FATTY ACID COMPONENT OF DIFFERENT BLUBBER OIL OF FINLESS PORPOISE

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ABSTRACT

This paper describes the fatty acid components of oils contained in different blubbers of Finless porpoise, *Neophocaena phocaenoides*. The sample oils were almost entirely triglycerides, but contained only trace amouts of sterols and sterolesters.

The fatty acid components of oils extracted from different blubbers of Finless porpoise contained chiefly $C_{16:1}$ (38.39–48.89%), $C_{14:0}$ (9.00–13.92%), $C_{14:1}$ (8.75–12.36%) and $C_{16:0}$ acids (7.22–11.80%). Although the proportion of fatty acid components contained in this experimental Finless porpoise deviated slightly from other dolphins and porpoises, and also was only a low level of *iso*-valeric acid which was comparatively much in dolphin and porpoise oil, the distribution pattern was comparable to those of dolphin and porpoise as reported by others.

INTRODUCTION

In the previous paper (Tsuyuki and Itoh, 1969), we reported that the blubber oil of an adult Finless porpoise consisted of 26 kinds of fatty acids with 8 to 22 carbon atoms, including mainly $C_{16:1}$ and $C_{18:1}$ acids.

This paper is concerned with the fatty acid components and distribution patterns of oils extracted from different part of a newly-born Finless poroise, *Neophocaena phocaenoides*, who was caught off the coast of Kawasaki, Kanagawa Prefecture, Japan, in June 1973. The mammal was a female with the size of 71.5 cm in length and 6.15 kg in weight.

We are much indebted to Dr. Toshio Kasuya who presented us the blubbers of Finless black porpoise.

MATERIAL AND METHODS

The sample oils were extracted from five different blubbers of the Finless porpoise by a high-speed blending with chloroform/methanol (2/1, v/v). The blubbers were front part of blow hole, dorsal part, thoracic part, tail part and dorsal fin. The properties of extracted oils are shown in Table 1. The sample oils were developed in thin layer chromatography on 0.25 mm thick layers of silicic acid

(Wakogel B-5, Wako-Junyaku-Kogyo) with pertroleum ether-ethyl ether-glacial acetic acid (90/10/1, v/v/v). Each blubber oil consisted of almost triglycerides respectively, having trace amount of cholesterols and cholesterolesters.

TABLE 1. PROPERTIES OF DIFFERENT BLUBBER OILS OF FINLESS PORPOISE.

Blubbers	Front of blow hole	Dorsal	Thoracic	Tail	Dorsal fin
Appearance (at 30°C)	Yellowish liquid	Yellowish liquid	Yellowish liquid	Whitish liquid	Whitish liquid
Oil content (%)	30.0	46.7	42.2	19.4	5.3
Refractive index (at 40°C)	1.4546	1.4596	1.4586	1.4592	1.4597
Acid value	0.54	0.89	0.95	0.61	0.55
Iodine value (Wijs)	60.8	71.4	68.8	77.8	84.1
Saponification value	213.4	220.4	221.4	225.5	224.3
Unsaponifiables (%)	1.49	0.83	0.64	1.44	0.37

Gas liquid chromatography (GLC) was conducted with a Shimadzu Instrument, Model 4PTF, using 267 cm × 3.0 mm id glass column packed with 5% diethyleneglycol succinate (DEGS) on 80–100 mesh Chromosorb W (AW, DMCS) and a hydrogen ionization detector. Shortchain components were resolved thermally at column temperature programming the range of 70–190°C, 4°C per minute. Long-chain components were analyzed at column temterature of 205°C isothermally. The fatty acid methyl esters of sample oils were esterified by BF_3-methanol reagent according to the method of Metcalfe *et al* (1966). The methyl esters were purified by thin layer chromatography in petroleum ether-ethyl ether-glacial acetic acid (90/10/1, v/v/v) at low temperature and nitrogen atmosphere to prevent losses of short-chain components. The GLC peaks were identified by the use of pure standards (Apllied Science Laboratories, Inc.) and polyunsaturated component peaks were identified by the difference between GLC patterns before and after hydrogenation with platinum black reagent at the regular intervals. All fatty acid peaks obtained on chromatogram were reported as weight percentages of total known fatty acids presented by the method of Magidman *et al.* (1962).

RESULTS AND DISCUSSION

The fatty acid components of different blubber oils in this Finless porpoise are listed in Table 2. The five different blubber oils have 44 kinds of fatty acids with the range of 8 to 22 carbon atoms, and the fatty acid components and distributions of those oils are entirely to be the same pattern. The most prominent fatty acids in different blubber oils are 38.39% to 48.89% of $C_{16:1}$ acid; 9.00% to 13.92% of $C_{14:0}$ acid; 8.75% to 12.36% of $C_{14:1}$ acid; 7.22% to 11.80% of $C_{16:0}$ acid; 4.67% to 6.46% of $C_{18:1}$ acid, respectively. The total percentages of the above metnioned five fatty acids in all fatty acids are respectively 77.26% of front blubber of blow hole, 87.35% of dorsal blubber, 85.51% of thoracic blubber, 83.33% of tail blubber and 82.39% of dorsal fin blubber. The percentages of total saturated acids vary

TABLE 2. FATTY ACID COMPONENT OF DIFFERENT BLUBBER OILS OF FINLESS PORPOISE.

Fatty acids	Blubbers				
	Front of blow hole	Dorsal	Thoracic	Tail	Dorsal fin
Saturated					
Iso 5:0	2.55	1.07	0.71	0.46	2.30
6:0	0.24	0.16	0.13	0.30	0.45
8:0	0.29	0.26	0.31	0.37	0.32
Iso 10:0	0.14	trace	trace	0.09	0.04
10:0	0.85	0.49	0.57	0.41	0.31
Iso 11:0	0.04	trace	trace	0.05	0.03
11:0	0.25	0.12	0.11	0.16	0.14
Iso 12:0	0.70	0.25	0.27	0.31	0.24
12:0	3.14	2.15	2.24	1.81	1.53
Iso 13:0	0.47	0.08	0.12	0.21	0.28
13:0	0.15	0.01	0.08	0.07	0.08
Iso 14:0	0.98	0.28	0.34	0.53	0.43
14:0	13.85	12.89	13.92	10.77	9.00
Iso 15:0	2.46	1.15	1.55	2.13	1.70
15:0	0.53	0.29	0.51	0.45	0.48
Iso 16:0	2.44	0.70	0.89	1.47	1.15
16:0	11.31	10.33	11.80	8.16	7.22
17:0	0.34	0.27	0.42	0.34	0.38
18:0	0.02	0.12	0.13	0.10	0.09
20:0	0.02	0.04	0.02	0.03	0.01
Total saturated	40.77	30.67	34.12	28.22	26.18
Monounsaturated					
6:1	0.52	0.32	0.29	0.43	0.77
8:1	0.08	0.09	trace	0.22	0.07
10:1	0.51	0.66	0.76	0.69	0.67
12:1	0.89	0.70	0.75	0.92	0.91
14:1	8.75	10.57	10.35	12.15	12.36
16:1	38.39	48.89	44.72	46.80	47.35
18:1	4.96	4.67	4.72	5.45	6.46
20:1	0.07	0.08	0.05	0.07	0.08
22:1	0.05	0.04	0.04	0.08	0.08
Total monounsaturated	54.22	66.02	61.68	66.81	68.75
Polyunsaturated					
12:2	0.53	0.51	0.55	0.65	0.73
14:2	1.75	0.47	0.94	1.11	1.01
16:2	0.32	0.14	0.31	0.24	0.29
16:3	0.22	0.26	0.44	0.28	0.24
18:2	0.99	0.83	0.81	1.09	1.36
18:3	0.23	0.29	0.30	0.44	0.42
18:4	0.05	0.03	0.03	0.04	0.04
20:2	0.09	0.06	0.09	0.10	0.10
20:3	0.18	0.17	0.15	0.28	0.19
20:4	0.17	0.13	0.11	0.19	0.15
20:5	0.08	0.05	0.07	0.06	0.05
22:2	0.02	0.02	0.02	0.05	0.04
22:3	0.06	0.02	0.08	0.04	0.07
22:5	0.11	0.15	0.12	0.14	0.14
22:6	0.21	0.18	0.18	0.26	0.24
Total polyunsaturated	5.01	3.31	4.20	4.97	5.07
	100.00	100.00	100.00	100.00	100.00

from 26.18% to 40.77% and similarly those of total unsaturated acids vary from 59.23% to 73.82%. Among the saturated acids, $C_{16:0}$ and $C_{14:0}$ acids are the main constituents in those oils. The proportions of fatty acids with more than 20 carbon atoms and the range of 6 to 8 carbon atoms have very small amounts.

In comparison with the previous study (Tsuyuki and Itoh, 1969), the most prominent fatty acids of the blubber oil in previous work were 26.9% of $C_{16:1}$, 20.4% of $C_{18:1}$ and 8.4% of $C_{14:0}$ acids. Among those fatty acids, $C_{18:1}$ acid is notably different to this experimental blubber oils which contained 4.67% to 6.46%. $C_{16:1}$ and $C_{14:0}$ acids of the former oil were reversely lower amounts than 38.39% to 48.89% and 8.75% to 12.36% of the latter oils respectively. The ratio of total saturated acids *vs* total unsaturated acids in the latter oils somewhat close to that of the former oil. The latter oils contained proportionately larger amounts of short-chain length acids than the former oil, but the levels of $C_{22:5}$ and $C_{22:6}$ acids of poly-unsaturated acid were found to be the lower levels than those ($C_{22:5}$ 3.9%, $C_{22:6}$ 5.3%) of the former oil. Although the fatty acid proportion in the oils of the newly-born Finless porpoise in this study and the adult Finless black porpoise in the previous study had thus difference, there were obviously a similar pattern in the fattly acid distribution.

On the other hand, the proportion and distribution of the fatty acid component in this experimental dolphin oil are assumed to be nearly similar to the results of a number of studies in other dolphin oils as reported by others, but isovaleric acid from 0.46% to 2.55% in this study was comparatively small amount for the reason that the sample was blubber tissue.

SUMMURY

1. The properties and fatty acid components of oils contained in different blubbers of Finless black porpoise, *Neophocaena phocaenoids*, have been studied.

2. The fatty acid components chiefly consisted of $C_{14:0}$, $C_{14:1}$, $C_{16:0}$, $C_{16:1}$ and $C_{18:1}$ acids in different blubber oils.

3. The fatty acid distributtion patterns in different bubber oils were almost similar to each other.

4. The Finless black porpoise oil had the fatty acid pattern which was characteristic of dolphin and porpoise oil.

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