# Animal Fats

## 5. THE COMPONENT ACIDS OF CHIMPANZEE FAT*

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Earlier papers in this series have dealt with the component acids of fats from several animals, and the present paper is concerned with chimpanzee fat, which does not appear to have been examined previously.

## EXPERIMENTAL

The crude material obtained (540 g.) was autoclaved at 120° and extracted as previously described (Gunstone & Russell, 1954*a*) yielding a solid fat (465 g.) of iodine value 58·1, saponification equivalent 280·1, and free acid 18·9% (as oleic). The mixed acids obtained on hydrolysis had iodine value 60·5 and equivalent 270·7.

These acids were separated into three fractions by crystallization from methanol at −55 to −60° and subsequent recrystallization of the insoluble portion at −20°. Each fraction was then esterified and distilled and the ester fractions examined as described in the earlier papers of this series. The results are given in Tables 1 and 2.

Myristic acid (m.p. 51–53°), palmitic acid (m.p. 61–63°), and stearic acid (m.p. 69–71°) were isolated from appropriate fractions and the presence of hexadec-9-enoic, oleic, and linoleic acid confirmed by the preparation of 9:10-dihydroxypalmitic (m.p. 124–126°), 9:10-dihydroxystearic (m.p. 128–131°) and 9:10:12:13-tetrabromostearic acid (m.p. 112–113°) respectively. No hexabromostearic acid was obtained, confirming the absence of linolenic acid. (All these samples gave no depression of m.p. when mixed with an authentic specimen.)

## DISCUSSION

In Table 3 the results obtained in the present work are compared with those obtained for other herbivorous animals for the $C_{16}$ and $C_{18}$ acids only, the fats being listed in order of their iodine value. These figures clearly show that as the iodine value rises

* Paper 4 of this series: Gunstone, F. D. & Russell, W. C. (1954*b*).

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Table 1. *Low-temperature crystallization of chimpanzee fatty acids*

| Fraction | Acids | | | Esters | |
|---|---|---|---|---|---|
| | Wt. (g.) | % (w/w) | Iodine value | Iodine value | Sapon. equiv. |
| *A* Insoluble at −20° | 64·6 | 35·8 | 3·0 | 2·5 | 275·9 |
| *B* Soluble at −20°, insoluble at −55° | 74·9 | 41·5 | 83·0 | 79·3 | 292·2 |
| *C* Soluble at −55° | 40·9 | 22·7 | 111·1 | 104·0 | — |

Table 2. *Component acids of chimpanzee fat*

All values except in last column are % (w/w) of total.

| | Fraction | | | Total | % (wt.)‡ | % (mol.)‡ |
|---|---|---|---|---|---|---|
| | *A* | *B* | *C* | | | |
| Lauric | — | — | 0·37 | 0·37 | 0·4 | 0·5 |
| Myristic | 0·66 | 1·05 | 0·68 | 2·39 | 2·4 | 2·8 |
| Palmitic | 27·10 | 2·42 | 0·21 | 29·73 | 29·8 | 31·4 |
| Stearic | 6·75 | — | — | 6·75 | 6·8 | 6·4 |
| Arachidic | 0·17 | — | — | 0·17 | 0·2 | 0·2 |
| Dodecenoic | — | — | 0·32 | 0·32 | 0·3 | 0·4 |
| Tetradecenoic | — | 0·10 | 0·72 | 0·82 | 0·8 | 1·0 |
| Hexadecenoic | 0·05 | 1·59 | 3·33 | 4·97 | 5·0 | 5·3 |
| Hexadecadienoic | — | — | 0·15 | 0·15 | 0·1 | 0·2 |
| Octadecenoic | 1·02 | 35·77 | 7·60 | 44·39 | 44·5 | 42·6 |
| Octadecadienoic | — | 0·50 | 7·44 | 7·94 | 8·0 | 7·7 |
| As eicosenoic§ | — | — | 1·67 | 1·67 | 1·7 | 1·5 |
| Unsaponifiable | 0·05 | 0·07 | 0·21 | 0·33 | — | — |

‡ Excluding unsaponifiable material.
§ Includes all unsaturated acids higher than $C_{18}$ (average unsaturation −2·0 H).

Table 3. *Component acids of some herbivorous animal fats*

All values are % (w/w).

| | Iodine value | Saturated | | Unsaturated | | | | Total saturated | Total $C_{18}$ acids |
|---|---|---|---|---|---|---|---|---|---|
| | | $C_{16}$ | $C_{18}$ | $C_{16}$ (−2·0 H) | $C_{18}$ (−2·0 H) | $C_{18}$ (−4·0 H) | $C_{18}$ (−6·0 H) | | |
| Camel[1] | 35·1 | 29 | 27 | 3 | 26 | 2 | 1 | 64 | 56 |
| Deer[1] | 35·5 | 25 | 35 | 3 | 25 | 3 | 3 | 66 | 66 |
| Ox[2] | 43·2 | 29 | 21 | 3 | 41 | 2 | — | 54 | 64 |
| Sheep[3] | 43·4 | 25 | 28 | 1 | 37 | 6 | — | 56 | 71 |
| Sheep[3] | 49·1 | 28 | 16 | 1 | 47 | 4 | — | 47 | 67 |
| Kangaroo[4] | 50·1 | 26 | 14 | 3 | 45 | 3 | — | 47 | 62 |
| Pig[5] | 54·3 | 30 | 16 | 3 | 41 | 7 | — | 47 | 64 |
| Chimpanzee | 58·1 | 30 | 7 | 5 | 45 | 8 | — | 40 | 60 |
| Pig[5] | 60·0 | 28 | 12 | 3 | 48 | 6 | — | 41 | 66 |
| Giant Panda[4] | 64·8 | 26 | 7 | 4 | 45 | 12 | — | 38 | 64 |

[1] Gunstone & Paton (1953); [2] Hilditch & Longenecker (1937); [3] Hilditch & Pedelty (1941); [4] Hilditch, Sime & Maddison (1942); [5] Hilditch, Lea & Pedelty (1939).

(35–65) the total content of saturated acids falls steadily (65–40 %). This is entirely due to the decreasing amount of stearic acid (35–7 %), the content of palmitic acid being constant (25–30 %) throughout the range (cf. Banks & Hilditch, 1931). The total amount of $C_{18}$ acids also remains fairly constant (60–70 %) for as the iodine value rises the decrease in stearic acid is balanced by an increase in the amount of oleic acid and, in the higher range of iodine value (55–65), by the appearance of larger amounts of octadecadienoic acid.

The values obtained for this sample of chimpanzee fat fit well into this general scheme.

## SUMMARY

Chimpanzee fat contains palmitic (30 %) and oleic acid (45 %) as major components with octadecadienoic (8 %), stearic (7 %), and hexadecenoic acid (5 %) as the most important minor component acids. It is similar to fats of similar iodine value from other herbivorous animals.

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## 6. THE COMPONENT ACIDS OF TIGER FAT AND OF PUMA FAT

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This communication is concerned with the component acids of tiger fat (*Felix tigeris*) and of puma fat (*F. concolor*). Despite the fact that the composition of fats from these animals has already been reported (for references, see Table 5) it was considered of interest to examine the samples available in view of their higher iodine value.

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## EXPERIMENTAL

These two fat samples were obtained through the kindness of Professor T. F. Hewer from animals which had died in Bristol Zoological Gardens. One sample was taken from the subcutaneous region of the groin of a 14-month-old male tiger, whilst the other came from the abdominal wall, the mesentery, and the omentum of an 11-year-old female puma which had been reared in captivity in this country. Both animals were fed on a mixture of raw cow and horse