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Review Article

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POSSIBLE USE OF PIG MEAT IN DOG AND CAT NUTRITION

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Abstract. This review aims to provide an overview of the nutritional values and the possibility of pig meat (muscle *longissimus lumborum*) in dogs and cats nutrition based on a review of scientific literature. Pork is the most common consumed meat both in Poland and in the world. The expanding body of information concerning factors effecting impacts on pork quality was reviewed. Pork is considered valuable due to the content of high-quality proteins, fat and fatty acids, minerals, and other bioactive compounds. The content of these components depends on many factors, including breed, genetic factors, age, but also on the animal's nutrition. The established views on pork are verified and confirmed by research that the nutritional and health-promoting value of this meat has significantly improved in recent years.

Key words: meat quality, chemical composition, pork, dogs nutrition, cats nutrition.

INTRODUCTION

Both dogs and cats belonging to the order Carnivora are classified as carnivores (facultative and obligate). Both their anatomical structure and the physiology of the digestive system prove their adaptation to receiving such food. Therefore, meat plays an important role in the diet of dogs and cats due to its unique chemical composition, content of high-quality protein, minerals, vitamins and antioxidants (Kasprzyk et al. 2015; Milczarek et al. 2019; Kasprzyk and Bogucka 2020).

The dominant position in the structure of meat consumption in Poland is occupied by pork for years. It is a culinary raw material particularly preferred by consumers due to its high nutritional value and sensory properties, as well as its low price (Moskal and Michalska 2017). Pork is considered valuable due to the content of high-quality proteins, B vitamins, heme iron, other minerals, and other bioactive active compounds. Pork is characterized by high fat content on the other hand, including saturated fatty acids, cholesterol and high sodium chloride content. The content of these components depends on many factors, including

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breed, genetic factors, age, but also on the animal's nutrition. The established views on pork are verified and confirmed by research that the nutritional and health-promoting value of this meat has significantly improved in recent years (Kołodziej-Skalska et al. 2020; Grela et al. 2021; Kołodziej-Skalska et al. 2022; Hu et al. 2023). Through diversification and targeted animal feed, it is possible to obtain animal products with a modified chemical composition and increased nutritional and sensory value. Strictly defined actions modifying animal nutrition can improve the properties of food products of animal origin. This can be achieved, for example, by reducing the fat content in meat, increasing the proportion of long-chain polyunsaturated fatty acids (LC-PUFAs) in animal diets, or increasing the levels of antioxidant components in animal diets. Breeding program led to a reduction in the back-fat thickness to up to 1.5 cm and an increase in the meat content in pig carcasses to approximately 60%. The ham weight and the size of the tenderloin also increased (Borzuta and Lisiak 2016).

In pet nutrition with a focus on dogs and cats, the popularity of commercial food and home-made diets with a high content of meat (fresh, dried) is increasing. In addition, high-protein diet benefits pets during weight loss (Bierer and Bui 2004; Laflamme 2005, 2018; Pan et al. 2023). Additionally, one of the most frequently diagnosed allergic skin diseases in dogs and cats is food allergy. It is believed to be the second or third skin disease caused by hypersensitivity, after atopic dermatitis and possibly flea-allergy dermatitis. This disease cases account for approximately 1 to 5% of all skin diseases in dogs and approximately 23% of cases of non-seasonal pruritus in dogs (Szczepanik and Pomorska 2005; Stilwell 2019). The antigens responsible for the development of allergies are typically glycoproteins (Gaschen and Merchant 2011). Most cases of allergic reactions in dogs are caused by beef (36%), dairy products (28%), wheat grains (15%), eggs (10%), chicken (9.6%). While pork – occasionally (4%) (Verlinden et al. 2006). In cats, the development of allergies is caused by commercial food (24.8%), beef (20%), dairy products (14.6%), fish (13%), lamb (6.7%) and poultry (4.5%).

In view of the above, it is worth answering the question whether pork, which is perceived as fatty and containing large amounts of cholesterol, can be a healthy and appropriate element in the diet of dogs and cats? The aim of this review article was to try to answer this question and verify views on the quality of pork using the example of the nutritional value of muscle *longissimus lumborum* (P_MLL).

FACTORS EFFECTING ON PORK QUALITY OF MEAT

The quality of meat is a combination of all the characteristics essential to the meat product, determining its utility value and unequivocally specifying whether it is suitable in terms of nutritional value for the consumer. The concept of meat quality also encompasses criteria such as health safety and availability. Improper treatment of animals during their lifetime can lead to meat defects and result in obtaining raw material of lower than desired quality. Equally significant impacts on the technological and culinary suitability of meat are the slaughtering processes and the handling of carcasses, followed by meat post-slaughter (cooling, dissection, refrigerated storage). After the animal's death, various transformations occur in the muscle tissue, turning it into meat. During this period, environmental temperature and the hygiene of spaces in contact with the meat raw material play a particularly important role.

The quality of meat is a complex concept. Its determinants are nutritional value, including protein content, content of fats determining caloric value, as well as the content of minerals and vitamins. Technological and sensory properties, such as water holding capacity, juiciness, pH, tenderness, smell, color, and even health safety, including the presence of parasites, pathogenic bacteria, drugs, and heavy metals (Kajak et al. 2007). Genetic factors (breed, genotype), environmental factors (nutrition, maintenance system, transportation, slaughter, post-slaughter processing, and the method and conditions of meat storage), and physiological factors (gender, age, condition, health status) influence the quality of pork.

Breed

In most countries, pig breeding includes both commercial breeds, for which production is carried out intensively, and native breeds oriented towards extensive breeding. The situation is similar in Poland, where breeding of native breeds is conducted under a genetic resource protection program and breeds and lines where breeding are lead on a larger scale in an intensive manner. Native pig breeds such as Złotnicka Pstra and Złotnicka Biała are characterized by a meatiness level of around 45–46%, while Puławska reaches approximately 50%. In contrast, carcasses of breeds like Polish Large White (WBP) or Polish Landrace (PBZ) pigs contain about 58–59% meat (Prasow et al. 2018). The above factors influence the quality of the produced slaughter material and its caloric content. One of the key quality features of meat is intramuscular fat content, which averages 2.5% for native breeds and is 1 percentage point higher compared to WBP and PBZ breeds. This indicates a higher energy value of slaughter material obtained from native breeds, as well as a higher nutritional value index (NQI) for fat.

Genotype

Research aimed at understanding the genome of pigs, intensified in the 1980s, has enabled the identification of genes associated with the productive traits of pigs, including the quality characteristics of pork. One of the most frequently described genes in the literature, whose unfavorable variant contributes to the occurrence of lower meat quality, is the ryanodine receptor gene (RYR1). Its presence in the pig population led to significant losses due to the occurrence of pork defects, including the PSE defect (pale soft exudative), which lowers the technological value of the raw material (Rybarczyk et al. 2003). Other genes and their polymorphisms also play a significant role, including the RN gene responsible for the occurrence of acidic meat symptoms, the HFABP gene responsible for increased deposition of intramuscular fat, MyoD representing a group of genes influencing myogenesis, i.e., muscle formation, and the calpastatin gene associated with the occurrence of proteolytic and glycolytic changes in meat after slaughter.

Sex of animal

Among the factors influencing the quality of carcasses and meat, gender is also worth mentioning in pigs destined for slaughter. This factor is gaining increasing importance due to the growing interest in fattening not only gilts or barrows but also surgically uncastrated boars. From previous studies, it is clear that better results in reducing the fat content of slaughter material and, on the other hand, increasing meatiness are achieved with gilts compared to barrows (Knecht et al. 2009). Even better results in this regard are obtained from boars. However, considering that meat obtained from fattened boars is characterized by an unpleasant odor due to androstenone and skatole produced by the testicles, the consumption of pork obtained from them is severely limited. In order to eliminate the unpleasant odor and improve the carcass value, immunological castration is increasingly used, also in Poland (Pejsak and Truszczyński 2009).

Nutrition

Numerous studies (Fabijańska et al. 2001; Milczarek and Osek 2006a, 2016b) have shown that pig nutrition is an important environmental factor influencing the quality of meat, including its nutritional value. The quality of pork is also shaped at various stages of production. Through nutrition, it is possible to modify the composition and quality of various products derived from farm animals, including pork obtained from pigs. From the consumer's perspective, expectations regarding food products are increasingly focused on the production of food that, in addition to nutritional properties, also has pro-health effects. In this context, particular interest is drawn to the production of pork with an increased content of essential polyunsaturated fatty acids (PUFA), especially from the n-3 family (eicosapentaenoic acid – EPA and docosahexaenoic acid – DHA), as well as n-6 (arachidonic acid), due to their role in preventing cardiovascular diseases. An effective way to modify the fatty acid composition of meat and pork fat is by adding vegetable oils, including soybean, rapeseed, sunflower, linseed, palm, as well as animal fats, to pig feed.

In Wang et al. (2011) research, it was demonstrated that the addition of soybean oil as an energy source to the feed for fattening pigs reduced the concentration of saturated and monounsaturated fatty acids in both backfat and the *longissimus dorsi* muscle (Wang et al. 2011). In other studies, the impact of adding animal fats, sunflower oil, and palm oil to the feed for fattening pigs on the fatty acid composition of intramuscular fat was determined. The highest content of saturated fatty acids was found in intramuscular fat of pigs fed animal fats, and the lowest in pigs where the feed was supplemented with sunflower oil (Alonso et al. 2012). Australian researchers also showed that regular consumption of functional pork obtained from pigs fed with feed enriched with long-chain fatty acids from the n-3 family, through the addition of tuna meal, may reduce the risk factors for cardiovascular diseases (Coates et al. 2009). Additionally, supplementing the feed for fattening pigs with extruded flaxseed positively affects the fatty acid profile in pork, including a significant increase in polyunsaturated fatty acids from the n-3 family (Juarez et al. 2011).

In connection with the above, the conditions of handling animals before slaughter, especially during transportation to meat processing plants, are not insignificant for the quality of the obtained slaughter material. Depending on the distance between the farm and the meat processing plant and the associated transport time, the impact of stress can result in qualitative meat defects. According to literature data, transporting pigs over shorter distances is associated with a higher frequency of the PSE meat defect, whereas over longer distances (above 300 km), the incidence of this defect was about half as frequent lower. On the other hand, the DFD (dark firm dry) meat defect occurred in few cases and only in pigs transported over longer distances (Tereszkiewicz et al. 2005). The occurrence of meat with the PSE qualitative defect is associated with higher glucose content and lower lactic acid content in the blood of pigs transported for shorter durations, resulting in lower pH_{45} of the *longissimus dorsi* muscle (Becerril-Herrera et al. 2010).

NUTRITIONAL VALUE OF PORK MEAT

The biological value of ingredient of diet is determined by the content of chemical compositions necessary for the proper functioning of the body, such as essential amino acids, fatty acids and minerals and trace elements. The analysis of the researches on the chemical composition of the muscle *longissimus lumborum* (P_MLL) presented in Tables 1, 3 and 4. In Table 2 was compared the nutritional guidelines (FEDIAF 2021) for dogs and cats for protein and essential amino acids in P_MLL and in typical protein components of commercial pet foods.

Protein

Meat of slaughtered animals is the main source of protein in the diet of both humans and companion animals. This protein contains all essential amino acids in the right proportions. Pork is generally characterized by its high content and quality. Its content in pork from 15 to 23% (Babicz et al. 2013; Milczarek 2021; Siemiński et al. 2023) and is characterized by higher quality based on amino acid composition compared to other frequently used protein components in commercial pet foods (Table 1 and 2).

Table 1. Chemical composition (g/100 g) and energy value (kJ/100 g) of pig meat (*m. longissimus lumborum*) (Babicz et al. 2013; Milczarek 2021; Siemiński et al. 2023)

Item	Content ($\bar{x}$ ± SD)
Moisture	74.37 ± 0.51
Crude protein	22.89 ± 0.67
Crude fat	2.13 ± 0.90
Crude ash	1.15 ± 0.02
Energy (kJ/100 g)	441.98 ± 22.52
NQI Protein	6.23 ± 0.31
NQI Fat	0.38 ± 0.13

$\bar{x}$ – mean values (n = 7); SD – standard deviation; NQI – nutritional quality index.

The estimated in this work pig meat has a high NQI protein value (>1) (Table 1), which indicates that it may be a good source of this component and can be used to compensate for its low content, especially in limited products. It has been shown that the meat of Puławska Fattening Pigs, compared to the Polish Large White × Puławska Crossbreeds and Hybrids of DanBred, is characterized by a high protein content, the highest value of the nutritional quality index (NQI > 6) and a high concentration of indispensable amino acids, including histidine (Siemiński et al. 2023). This confirmed that the chemical composition and quality of pork depend on genetic factors.

Compared to other protein ingredients, P_MLL has the highest level of lysine, tryptophan, and threonine, which, together with methionine, are the main limiting amino acids in diets for dogs and cats (NRC 2006). Table 2 shows a comparison between P_MLL and the main protein sources used in pet food.

As shown in Table 2, P_MLL has an amino acid profile comparable to high-quality protein sources such as egg powder (EGG). There have been a two experiments were conducted to evaluate digestibility and palatability of a new commercial pork-based raw diet for zoo-managed felids (Iske et al. 2016). Currently two protein sources (beef or horse) comprise the majority of commercial raw meat diet formulations for exotic carnivores in zoological institutions. Pork-based diets have traditionally not been widely utilized and thus nutrient digestibility of pork has not been adequately evaluated in exotic carnivores. Pork was the most digestible for every macronutrient analyzed compared to beef and horse diets. Additionally, on average, felids consuming the pork diet had fecal scores that were closest to ideal. So pork-based diets could be included among dietary options for large zoo felids.

Table 2. Protein content and essential amino acid composition (g/100 g dry matter) of pig loin and some protein sources in comparison and the recommendations for dogs and cats

Item	FEDIAF Dog	FEDIAF Cats	P_MLL	PBM	EGG	SM	MG
Crude protein	21.0	33.3	73.3	65.0	47.2	46.5	61.1
Essential amino acids							
Arginine, Arg	0.60	1.30	17.91	3.90	2.84	3.35	1.96
Histidine, His	0.27	0.35	11.52	1.07	1.12	1.21	1.28
Isoleucine, Ile	0.53	0.57	12.84	2.07	2.58	2.29	2.54
Leucine, Leu	0.95	1.36	22.26	3.89	4.05	3.56	10.6
Lysine, Lys	0.46	0.45	22.39	3.09	3.04	2.95	1.00
Methionine, Met	0.46	0.23	7.45	1.06	1.48	0.61	1.38
Methionine + cystine, Met+Cys	0.88	0.45	8.40	1.84	2.58	1.28	2.45
Phenyloalanine, Phe	0.63	0.53	10.29	2.24	2.52	2.42	3.93
Phenyloalanine + tyrosine, Phe+Tyr	1.03	2.04	19.19	3.71	4.45	3.81	7.16
Threonine, Thr	0.60	0.69	13.91	2.16	2.27	1.79	2.09
Tryptophan, Trp	0.20	0.17	15.49	0.52	0.58	0.65	0.31
Valine, Val	0.68	0.68	13.97	2.67	2.89	2.14	2.86
References	FEDIAF 2021		Chernukha et al. 2023, Milczarek and Osek 2016a, Nevrkla et al. 2023	Vasconcellos et al. 2023			

FEDIAF (2021) – recommended nutrient levels for adult dogs (95 kcal/kg$^{0.75)}$ and cats (75 kcal/kg$^{0.67}$) in units per 100 g of dry matter (DM); P_MLL – pig *Musculus longissimus lumborum*; PBM – poultry by-product meat; EGG – egg powder; SM – soybean meal; MG -– maize gluten feed.

In other study estimated protein digestibility and amino acids (AA) bioavailability of pork loin in dogs' diets compared to others protein sources (beef loin, chicken breast, pollock fillet, and salmon fillet) (Faber et al. 2010). Among these sources, pollock fillet was shown to be the most digestible protein and chicken breast the least, based on predicted and standardized AA digestibility values. Beef loin and pork loin were similar in digestibility. Salmon fillet was similar in digestibility compared with beef loin and pork loin.

Fat and fatty acids

Dogs and cats can equally use dietary energy from both protein and fat (Hewson-Hughes et al. 2011; 2013). However, due to the higher caloric density of fat than protein and simpler metabolism, fat in the food of dogs and cats plays the main and very effective role as a source and carrier of energy (Górska and Malajowicz 2020).

Table 3. Fatty acid composition (% total) and quality indicators of pig meat (*m. longissimus lumborum*) (Alonso et al. 2010; Lisiak et al. 2013; Milczarek 2021; Świątkiewicz 2021)

Item	Content (x̄ ± SD)
C10:0	0.22 ±
C12:0	0.38 ± 0,30
C14:0	1.32 ± 0.38
C16:0	22.21 ± 1.60
C18:0	12.54 ± 1.30
C20:0	0.22 ± 0.10
C18:1 n-9	40.90 ± 5.97
C20:1 n-9	0.77 ± 0.35
C18:2 n-6	11.85 ± 4.82
C20:2 n-6	0.31 ± 0.19
C20:3 n-6	0.24 ± 0.03
C20:4 n-6	3.04 ± 1.72
C22:4 n-6	0.17 ± 0.06
C18:3 n-3	1.05 ± 0.72
C20:5 n-3	0.37 ± 0.15
C22:6 n-3	0.42 ± 0.24
SFA	37.89 ± 2.33
UFA	61.42 ± 2.21
MUFA	44.24 ± 6.64
PUFA	20.41 ± 4.35
DFA	73.97± 2.35
OFA	24.49 ± 2.78
UFA/SFA	1.63 ± 0.17
n-6/n-3	6.01 ± 2.24
S:P	0.59 ± 0.05
AI	0.39 ± 0.04
TI	1.06 ± 0.22

x̄ ± SD – mean value (n = 10) with standard deviation; SFA – all saturated fatty acids, UFA ΣPUFA + MUFA; MUFA – monounsaturated fatty acids; PUFA – polyunsaturated fatty acids; DFA – dietary fatty acids having desirable neutral of hypocholesterolemic effect (UFA + C18:0); OFA – dietary fatty acids having undesirable hypercholesterolemic effect (C14:0 + C16:0); S:P – fat saturation index; AI – atherogenic index (Ulbricht and Southgate 1991); TI – thrombogenic index (Ulbricht and Southgate 1991).

In the past few years, pork was perceived as fatty and unhealthy meat. However, systematic and strictly directed long-term breeding program on pigs has brought excellent results in the form of improving the meat content of pigs and reducing their fatness. Current research results indicate that modern pork contains less fat and cholesterol than in previous years (Bertocci and Mannino 2023). The cholesterol level in pork does not exceed 55 mg/100 g.

This means that it is lower than in beef, deer or rabbit meat (Edward et al. 2023). Over recent years, there has been great progress in breeding in this regard (Koćwin-Podsiadła et al. 2003; Miar et al. 2015; Sionek and Przybylski 2015; Bonesmo and Enger 2021). In Poland, it is assumed that the intramuscular fat content required for the optimum taste and flavour of meat should be between 2.5 and 3% (Tyra et al. 2013). The average value in the references data of 2.13% in *m. longissimus lumborum* is presented in Table 1. The nutritional quality index (NQI) for fat is on average 0.38.

Fat is a source of essential fatty acids (EFAs). Compared to dogs, cats are evolved to digest large amounts of saturated fatty acids (SFAs) and, unlike other mammals, they cannot effectively convert linoleic acid (LA) into arachidonic acid (AA) (Trevizan et al. 2012). Table 3 shows the quality of fat based on literature data on the profile of fatty acids in *m. longissimus lumborum*, analyzing their groups: saturated (SFA) and unsaturated (UFA), including monounsaturated (MUFA) and polyunsaturated (PUFA) and fatty acids with hypocholesterolemic (DFA) and hypercholesterolemic (OFA) effects. The proportions between acid groups and the atherogenicity (AI) and thrombogenicity (TI) indexes were also calculated. Among SFAs in the assessed muscle, palmitic acid dominates. An important observation from the nutritional point of view is the higher share of UFAs recorded in the estimated muscle (61.42% compared to SFA 37.89%, respectively). The UFA/SFA ratio in MLL is 1.63.

Some FAs, such as LC-PUFA from the n-3 family, docosahexaenoic acid (DHA C22:6) and eicosapentaenoic acid (EPA C20:5) are of particular importance in the diet of dogs and cats. The dog's body does not have the ability to synthesize ALA acid. Therefore, EPA and DHA acids must be supplied directly from the dog's diet. Their main dietary sources to this day are mainly oily marine fish. Unfortunately, the deteriorating situation of fish stocks, water purity or climate change is prompting the search for additional options for obtaining or producing LC–PUFA DHA and EPA. The results of a number of studies have shown that deficiency of these acids has been linked to such diseases such as infertility, ischemic heart disease, peripheral cutaneous vasculitis, poor weight gain in growing animals, cognitive disorders and eye retinopathy (Bauer 2011; Lenox 2016; Gaylord et al. 2018; Santos et al. 2021).

An important indicator determining the quality of fat is the quantitative indices of fatty acids. One of them is the proportion of n-6 to n-3 PUFA. The contemporary diet of dogs (highly processed, supported mainly by vegetable fats) provides mainly n-6, and the n-6 to n-3 ratio even exceeds 20:1, which leads to many diseases in companion animals (circulatory system, heart ischemia, obesity, cancer). Kearns et al. (1999) showed that the ratio of n-6 to n-3 fatty acids provides the best health benefits in dogs' diets when it is 5:1, while other studies (Hall et al. 2006) shown 1.4:1 and even 1:1, respectively. Excess n-6 fatty acids pose a threat to the proper use of dietary n-3 fatty acids, because n-3 and n-6 fatty acids compete for the same enzymes (Dunbar and Bauer 2002; Schmitz and Ecker 2008). In the fat of the estimated muscle it was on average 6:1. Research indicates that the fatty acid composition of animal carcasses can be improved by the type and amount of fat provided in compound feed (Paściak et al. 2003). The ratio of n-6 to n-3 in pork, regardless of batch of meat, is below 10:1, and in poultry meat 20:1 (https://www.nutritionvalue.org/). Saturated fatty acids with 12, 14 and 16 carbon atoms (C12:0, C14:0 and C16:0) are considered atherogenic because they increase the level of cholesterol and LDL fraction in the blood plasma. In turn, saturated fatty acids with 14, 16 and 18 carbon atoms (C14:0, C16:0 and C18:0) are considered thrombogenic because they stimulate platelet aggregation. The anti-atherosclerotic effect is attributed to MUFA and PUFA fatty acids from the n-6 and n-3 families. In this context, the obtained values of the AI and TI indexes for the estimated pork may suggest high health quality of the meat based on the fatty acid profile (Table 3). The data presented in Table 3 show that estimated pork meat is characterized by a low content of SFA and hypercholesterolemic acids (OFA) and a more favorable UFA/SFA and DFA/OFA ratio as well as a low atherogenic index (AI). Pork meat with a favorable share of n-3 PUFA and a good ratio of n-6 to n-3 allows dogs and cats to increase the consumption of these valuable bioactive substances without radical dietary changes.

Mineral components

Pig meat is source of essential macro- and microelements for dogs ang cats (Table 4).

Table 4. Content of elements (mg/100 g) in pig meat (*m. longissimus lumborum*) (Milczarek et al. 2019; Cebulska et al. 2021)

Item	Content ($\bar{x}$ ± SD)
Macroelements	
Calcium	6.87 ± 0.46
Phosphorus	200.81 ± 4.89
Potassium	388.33 ± 4.44
Sodium	43.63 ± 3.06
Magnesium	25.64 ± 2.16
Microelements	
Copper	0.08 ± 0.04
Iron	0.96 ± 0.15
Manganese	0.02 ± 0.01
Zinc	1.39 ± 0.09
Ca : P ratio	0.0342

$\bar{x}$ ± SD – mean value (n = 6) with standard deviation.

The content of calcium (Ca) and phosphorus (P) in pork seems to be the most favorable in comparison to the meat of other species of slaughter or game animals. Moreover, for example, turkey meat, like pork, has a high calcium content, but its phosphorus content is much higher, which negatively affects the Ca:P ratio and may result in poorer Ca absorption. Pork can be classified as a low-sodium product. The sodium (Na) content of pork is low compared to beef (68 mg/100 g) and poultry (60 mg/100 g) (https://www.nutritionvalue.org/). Therefore, it can be suggested as a dietary component for hypertension, which is a common health problem in both dogs and cats, which may have serious consequences (Boatright 2023). Pork also provides significant amounts of easily digestible iron, necessary for the synthesis of hemoglobin, as well as other microelements, such as zinc, manganese and copper, which are part of many enzymes.

Pork is also a valuable source of bioactive compounds for dogs and cats. These include, among others: taurine. Dogs are carnivorous because of their need for arginine; for cats, additional essential amino acids are arginine and taurine (FEDIAF 2021). In cats, the endogenous synthesis of taurine in tissues is much slower than in dogs and covers only from several to a dozen or so percent of the cat's need for this amino acid. Additionally, cats lose large amounts of taurine in urine and feces. Moreover, much of this amino acid is broken down by intestinal bacteria. Taurine is produced mainly from methionine and cysteine in the liver and central nervous system, and its supplementation is very important due to the low ability to produce it endogenously, even in dogs. This means that it should be supplied with foods of animal origin. Taurine plays an important biological role in the body. It is involved, among other things, in the conjugation of bile acids and ensuring the health of the heart muscle. It is also suspected to play an important role in heart physiology. Taurine deficiency leads to blindness, fertility disorders, impairment of the central nervous system and other problems. The most common source of taurine in the diet is animal muscle tissue. However, the processing of this product in the production of dog food may significantly change the concentration of taurine in a given diet.

Some types of meat, e.g. rabbit and poultry, are low in taurine (Pasantes-Morales et al. 1989), and high-fiber diets may contribute to the development of taurine deficiencies because certain sources of fiber (for example, legumes) have a reducing effect on the concentration of this amino acid (Bohn 2020). It is found in pork meat 78.3 mg taurine/100 g DM (corresponding to 23.2 mg/100 g fresh weight) (Marušić et al. 2013). Taurine increased up to 212 mg/100 g DM during the dry-curing process which was not expected because taurine is not a product of proteolysis that would occur during dry-curing processing (Toldrá and Flores 1998).

Komae et al. (2022a, 2022b) found strong antioxidants in meat that help protect the body against oxidative stress. Substances found in large amounts in meat and fish are imidazole dipeptides (IDPs) containing an additional oxygen atom (2-Oxo-imidazole-containing dipeptides (2-oxo-IDPs). 2-oxo-IDPs are a group of compounds in which structure can include the presence of the non-protein amino acid beta-alanine or gamma-aminobutyric acid (GABA) and L-histidine (Boldyrev et al. 2013). These compounds occur in high concentrations in the skeletal muscles and brain of most vertebrates. At the same time, it turned out that these substances have extremely strong antioxidant properties. Using a technique mass spectrometry, the authors showed that pork also contains large amounts of these compounds. Carnosine (2-oxo-carnosine) is the dominant IDP in pork. It is a natural neuroprotective substance, and its presence in the body prevents the processes of senescence – cell aging (Syta et al. 2018). Carnosine as a strong antioxidant – it can remove reactive oxygen species (ROS) (Stvolinsky et al. 2017). In addition, it has the ability to chelate heavy metals that cause cell damage.

Attention was also paid to its role in kidney diseases, especially in acute renal failure. It can effectively reduce the risk of diseases that are often correlated with the cellular aging process. Taking into account the fact that its concentration decreases in the body with age, causing disturbances in the body's homeostasis, 2-oxo-carnosine is particularly important for mature animals.

CONCLUSIONS

A review of the literature on the subject showed that pork is a necessary component of the diet of dogs and cats due to its unique chemical composition and high nutritional value. It is an important and difficult to replace source of many valuable nutrients, such as complete protein, fat with the desired fatty acid profile, and macro- and microelements. The main component of muscle tissue are proteins, which are characterized by high biological value, have favorable proportions of amino acids and contain all exogenous amino acids necessary for the synthesis of body proteins. Compared to, for example, beef, pork is characterized by a favorable fatty acid profile: a lower content of SFAs and a much higher level of PUFAs, and therefore a more favorable proportion of PUFA/SFA acids and DFA, OFA, AI and TI indexes. Compared to poultry, pork has a much better proportion of n-6 to n-3 acids. Pork included in the diet of dogs and cats also provides important biologically active substances, including very strong antioxidants.

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MOŻLIWOŚĆ WYKORZYSTANIA MIĘSA WIEPRZOWEGO W ŻYWIENIU PSÓW I KOTÓW

Streszczenie. Celem niniejszej pracy przeglądowej jest charakterystyka wartości odżywczych i możliwości wykorzystania mięsa wieprzowego (mięśnia *longissimus lumborum*) w żywieniu psów i kotów oparta na przeglądzie literatury naukowej. Wieprzowina jest najczęściej spożywanym mięsem zarówno w Polsce, jak i na świecie. Dokonano przeglądu informacji dotyczących czynników wpływających na jakość wieprzowiny. Mięso te uznawane jest za wartościowe ze względu na zawartość wysokiej jakości białek, tłuszczu i kwasów tłuszczowych, minerałów oraz innych związków bioaktywnych. Zawartość tych składników zależy od wielu czynników, m.in. rasy, czynników genetycznych, wieku, ale także sposobu żywienia zwierzęcia. Ugruntowane poglądy na temat wieprzowiny zostały zweryfikowane i potwierdzone badaniami, które wykazały, że wartość odżywcza i zdrowotna tego mięsa uległa w ostatnich latach znacznej poprawie.

Słowa kluczowe: jakość mięsa, skład chemiczny, wieprzowina, żywienie psów, żywienie kotów.