POSSIBILITIES FOR COMPLEX USE LIVER OIL OF SOME SPECIES OF SHARKS

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The specific chemical composition of oils from the livers of some shark species makes the direct usage of these oils for the human consumption or technical purposes impossible in many cases.

The reason for it lies in high content of unsaponifiable matter, which in this case contains mainly squalen, 6 — unsaturated hydrocarbon, being used as an antioxidant or after its polymerisation, as the watch — fat.

In this work there were carried out two independent sets of experimental squalen separations from the liver of shark *Lepidorhinus squamosus*. The characteristic of such oil were as follows.

Table 1

The characteristic of shark oil

Iodine value	295	Iodine value of unsaponifiable matter	313.5
Acid value	0.56	Contents of squalen in unsaponifiable matter	93.6%
Unsaponifiable matter	77.9%	Contents of cholesterol in unsaponifiable matter	traces

The squalen isolation by saponifying of oils. 500 grs of examined oil, after its cold saponifying with 2N alcoholic solution of potassium hydroxide, was centrifuged in "Westphalia" type centrifuge at 3000 rpm at the temperature of 30°. As result of this operation 278 grs of squalen were obtained.

The purity of squalen received was controlled by thin layer chromatography on silica gel in following solvent systems:

1) in n-hexane.

The results were compared with the pattern obtained with samples of squalen from Buchs and Merck companies.

No differences were observed. Using the same solvent system the effectivness of the water purification of the squalen was also tested.

On the next figure the chromatogram of centrifuged sample of soap has been presented, it shows that one step centrifuging doesn't remove all squalen from this sample.

2) For additional control of the squalen fraction investigated, and the soap fraction, also the third solvent system was used, which consisted of the following mixture: petroleum ether with ethyl ether and acetic acid, in ratio: of 60 : 40 : 0,1, respectively.

The results obtained are presented in Fig. 4.

In the second part of this work, the squalen has been isolation by thermal crystallization of shark oil.

The thermal crystallization of the shark oil at the temperature 0°, —10° and —20° has been carried out, in order to investigate the possibility to obtain the unchanged glyceride fraction along with the squalen fraction.

The Table 2 shows the increase of the unsaponifiable matter content in liquid fractions obtained by means of the crystallization. The composition of the fatty acids fraction was evaluated (Table 3).

Table 2

Characteristic of obtained liquid fractions

Crystallization temperature	Liquid fraction (%)	Unsaponifiable matter (%)	Jodine value
0°	97.5	79.0	240.1
—10°	85.0	85.4	267.7
—20°	55.0	90.4	282.4

Table 3

The composition of fatty acids of triglycerides in solid and liquid fractions (%)

Fatty acids	Oil	Solid fraction			Liquid fraction		
		0°	—10°	—20°	0°	—10°	—20°
Saturated	21.2	27.8	25.0	22.6	20.6	25.0	22.6
Monounsaturated (total)	52.8	50.8	54.5	56.7	56.3	54.5	56.7
$C_{22:1}$	8.8	8.8	8.9	9.1	8.8	8.9	9.1
$C_{22:5}$ and $C_{22:16}$	6.4	3.1	5.1	7.8	3.1	5.1	7.8

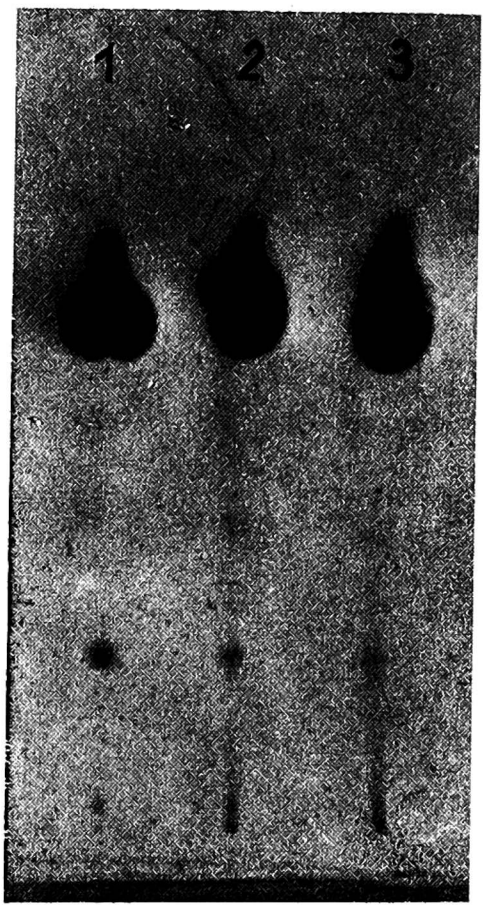


Fig. 1. Chromatogram (TLC) in *n*-heksane: 1 — squalen obtained, 2 — squalen from Buchs, 3 — squalen from Merck

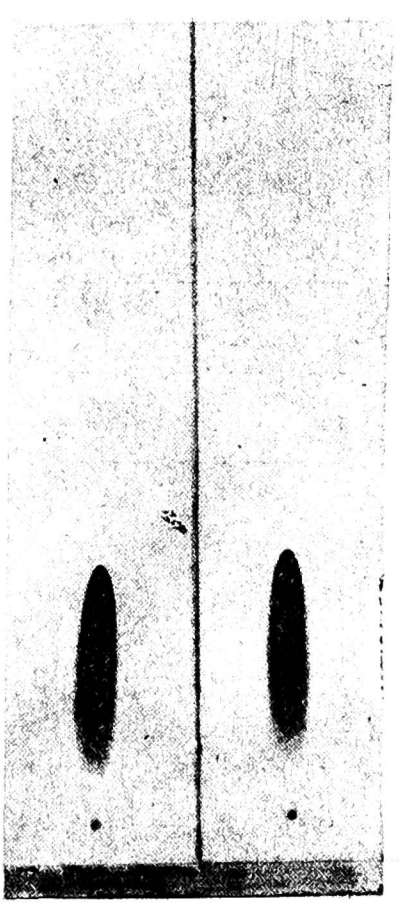
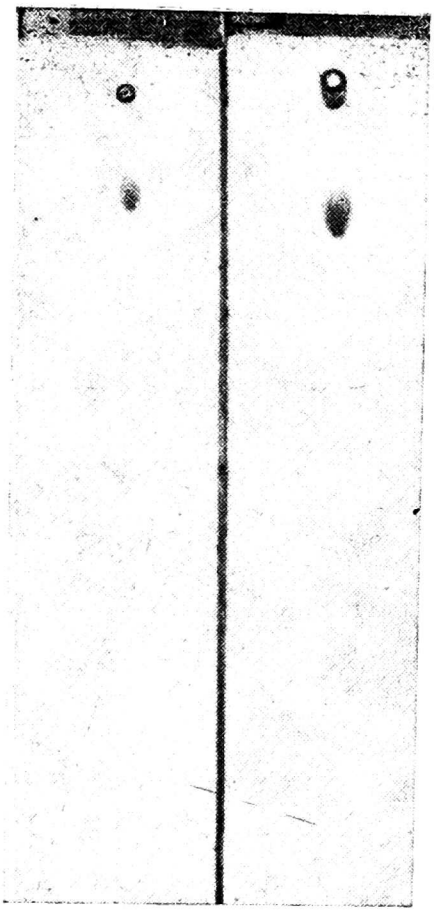


Fig. 2. Chromatogram in n-heksane sample of the squalen before and after purification process

Fig. 3. Chromatogram centrifuged sample of soap before and after purification process



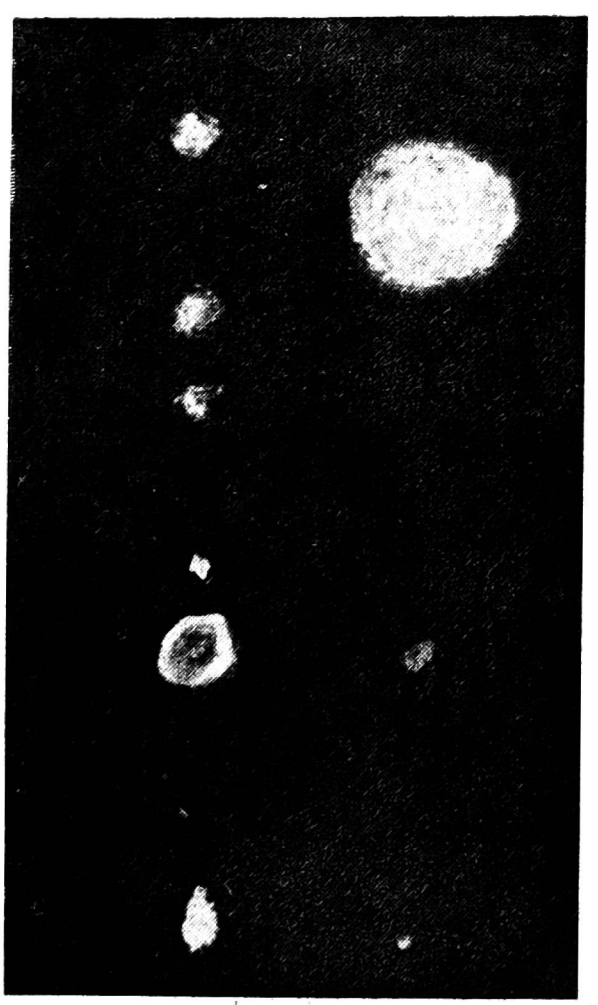


Fig. 4. Chromatogram soap and squalen fraction in mixture petroleum ether with ethyl ether and acetic acid in ratio of 60 : 40 : 0.1 respectively

CONCLUSIONS

The results given above prove that the thermal crystallization method doesn't enable the complets separation of the unsaponifiable matter from the triglycerides. The relatively small quantity of triglycerides (approx. 20%) remains disolved in the squalen fraction and can't be removed even by using of very low crystallization temperatures.

As the result of the oil crystallization two fractions has been obtained: the first, solid one, amounting to 45% of the oil and containing 61.7% of the unsaponifiable matter and the second, liquid one (55.0% of the oil) with 91.4% of the unsaponifiable matter. The obtained at —20° very rich in squalen liquid fraction may be considered as its concentrate. The advantage of the crystallization method lies in the omission of the drastic treatment of the squalen, very sensitive to the oxidation (6 double bonds).

REFERENCES

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MOŻLIWOŚCI WYKORZYSTANIA OLEJU WĄTROBY NIEKTÓRYCH GATUNKÓW REKINÓW

Streszczenie

Olej wątroby niektórych gatunków rekinów zawiera duże ilości substancji niezmydlających się, zwłaszcza węglowodorów, które są przede wszystkim reprezentowane przez skwalen. Oleje te nie mogą być bezpośrednio użyte ani w przemyśle spożywczym, jak również do produkcji mydeł i detergentów.

Przeprowadzono dwie próby przygotowania tego surowca do wykorzystania na skalę przemysłową, a mianowicie:

a) po zmydleniu badanego oleju w warunkach zachowawczych, odseparowano drogą wirowania frakcję substancji niezmydlających się od roztworu mydeł. Przeprowadzona kontrola (drogą chromatografii cienkowarstwowej) wykazała wysoką czystość frakcji skwalenowej oraz niedużą zawartość substancji niezmydlających się w roztworze mydeł.

b) olej rekina krystalizowano w temp. 0°, —10° i —20°. Wykazano, iż tą drogą nie można otrzymać pełnej izolacji skwalenu od trójglicerydów, a jedynie zwiększenie koncentracji tego węglowodoru w frakcjach płynnych. Otrzymany produkt można traktować jako koncentrat skwalenu.

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ВОЗМОЖНОСТИ ИСПОЛЬЗОВАНИЯ МАСЛА ПЕЧЕНИ НЕКОТОРЫХ ВИДОВ АКУЛ

Резюме

Масло печени некоторых видов акул содержит большие количества неомыляющихся веществ, особенно углеводов, среди которых на первое место выдвигается сквален. Эти масла не могут непосредственно использовываться ни в пищевой промышленности, ни в производстве мыл и детергентов.

Былипроведены две пробы подготовки указанного сырья для использования в промышленном масштабе, в частности:

а) после омыления исследуемого масла в сохранительных условиях отделяли путем центрифугирования фракцию неомыляющихся веществ от раствора мыл. Проведенный контроль (путем тонкослойной хроматографии) показал высокую чистоту скваленовой фракции и небольшое содержание неомыляющихся веществ в растворе мыл,

б) акуловое масло кристаллизировали в температуре 0°, —10° и —20°. Установлено, что этим способом не можно обеспечить полной изоляции сквалена от триглицеридов, а лишь можно повысить концентрацию этого углевода в жидких фракциях. Полученный продукт можно считать концентратом сквалена.