DOI: 10.21005/AAPZ2018.47.3.01

FOLIA POMERANAE UNIVERSITATIS TECHNOLOGIAE STETINENSIS
Folia Pomer. Univ. Technol. Stetin., Agric., Aliment., Pisc., Zootech. 2018, 343(47)3, 5–10

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NUTRITIONAL VALUE OF POULTRY MEAT UTILIZED IN THE DOGS DIET

WARTOŚĆ ODŻYWCZA MIĘSA DROBIOWEGO WYKORZYSTYWANEGO W DIECIE PSÓW

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Streszczenie. Mięso drobiu jest istotnym źródłem energii i składników odżywczych, zapewniającym wysoką jakość białka w diecie psów. Celem badań było określenie jakości mięsa kurcząt brojlerów. Materiał doświadczalny pracy stanowiły kurczęta brojlery ROSS 308, chowywane w kontrolowanych warunkach środowiskowych do 42 dnia życia. W mięśniach piersiowych i udowych oznaczano zawartość podstawowych składników i profil aminokwasowy. Na podstawie przeprowadzonych badań stwierdzono, że mięśnie piersiowe zawierają więcej białka, a mniej tłuszczu, niż mięśnie ud. Mięśnie udowe cechowały się większą zawartością tłuszczu śródmięśniowego, co wpłynęło na ich większą wyliczoną wartość energetyczną. Mięso drobiowe ma wysoką jakość odżywczą białka, jest dobrym źródłem aminokwasów egzogennych, co jest korzystne pod względem żywieniowym.

Key words: amino acids, broiler chickens, chemical composition, metabolisable energy, meat quality, dogs diet.
Słowa kluczowe: aminokwasy, skład chemiczny, energia metaboliczna, jakość mięsa, kurczęta brojlery, dieta psów.

INTRODUCTION

Dogs nutrition, regardless of the method to be chosen, requires the use of appropriate raw materials. The quality and quantity of these raw materials determine the degree of coverage of the demand for nutrients. Evolutionary dogs are adapted to predation as relative carnivores, and thus the basis of their diet is the meat of various species of animals. Meat and products of animal origin due to its nutritional value, amino acid composition and the ratio of fatty acids is the best basis for feeding dogs. Poultry meat is the cheapest source of animal protein. This meat is popular mainly due to the short production cycle, and thus the lower cost of production compared to the meat of large slaughter animals. In addition, it is distinguished by nutritional and culinary values. Poultry meat is valued primarily as a source of protein with high nutritional value. In comparison with other meat species, poultry meat is easily digestible, it contains more full-value protein (Pomianowski et al. 2011). The chemical

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composition, nutritional value and consequently the quality of poultry meat are influenced by both species, genotype (breed), age, sex, type of use, nutrition, husbandry conditions, as well as ante-mortem treatment of birds (stress) (Pietrzak et al. 2013). The production of poultry meat in the world shows a clear upward trend, the highest of all types of meat obtained from livestock. The basic slaughter material is broiler chickens, or commercial hybrids of hens reared intensively. Meat of broiler chickens constitutes about 82% of the total national poultry meat (Gornowicz et al. 2017). In the course of trade, poultry meat occurs in the form of carcasses and culinary elements, among others breasts, legs, thighs, shins, wings.

The purpose of the paper was to assess the nutritional value of broiler chicken meat.

MATERIAL AND METHODS

The research material were breast muscles and thigh muscles from ROSS 308 broiler chickens. The chickens were raised for 42 days, feeding them for the first 21 days with Starter mixes, followed by Grower mixes. After finishing the rearing, 10 chickens from the group (5 hens and 5 roosters) were randomly selected and slaughtered. The obtained carcasses were cooled for 24 hours at a temperature of 0–4°C, and then thoracic and leg muscles were dissected from each carcass. In all homogenized samples the content of basic constituents according to AOAC (2012) was determined. The crude protein (N × 6.25) was determined by the Kjeldahl method using a Büchi B-324 apparatus and a Büchi 324 distillation assembly. The crude fat content was determined by Soxhlet method and diethyl ether was used as the solvent. The content of crude ash was determined by mineralization of the sample in a muffle furnace at 580ºC for 8 h.

The total carbohydrate content was calculated from the so-called difference according to the scheme (Kunachowicz et al. 2005):

total carbohydrates (TC) = 100 – (water + crude protein + crude fat + crude ash)

The energy value expressed in the form of metabolic energy (ME) of meat was calculated based on the determined chemical composition according to the equation given by the National Research Council (2006) using the modified Atwater method coefficients in accordance with the formula:

EM (kcal per 100 g) = % crude protein × 3.5 +% crude fat × 8.5 +% total carbohydrates × 3.5

The proportion of amino acids in the samples, with the exception of tryptophan, was determined in the AAA-400 type amino acid analyzer, after previous hydrolysis of 6 M HCl. In addition, sulfuric amino acids were hydrolyzed with 6 M HCl after oxidation with a 9: 1 ratio of formic acid and hydrogen peroxide. Tryptophan was determined according to the AOAC method (2012).

The statistical analysis of the results was carried out using the Statistica®12 program. The mean values were compared using the Duncan test for $p \leq 0,05$.

RESULTS AND DISCUSSION

From a nutritional point of view, the upward trend in poultry production is assessed positively, since poultry meat is mainly products that supply significant quantities of high--quality protein and other nutrients. The nutritional value of meat is evaluated, among others

in terms of protein content and its amino acid composition, fat content and type of fatty acids and digestibility of nutrients. The composition of poultry meat varies depending on which part of the carcass was obtained. It depends to a large extent on zoohygienic conditions, nutrition, and above all on genetic factors (Osek et al. 2005).

Table 1. Basic chemical composition of broiler chicken meat
Tabela 1. Podstawowy skład chemiczny mięsa kurcząt brojlerów

Trait Cecha	Muscles – Mięśnie		Average Średnia
	leg udowe	breast piersiowe	
Dry matter Sucha masa [%]	24.13 ± 1.36	25.80 ± 0.98	24.96 ± 1.42
Intramuscular fat Tłuszcz śródmięśniowy [%]	2.02[a] ± 0.38	0.58[b] ± 0.18	1.30 ± 0.81
Crude protein Białko surowe [%]	20.56[a] ± 1.06	23.35[b] ± 1.02	21.96 ± 1.77
Ash Popiół [%]	0.99 ± 0.08	0.97 ± 0.16	0.98 ± 0.12
Carbohydrates Węglowodany [%]	0.57 ± 0.32	0.90 ± 0.46	0.73 ± 0.41
Energy value Wartość energetyczna [kcal]	91.07 ± 0.19	89.80 ± 0.07	90.43 ± 0.05
Energy value Wartość energetyczna [kJ]	381.05 ± 0.14	375.73 ± 0.05	378.39 ± 0.18

a, b – statistically significant differences in the rows at $p \leq 0.05$ – różnice statystycznie istotne w wierszach przy $p \leq 0,05$.

The results of the analysis of the basic chemical composition in the thigh and thoracic muscles are presented in Table 1. The obtained values are convergent with literature data (Biesiada-Drzazga et al. 2011; Pomianowski et al. 2011). Protein is essential for the life and proper functioning of the body building material, so it must be constantly supplied in a dog diet (Łysoń et al. 2017). Poultry meat is a good source of wholesome animal protein. Compared to pork or beef meat, poultry meat contains more raw protein and less connective tissue (especially collagen in young birds) and has a lower energy value, because it contains less fat, and in addition, this fat is rich in unsaturated fatty acids (Kijowski 2000). Breast muscles contain an average of 23.35 g, and femoral – 21 g of protein, which confirms the results obtained by other authors (Lipiński et al. 2009; Orkusz 2015).

In the meat of the analyzed broilers, the intramuscular fat content depended on the anatomical part, i.e. 0.58% in the breast muscle and 2.02% in the thigh muscles. Pietrzak et al. (2013) found in breast muscles about 100% more fat than in the presented studies. According to other authors, the fat content in chicken breast muscle is in the range of 0.3–2.9% (Berri et al. 2005; Grześkowiak et al. 2011). The femoral muscles contain more fat than the breast muscles, as confirmed by Milczarek et al. (2011). The protein content in the samples was closely related to the fat content. The more fat, the less protein in both types of muscles. It has been shown that the amount of intramuscular fat affects the palatability and juiciness of broiler chicken meat (Augustyńska-Preisner and Sokołowicz 2014).

As shown by the presented research, poultry meat is characterized by low energy value (on average 90.43 kcal) in comparison to pork (347 kcal), beef (287 kcal) and calf meat (128 kcal) (Kowalska 2006; Wilczak 2016).

Table 2. Content of exogenous amino acids (mg per 100 g of raw material) in the examined muscles of broiler chickens
Tabela 2. Zawartość aminokwasów egzogennych (mg na 100 g surowca) w badanych mięśniach kurcząt brojlerów

Item Wyszczególnienie	Muscles – Mięśnie		Average Średnia
	leg udowe	breast piersiowe	
Lys	1961	2245	2103
Met + Cys	690	873	782
Thr	994	1087	1041
Ile	1005	1176	1091
Trp	291[a]	645[b]	468
Val	1025[a]	1212[b]	1119
Leu	1629[a]	1837[b]	1733
His	873[a]	1520[b]	1197
Arg	1619[a]	1831[b]	1725
Phe+Tyr	1392	1566	1479

a, b – statistically significant differences in the rows at $p \leq 0.05$ – różnice statystycznie istotne w wierszach przy $p \leq 0,05$.

The quality of the protein is assessed on the basis of the amino acids it contains. The proteins of poultry meat contain, in appropriate proportions, all the exogenous amino acids, not synthesized in the dog's system, and endogenous amino acids, being a source of nitrogen, which ensures the proper synthesis of body proteins, and thus the proper development, growth and maintenance of vital functions. As shown by our own analyzes, poultry meat is rich in essential amino acids (Table 2). Limiting amino acids are those that exist in the starting raw materials in such small quantities that they determine the fullness of the protein prepared from a given raw material. For dogs, it is lysine, tryptophan and methionine. Analyzing the amino acid profile of protein, poultry meat has a similar composition for individual amino acids for beef or ostrich (Krusiński 2006). Poultry meat is richer in deficient amino acids compared to pork, as well as goats (Webb et al. 2005). Compared to vegetable raw materials (cereals) that are used as a component of ready-made dog food that is deficient in lysine, threonine or tryptophan, poultry meat is a great source of these important amino acids. Tryptophan is essential for the synthesis of serotonin, which contributes to less aggressive behavior. Dogs deficient in this amino acid are too reactive, nervous, more sensitive to pain, cannot cope with emotions and can show aggressive behavior. Tyrosine, on the other hand, is a precursor of dopamine and norepinephrine, causing agitation that can trigger aggression (Bourgeois et al. 2006).

CONCLUSIONS

The studied poultry meat was characterized by high nutritional and dietary value. This is evidenced by the high amount of protein and low fat content. Poultry meat is a nutrient raw material characterized by a high content of full-value protein. Poultry meat is a very good source of essential amino acids for dogs.

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Abstract. Poultry meat is an important source of energy and nutrients, ensuring high quality of protein in the diet of dogs. The aim of the research was to determine the quality of broiler chicken meat. The experimental material of the paper were broiler chickens ROSS 308 reared in controlled environmental conditions up to 42 days of age. The content of basic ingredients and the amino acid profile were determined in breast and thigh muscles. Based on the research, it was found that the breast muscles contain more protein and less fat than the thigh muscles. The femoral muscles were characterized by a higher content of intramuscular fat, which influenced their higher energy value. Poultry meat has a high protein nutritional quality, is a good source of essential amino acids, which is beneficial in terms of nutrition.

The authors thank PhD Janusz Kaczmarek, Specialist Poultry Production Company, Żółwia Błoć, Goleniów, West Pomeranian for transferred biological material for research.