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SHORT REPORT

Cholesterol content and fatty acid composition of two fat depots from slaughter ostriches (S*truthio camelus*) aged 14 months

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The cholesterol content differed (P<0.05) between breast (49.5 mg/100 g) and back (74.3 mg/100 g) fat. Differences (P<0.05) in individual fatty acids were found especially for arachidonic acid (20:4). High contents of 18:2, 18:3 and 20:4 from both depots suggest, that ostrich fat could be a source of essential fatty acids in human and animal diets. The influence of various factors and especially feeding regimen on quantity and quality of ostrich fat should further be investigated.

KEY WORDS: cholesterol / fat / fatty acids / ostrich / slaughter

In the recent years the number of slaughter ostriches has been globally increasing. With rising demand for prime products such as dietetic meat and highly valued skin the ostrich industry started to utilize ostrich minor products, especially fat. This includes the oil rendered from fat and used in cosmetics [Sales and Franken 1999]. Moreover, food industry uses ostrich fat as an ingredient of value-added products for humans, as well as a supplement to pet food, mainly for dogs and cats.

Fat in the *Ratitae* (ostrich, emu, rhea) carcass is situated in specific depots in abdomen, on breast, and on back [Sales *et al*. 1999]. Recently Horbańczuk *et al*. [2003] reported on cholesterol content and fatty acids profile of breast fat obtained from ostrich females culled at the age of five years. Since our knowledge about the quality of ostrich fat [Gunstone and Russell 1954, Sales and Franken 1999] is still limited, an attempt was made at obtaining information on the cholesterol and fatty acids content of two fat depots in ostriches slaughtered at the age of 14 months.

Material and methods

Ostriches were reared on a farm at Stypułów, near Zielona Góra, Poland according to EU standards [Horbańczuk 2002] and slaughtered at the commercial abattoir. Up to the end of month 4 of age the birds were fed pelleted diet (2% of body weight) containing 16% crude protein and 9.7 MJ/kg ME, and 14.5% crude protein and 9,5MJ/kg ME from month 5. Ostriches had a limited access to grass over spring to late autumn (approx. 1 kg/bird/day) and were offered hay in winter (approx. 0.1 kg/bird/day). Samples were collected from breast and back fat depots, approximately 15 g from each region from each bird, of six male ostriches randomly chosen from a group slaughtered at the age of 14 months.

The fat samples were immediately vacuum-packed into plastic bags and then stored at -20°C until analysed. Analytical procedures were identical with those applied earlier for breast fat depot of culled ostrich females slaughtered at the age of 5 years [Horbańczuk *et al*. 2003].

Cholesterol content was presented in mg/100g adipose tissue, while individual fatty acids as per cent of their sum. The results were evaluated statistically using one-way model of GLM procedure of SAS [1991].

Results and discussion

The cholesterol content and fatty acid composition of ostrich fat depots from breast and back regions are shown in Table 1. The cholesterol content differed ($P<0.05$) between breast and back fat. Moreover the cholesterol content of 49.5 mg/100 g found in the fat from breast region differed markedly from 80.0 mg/100 g reported earlier for the same region by Horbańczuk *et al*. [2003]. The difference amounting to 30.5 mg/100 g tissue was clearly caused by age at slaughter (14 months *vs* 5 years) and sex of birds (males *vs* females). The value given in this report for ostrich back fat appears

Table 1. Means and their standard deviations (SD) for cholesterol and fatty acid composition of back and breast fat depots from ostriches aged 14 months (n=6)

Item	Back fat		Breast fat		Difference significant at P≤
	mean	SD	mean	SD	
Cholesterol (mg/100 g)	74.33	13.49	49.50	5.61	0.01
Fatty acids (% of total fatty acids)					
saturated (SFA)					
3:0	0.16	0.04	0.23	0.05	0.05
4:0	0.01	0.01	0.04	0.01	0.001
6:0	0.14	0.08	0.34	0.22	ns
8:0	0.04	0.02	0.05	0.02	ns
10:0	0.24	0.08	0.20	0.08	ns
12:0	0.08	0.01	0.07	0.01	ns
14:0	4.02	0.66	2.27	0.35	
16:0	25.93	1.47	27.11	1.36	ns
17:0	0.027	0.01	0.02	0.00	ns
18:0	1.50	0.36	1.45	0.28	ns
total SFA	32.15	1.53	31.78	1.49	ns
monounsaturated (MUFA)					
12:1	0.03	0.01	0.03	0.01	ns
14:1	0.09	0.02	0.07	0.02	ns
16:1	4.38	1.40	4.48	0.77	ns
18:1	28.33	4.67	25.02	4.01	ns
total MUFA	32.83	5.90	29.60	3.47	ns
polyunsaturated (PUFA)					
18:2	10.09	1.61	10.58	1.54	ns
18:3	16.75	4.89	22.17	4.43	ns
20:3	0.03	0.01	0.13	0.03	0.001
20:4	8.06	1.37	5.67	0.70	0.01
total PUFA	35.01	5.93	38.62	2.98	ns
PUFA/SFA	1.09	0.20	1.22	0.10	ns

higher, and for breast fat lower, than those quoted by Mandigo [1991] for chicken and porcine fat (65 mg and 70 mg/100 g tissue, respectively).

The inter-region differences ($P<0.05$) in individal fatty acids share were found especially for arachidonic acid (20:4), which together with 18:2 (linoleic) and 18:3 (linolenic) dominated within the polyunsaturated fatty acids (PUFA). A sum of monounsaturated fatty acids (MUFA) did not differ significantly between breast and back fat, but was by 18-20 per cent points lower than those reported for chicken fat by Balcerak [2003]. On the other hand, the sum of PUFA was found higher than that reported for chicken abdominal fat (20.8%) by Balcerak [2003] and geese (9.83%) by Borys *et al*. [1999].

Even though the inter-species differences in the fatty acid profile are considerable, it is generally known, that amount and composition of animal fat is affected by nutrition [e.g. Lopez-Ferrer *et al*. [1999]. In their study 8% vegetable oils (rapeseed, soybean,

sunflower, linseed) were added to broiler diets and fed throughout the whole 35-day growth period. Although the PUFA increased considerably (up to 24.0% with rapeseed oil and up to 46.7% with soybean oil), the share of arachidonic acid remained low, ranging from 0.15 to 0.23%. Similarly, low values for 20:4 have been reported in broiler chickens by Balcerak [2003]. It may suggest, that despite a possible increase of PUFA in the abdominal fat of broiler chickens an ability to increase the content of desirable fatty acids is limited. Does that mean the ostrich is an exception?

In conclusion, ostrich fat depot especially from breast regions is characterized by low level of cholesterol as compared to fat from the chicken or geese. The high proportion of PUFA may suggest, that fat from ostriches could be a good source of essential fatty acids, which can be incorporated by the food industry into human or pet diets.

According to the authors' observations one slaughter bird can supply as much as 14-16 kg fat (usually 5-6 kg). Therefore, the effect of age, sex and especially feeding on quantity and quality of ostrich fat should be investigated.

REFERENCES

1. BALCERAK H., 2003 – Wpływ intensywności wzrostu brojlerów na skład tuszki i wybrane wskaźniki technologiczne (The influence of growth intensity of broilers on carcass quality and certain technological indicators). Ph.D Thesis. In Polish. Warsaw Agricultural University, pp.1-82.
2. BORYS B., PAKULSKA E., BORYS A., 2001 – Effect of feeding method and strain of White Kołuda geese on some health quality parameters of meat and abdominal fat. ***Polish Journal of Food and Nutrition Sciences*** 10/51 (3), 49-53.
3. GUNSTONE F.D, RUSSELL W.C, 1954 – Animal fats. 3. The component acids of ostrich fat. ***Biochemical Journal*** 57, 459-461.
4. HORBAŃCZUK J.O., 2002 – The Ostrich. Published by European Ostrich Group, Denmark.
5. HORBAŃCZUK J.O., COOPER R.G., JÓŹWIK A., KLEWIEC J., KRZYŻEWSKI J., MALECKI I., CHYLIŃSKI W., WÓJCIK A., KAWKA M., 2003 – Cholesterol content and fatty acids composition of fat from culled breeding ostriches (Struthio camelus). ***Animal Science Papers and Reports*** 21 (4) 271-275.
6. LOPEZ-FERRER S., BAUCELLS M.S., BARROETA A.C., GRASHORN M.A., 1999 – Influence of vegetable oil sources on quality parameters of broiler meat. ***Archiv für Geflügelkunde*** 63 (1), 29-35.
7. MANDIGO R.W., 1991 – Meat processing: modification of processed meat. In: Fat and cholesterol reduced foods (Chuck Haberstroh and Charles E.Morris, Eds). Portfolio Publishing Company,The Woodlands, Texas, USA 119-131.
8. SALES J., FRANKEN L.R, 1999 – Ostrich fat. ***Australian Ostrich Association Journal*** 37, 39-45.
9. SALES J., HORBAŃCZUK J.O., DINGLE J., COLEMAN R., SENSIK S., 1999 – Carcase characteristics of emus (Dromaius novaehollandiae). ***British Poultry Science*** 40, 145-147.
10. SAS, 1991 – User's Guide, Statistics, version 5 edition. SAS Institute, Inc., Cary, NC.

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Poziom cholesterolu i skład kwasów tłuszczowych w tłuszczu z dwóch okolic ciała strusi rzeźnych ubitych w wieku 14 miesięcy

S t r e s z c z e n i e

Pod względem poziomu cholesterolu tłuszcz z okolicy mostka różnił się od tłuszczu pochodzącego z grzbietu (odpowiednio 49,5 i 74,5 mg/100 g, P<0,05). W zawartości kwasu arachidonowego (20:4) wystąpiła różnica (P<0,01) na korzyść tłuszczu grzbietowego. Wysoka zawartość 18:2, 18:3 i 20:4 w tłuszczu z obu okolic wskazuje, że tłuszcz podskórny strusi może być źródłem niezbędnych kwasów tłuszczowych w diecie ludzi i zwierząt. Potrzebne są dalsze badania wpływu czynników środowiskowych, a zwłaszcza żywienia na ilość i jakość tłuszczu pozyskiwanego od strusi rzeźnych.