

SHARK LIVER OIL.*

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As part of our investigation of fish liver oils as sources of Vitamins A and D we have examined the liver oils from a number of species of shark. The commercial samples have generally proved to be not only very poor in taste and color but, with one exception, inferior to cod liver oil in Vitamin A content. Estimation of Vitamin A was made colorimetrically by the antimony trichloride method, using a biologically assayed cod liver oil for comparison, and these data together with those of free fatty acid and unsaponifiable matter, are listed in

TABLE I.—COMMERCIAL OILS.

Species of Shark.	% F. F. A.	% Unsaponifiable.	Estimated Vitamin A.
1. Dusky	0.088	2.71	645
2. Leopard	0.186	11.41	410
3. Nurse	0.059	2.79	905
4. Sawfish	0.079	4.85	168
5. Sun	0.079	5.95	4500-6000

Lack of care in the rendering of these oils may easily account for low vitamin content as well as the highly unsatisfactory odor and taste. We therefore prepared a number of oils from fresh livers, using careful, anaerobic technique in order to obtain oils with their full vitamin content, free from the putrid, very fishy and ammoniacal odor and taste observed in the commercial samples. The rendering process is as follows:

The shark liver is macerated and placed in a steam-jacketed, enameled kettle. A small amount of water is added and the mass, agitated the while, is heated to boiling. The boiling is continued 20 minutes with intermittent stirring. The tissue breaks up readily and, when the steam is shut off and the mass cools, settles out, leaving a layer of oil which is easily removed. The oil is mixed with a filter aid and filtered. As before stated, air is excluded, the oil being protected by an inert gas throughout the process.

The following data were obtained on the oils produced in the manner described above:

TABLE II.

Sample No.	Species of Shark.	Color of Oil.	% F. F. A.	% Un-saponifiable.	Vitamin A. Colorimetrically Estimated.	Vitamin A. Biologically Determined.	Vitamin D. Biologically Determined.
1.	Nurse	Yellow	0.28	1.69	868
2.	Sawfish	Reddish yellow	0.42	3.00	3400	2222	14
3.	Sand	Water-white	0.16	9.6	200
4.	Leopard	Orange	0.16	12.4	3080	2700	<14
5.	Nurse (male)	Yellow	0.28	..	400
6.	Nurse (female)	Yellow	0.84	..	400

In each instance one whole shark liver was rendered. The livers vary in weight from 15 lbs. for No. 5 to 55 lbs. for No. 2. The yield of oil was, of course, lower than would be obtained

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by a solvent extraction method, but in every case was better than the normal recovery from cod livers. The lowest yields, 48.6 and 51.7% were obtained on the two smallest livers, Nos. 5 and 6; the other Nurse liver, however, weighed 36 lbs. and yielded 66% of oil. The largest liver, No. 2, gave a yield of 55.3%, and the highest yield, 70.8%, was obtained on No. 4, which weighed 43 lbs.

When these oils were tested colorimetrically for Vitamin A it was found that those from the Sawfish and Leopard species gave much higher values than any of the others, whereas the commercial samples from those two species had given the lowest values. When assayed biologically the specially prepared Sawfish and Leopard oils gave Vitamin A values of 2222 and 2700 U. S. P. X units, respectively, and the cod liver oil control showed 1566 U. S. P. X units. The two shark liver oils were therefore 50-80% stronger in Vitamin A than cod liver oil.

While two of the shark liver oils proved to be considerably more potent than cod liver oil with respect to Vitamin A, they were only one-tenth as strong in Vitamin D, each having about 14 Steenbock units as against 134 in the cod liver oil.

These carefully prepared oils were all free from any putrid or ammoniacal taste or odor, and had only a slight natural fishy taste. They all deposited stearine on standing at room temperature.

SUMMARY.

1. Commercial samples of liver oils from the Dusky, Leopard, Nurse, Sawfish and Sun sharks were tested colorimetrically for Vitamin A.
2. Oils were prepared from the fresh livers of Nurse, Sawfish, Sand and Leopard sharks and were tested colorimetrically for Vitamin A.
3. Oils from the fresh livers of Sawfish and Leopard sharks were assayed biologically for Vitamin A and D.

THE PROBLEMS* OF THE TEACHERS AND STATE BOARD EXAMINERS.¹

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The Teachers of Practical Pharmacy and Dispensing will no doubt agree that the scope of their subject is gradually changing and becoming more complicated. Many causes might be cited, but two of the outstanding are: First, the limited amount of practical drug store experience possessed by the individual when he enters the Pharmacy School and when he appears before the State Board Examiners to prove that he is qualified to practice the profession of Pharmacy; *second*, the large number of new preparations put on the market and the lack of knowledge, concerning these preparations on the part of the physician, the pharmacist and the teacher of pharmacy.

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