THE CALCULATION OF THE VITAMIN A POTENCY OF FISH LIVERS

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In nearly all transactions involving fish livers, the livers are sold on the basis of the number of millions of units of vitamin A per pound of the liver. This figure is calculated from the data obtained from the oil and vitamin A analysis. A discussion of the method of making this calculation follows:

The oil content of the livers is reported as a percentage based upon weight. For example, one lot of soupfin shark livers studied in this laboratory analyzed 62.3 percent oil. This meant that, on the average, 62.3 pounds of oil were contained in every hundred pounds of this particular group of soupfin shark livers.

Vitamin A potency of liver oil is reported as the number of units of vitamin A contained in one gram of the oil. 1/ In the analysis of the soupfin shark liver just mentioned, it was found that one gram of the oil contained 116,300 spec. units of vitamin A. It may seem strange that the potency of the oil is reported in grams when most common materials are weighed in pounds and ounces. However, the chemist has found it convenient to use the metric system in the laboratory, and he naturally reports his results in the units of measure in which he ordinarily works; but, except for making the labor of an additional multiplication necessary, the reporting of vitamin A on the gram basis causes no particular difficulty.

Assuming then that the oil content and oil potency have been obtained from a chemical analysis, the first step is to calculate the number of units of vitamin A in a pound of the oil. Since there are 454 (or more accurately, 453.6) grams to a pound, this can be done by multiplying the number of units in one gram of the oil by 454. As an example, oil from the soupfin shark just mentioned would have yielded 52,800,200 units per pound as follows:

116,300 x 454 = 52,800,200 spec. units of vitamin A per pound

This gives the oil potency or the number of units per pound of oil. Since only a part of the liver is composed of oil, it is necessary to multiply the oil potency by the fractional amount of oil in the liver to get liver potency. To do

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1/ The official method used at the present time requires a biological assay with rats. The assay is conducted according to the method described in the latest available volume of the U. S. Pharmacopoeia. The unit described in this paper is the spec. unit of apparent vitamin A potency. This is equal to 2,000 E(1%, 1 cm. at 328 millimicrons).

this, it is first necessary to convert percent into a decimal, which can be done by dividing percent by 100 as follows:

$$62.3 \text{ percent} = \frac{62.3}{100} = 0.623 \text{ parts of oil per unit weight of liver}$$

Hence, liver potency is obtained by multiplying oil potency by this figure:

$$52,800,200 \times 0.623 = 32,894,524.6 \text{ spec. units of vitamin A per pound of liver}$$

It is conventional to report liver potency in terms of millions of units per pound. Therefore, the number of units per pound is divided by a million as follows:

$$\frac{32,894,524.6}{1,000,000} = 32.894,524.6 \text{ million spec. units of vitamin A per pound}$$
of liver

This is a cumbersome figure which can be simplified if the factors involved in its determination are considered. That is, if an independent attempt were made to redetermine the amount of vitamin A in these livers, the experimental error is such that these figures could not be reproduced again exactly. Experience has shown that any figures beyond the first four are meaningless. Therefore, these excess figures can be dropped and the vitamin A potency of the livers reported as 32.89 million units per pound of liver.

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