

As also pointed out by the writer in the above-mentioned article in *JOUR. A. PH. A.*, 22 (1933), 109-112, medicinal cod liver oil is often thickened or congealed by precipitation of stearin at temperatures of about minus 8° C. or lower and even at refrigerator temperature (10° C.) its viscosity is greatly increased (from 5.6 to 8.1, on the average). "As a consequence, when it is desired to minimize the influence of viscosity upon the taking of cod liver oil it is well to direct that the dose be taken from a small bottle of the oil kept at room temperature, the main supply being preserved in the refrigerator or other cool place."

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COD LIVER OIL—STABILITY OF VITAMIN A CONTENT UNDER
CONDITIONS OF COMMERCIAL DISTRIBUTION.*

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The value of cod liver oil resides in its vitamin content. Consequently, consideration of the degree of stability of the vitamin content of cod liver oil is of importance. The following data concern the stability of the vitamin A content of cod liver oil, consideration of the vitamin D content being reserved for a possible future communication. Poulsson (1) found that a sample of cod liver oil, 23 years old, promoted growth in rats kept on a deficient diet when fed with 3 to 5 mg. daily of the oil. Evers (2) reported that cod liver oil, when properly stored, retains a considerable proportion of its vitamin A activity for long periods (up to 26 years), and that exposure to light or oxidation lowers its vitamin A activity, the chief cause of loss of activity being the action of light. Sunlight, especially, was found by Evers to destroy vitamin A rapidly and in this respect it appeared to be more active than ultraviolet radiation from a mercury vapor lamp. He suggested that the oil be preserved in amber bottles with as little exposure to the air as possible. Holmes and Pigott (3) found that exposure of cod liver oil in flint-glass bottles to direct sunlight transmitted through ordinary glass windows as much as possible during 16-24 months resulted in marked loss of potency. Exposure to diffused sunlight during 14-26 months showed no detectable detrimental effect except in an excessively warm location. The experiments were controlled by parallel samples enclosed in cartons to shut off the light. Holmes and Pigott concluded that light-proof containers, such as amber bottles or flint bottles wrapped in paper or cartons should be used in storing and distributing cod liver oil.

* Scientific Section, A. PH. A., Madison meeting, 1933.

As a contribution to the subject of the stability of the vitamin A content of cod liver oil a study was made regarding the possible effects of the varying conditions and vicissitudes to which cod liver oil is subjected under conditions of commercial distribution. To do this, bottles of cod liver oil which had been out in the trade for various periods of time and which were returned for credit (almost invariably because of labels soiled through handling) were taken at random and the oil re-assayed for vitamin A and the assay compared with the original assay of the oil. The oils involved were of medicinal grade from the Lofoten area of Norway and conformed with the characteristics and tests outlined in a previous article by the writer (JOUR. A. PH. A., 21 (1932), 1145). The oils were contained in either 4-oz. or 12-oz. greenish flint, screw-capped glass bottles without wrapping or carton around the individual bottle, the filled bottles being packed in cartons of 6 bottles each, in the case of the 12-oz. size bottles, or in cartons of 12 bottles each in the case of the 4-oz. size bottles. The oils were marketed through the usual wholesaler-retailer route. Presumably, the retailer orders from a twelfth of a dozen up, as required, and the wholesaler removes the bottles of oil from the cartons, as necessary to supply the ordered quantity and then forwards the bottles of oil to the retailer.

Practically nothing is known of the varying conditions and vicissitudes to which the bottled oils had been subjected out in the trade. However, none of the bottles had been opened since they were sealed at the factory. The bottles of oil had been subjected to all of the actual, normal conditions of trade and not to any artificial set of conditions in any particular. Consequently, the results should fairly indicate the stability of the vitamin A content of bottled cod liver oil under the ordinary conditions of the handling undergone by these oils during commercial distribution.

TABLE SHOWING STABILITY OF VITAMIN A CONTENT OF COD LIVER OIL UNDER CONDITIONS OF COMMERCIAL DISTRIBUTION.

Batch.	Vitamin A Content when Originally Bottled.	Vitamin A Content after Exposure to Trade Conditions.	Length of Time Exposed to Trade Conditions.
18591	Not less than 1000 units	Not less than 1000 units	3 years, 11 months
18764	Close to 1000 units	Close to 800 units	4 years
19132	Not less than 1000 units	Not less than 1000 units	3 years, 11 months
19200	Between 800 and 1000 units	Between 800 and 1000 units	3 years, 8 months
19352	Not less than 1000 units	Not less than 1000 units	3 years, 9 months
19400	Not less than 1000 units	Not less than 1000 units	3 years, 9 months
19800	Between 800 and 1000 units	Between 800 and 1000 units	3 years, 4 months
20125A	Not less than 1000 units	Not less than 1000 units	2 years, 8 months

The above results indicate that it is very unlikely that bottled medicinal cod liver oil will deteriorate in respect to its vitamin A content before reaching the hands of the consumer. Nevertheless, good pharmaceutical practice dictates that protection from the direct rays of the sun and from excessive exposure to the air or storage in warm locations should not be denied this product.

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