Original Research

Chemical Composition of Lipids Isolated from Selected Organs and Tissues of the Raccoon Dog (*Nyctereutes procyonoides*)

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Abstract

Our paper presents a qualitative analysis of particular lipid classes (phospholipids, triacylglycerols, cholesterol, free fatty acids) isolated from the tissues of raccoon dogs harvested in northeastern Poland. In all examined tissues (except for the liver) the dominant group of lipids were triacylglycerols. The amounts of lipids representing the other classes depended on the kind of tissue from which the fat was isolated. The concentration of phospholipids was 0.7% in subcutaneous tissue and 41.7% in the liver, cholesterol content ranged between 0.6 and 4.8%, while the amount of fee fatty acids varied from 0.3% in subcutaneous tissue to 5.1% in the liver. Fat deposited in different body parts of the raccoon dog is generally uniform with regard to FA composition. Particular attention should be paid to the presence of trans-octadecenoic acids in the tissues of raccoon dogs, since these acids are commonly found in ruminants and herbivores.

Keywords: raccoon dog, lipids, fatty acids, chemical composition of lipids

Introduction

The raccoon dog is the only canid to go into torpor through the cold months, and the smallest predator of the canidae family living in Poland. Since the very beginning raccoon dogs have been treated in Poland as alien and unwelcome. The Hunting Act of 1959 defined the raccoon dog as a game animal for which there is no close season. Due to their high reproductive potential, ability to quickly invade new areas and secretive behavior, raccoon dogs have colonized the areas located within the temperate zone in Europe, where they are often referred to as an "alien from another planet."

Raccoon dogs are carnivores. Their diet consists of mice, voles, insects, small invertebrates, carrion, birds and eggs laid in ground nests as well as a variety of vegetable food (fruits, maize seeds), consumed primarily in the autumn [1]. The composition of the diet of these animals was found to depend on habitat (Table 1).

According to numerous authors, the raccoon dog is an attractive model for lipid research as the species shows pronounced autumnal fattening and natural weight loss in the winter and spring [15-17]. However, raccoon dogs do not

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go into a deep sleep in the winter – they wake easily during the spring thaw. Asikainen et al. (2005) have demonstrated that different wintertime feeding regimes have no impact on the plasma glucose, total protein, cortisol, estradiol, progesterone or testosterone levels, or on the reproductive success of the raccoon dog, which indicates versatile adaptive capacity of the species. Changes were only observed in the concentrations of lipids used for restoring energy reserves. Mustonen et al. (2007) have postulated that the patterns of deposition and distribution of white adipose tissue (WAT) fatty acids are selective, seasonal and dependent on their molecular structure. The present study was supposed to provide new insights into those important and interesting problems.

Materials and Methods

The experimental materials consisted of samples of depot adipose tissue (subcutaneous white adipose tissue – taken in the abdominal area, leaf fat), internal adipose tissue (perirenal, periintestinal), muscular tissue (thigh muscle, tenderloin) and internal organs (kidneys, liver), collected from four adult raccoon dogs in good health, harvested in the autumn (at the end of October) in northeastern Poland (Masurian Lakeland). Prior to lipid extraction the samples were stored at -75ºC. All raccoon dogs were shot by hunters. The approximate age of the animals was determined based on the number of winter cement layers analyzed in the cross-sectional view of the root of a canine tooth.

Reagents

The following reagents were used: chloroform (Chempur), methanol, hexane, isopropanol, ethylene acetate, boron (III) fluoride BF_3 in methanol (Merck), diethyl ether, acetic acid, methylene chloride, ethanol (POCh S.A.), sodium chloride NaCl and sodium hydroxide NaOH (Standard Ltd.), anhydrous sodium sulfate Na_2SO_4 (Eurochem BGD Ltd.), as well as a mixture of standards: Supelco 37 Component (Supelco), Mixture ME 62, Mixture ME 64 and Mixture ME 81 (Larodan, Fine Chemicals).

Analytical Procedure

Total lipids extraction: Fat was isolated from the tissues of raccoon dogs by a method proposed by Folch [4].

Quantitative analysis of lipid classes: The isolated fat was divided into lipid classes, i.e. phospholipids (PLs), free fatty acids (FFAs), triacylglycerols (TAGs), cholesterol (CH) and cholesterol esters (CEs) by the SPE technique, on Bakerbond® amine columns (500 mg), as described by Kałużny et al. [2]. The proportions of particular lipid classes in the analyzed samples were determined on a weight basis. The composition of eluted fractions was confirmed by TLC.

Analysis of fatty acids. Total lipids were converted into methyl esters of fatty acids (FAMEs), in accordance with the European Standard EN:ISO 5509:2000. FAMEs were separated based on the length of a hydrocarbon chain and the degree of unsaturation, by gas chromatography GC [5], using a Hewlett-Packard gas chromatograph with a split/splitless injector (split mode, split ratio 1:100) and a flame-ionization detector (FID), on a Rtx 2330 column (100 m, 0.25 mm, Restek, Bellefonte, Pennsylvania, USA). A qualitative and quantitative analysis of fatty acids was performed using standard FAME solutions (Supelco Bellefonte, Pennsylvania, USA; Larodan Fine Chemicals, Malmö, Sweden).

Table 1. Composition of the diet of raccoon dogs in different areas of northeastern Poland (% of biomass) [1].

Food	Biebrza river valley				Białowieza forest*	
	spring	summer	autumn	winter	spring & summer	autumn & winter
Insectivorous animals	1.1	4.4	0.9	2.0	6.8	4.6
Rodents	81.8	82.1	73.1	95.6	6.8	11.0
Hares	10.3	2.0	-	-	-	-
Predatory mammals	-	-	8.0	-	-	-
Carrion of hoofed mammals	1.4	+	1.2	1.6	28.6	56.1
Birds	0.8	10.8	1.0	0.2	13.0	1.5
Pejors	4.4	0.3	2.4	-	-	0.6
Amphibians	-	-	0.5	0.2	21.9	16.2
Invertebrates	+	0.1	0.4	+	12.9	5.7
Plants	0.2	0.3	12.5	0.1	5.2	3.9
Σ biomass (g)	2750	1150	1526	5184	2374	12880

Symbols + - trace; * - Jędrzejewska and Jędrzejewski [6].

Results and Discussion

The tissues of raccoon dogs harvested in the autumn contained 2.35 to 81.67% of fat (Fig. 1). The largest amount of fat was isolated from depot adipose tissue, i.e. from subcutaneous tissue and leaf fat (76.8 and 81.7% of tissue weight, respectively). The lipid content of perirenal tissue was also high (78.5% of tissue weight). In the other analyzed internal tissues surrounding internal organs (periintestinal tissue), fat accounted for 42.6%. In the kidneys and liver fat made up 7.7 and 2.4% of tissue weight, respectively. An equally low fat content was recorded in the muscular tissues of raccoon dogs: 6.7% in tenderloin and 3.1% in thigh muscle.

Concentrations of Lipids Representing Particular Classes

The concentrations of lipids representing particular classes depended on the type and function of tissue from which they were extracted (Table 2). The main lipid fraction in the depot adipose tissues of raccoon dogs were TAGs, accounting for 83.5% of subcutaneous tissue lipids, 72.4% of leaf fat and 54.2% of periintestinal fat. Fat used as an additional source of energy is deposited as TAGs. Cholesterol esters (CEs) accounted for 10 to over 13% of lipids contained in depot adipose tissues. The cholesterol (C) content of these tissues is about 3% of lipid weight. Phospholipids (PLs) made up almost 10% of lipids in periintestinal tissue. In the remaining depot adipose tissues, PL levels oscillated around 1%.

TAGs constituted the main fraction also in muscular tissue lipids (tenderloin) and kidney lipids (74.2 and 58.9% of lipid weight), followed by phospholipids (11.2 and 22.3%). PLs constituted the main fraction (almost 42%) only in the liver, where blood plasma phospholipids are produced. The levels of TAGs and CEs in the livers of raccoon dogs were high, exceeding 22%, because the liver is the most active tissue in which lipid digestion or metabolism takes place, including the synthesis of phospholipids indispensable for the production of bile components and for the synthesis of VLDL (very low density lipoprotein cholesterol). Fat tissues accumulate depot fat. In contrast to the liver, the content of phospholipids and CE in depot fat is very low, and they can be found practically only in the membranes of adipocytes.

In the lipids of the analyzed tissues, cholesterol (CH) accounted for 4.8% (kidneys) to 6% (muscular tissue). The concentrations of free fatty acids (FFAs) in the tissues of raccoon dogs were relatively low, from about 0.3% of the lipids of subcutaneous adipose tissue to 5.1% of liver lipids.

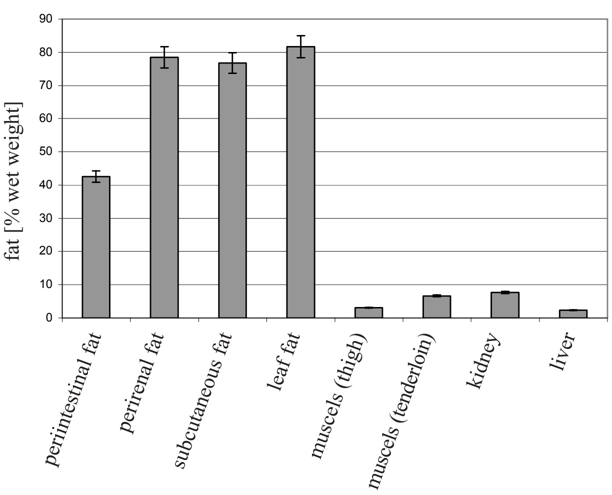

Fig. 1. Lipid content of particular depot adipose tissues, muscular tissue, kidney and liver of the raccoon dog Nyctereutes procyonoides (% of wet weight).

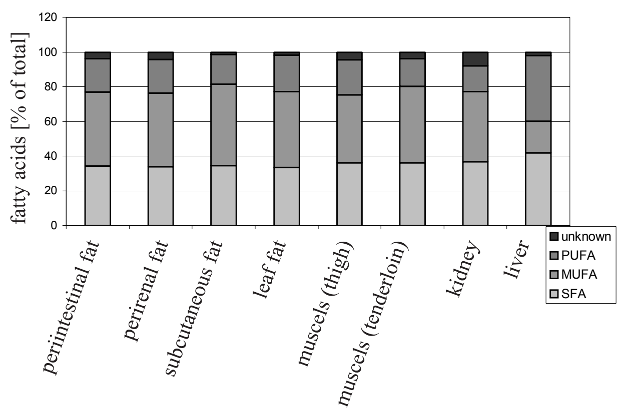

Fig. 2. Fatty acid classes in lipids isolated from particular tissues of the raccoon dog (% of total content).

Table 2. Content of lipid classes in fat isolated from particular tissues of raccoon (m±SD [mg/100mg fat from tissues]).

	TG	PL	CE	CH	FFA
Subcutaneous fat	83.5±7.5	0.7±0.1	10.7±1.5	3.7±0.4	0.3±0.1
Leaf fat	72.4±1.3	0.8±0.2	13.6±1.4	2.9±0.3	1.2±0.5
Perintestinal fat	54.2±1.8	9.6±0.6	13.4±2.5	2.4±0.8	1.4±0.2
Tenderloin	74.2±2.3	11.2±0.4	3.0±1.1	0.6±0.1	2.6±0.2
Kidney	58.9±12.9	22.3±7.2	7.1±1.3	4.8±0.7	3.9±0.8
Liver	22.6±3.3	41.7±11.2	22.5±5.3	0.8±0.1	5.1±0.7

Fatty Acid Composition of the Tissues of Raccoon Dogs

In the livers of raccoon dogs the concentrations of saturated fatty acids (SFAs), monounsaturated fatty acids (MUFAs) and polyunsaturated fatty acids (PUFAs) were 41.89%, 18.28% and 37.94% of total FA content, respectively. Kidney fat contained 36.69% of SFAs, 40.54% of MUFAs and 14.86% of PUFAs. In lipids isolated from the other investigated tissues, i.e. from depot adipose tissue (leaf fat, subcutaneous fat), internal adipose tissue (periintestinal and perirenal tissue) and muscular tissue (thigh, tenderloin), the levels of particular FA groups were comparable (Fig. 2).

Saturated Fatty Acids (SFAs)

Saturated fatty acids in lipids isolated from the tissues of raccoon dogs had 12 (lauric acid) to 18 (stearic acid) carbon atoms (Table 3). The highest proportion of SFAs was reported in lipids isolated from the liver - 41.89% of total FAs, including almost 22.5% of stearic acid (C 18:0) and over 17% of palmitic acid (C 16:0). SFAs in lipids isolated from the remaining tissues were dominated by palmitic acid (C16:0), whose mean concentration ranged from 20.43% in periintestinal tissue to 24.88% in kidney fat. This is in agreement with the palmitic acid content of adipose tissue in the majority of mammals. In lipids of porcine depot adipose tissue palmitic acid accounts for nearly 24% of total FAs, while in lipids of adipose tissue of the grey wolf, a relative of the raccoon dog, for 21.6% (Table 5).

The second most abundant saturated fatty acid was stearic acid (C18:0), which made up 7% of total FAs in the kidneys, over 11% in the thigh muscle and over 8% in lipids of subcutaneous adipose tissue. For comparison, pork fat contains over 12% of stearic acid, whereas the concentration of this acid in subcutaneous depot adipose tissue of the wolf is as high as 16.9%. The third most abundant saturated fatty acid was myristic acid (C14:0), whose level varied from 2.40% of total FAs (thigh muscle) to nearly 3.50% (subcutaneous fat). However, the myristic acid content of liver lipids was as low as 0.8%. The results obtained with respect to the percentage of SFAs in the lipids of subcutaneous adipose tissue (34.54%) are close to those reported by Käkelä et al. [7[(36.63% - mean value for tissues of the dorsal upper layer, dorsal inner layer and inguinal layer).

Monounsaturated Fatty Acids (MUFAs)

Lipids isolated from the tissues of raccoon dogs contained about 43% of monounsaturated fatty acids, except for kidney and liver lipids, where MUFAs accounted for 40.5 and 18.3% of total FAs, respectively. MUFAs were dominated by oleic acid (C 18:1 n-9) whose concentration ranged from about 27% of total FAs in the thigh muscle to almost 36% in subcutaneous fat. The oleic acid content of liver lipids was lower at 12.1%. High levels of oleic acid are characteristic of animal fats. This acid accounts for over 35% of total FAs in subcutaneous depot fat of the wolf [9] and for over 42.6% in pork fat.

The second most abundant monounsaturated fatty acid found in fat isolated from tissues of raccoon dogs was palmitoleic acid (16:1 n-7) whose average proportion in total FAs was around 5.5% in almost all analyzed tissues (from 5% in thigh muscle fat to 6.45% in leaf fat), except for liver fat, where it accounted for 1.8% only (Table 3). These values are relatively high for animal adipose tissues. Lipids isolated from the subcutaneous depot adipose tissues of the pig and wolf contain only about 1% and 3.5% of palmitoleic acid, respectively.

Particular attention should be paid to the presence of trans isomers of C 18:1 acids, primarily of C 18:1 n-7t (18:1 11t, vaccenic acid), in the tissues of the raccoon dog, since these acids are commonly found in ruminants and herbivores. Animal tissues very rarely contain trans fatty acids. The only exceptions are vaccenic (trans-11-octadecenoic C18:1 n-7t) acid, elaidic acid (C18:1 n-9t) and conjugated linoleic acid (CLA) with a structure of octadecadienoic acid whose double bonds are conjugated (e.g. cis-9-trans-11-octadecadienoic acid or trans-7-cis-9-octadecadienoic acid), found in the tissues and milk of ruminants. The presence of trans isomers in the tissues of ruminants is a consequence of bio-hydrogenation of PUFAs (linoleic acid, LA and α-linolenic acid, ALA) supplied in food, caused by the specific bacterial flora in the rumen [8]. Vaccenic acid concentration in the tissues of ruminants is 2 to 5% of total FAs [7].

In our study, trans-11-octadecenoic acid content varied from 0.29% in thigh muscle lipids to 0.40% in periintestinal fat. The remaining trans-octadecenoic acid constituted from 0.12% of total FAs in the liver to 0.24% in leaf fat. Among wild non-ruminants, trans-octadecenoic acids (at a concentration of approximately 3%) were found in the tissues of Canadians beavers, i.e. strictly herbivorous animals [7]. Raccoon dogs are generally carnivores, but they also eat vegetable food. Trans isomerases have not been described from the digestive tract of the raccoon dog to date, so the occurrence of trans fatty acids in the tissues of this animal seems quite unusual. It is possible that the source of the above enzymes are prey animals eaten by raccoon dogs. Further studies are needed to analyze microflora composition in the digestive tract of these animals, and to determine the origin of trans-octadecenoic fatty acids in their tissues.

The proportion of the remaining polyunsaturated fatty acids was low, and it varied between 0.1 and 1.2%, depending on the kind of tissue from which lipids were isolated.

Our results concerning the concentrations of Σ MUFAs in the subcutaneous tissues of the raccoon dog (46.94%) correspond to those obtained by Finnish researchers [7, 17] (45.93% and 45.9% respectively). Unfortunately, other data regarding the fatty acid composition of raccoon dog's tissues cannot be compared with the findings of the cited authors since fat samples were collected at different sites of the body.

Polyunsaturated Fatty Acids (PUFAs)

PUFA concentrations in lipids isolated from depot adipose tissue (subcutaneous, leaf fat), internal adipose tissue (perirenal, periintestinal) and muscular tissue (thigh muscle, tenderloin) were comparable, and ranged from 16.04 to 21.01% of total FAs (Table 3). The PUFA content of lipids isolated from the kidneys was lower – only 14.86% of total FAs. This shows that the contribution of this group of fatty acids to the total FA content of the analyzed tissues was the lowest. Only in liver lipids PUFAs were the second most abundant FA group (37.94%), with a distinct domination of n-6 fatty acids (27.61% of total FAs) over n-3 fatty acids (9.70%). In lipids isolated from the adipose and muscular tissues of raccoon dogs the concentrations of n-6 and n-3 fatty acids we re 10.22 to 15.39% and 4.35 to 7.28% of total

Table 3. Fatty acid composition of particular tissues of raccoon dogs dwelling in northeastern Poland.

Fatty Acids	RSD [%]	Perintestinal fat	Perirenal fat	Subcutaneous fat	Leaf fat	Thigh	Tenderloin	Liver	Kidney
C 12:0	2.75	0.24	0.28	0.24	0.24	0.24	0.24	0.06	0.25
C 14:0	3.15	2.98	3.08	3.45	3.23	2.41	3.00	0.80	0.59
C 15:0	8.08	0.30	0.31	0.34	0.34	0.23	0.31	0.26	0.28
C 16:0	2.31	20.43	20.44	21.96	20.72	21.60	22.83	17.53	24.88
C 17:0	5.18	0.57	0.65	0.39	0.52	0.60	0.54	0.79	0.64
C 18:0	3.51	9.70	9.14	8.16	8.46	11.10	9.24	22.47	8.04
Σ SFA		**34.23**	**33.90**	**34.54**	**33.50**	**36.18**	**36.16**	**41.89**	**36.69**
C 14:1n-5	6.32	0.41	0.47	0.44	0.30	0.30	0.49	0.10	0.82
s. C 15: 1n-6	5.28	0.13	0.29	0.17	0.26	1.17	0.35	0.06	1.73
C 16:1 n-7	7.85	5.68	5.91	6.46	6.45	5.00	6.05	1.84	5.48
s. C 17:1n-8	9.33	0.38	0.53	0.42	0.43	1.24	0.63	0.61	1.11
C 18:1 n-7t	5.81	0.39	0.37	0.30	0.35	0.29	0.34	0.32	0.30
Another C 18:1 t	3.32	0.21	0.25	0.13	0.24	0.18	0.18	0.12	0.16
C 18:1 n-9	3.17	32.32	31.28	35.96	32.68	27.02	32.44	12.08	26.28
C 18:1 n-7	6.60	2.80	2.95	2.79	2.72	3.67	3.27	3.07	3.43
C 20:1 n-9	8.87	0.29	0.43	0.27	0.28	0.28	0.27	0.08	0.24
C 22:1 n-9	9.02	0.02	0.07	0.09	0.06	0.12	0.12	0.52	5.18
Σ MUFA		**42.61**	**42.48**	**46.94**	**43.72**	**39.15**	**44.02**	**18.28**	**40.54**
C 18:2n-6	2.39	8.95	8.77	7.75	8.83	9.76	8.05	10.21	6.95
C 20:3n-6	8.12	0.29	0.31	0.25	1.47	0.31	0.26	0.92	0.18
C 20:4n-6	9.35	2.18	2.23	1.61	2.20	4.50	2.22	13.84	4.04
C 22:4n-6	10.51	0.02	0.04	0.05	0.07	0.05	0.05	0.00	0.04
C 22:5n-6	9.05	0.35	0.28	0.56	0.65	0.75	0.52	2.64	0.26
Σ PUFA (n-6)		**11.79**	**11.63**	**10.22**	**13.23**	**15.39**	**11.09**	**27.61**	**11.47**
C 18:3n-3	7.38	3.95	4.04	3.49	4.12	2.00	2.71	1.91	1.59
C 20:3n-3	8.57	0.23	0.25	0.18	0.20	0.14	0.09	0.10	0.16
C 20:5n-3	8.00	0.65	0.75	1.08	0.76	0.57	0.45	1.40	0.48
C 22:5n-3	7.19	1.12	1.19	0.92	1.11	0.86	0.67	3.21	0.43
C 22:6n-3	6.05	1.05	1.07	0.81	1.08	0.79	0.57	3.08	0.45
Σ PUFAn-3		**7.00**	**7.29**	**6.47**	**7.28**	**4.35**	**4.49**	**9.70**	**3.11**
C 20:2n-9	7.72	0,53	0,57	0.43	0.50	0.46	0.46	0.63	0.28
Σ PUFA		**19,32**	**19,49**	**17.12**	**21.01**	**20.20**	**16.04**	**37.94**	**14.86**

FAs, respectively. The fatty acid composition of adipose tissue may reflect the animal's diet, especially in cases when energy intake is substantially overloaded. In contrast to non-hibernating animals, hibernating animals accumulate more unsaturated FAs, because during hibernation their body temperature is substantially decreased (to save energy). Fats that have a higher degree of unsaturated FAs have lower melting points. Thus, fat solidification may be avoided. The FA composition of depot fat may depend on the climatic conditions under which animals live.

Lipids of the investigated adipose and muscular tissues were similar with regard to the levels of both n-3 and n-6 fatty acids. n-6 fatty acids were dominated by linoleic acid (LA, C18:2 n-6) which accounted for 7.75 (subcutaneous fat) to 9.76% (tenderloin) of total FA composition. The reported results are consistent with reference data [7, 17]. For comparison, the subcutaneous tissue of the wolf contains only 3.3% of LA. The lipids of these tissues contained 1.61 to 4.50% of arachidonic acid (AA, C20:4 n-6). In liver lipids LA and AA made up 10.21% and 13.84% of total FAs. Such a high AA content of liver lipids seems to be characteristic of raccoon dogs. In other mammals, including wild ones like the mink or fox (similar to the raccoon dog with respect to the mode of life, though they do not hibernate), AA concentration in liver lipids is as low as 1 to 4% of total FAs (Table 5). The liver lipids of the muskrat (mostly herbivorous, but feeding also on snails, bivalves or carrion) have an equally high content of this fatty acid – approximately 11%.

The percentages of the other identified n-6 fatty acids, i.e. dihomo-γ-linolenic acid (DGLA, 20:3), eicosapentaenoic acid (EPA, 20:5) docosatetraenoic acid (22:4) and docosapentaenoic acid (DPA, 22:5), in lipids isolated from the tissues of raccoon dogs did not exceed 0.8% of total FAs (the only exception was n-6 22:5 acid which accounted for over 2.6% in liver lipids). α-linolenic acid (ALA, n-3 C18:3) dominated among n-3 fatty acids, constituting 2.00 (thigh muscle fat) to 4.12% (leaf fat) of the FA composition of lipids isolated from adipose and muscular tissues, and only 1.59 to 1.91% in lipids of the analyzed internal organs of raccoon dogs. Liver lipids contained as much as 3.21% of docosapentaenoic acid (DPA, 22:5) and 3.08% of docosahexaenoic acid (DHA, 22:6). In the remaining tissues of raccoon dogs, examined in this experiment, the concentrations of DPA and DHA ranged from 0.43 (kidneys) to 1.19% (perirenal fat), and from 0.45 (kidneys) to 1.08% (leaf fat) of total FAs, respectively.

Table 4. Concentrations of selected fatty acids in the depot subcutaneous tissue of the grey wolf, pig and raccoon dog (% of total FA).

Fatty acids	Grey wolf [1]	Pork fat	Raccoon dog
12:00	-	0.10	0.24
14:00	2.80	2.14	3.45
16:00	21.60	23.90	21.96
18:00	16.90	12.41	8.16
16:1 n-7	3.50	1.06	6.46
18:1 n-9	35.50	42.63	35.96
18:2 n-6	3.30	4.46	7.75
20:3 n-6	0.10	tr.	0.25
20:4 n-6	0.40	0.39	1.61
18:3 n-3	2.50	0.22	3.49
22:5 n-3	0.40	tr.	0.92

[1] Käkelä and Hyvärinen [7]

Table 5. Concentrations of selected fatty acids in the liver fat of the sheep, blue fox, mink, muskrat and raccoon dog (% of total FAs).

FA	Sheep [1]	Blue fox [2]	Mink [2]	Muskrat [3]	Raccoon dog	Badger [4]
14:00	0.6	0.3	0.4	0.3	0.8	0.74
16:00	15.7	15.1	20.0	20.9	17.5	13.18
16:1 n-7	2.3	4.6	6.7	0.4	1.8	0.49
18:00	21.0	22.4	6.8	20.5	22.5	22.98
18:1n-9	20.6	14.1	21.2	7.3	12.1	8.88
18:2 n-6 LA	3.6	5.1	5.1	18.2	10.2	8.89
18:3n-3 ALA	3.3	-	-	2.7	1.9	1.10
20:4 n-6	2.7	3.7	1.0	10.9	13.8	16.60
20:5 n-3	3.3	6.2	2.1	0.7	1.4	2.28
22:5 n-3	4.6	1.7	0.7	1.0	3.2	7.98
22:6 n-3	3.6	9.7	4.6	6.9	3.1	0.80

[1] Ensen et al. [10]
[2] Ahlstrom and Skrede [11]
[3] Käkelä and Hyvärinen [7]
[4] Zalewski et al. [13]

Conclusions

Available literature provides no detailed information on the lipid composition of tissues of the raccoon dog. This paper is the first one to present the fatty acid composition of lipids isolated from different tissues of male raccoon dogs harvested in northeastern Poland. It also contains preliminary data on the content of lipids representing particular classes within the analyzed tissues.

In all investigated tissues the dominant group of lipids were triacylglycerols (from 54.2% to 83.5% of lipid weight). The only exception was the liver, where TAGs accounted for 22.6% of total lipids. The amounts of lipids of the other classes differed considerably, depending on the kind of tissue from which the fat was isolated: PLs - 0.7 to 41.7%, CEs - 3.0 to 22.5%, CH - 0.6 to 4.8%, and FFAs - 0.3 to 5.1%.

Adipose tissue (subcutaneous, leaf fat, perirenal, periintestinal) and muscular tissue (thigh muscle, tenderloin) were comparable in respect to FA composition, including the concentrations of particular FA groups, i.e. SFAs, MUFAs and PUFAs, as well as particular FAs. Fat deposited in different body parts of the raccoon dog is generally uniform with regard to FA composition. Fat isolated from the internal organs of raccoon dogs is characterized by a different FA composition. This concerns particularly liver fat, which differs significantly from the other tissues in the content of both FA groups (domination of PUFAs, a much lower proportion of MUFAs) and individual FAs, since it contains much larger amounts of stearic acid (18:0) and highly unsaturated fatty acids: arachidonic acid (AA, n-6 20:4), docosapentaenoic acid (DPA, n-6 22:5), docosapentaenoic acid (DPA, n-3 22:5) and docosahexaenoic acid (DHA, n-6 22:6).

Fat isolated from the tissues of raccoon dogs has a relatively high concentration of PUFAs (LA, AA, ALA), compared with the tissues of animals closely related to the raccoon dog, e.g. the grey wolf.

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