LXXX. THE IRRADIATION OF A TURBOT VITAMIN A CONCENTRATE WITH HOMOGENEOUS ULTRA-VIOLET RADIATION.

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THE fact that concentrates of vitamin A may contain a chromogenic substance which under special conditions can be made to give rise to an increase in the Carr-Price units of the concentrate has been reported from time to time especially during the earlier work on the irradiation of vitamin A. Hawk [1929] and Norris and Church [1930] reported that exposure to air and light had this effect. Drummond [1930] however was unable to obtain similar results. Heilbron *et al.* [1931] found that in liver oils, which with the antimony trichloride test showed a preponderance of the $572m\mu$ chromogen over that of the $606m\mu$, an increase in strength of the $606m\mu$ occurred after several months' storage together with a small increase in strength of the extinction coefficient of the oils at $328m\mu$. In the author's work it has been found possible with a turbot concentrate containing 60 % vitamin A to increase both the blue units and the absorption coefficient at $328m\mu$ above the data recorded for the purest vitamin A by Carr and Jewell [1933].

EXPERIMENTAL.

A Hilger E_3 all-quartz spectrometer with sector photometer and a condensed copper spark to supply the light source were used to determine the absorption spectra of the solutions used. An air-cooled quartz mercury vapour lamp was used as source of ultra-violet radiation. The lamp was used throughout in the "end on" position and placed as close as possible to the vitamin A solution which was contained in a quartz test-tube and kept stirred during the experiments by a magnetic stirrer; irradiation was thus accomplished in the complete absence of air. A sheet of "uvirol" glass transmitting within the range $300-390m\mu$ was interposed between the solution and the lamp and all solutions were irradiated with this radiation. The value of E is calculated from the relation $\log I_0/I = Ecd$ where C is expressed in mg./ml., d in cm.; that of the blue values is calculated for Lovibond blue units for 1 mg./ml. as in the paper of Woolf and Moore [1932]. All solutions were irradiated and their absorption spectra determined in spectroscopic alcohol. After irradiation the solutions were evaporated at 50° *in vacuo* and concentrated for E and blue value readings, the blue values being determined in chloroform in the usual manner, the reading being taken immediately after addition of the antimony trichloride reagent.

A turbot concentrate prepared by Dr T. Moore of Cambridge was used in these experiments. It was found that with solutions containing 0.0011 % vitamin A an exposure of 3 hours caused only a small decrease in E and blue units and that solutions containing 0.00011 % vitamin A, in the case of this

particular concentrate, were readily affected by short exposures; the latter concentration was therefore used throughout this investigation.

After 1 minute's irradiation both E and blue units have decreased, and the absorption band of the blue solution of the non-irradiated concentrate at $565m\mu$ has changed to a band at $570m\mu$. After 3 minutes' irradiation E and blue units have further decreased and the blue solutions show a band at $575m\mu$. On further irradiation both E and the blue units increase until a maximum is reached after 21 minutes' irradiation, the absorption band of the blue solutions being $575m\mu$ and the absorption band in the ultra-violet at $328m\mu$ slightly flattened out. After 28 minutes' irradiation the blue units and E have fallen, selective absorption having almost disappeared, the band of the blue solutions with antimony trichloride now reading $570m\mu$. Further irradiation caused general absorption and very low blue values.

During irradiation a product has thus been formed which as regards E and blue units does not differ from vitamin A. The behaviour of the concentrate is certainly evidence of its lack of homogeneity and that the substance absorbing at $565m\mu$, which was evidently in excess in the concentrate, is transformed into one absorbing at $575m\mu$; further the change involves both E and blue units in definite proportions, so that if the substance absorbing at $575m\mu$ is without biological activity, it might readily simulate vitamin A. It is also noteworthy that the concentrate was so readily influenced by dilution as regards its reaction under ultra-violet radiation.

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