Acta Sci. Pol., Technol. Aliment. 11(4) 2012, 373-379
pISSN 1644-0730 eISSN 1889-9594 www.food.actapol.net/

AFRICAN OSTRICH (*STRUTHIO CAMELUS*) MEAT AS A SOURCE OF ESSENTIAL AND TOXIC ELEMENTS IN A HUMAN DIET

Monika Rajkowska[1]✉, Kamila Pokorska[1], Mikołaj Protasowicki[1], Arkadiusz Żych[2]

[1]Department of Toxicology, West Pomeranian University of Technology in Szczecin
Papieża Pawła VI/3, 71-459 Szczecin, **Poland**
[2]Department of Meat Technology, West Pomeranian University of Technology in Szczecin
Kazimierza Królewicza 4, 71-550 Szczecin, **Poland**

ABSTRACT

Background. Metal contamination of food is virtually unavoidable, the only possible option is trying to minimize the amount of metals ingested. The purpose of these investigations was to determine the amounts of some essential macroelements and microelements and also the amounts of harmful metals in the selected ostrich muscles. The secondary purpose was to assess to what extent ostrich meat can be a source of the selected micro- and macroelements.
Material and methods. The research material was obtained from ostrich meat from the Kołczewo ostrich farm in Poland. For the mercury determination, material was mineralized with mixture of HNO_3 and $HClO_4$ and the content was determined by CV-AAS. In case of other metals, the study material was mineralized with concentrated HNO_3 in a microwave oven. The contents of Pb and Cd were determined by GF-AAS and other metals by ICP-MS. Statistical analyses were also applied on the obtained data.
Results. Elements, with regard to their average amount in meat, can be ordered in the following fashion: K > Na > Mg > Ca > Fe > Zn > Cu > Mn > Pb > Cd > Hg. Examination of the relations between the elements revealed positive correlation coefficients between potassium and sodium (r = 0.70), potassium and magnesium (r = 0.59), and between sodium and magnesium (r = 0.46).
Conclusions. The analysis showed that, depending on the population group of people, ostrich meat can be a valuable source of zinc and iron. The amount of lead, cadmium and mercury in the muscles never exceeded the acceptable levels.

Key words: ostrich meat, macroelements, microelements, toxic elements, PTWI

INTRODUCTION

Ostrich meat is perceived as an alternative for other kinds of meat, beef in particular. It is characterised by high protein, low fat, cholesterol and also calorific value. The meat also has a good profile of fatty acids – the proportion of polyunsaturated fatty acids is significantly higher, than that of broiler chicken meat or beef. The ratio of saturated, monounsaturated and polyunsaturated fatty acids is close to 1:1:1. Most metallic elements e.g. Cu, Mn, Zn, Fe, play an important role in functioning of living organisms, as regulatory factors or as constituents of enzymes. Overaccumulation of toxic or even of essential metals is a frequent cause of disruption of metabolic processes, deterioration of body functions, and in extreme cases, death. Metal contamination of food is virtually unavoidable, the only possible option is trying to minimize the amount of metals ingested.

✉Monika.Rajkowska@zut.edu.pl

The aim of the paper is to determine the amounts of macroelements (K, Na, Mg, Ca), essential microelements (Fe, Mn, Zn, Cu) and the amounts of harmful elements (Pb, Cd, Hg) in the selected ostrich muscles, and to compare these values with the amounts of metals in different kinds of meat. The secondary aim is to assess to what extent ostrich meat can be a source of the selected micro- and macroelements.

MATERIAL AND METHODS

Samples

The research material was obtained from African ostrich (*Struthio camelus*) meat from the Kołczewo ostrich farm in West Pomeranian Voivodeship in Poland. Three cocks and three hens weighing between 70 and 100 kg were slaughtered at the age of 10, 12 and 14 months. From each carcass samples of 11 kinds of muscles (50-100 g) were dissected, packed in PE plastic bags and kept in frozen storage (–20°C) until the start of the analysis.

Analysis

In order to determine the amount of mercury, 5 g ±0.001 g muscle samples were mineralized with 10 ml of concentrated HNO_3 and $HClO_4$ (ratio 4:1). Amounts of other elements were determined by mineralization in a microwave oven (MDS 2000). For this purpose 1 g ±0.001 g of muscles was weighed out on Teflon beakers with an addition of 3 ml of 65% nitric acid (V). Simultaneously, blind tests and certified material Fish paste 2 were mineralized. The number of replicate was three for all types of muscles and certified material. Mercury content was determined through cold vapours technique in Bacharach Coleman Mass 50 mercury analyser. Amounts of other elements were determined by Inductively Coupled Plasma Mass Spectrometry (ICP-MS) in an Elan DRC'e (Perkin Elmer) instrument and are presented in terms of wet weight of tissue ($mg \cdot kg^{-1}$ w.w.). Statistical analysis was carried out using the software Statistica (data analysis software system, version 8.0, StatSoft). Analysis of variance (Anova) and Duncan's test were performed and linear correlation coefficients were calculated. Level of significance $p \leq 0.05$ was accepted for the calculations.

RESULTS AND DISCUSSION

Macroelements

Due to very few publications on the amount of elements in individual ostrich muscles and in muscles of other animals it was generally not possible to relate the achieved results to data provided by different researchers. Statistical analysis showed no substantial influence of the kind of muscle on potassium, calcium or sodium content. Among the selected macroelements K was the most prevalent one, followed by Na, Mg and Ca. Such proportions are also typical of other kinds of meat [Sales and Hayes 1996]. Examination of the relations between the selected macroelements present in the muscles revealed positive correlation coefficients between K and Na ($r = 0.70$), K and Mg ($r = 0.59$), and between Na and Mg ($r = 0.46$). Potassium content (Table 1) in the examined ostrich meat was similar

Table 1. Mean content of selected macro- and microelements in 11 muscles of male and female ostrich, $mg \cdot kg^{-1}$ w.w.

Calculated value	Dry matter, %		K		Mg		Ca		Na		Fe		Zn		Mn		Cu	
	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M
Mean	24.7	24.7	2 705	3 896	201	231	46.5	45.1	476	612	32.3	38.0	22.9	24.7	0.20	0.20	1.25	1.13
±SD	1.7	2.3	697	1 142	37	52	28.7	25.1	201	155	12.5	11.4	10.5	11.8	0.10	0.08	0.50	0.42
Total mean ±SD	24.7 ±2.0		3 286 ±1 111		216 ±51		45.8 ±26.9		542 ±192		35.1 ± 12.3		23.8 ±11.1		0.20 ±0.09		1.20 ±0.47	
CV, %	8.1		33.8		23.6		58.7		35.4		35.0		46.6		45.0		39.2	

F – female (n = 3), M – male (n = 3), CV – variation coefficient.

to the amount obtained in ostrich [Paleari et al. 1998] and in emu meat [Pegg et al. 2006]. Lower amounts of K were observed in chicken meat [Krusiński 2006] and higher in beef [Holland et al. 1991]. The average amount of K in a 100 g portion of examined meat (328.6 mg) constitutes 7% of the recommended daily intake (RDI) which equals 4700 mg per day [EFSA... 2006]. The average amount of magnesium in the examined ostrich meat (Table 1) was similar to the amount obtained by another researchers [Sales and Hayes 1996, Paleari et al. 1998]. Lower amounts of Mg in ostrich meat were observed by Ramos et al. [2009] and marginally higher values were observed by Pegg et al. [2006]. Polidori et al. [2008] examining quality of donkey meat obtained results similar to these presented in this paper. Contrasted with other kinds of meat ostrich meat proved to be poorer in this element than broiler meat [Krusiński 2006]. The *Flexor cruris lateralis* muscle was characterised by a substantially higher magnesium content in comparison with other muscles (Table 2). Recommended daily intake of Mg by human, depending on age, sex and physical condition, does not exceed 420 mg. The result (216 $mg \cdot kg^{-1}$) is therefore up to 27% of the RDI [EFSA... 2006]. The average amount of Ca in the examined ostrich muscles was 46.5 $mg \cdot kg^{-1}$ (Table 1). Similar results were obtained for emu meat [Pegg et al. 2006]. Higher content of this element was observed by others authors [Sales and Hayes 1996, Paleari et al. 1998] and lower by Ramos et al. [2009]. The lowest amount of calcium was found in the *Flexor cruris lateralis* muscle, and the highest in *Gastrocnemius pars externa* (Table 2). The average amount of Ca constitutes between 0.35% and 1.5% of the RDI of this element [EFSA... 2006]. The average amount of sodium in the examined ostrich muscles was 542 $mg \cdot kg^{-1}$ (Table 1). Ostrich meat,

Table 2. Mean content of elements in different ostrich muscles, $mg \cdot kg^{-1}$ w.w.

Muscles	K	Mg	Ca	Na	Fe	Zn	Mn	Cu
M. gastrocnemius pars externa	3 118 ±976^{ab}	206 ±42^{ab}	58.0 ±28.0	555 ±179	33.2 ±15.0^{ab}	29.4 ±9.9^{b}	0.26 ±0.09^{a}	0.96 ±0.26
M. fibularis longus	3 128 ±1 074^{ab}	197 ±24^{b}	46.2 ±30.9	581 ±204	36.5 ±15.8^{ab}	28.0 ±12.7^{b}	0.22 ±0.09^{ab}	1.03 ±0.28
M. gastrocnemius pars interna	3 538 ±793^{ab}	228 ±24^{ab}	50.3 ±31.4	578 ±187	28.1 ±7.2^{a}	30.1 ±10.0^{b}	0.16 ±0.06^{b}	1.27 ±0.78
M. obturatorius medalis	3 057 ±930^{ab}	205 ±38^{ab}	43.3 ±24.7	597 ±201	34.1 ±11.4^{ab}	23.9 ±12.6^{ba}	0.21 ±0.09^{ab}	1.40 ±0.49
M. flexor cruris lateralis	3 734 ±1 157^{ab}	250 ±40^{a}	32.5 ±13.0	558 ±191	38.8 ±17.5^{ab}	16.9 ±11.8^{ac}	0.24 ±0.10^{a}	1.22 ±0.51
M. iliofibularis	3 417 ±1 221^{ab}	199 ±77^{b}	40.6 ±26.2	451 ±187	32.8 ±10.3^{ab}	12.3 ±5.0^{c}	0.16 ±0.10^{b}	1.12 ±0.35
M. iliotibialis lateralis	3 982 ±1 625^{a}	241 ±101^{ab}	51.5 ±34.6	482 ±232	38.4 ±12.1^{ab}	19.4 ±8.0^{ac}	0.21 ±0.06^{ab}	1.23 ±0.42
M. iliofemoralis externus	2 977 ±1 315^{ab}	199 ±42^{b}	43.5 ±28.8	501 ±176	34.0 ±11.7^{ab}	31.5 ±9.4^{b}	0.21 ±0.08^{ab}	1.12 ±0.32
M. iliotibialis cranialis	3 230 ±973^{ab}	222 ±31^{ab}	46.3 ±25.5	618 ±179	37.1 ±8.5^{ab}	21.5 ±4.7^{a}	0.16 ±0.13^{b}	1.24 ±0.84
M. iliofemoralis	3 105 ±1 195^{ab}	235 ±20^{ab}	46.4 ±25.3	505 ±222	41.1 ±14.1^{b}	16.0 ±9.8^{ac}	0.21 ±0.09^{ab}	1.44 ±0.33
M. femorotibialis externus	2 840 ±539^{b}	198 ±40^{b}	41.9 ±23.4	522 ±143	33.9 ±9.5^{ab}	30.5 ±6.6^{b}	0.15 ±0.05^{b}	0.95 ±0.14

Within columns, means with a common superscript are not significantly different ($p \leq 0.05$).

contrasted with other kinds of meat, revealed to have the same amount of Na as donkey meat Polidori et al. [2008], and a lower level of Na than that observed in broiler meat [Makała 2003] and in beef [Krusiński 2006]. The highest amount of Na was found in the *Iliotibialis cranialis* muscle, the lowest in *Iliofibularis* (Table 2). Consumption of 100 g of the examined ostrich meat constitutes, depending on the population group, between 3.6% and 45.2% of the RDI, which is between 120-1500 mg [EFSA... 2006].

Microelements

Microelements, with regard to their amount in ostrich muscles, can be ordered in the following fashion: Fe > Zn > Cu > Mn. The same proportion of elements was found also in ostrich [Sales and Hayes 1996], emu meat [Pegg et al. 2006] and in chicken [Krusiński 2006]. The average amount of iron (Table 1) is comparable to that obtained for ostrich meat [Makała 2003] and for donkey meat [Polidori et al. 2008]. Higher amount of iron was observed in emu meat [Pegg et al. 2006]. A significant difference in iron content was observed between the *Iliofemoralis* muscle (41.1 $mg \cdot kg^{-1}$) and the *Gastrocnemius pars interna* muscle (28.1 $mg \cdot kg^{-1}$). Similar results were obtained by Sales and Hayes [1996]. It was calculated that, depending on the population group, 100 g of the examined meat constitutes Fe between 12% and 58% of the RDI [EFSA... 2006]. The average amount of zinc in the examined material was 23.8 $mg \cdot kg^{-1}$. This amount is comparable to results obtained for ostrich by other researchers [Lombardi-Boccia et al. 2005]. In this research substantial differences in Zn content between various muscles were observed (Table 2). Such differences were also observed between 3 kinds of ostrich muscles [Sales and Hayes 1996]. The European Population Reference Intake (PRI) for Zn for adult males and females is 9.5 mg per day and 7.0 mg per day, respectively. For those groups of population consumption of 100 g of ostrich meat provides 25% and 34%, respectively [EFSA... 2006]. The amount of Mn in the examined samples was 0.20 $mg \cdot kg^{-1}$ (Table 1). Three times higher values were obtained in ostrich meat [Sales and Hayes 1996] as well as in other kinds of poultry meat and in rabbit meat [Hermida et al. 2006] and two times lower than in beef [Krusiński 2006]. The highest amount of Mn was found in the *Gastrocnemius pars externa* muscle, and the lowest in *Femorotibialis externus* (Table 2). In accordance with similar studies [Sales and Hayes 1996] no difference in Mn content between the *Iliofibularis* and *Gastrocnemius pars interna* muscles was observed. Provisional daily dietary manganese intake for adults of 2.0 to 5.0 mg was established by the US National Research Council [1989] and the Scientific Committee for Food of the EU estimated 1-10 mg per day as an acceptable range of intake. The results show that 100 g portion of ostrich meat can achieve to 2% an acceptable range of intake [EFSA... 2006]. The amount of Cu (1.20 $mg \cdot kg^{-1}$) was similar to that obtained in ostrich meat and beef [Sales and Hayes 1996]. Twice as high values are given in emu meat [Pegg et al. 2006]. Lower amount of copper was observed in pork, poultry and rabbit meat [Lombardi-Boccia et al. 2005]. Consumption of 100 g of ostrich meat provides 9.2% for women during lactation, and 13.3% for the remaining population groups [EFSA... 2006].

Toxic elements

In relation to the standards set forth in the Commission Regulations... [2006, 2008] the average Pb, Cd and Hg amounts in the selected ostrich muscles were much lower than the acceptable levels. Majority of the 11 examined muscles showed strong positive correlation between Cd and Pb (r = 0.73-0.89). The average amount of Pb in meat of the examined ostriches was 0.020 $mg \cdot kg^{-1}$ (Table 3). Similar results were obtained for different kinds of beef [Żebrowska-Rasz 1992]. Higher average concentration of lead was observed in roe deer, red deer, wild boar and cattle meat [Michalska and Żmudzki 1992], and in sheep meat [Rudy 2009]. The highest amount of lead was found in the *Gastrocnemius pars externa* muscle, the lowest was observed in the *Obturatorius medialis* and *Iliotibialis lateralis* muscles. The results show that consumption of 100 g of ostrich meat once a week, by a 70 kg man, delivers a maximum dose of Pb equal to 0.1% of the provisional tolerable weekly intake (PTWI) for this element, which is set at 0.025 mg for each kg of body weight [WHO 2008]. The average amount of Cd was 0.004 $mg \cdot kg^{-1}$ (Table 3). Michalska and Żmudzki [1992] observed an average level of Cd in pig and cattle muscles of respectively 0.008 $mg \cdot kg^{-1}$ and 0.007 $mg \cdot kg^{-1}$. In wild boar, roe deer and

Table 3. Mean content of selected toxic metals in 11 muscles of male and female ostrich, mg·kg^{-1} w.w.

Calculated value	Dry matter, %		Pb		Cd		Hg	
	F	M	F	M	F	M	F	M
Mean	24.7	24.7	0.017	0.024	0.003	0.004	0.003	0.002
±SD	1.7	2.3	0.036	0.020	0.003	0.002	0.002	0.002
Mean ±SD	24.7 ±2.0		0.020 ±0.030		0.004 ±0.004		0.002 ±0.002	
CV, %	8.1		150		100		100	

F – female (n = 3), M – male (n = 3), CV – variation coefficient.

red deer muscles these researchers observed amounts of Cd more than four times higher than those in ostrich muscles. High concentration of Cd, in relation to the values revealed in this research, was observed in cattle tissue [Żebrowska-Rasz 1992] and in tissue from animals reared in the areas of brown coal extraction in Poland [Żmudzki et al. 1992]. Twice as low amounts of Cd were observed in veal [Miranda et al. 2001], and in lamb [Jorhem 1999]. Among the 11 examined muscles the highest Cd content was observed in the *Iliotibialis cranialis* muscle and the lowest in the *Obturatorius medialis* and *Iliofemoralis* muscles (Table 4). According to WHO [2008] PTWI for Cd is 0.007 mg for each kg of body weight. A man weighing 70 kg consuming a 100 g portion of ostrich meat once a week ingests about 0.1 % of PTWI for Cd. The average level of Hg (Table 3) was similar to that observed in tissue of reared animals [Żmudzki et al. 1992]. Similar average amounts were observed in cattle [Żebrowska-Rasz 1992] and lower mercury content was found in sheep meat [Rudy 2009]. Among all examined muscles the highest values of mercury was observed in *Gastrocnemius pars externa* (Table 4). With PTWI for this element equal to 0.004 mg·kg^{-1} of body

Table 4. Mean content of toxic metals in different ostrich muscles, mg·kg^{-1} w.w.

Muscles	Pb	Cd	Hg
M. gastrocnemius pars externa	0.031 ±0.015^{a}	0.004 ±0.003^{ab}	0.004 ±0.003^{b}
M. fibularis longus	0.022 ±0.016^{ab}	0.003 ±0.003^{ab}	0.002 ±0.001^{ab}
M. gastrocnemius pars interna	0.016 ±0.023^{ab}	0.003 ±0.002^{a}	0.003 ±0.002^{ab}
M. obturatorius medalis	0.013 ±0.018^{b}	0.002 ±0.001^{a}	0.002 ±0.001^{ab}
M. flexor cruris lateralis	0.021 ±0.019^{ab}	0.003 ±0.001^{ab}	0.003 ±0.002^{ab}
M. iliofibularis	0.014 ±0.016^{ab}	0.004 ±0.005^{ab}	0.003 ±0.002^{b}
M. iliotibialis lateralis	0.013 ±0.014^{b}	0.006 ±0.005^{b}	0.002 ±0.001^{ab}
M. iliofemoralis externus	0.020 ±0.012^{ab}	0.003 ±0.004^{a}	0.002 ±0.001^{a}
M. iliotibialis cranialis	0.016 ±0.014^{ab}	0.007 ±0.007^{b}	0.002 ±0.001^{a}
M. iliofemoralis	0.026 ±0.023^{ab}	0.002 ±0.002^{a}	0.001 ±0.001^{a}
M. femorotibialis externus	0.018 ±0.021^{ab}	0.003 ±0.004^{ab}	0.001 ±0.001^{a}

Within columns, means with a common superscript are not significantly different ($p \leq 0.05$).

weight [WHO 2008], a 70 kg man consuming a 100 g portion of the examined ostrich meat once a week ingests less than 0.1% of PTWI for mercury.

CONCLUSIONS

This research proves that ostrich meat can be a valuable source of zinc, iron, magnesium and copper and a less important source of potassium. This kind of meat does not make a good source of calcium and manganese. None of the analysed muscles revealed to have an amount of lead, cadmium or mercury that exceeds the maximum acceptable standards or PTWI values for these metals.

REFERENCES

Commission Regulation (EC) no. 1881/2006. Setting maximum levels for certain contaminants in foodstuffs. European Commission. 2006. Offic. J. Europ. Union L 364/5, 20.

Commission Regulation (EC) no. 629/2008 amending Regulation (EC) no. 1881/2006 setting maximum levels for certain contaminants in foodstuffs. European Commission. 2008. Offic. J. Europ. Union L 173/6, 4.

EFSA – European Food and Safety Agency (2006). Tolerable intake levels for vitamins and minerals. Report of Scientific Committee on Food – Scientific Panel on Dietetic Products. Nutrition and Allergies. 191-214.

Hermida M., Gonzales M., Miranda M., Rodríguez-Otero J.L., 2006. Mineral analysis in rabbit meat from Galicia (NW Spain). Meat Sci. 73, 635-639.

Holland B., Welch A.A., Unwin I.D., Buss D.H., Paul A.A., Soughtgate D.A.T., 1991. McCance and Widdowson's the composition of foods. Royal Soc. Chem. Minist. Agric. Fish. Food. Richard Clay Bungay, Suffolk.

Jorhem L., 1999. Lead and cadmium in tissues from horse, sheep, lamb and reindeer in Sweden. Z. Lebensm. Unters Forsch. A, 208, 106-109.

Krusiński R., 2006. Ocena walorów dietetycznych mięsa pozyskiwanego od strusia afrykańskiego (*Struthio Camelus*) [Assessment of nutritional value of meat obtained from african ostrich (*Struthio Camelus*)]. Ann. Univ. Mariae Curie-Skłodowska Sect. EE 24, 377-382 [in Polish].

Lombardi-Boccia G., Lanzi S., Aguzzi A., 2005. Aspects of meat quality: trace elements and B vitamins in raw and cooked meats. J. Food Campos. Anal. 18, 39-46.

Makała H., 2003. Mięso strusia – nowy surowiec w przetwórstwie mięsa [Ostrich meat – a new material in meat processing]. Gosp. Mięsna 9, 28-31 [in Polish].

Michalska K., Żmudzki J., 1992. Zawartość metali w tkankach dzików, saren i jeleni w regionie wielkopolskim [The metal content in tissues of wild boar, roe deer and red deer in the region of Wielkopolska]. Med. Weter. 48 (4), 160-162 [in Polish].

Miranda M., López-Alonso M., Castillo C., Hernández J., Benedito J.L., 2001. Cadmium levels in liver, kidney and meat in calves from Asturias (North Spain). Eur. Food Res. Technol. 212, 426-430.

National Research Council, 1989. Recommended dietary allowances. National Acad. Press Washington.

Paleari M.A., Camisasca S., Beretta G., Renon P., Corsico P., Bertolo G., Crivelli G., 1998. Ostrich meat: physico-chemical characteristics and comparison with turkey and bovine meat. Meat Sci. 48 (3/4), 205-210.

Pegg R.B., Amarowicz R., Code W.E., 2006. Nutritional characteristics of emu (*Dromaius novaehollandiae*) meat and its value-added products. Food Chem. 97, 193-202.

Polidori P., Vincenzetti S., Cavallucci C., Beghelli D., 2008. Quality of donkey meat and carcass characteristics. Meat Sci. 80, 1222-1224.

Ramos A., Cabrera M.C., del Puerto M., Saadoun A., 2009. Minerals, haem and non-haem iron contents of rhea meat. Meat Sci. 81, 116-119.

Rudy M., 2009. The analysis of correlations between the age and the level of bioaccumulation of heavy metals in tissues and the chemical composition of sheep meat from the region in SE Poland. Food Chem. Toxicol. 47, 1117-1122.

Sales J., Hayes J.P., 1996. Proximate, amino acid and mineral composition of ostrich meat. Food Chem. 56 (2), 167-170.

WHO, 2008. Guidelines for drinking-water quality. Incorporating the first and second addenda. WHO Press, World Health Organ. Geneva, 103.

Żebrowska-Rasz H., 1992. Zanieczyszczenia chemiczne w tkankach zwierząt i żywności pochodzenia zwierzęcego [Chemical contaminants in tissues of animals and food of animal origin]. Przegl. Hod. 10, 1-5 [in Polish].

Żmudzki J., Juszkiewicz T., Niewiadomska A., Szkoda J., Semeniuk S., Gołębiowski A., Szyposzyński K., 1992. Chemiczne skażenia bydła, mleka i jaj w regionie zgorzelecko-bogatyńskim [Chemical contamination of cattle, milk and eggs in the region zgorzelecko-bogatyńskim]. Med. Weter. 48 (5), 213-215 [in Polish].

MIĘSO STRUSIA AFRYKAŃSKIEGO (*STRUTHIO CAMELUS*) JAKO ŹRÓDŁO PIERWIASTKÓW NIEZBĘDNYCH I TOKSYCZNYCH W DIECIE CZŁOWIEKA

STRESZCZENIE

Wstęp. Zanieczyszczenie żywności metalami jest praktycznie nieuniknione, jedyną możliwą opcją jest dążenie do minimalizowania ich ilości. Celem badań było określenie zawartości wybranych makroelementów i mikroelementów, a także szkodliwych metali w wybranych mięśniach strusi. Celem pracy była również ocena udziału mięsa strusi w zaspokajaniu zapotrzebowania człowieka na wybrane pierwiastki.
Materiał i metody. Materiałem do badań były mięśnie strusi, pozyskane z fermy w Kołczewie. W celu oznaczenia zawartości rtęci, mięśnie mineralizowano w mieszaninie kwasów HNO_3 i $HClO_4$, po czym oznaczono metodą CV-AAS. W analizie pozostałych metali materiał mineralizowano w piecu mikrofalowym z dodatkiem HNO_3. Zawartość Pb i Cd oznaczono metodą GF-AAS, a pozostałe metale metodą ICP-AES. Uzyskane wyniki poddano analizie statystycznej.
Wyniki. Pierwiastki, w odniesieniu do średniej ich zawartości w mięśniach strusi, można uszeregować w następujący sposób: K > Na > Mg > Ca > Fe > Zn > Cu > Mn > Pb > Cd > Hg. Analiza statystyczna wykazała dodatnie zależności pomiędzy potasem i sodem (r = 0,70), potasem i magnezem (r = 0,59) oraz sodem i magnezem (r = 0,46).
Wnioski. Przeprowadzone badania wykazały, że w zależności od populacji ludzi mięso strusia może być cennym źródłem cynku i żelaza oraz nie stanowi zagrożenia pod względem zawartości metali toksycznych. W żadnym przypadku ilość ołowiu, kadmu i rtęci nie przekroczyła dopuszczalnych norm.

Słowa kluczowe: mięso strusia, makroelementy, mikroelementy, pierwiastki toksyczne, PTWI

Received – Przyjęto: 9.05.2012 Accepted for print – Zaakceptowano do druku: 26.06.2012

For citation – Do cytowania

Rajkowska M., Pokorska K., Protasowicki M., Żych A., 2012. African ostrich (*Struthio camelus*) meat as a source of essential and toxic elements in a human diet. Acta Sci. Pol., Technol. Aliment. 11(4), 373-379.