LXXI. THE ACTION OF OZONE ON THE FAT-SOLUBLE FACTOR IN FATS.

PRELIMINARY NOTE.

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In a previous communication [Zilva, 1919] it was shown that when butter was spread in a thin layer on a plate and exposed to ultra-violet rays for six to eight hours, the fat-soluble factor in it was inactivated. It was then pointed out that as ozone was produced by the mercury quartz lamp from the atmospheric oxygen the butter was at the same time exposed to the action of this gas, and that further investigation would be required in order to ascertain whether the inactivation was due to the action of the rays or to that of the ozone. It was therefore decided to establish the influence of ultra-violet rays on the fat-soluble factor in the absence of oxygen and the action of ozone on it in the dark, as well as to determine the iodine value of the fat under different conditions of exposure. As the results were of great interest, the inquiry into the action of ozone was extended to the antineuritic and antiscorbutic factors. The object of this note is to give a brief summary of the results obtained by studying the action of ozone on the fat-soluble factor only. The experimental data are reserved for another communication in which the influence of ozone on all the accessory factors will be described and discussed in detail.

For technical convenience active fats which are transparent and liquid at room temperature, like whale oil and cod liver oil, were chosen for this investigation. The latter oil being very active was found to be the more suitable and most of the experiments were therefore carried out with it. On exposure for six to eight hours in shallow layers in Petri dishes to the action of the ultra-violet rays in an atmosphere containing ozone these oils were entirely inactivated.

Unlike the butter, however, the cod liver oil was not bleached but assumed a slightly darker colour, which suggests that the nature at least of some of the colouring matter associated with it is different from that of butter.

In order to study the effect of ultra-violet rays on the fat-soluble factor in cod liver oil in the absence of oxygen the oil was placed in a thin layer a few millimetres thick between two tubes, one of which fitted loosely into the

other. The outer tube was made of quartz, so that the ultra-violet rays could reach the oil without being previously absorbed. The air above the layer of oil was displaced by carbon dioxide gas, and the tube was revolved by a water motor during the exposure. On testing the exposed oil on rats receiving a diet deficient in the fat-soluble factor it was found that an exposure even of 16 hours' duration did not inactivate the oil, nor was there any evidence that the activity of the oil was impaired to any great extent by such an exposure.

The next set of experiments was carried out with cod liver oil exposed to ozone in the dark. This was done by introducing some of the oil into a dark-stained glass bottle through which a current of ozone was passed. By rolling the bottle at short intervals the oil was thoroughly exposed. About ten hours of this treatment almost solidified the oil at the concentration used. After six hours' exposure the oil was much more viscous than before treatment, and high doses of this modified oil, which was originally extremely active, failed to promote growth in rats deficient in the fat-soluble factor.

It is evident then that ozone inactivates the fat-soluble factor in active oils and fats. This is in agreement with the recent observations of Hopkins [1920, 1, 2] and Drummond and Coward [1920] that the fat-soluble factor in fats on being exposed to atmospheric oxygen becomes inactivated. The action of ozone is of course much more drastic and therefore more rapid.

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