, Pomerania and Podlasie). Nine types of cured meat products manufactured by four producers were investigated. In total, 90 samples of cured meat products were tested. The tests did not reveal the presence of *Staphylococcus aureus*, *Escherichia coli* or *Salmonella* species in the cured meat products. In one of the products tested (Szynka Wędzona z Mazurskiej Masarni - raw), the presence of *Listeria monocytogenes* was detected, and in two of the products tested (Szynka Wędzona z Mazurskiej Masarni - raw and Kindziuk from Puńsk), *Staphylococcus xylosus* was detected. The total count of mesophilic aerobic microorganisms (TVC) ranged between 2.48 log cfu/g in Połędwica Wędzona z Mazurskiej Masarni to 6.45 log cfu/g in Wątrobianka, with the average values ranging from 2.99 to 5.56 log cfu/g (depending on the type of product tested). Own studies indicate that polish traditional meat products have no significance as a source of food borne pathogens; however, maintaining sanitary regimes seems to be essential for assuring quality and safety of these special products.

Key words: Traditional products, cured meat products, microbiological quality, *Listeria monocytogenes*.

INTRODUCTION

Traditional meat products like cured meat products, have always accompanied people living in different areas of the world. Specific recipes passed from generation to generation, frequently shaped by centuries of tradition,

religious considerations and economic conditions of local communities have gained particular appreciation in recent times (Gawęcki and Swulińska-Katulska, 2008; Borowski, 2010). During the past several years, the

evident increase of interest in a particularly wide group of consumers in cured meat products of that type has been observed. That interesting results, in part, form large amount of generally available cured meat products, manufactured on industrial scale by large processing plants, and partly from the specific “fashion” for products of that type. But it is also mainly due to their unique sensory qualities (Borowska, 2007; Pomianowski, 2009; Żakowska-Biemans and Kuc, 2009; Kołożyn-Krajewska and Dolatowski, 2010). Purchasing such products may also have sentimental background which is as a result of strive for flavours and aromas remembered from childhood; it may also be associated, for example, with the “excellent cuisine” of the grandmother.

Better known traditional cured meat products manufactured in the European Union (EU) that are frequently exported have enjoyed popularity and appreciation of consumers from numerous countries for years (Tregear et al., 2007). Obtaining knowledge on the others that are less popular is in turn supported by tourism to more and more distant destinations worldwide common in the present times. Among the better known traditional cured meat products are: Lacón Ham or Chorizo sausage (in Spain), Prosciutto di Parma, Salami, Salsiccia di Calabria sausage or the famous Bologna (in Italy), Alheira de Vinhais (in Portugal), Schwarzwald Ham (in Germany) etc. (Borowska 2007). The names of the products listed are reserved and their production is covered by the EU protection programme (<http://ec.europa.eu>). There are also less popular cured meat products that are very well known to the local communities of specific countries. Such products include: Kargyong, Satchu or Chartayshya - produced in India, Tibet and China (Rai et al., 2009); Jinhua ham from China; Longganisa from the Philippines; Morcilla from South America as well as Jerky or its African equivalent Biltong (<http://www.fao.org>) and also the Sremska sausage from Serbia (Živković et al., 2012) or Boucané from Reunion (Poligné et al., 2001). Independent on the level of popularity, products of that type possess certain common characteristic. The methods of making them, depending on the country and region of origin, are poles apart from the methods applied in production of their industrially produced equivalents. That specificity applies to the recipe, choice of raw material, spices and production conditions applicable in case of traditional cured meat products that, depending on the hygienic regimes applied may influence the microbiological quality, and consequently their health safety, significantly (Abraham et al., 1998; Moore, 2004; Chevallier et al., 2006; Ferreira et al., 2006; Ferreira et al., 2007; Gounadaki et al., 2008; Mhlambi et al., 2010; Naidoo and Lindsay, 2010; Martin et al., 2011; Shale and Malebo, 2011; Rajkovic, 2012).

The information concerning the microbiological quality of traditional cured meat products available in scientific literature is not always satisfactory. The results of studies on the presence of various pathogens in traditional cured

meat products obtained by authors from different countries confirm that products of that type may sometimes be the cause of serious diseases in humans (Abraham et al., 1998; Moore, 2004; Chevallier et al., 2006; Ferreira et al., 2006; Ferreira et al., 2007; Gounadaki et al., 2008; Mhlambi et al., 2010; Naidoo and Lindsay, 2010; Shale and Malebo, 2011; Rajkovic, 2012).

Based on the above as well as the fact that the literature available offers few reports on microbiological safety of polish traditional cured meat products, this study was undertaken with the aim of determining the microbiological quality of traditional cured meat products manufactured in the area of North-eastern Poland.

MATERIALS AND METHODS

The study aims to determine the microbiological quality of polish cured meat products manufactured by five small manufacturers in three voivodships in North-eastern Poland (Warmińsko-Mazurskie, Podlaskie and Pomeranian) using five traditional methods in the years 2009 to 2011. The studies encompassed nine traditional cured meat products: six of them smoked (Kump nadbużański z ćwiartki, Kumpia z Komina, Kindziuk from Puńska, Połędwica Wędzona z Mazurskiej Masarni [Smoked Tenderloin from Mazury Pork-butcher's Shop], Szynka Wędzona z Mazurskiej Masarni [Smoked Ham from Mazury Pork-butcher's Shop] - raw and parboiled) as well as three pluck products (Kaszanka [black pudding], Salceson [headcheese], Wątrobianka [liverwurst]).

Qualitative microbiological tests of the above-indicated samples were conducted according to the principles contained in the: PN-ISO PN-EN ISO 6579:2003 Microbiology of food and animal feeding stuffs; horizontal method for the detection of *Salmonella* spp.; PN-EN ISO 6888-3:2004/AC:2005 Microbiology of food and animal feeding stuffs - Horizontal method for the enumeration of coagulase-positive staphylococci (*Staphylococcus aureus* and other species) - Part 3: Detection and MPN technique for low numbers; PN-ISO 7251:2006 Microbiology of food and animal feeding stuffs - Horizontal method for the detection and enumeration of presumptive *Escherichia coli* - Most probable number technique; PN-EN ISO 4833:2004/Ap1:2005 Microbiology of food and animal feeding stuffs - Horizontal method for the enumeration of microorganisms - Colony-count technique at 30°C and PN-EN ISO 11290-1:1999/A1:2005 Microbiology of food and animal feeding stuffs - Horizontal method for the detection and enumeration of *Listeria monocytogenes* detection method.

All the samples were purchased from the manufacturers directly and they originated from five different production batches. Transport of samples to the microbiological laboratory lasted no longer than 4 h under appropriate thermal conditions ($6 \pm 2^\circ\text{C}$). Each product was tested for the presence of pathogens by applying the methodologies provided for the individual bacteria.

In addition to the tests for the presence of pathogens, direct - quantitative tests were conducted aiming at revealing the actual microbiological status focusing on the numbers of pathogenic bacteria. For that purpose, 10 g samples were collected from various parts of the product to increase the potential for detecting the highest number of pathogenic bacteria. Next, the material collected was placed in the Stomacher Bag with 90 ml of liquid for dilutions. The sample prepared in that way was homogenised for 2 min in a Stomacher homogeniser (Lab-Blender 400, England). Next, a number of further decimal dilutions were prepared. From every dilution, 0.1 ml of the suspension tested was inoculated on two parallel selective/differentiating media and incubated at 37°C for 24 to 48 h. Following the incubation period, the micro-organic

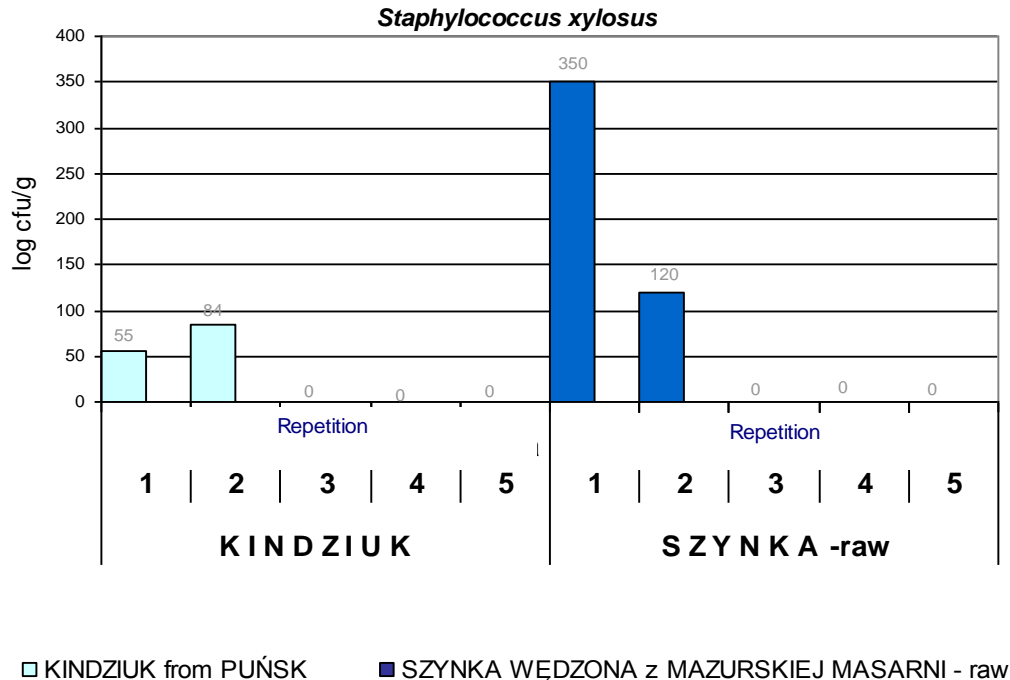


Figure 1. *S. xylosus* enumerated in two polish traditional meat products.

growth was evaluated visually. Every time, the growth characteristic for a given pathogenic bacteria was detected; the material from the medium was passed for identification to avoid false positive results. Additionally, the mesophilic aerobic microorganisms (TVC) growth at 37°C was determined for each product by applying the above described methodology. Five series of tests for each of the nine products were conducted.

In total, 90 samples of cured meat products were tested of which 45 were subject to qualitative tests and 45, to quantitative tests.

Statistical analysis was performed using Statistica 10 PL. The Shapiro-Wilk test was used to examine the distribution of variables, and the Levene test to evaluate homogeneity of their variances. Statistical analysis was carried out using univariate repeated measures, ANOVA, Kruskal-Wallis and Student's t tests. Statistical significance was considered at $\alpha = 0.05$.

RESULTS

The results of qualitative microbiological tests conducted on traditional cured meat products originating from three voivodships encompassing nine different products tested during three consecutive years did not show the presence of pathogenic species of bacteria: *S. aureus*, *E. coli* and *Salmonella* species. In one of the samples of Szyńska Wędzona z Mazurskiej Masarni - raw, the presence of *L. monocytogenes* was detected while in four samples from two smoked products (Szyńska Wędzona z Mazurskiej Masarni - raw, and Kindziuk from Puńsk) *Staphylococcus xylosus* was enumerated at the level of 5.5×10^1 cfu/g to 3.5×10^2 cfu/g (Figure 1). During the study, at every time the total number of aerobic

mesophilic microorganisms (TVB-total viable count) was determined. Although the Commission Regulation 2073/2005 does not stipulate conducting quantitative test of that type in case of meat products (that is, the EU law does not require it), an attempt at quantitative analysis of that indicator was undertaken. The above test was aimed at determining the degree of the finished product contamination with the so-called residual microflora and the results obtained are presented in Figures 1 to 5. The TVC ranged from 2.99 to 5.56 log cfu/g and depended on the type of cured meat product tested (Figure 2) and incubation temperature. The differences in the TVC values occurred in case of both products originating from different manufacturers as well as the same products originating from different product batches (Figures 3 to 5).

In each examined product, the difference between TVC levels was compared in each series of tests, with incubation of samples at temperatures of 30 and 37°C. Statistical analysis showed significant differences in marked TVC levels between series of tests in Kaszanka, Salceson, Kump and Kumpia (t test, $p < 0.05$); but did not show them in Wątrobianka, Połędwica, Szyńska - raw and cooked and Kindziuk (t test, $p > 0.05$).

The lowest average level of contamination with aerobic microflora (2.99 log cfu/g) and the lowest amplitude of that contamination between individual batches were determined in case of Połędwica (Figure 4). As indicated in Figure 2, the highest average TVC (5.56 log cfu/g) was recorded in case of the product called Kump (pork hind leg, pickled and smoked). The production process of that

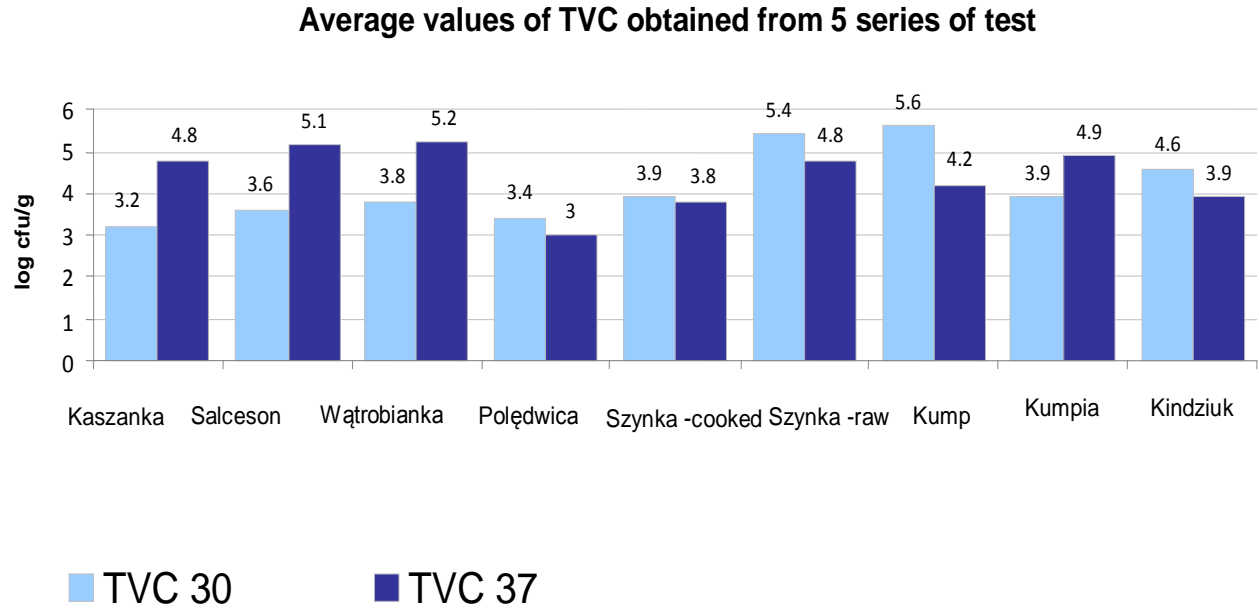


Figure 2. Average values of TVC in nine traditionally manufactured meat products from north-east part of Poland.

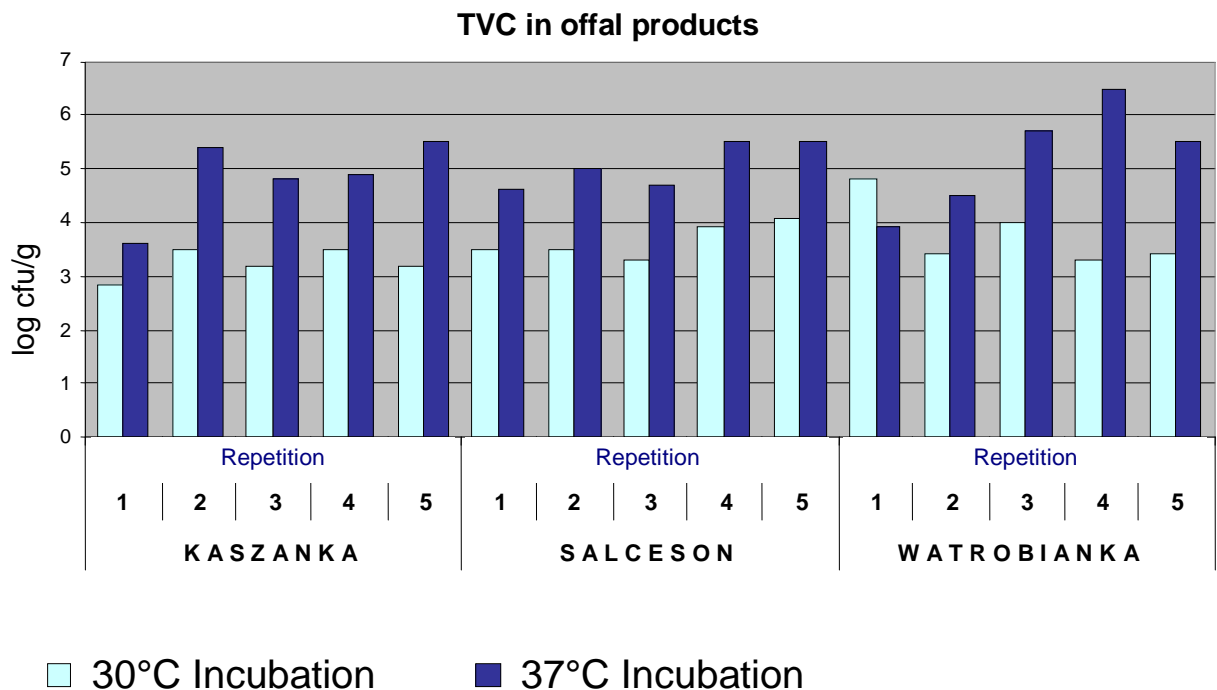


Figure 3. TVC in selected Polish traditionally manufactured offal products from north-east part of Poland.

product takes around four weeks. Different from Polędwica, that product is not subject to parboiling or cooking. In case of that product, the results ranged from 4.74 to 6.38 log cfu/g. For inoculates incubated at 37°C a similar amplitude was obtained, although the individual values were slightly lower (Figure 5). The highest abso-

lute TVC value, that is 6.45 log cfu/g, was recorded in case of Wątrobianka at the incubation temperature of 37°C (Figure 3). The studied parameter was dependent on both the product type and the incubation temperature.

Statistical analysis did not show significant differences between the mean values of TVC marked for three offal

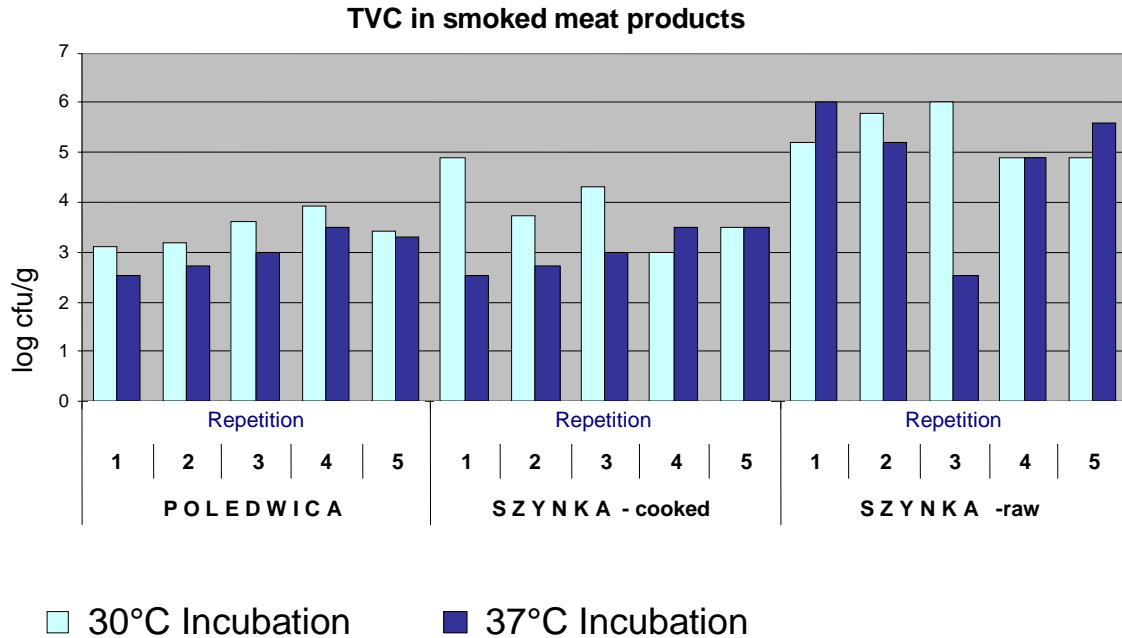


Figure 4. TVC in selected polish traditionally manufactured (smoked and cooked) meat products from north-east part of Poland.

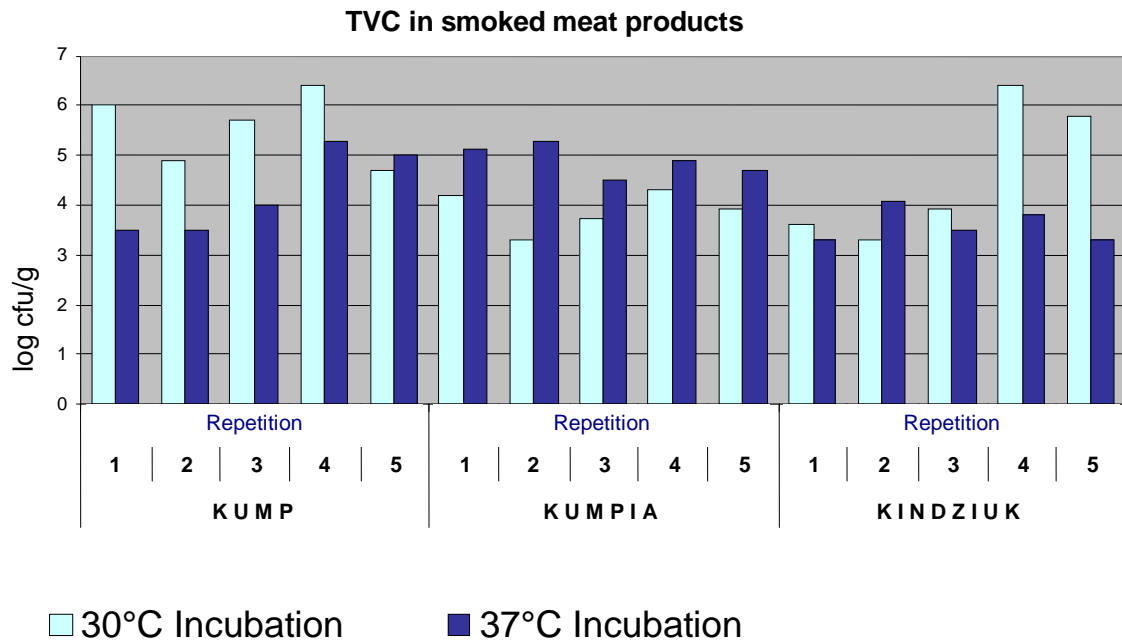


Figure 5. TVC in selected polish traditionally manufactured (smoked and uncooked) meat products from north-east part of Poland.

products. They also were not shown between the six examined smoked meat products (30°C - t test, $p = 0.133$ and 37°C - t test, $p = 0.066$). Comparing the mean TVC (30°C) of uncooked smoked meat products (Szynka-raw, Kump, Kumpia), significant differences were shown (univa-

riate ANOVA, $p = 0.001$). Post-hoc analysis showed that there are significant differences in the mean TVC values between Szynka - raw and Kumpia; the mean level of TVC in Szynka - raw was significantly higher than in Kumpia ($p = 0.001$). Significant differences between the

mean values of TVC in Kump and Kumpia were also confirmed, Kump's being higher than Kumpia's ($p = 0.000$). Post-hoc analysis did not show significant differences between the mean TVC levels of Szynka - raw and Kump ($p > 0.05$).

For the samples of uncooked smoked meat products, incubated at 37°C, no significant differences of the mean TVC values were shown (univariate Anova, $p = 0.510$).

In addition, no significant differences were shown between the mean levels of TVC marked in three cooked meat products (Połędwica, Szynka-cooked, Kindziuk) examined both at 30°C (Kruskal-Wallis test, $p = 0.327$) and 37°C (univariate Anova, $p = 0.115$). To sum up, the microbiological quality of polish traditional meat products indicator can be considered as safe. Although *Listeria monocytogenes* was detected in one product it is worth mentioning that this pathogen is harmful only to newborns and elderly people. Higher levels of TVC were observed in raw smoked meat product than in those subject additional posts smoking thermal treatment. Statistically, significant differences in the TVC levels in products from the same manufacturer were observed. This may be due to the facet, that production of this specific food product is not standardized yet. According to the authors, standardization of production will let one avoid the above mentioned discrepancies and lead to manufacturing of repeatable and microbiologically safe products.

DISCUSSION

Products manufactured by applying traditional methods are frequently ready to eat (RTE) products that may represent a significant source of pathogens dangerous for health (Abraham et al., 1998; Moore, 2004; Chevallier et al., 2006; Ferreira et al., 2006; Ferreira et al., 2007; Gounadaki et al., 2008; Mhlambi et al., 2010; Naidoo and Lindsay, 2010; Shale and Malebo, 2011; Rajkovic, 2012). Differences in the processing methods applied during production of traditional cured meat products may determine the differences in the final product quality. This also happens in case of production of the same product but in different locations (Ferreira et al., 2006, 2007, 2009). It can be noticed, however, that similar methods of food processing and preservation result in similar microbiological status of products, which is also indicated by the results of this study reflecting the microbiological quality of products subjected to smoking. Significant differences are visible in comparing the microbiological quality of meat products manufactured at different latitudes, which may result from the use of different raw materials sometimes processed in extremely different conditions. In case of cured meat products characteristic for the "cold" part of Europe, the processing is dominated by pickling and smoking while the residents of the southern part of the Old Continent base meat processing

mainly on fermentation, ripening and drying. The question arises at this point, which of the above-described processing methods are more effective in controlling undesired pathogenic microflora in the finished product? The raw material used for making meat products is characterised by different levels of contamination (Ukut et al., 2010) and even after thermal processing the residual microflora may remain in the product, and may grow, as a result of storage or transport under inappropriate conditions. Additionally, even the product of the highest quality may be contaminated with pathogenic microorganisms. In that case, the production environment of the meat products may be the source (Lebert et al., 2007; Talon et al., 2007; Gounadaki et al., 2008).

The results of this study as well as that obtained by other authors (Walczyccka et al., 2009; Vukovic´ et al., 2011) are sometimes divergent; although in their general meaning, they seem to confirm that the traditional production methods applied, indifferent of the longitude and latitude, are usually effective in eliminating microorganisms from the meat used as raw material. On the other hand, however, the results of this study and those of referenced authors indicate that products produced by means of traditional methods may sometimes represent an important source of pathogens dangerous for humans. The largest number of reports concerns *Listeria monocytogenes* in fermented RTE products. Colak et al. (2007) tested 300 samples of Turkish sucuk sausage and detected dangerous pathogen in 35 samples representing 11.5% of the tested population. Ferreira et al. (2006), testing the smoked fermented Alheiras sausages - the traditional meat product of Portugal, isolated *L. monocytogenes*, *S. aureus* and *Salmonella species* from them. In different parts of the world, Raji (2006) undertook an attempt at determining the microbiological quality of kilishi - a traditional product popular in Nigeria. The results of his studies confirmed unsatisfactory quality of the final product.

The number of *S. aureus* isolated from that product was at the level of 1.6×10^4 to 2.05×10^4 cfu/g, while the number of *E. coli* was at the level of 1.2×10 to 3.8×10 cfu/g. Other African researchers recovered *L. monocytogenes* and *S. aureus* from Biltong - the traditional meat product subjected to drying, in most cases in the traditional way - in the sun (Naidoo and Lindsay, 2010). Shale and Malebo (2011) also confirmed those results, apart from staphylococcus whose level of contamination ranged from 1.01×10^5 to 1.26×10^6 cfu/g. The wide range of products in which the presence of *L. monocytogenes* was detected confirms that even in the case of a special group of food products, traditional products undoubtedly have pathogen that is highly cosmopolitan. Contamination with *Listeria* may take place practically at every stage of production or storage of the finished product. Its presence is determined by such factors as the final product type, quality and type of raw material and the slaughter conditions. The European Union

legislation is highly restrictive concerning *L. monocytogenes*, and Commission Regulation 2073/2005 indicates clearly that in case of the RTE products the presence of that pathogen in 25 g of the final product is inadmissible.

Numerous researchers, however, came to different conclusions concerning the microbiological quality of traditional cured meat products. Comi et al. (2005), studying the traditional Italian fermented meat products, did not detect the presence of pathogenic bacteria in them. Similar results were obtained by Drosinos et al. (2005) studying Greek products of the same type. Also Cobos and Diaz (2007), studying the traditional meat product *Lacón gallego* in many aspects, did not record the presence of pathogenic bacteria in it, although they detected a relatively high TVC in the final product that was at the level of 7 log cfu/g after two weeks of storage at 2°C. It is worth noticing that the product of that type, prior to consumption, is subject to additional processes such as desalination and cooking, which decrease the TVC significantly to the undetectable level. Naidoo and Lindsay (2010) obtained similar results. According to those researchers, the TVC in the African dried product Biltong was 7 log cfu/g. Mhlambi et al. (2010) obtained similar results concerning the same traditional product, while Shale and Malebo (2011) drew attention to the fact that the final product contamination level is linked to a significant extent to the place of its distribution. Those authors tested samples collected from different locations (stand, food kiosk, supermarket and the butcher's shop). The TVC ranged from 10⁴ to 10⁶ cfu/g, and the highest values were recorded for the two earliest places of distribution while the lowest were detected at the butcher's shop. Lin and Chao (2001), testing the traditional Chinese-style sausage, recorded TVC at the level of ca. 6.5 log cfu/g. Additionally, those authors, storing those sausages at 4°C for nine weeks, determined that the value was not subject to significant changes during the storage period. The same product type (Cantonese sausage), originating from different producers, was also tested by Wu et al. (2010). They obtained significantly different results as the TVC values ranged from 4.15 to 8.71 log cfu/g. Also Kozačinski et al. (2008), studying traditional fermented products, did not determine the presence of pathogenic bacteria (*Salmonella* sp., *L. monocytogenes* or *S. aureus*) in the final product after 28 days of ripening, although *Listeria* was detected at earlier stages of production. Ferreira et al. (2009) and Ramalhosa et al. (2012) also did not record the presence of pathogenic bacteria of the above genera in the Portuguese products. African researchers, describing the product called Kilishi (African dried meat product), pointed out in their studies that appropriately conducted drying in the sun combined with application of sugar, salt and pepper is the effective method for elimination of pathogenic bacteria (Jones et al., 2001). In a different part of the world, Gonzalez and Diez (2002),

testing Spanish Chorizo for *S. aureus*, did not detect the presence of that pathogen either at the beginning of fermentation or after completing it (in the final product).

The presence of CNS - coagulase negative and catalase positive staphylococci belonging to *S. xylosus* was detected in the traditional products from the area of North-east Poland. That microorganism belongs to the useful microflora that is highly demanded and frequently isolated in case of traditional fermented products in manufacturing in which it plays a significant role (Martín et al., 2005). Its presence in Szynka and in Kindziuk does not pose any risk for consumers' health. That microorganism, when found in fermented products during formation of the required characteristics, may have very good influence on the final product quality (Fiorentini et al., 2009).

Application of specific methods during production of traditional products is correlated tightly with the culture and embedded deeply in the given community. Consequently, traditional products represent a type of culinary national heritage, the precisely developed know-how which proves already that our ancestors were aware of the necessity to apply specific processing methods applied individually or in combination with other methods for the purpose of giving the products the demanded characteristics and extending their period of suitability for consumption (Karthikeyan et al., 2000). Those are then the bases of some kind of the currently popular trend in food processing that is the so-called "hurdle technology" applied by processors (Leistner and Gorris, 1995; Leistner, 2000). Consequently, that is not an invention of the recent years. We are only dealing with the development of that technology for decades where just salting, pickling and marinating were available that could be combined with simple thermal processing such as smoking or baking only. Currently, food manufacturers have the technology of high pressures or packaging in modified atmosphere or vacuum available (Bajovic et al., 2012; Chen et al., 2012).

The results obtained indicate that despite the absence of pathogenic bacteria, the endogenous microflora of the product as well as the possibility of post-production contamination of the finished product (Gounadaki et al., 2008) with both pathogenic and saprophytic bacteria pose some problems. It can be assumed that the microflora present in the final product is generated from those two main sources. In case of traditional cured meat products, it is found out that the non-pathogenic bacteria, most often participating in formation of the required finished product characteristics, are the major components of that microflora. Those are mainly microorganisms belonging to the Micrococcaceae and Streptococcaceae families and lactic acid bacteria (LAB) in case of ripening/fermented/ not processed thermally products.

Incidence frequency analysis concerning food poisoning and infections caused by the four investigated bacteria indicated that the *Salmonella* spp. were the most

frequently mentioned identified cause of food infections. In 2010, 99020 cases were recorded in Europe, which is 8.8% fewer than in the preceding year. VTEC with 4000 cases and *L. monocytogenes* with 1601 cases are the next most frequent causes identified. Meat and meat products, eggs as well as vegetables and fruit are the most frequently mentioned food products that were the source of those bacteria (The European Union Summary Report, 2012). Results of this study and studies by the referenced authors confirm slightly better microbiological quality of products subjected to thermal processing as compared to those that are not subjected to such treatment (e.g. fermented products).

This study confirms that the general confidence of polish consumers concerning quality and safety of products manufactured by applying traditional methods is justified. They show clearly the very limited role of traditional cured meat products in transmission of the most important and at the same time most dangerous pathogens. The reasons for that situation can be referred to the relatively simple methods of traditional products' processing based on the minimum intervention of simple components/additives. The differences in the content of aerobic microorganisms can result from different micro-organic quality of raw materials, which was confirmed by Kozačinski et al. (2008) in their studies as well as application of spices/seasoning that might be the source of the processed meat contamination (Shamsuddeen, 2009). The place of production of a given product (Fonkem et al., 2010), and exactly the awareness and experience of the manufacturer concerning observation of the good manufacturing practices (GMP) and in particular the good hygienic practice (GHP) are also important. Hygienic regime is one of the key factors conditioning appropriate microbiological quality of the finished product (Chevallier et al., 2006; Talon et al., 2007; Kozačinski et al., 2008; Ferreira et al., 2009). The mean TVC values in this study ranged from 2.99 to 5.56 log cfu/g. That values are similar to those obtained by Yantao et al. (2010) during their studies on the Cantonese sausage, with mean value of 5.55 log cfu/g (from 4.15 to 8.71 log cfu/g) and slightly lower than the TVC results obtained for the similar product by Lin and Chao (2001).

Jones et al. (2001) determined the TVC at the level of 7.4×10^4 cfu/g (that is, ca. 4.87 log cfu/g) in the African product - Kilishi. Interesting conclusions have been formulated also by Fonkem et al. (2010) investigating Kilishi produced in Cameroun during different seasons of the year. They recorded clear influence of the season of year on the microbiological quality of the final product showing that during the rainy season contamination of that product was evidently higher (TVC at the mean level of 8.13×10^5). The differences in results of studies on final traditional product microbiological quality could result partly from the above-indicated factors. However, the following factors seem to have significant influence on the

results of studies: Manufacturing location of product and sampling location. Consequently, the differences in the results of microbiological tests for a product of the same type obtained by different authors are not infrequent. For example, in testing the African traditional product - Suya, according to Inyang et al. (2005), the TVC in that product was at the level of 3.7×10^5 to 2.4×10^6 . During the later testing of the same product, similar results (2.22×10^5) were obtained by Edema et al. (2008), while the studies by Uzeh et al. (2006) indicate that the TVC in Suya was at the level of 7×10^2 to 1.7×10^4 .

Conclusion

The results of this study and that of other referenced authors indicate clearly that products manufactured according to the traditional methods are relatively durable and their microbiological quality in most cases raises no objections. The belief that traditional food is safe increases the confidence and the group of potential buyers for such products. Despite the very simple processing methods and not applying the latest achievements of science and technology, they are usually safe for human health. Maintaining the appropriate sanitary conditions during the entire manufacturing process is the key issue concerning the microbiological quality of that type. Consequently, this may have significant influence on the health and life of the consumer; and consequently the feeling of safety and confidence of the consumer in the specific product. High quality of traditional products tested is, undoubtedly, a characteristic differentiating food of that type and at the same time a factor that could determine its market success.

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