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Effect of 2-4 Dinitrophenol on Oxygen Consumption of the Rabbit Lens.*

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Recent findings suggest that the therapeutic use of 2-4 dinitrophenol (DNP) in the treatment of obesity is followed in a small percentage of cases by the development of cataract.^{1,2} Since the etiology of cataract is obscure and since metabolic disturbances in the lens may play a part,³ an investigation of the action of this metabolic stimulant on the oxygen consumption of the lens was undertaken.

Young white rabbits about 1 kg. in weight were used throughout. These were killed by a blow on the back of the neck and the lenses rapidly removed, care being taken to avoid injury to the capsules. Excised lenses were placed at once in small (6 ccm.) vessels belonging to a set of 4 differential Barcroft microrespirometers. The suspension medium was mammalian Ringer's solution containing 0.2% glucose, buffered at pH 7.2 with M/150 phosphate. The vessels were then filled with oxygen and immersed in a water bath at $30^{\circ} \pm 0.01^{\circ}\text{C}$. The respirometer shaker was operated at a rate of 110 round trips per minute, with an excursion of 5 cm. Lenses were equilibrated for an hour under these conditions before measurement of respiration was commenced. These values of temperature and rate of shaking were maintained throughout. A total of 144 lenses was used in the 36 runs made.

Each lens served as its own control for a 60-minute period. DNP (as sodium dinitrophenoxide) was then added from the sidearms to the experimental vessels, Ringer's to the controls. In no case did such addition result in significant change of pH.

The oxygen consumption of the lens is relatively low. In cmm. oxygen (N.P.T.) per gm. wet weight per hour (Q_{O_2}) the mean of 44 runs was 32.1 for the first hour of measurement. The range was 20.3 to 52.8, the standard deviation 7.4. There was a definite decrease in Q_{O_2} with increase in lens weight. Integral curves showing total oxygen consumption as a function of time are of the declining-

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¹ Boardman, W. W., *J. Am. Med. Assn.*, 1935, **195**, 108.

² Horner, W. D., *Arch. Ophthalm.*, 1936, **16**, 447.

³ Bourne, M. C., *Physiol. Rev.*, 1937, **17**, 1.

rate type, although the decrease in rate is quite small (Curve I, Fig. 1, is typical).

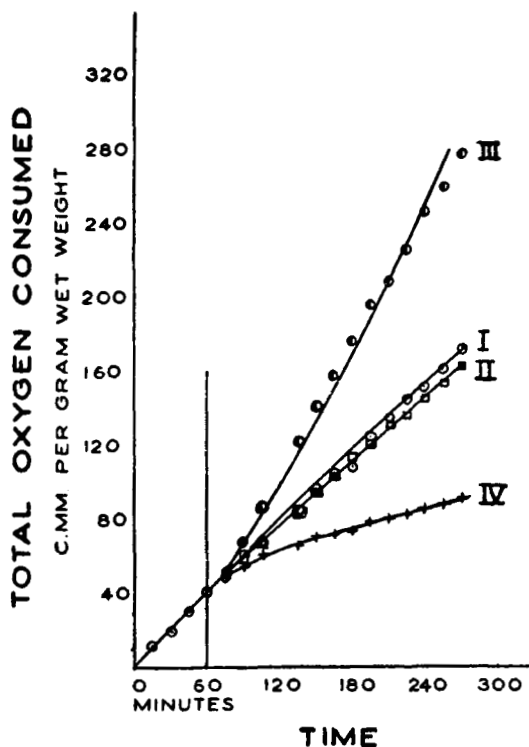


FIG. 1.

O₂ consumption of rabbit lens in Ringer's solution. Curves I and II represent respiration of lenses from one animal, III and IV from another. At 60 minutes DNP was added from the sidearms of vessels II, III and IV, Ringer's from the sidearm of I. The following were the concentrations of DNP in the several vessels. I, 0 (control); II, 0.005 mg. % (subliminal); III, 0.25 mg. % (stimulating); IV, 400.0 mg. % (inhibitory). On this scale curves I, II, III and IV are coincident for the first 60 minutes.

Twenty-five concentrations of DNP were employed, ranging from 0.005 to 400.0 mg. %. In general, concentrations above 5 mg. % were inhibitory. 0.05 to 1.25 mg. % stimulating, below 0.05 mg. % subliminal. The optimum concentration lay in the range 0.10 to 0.30 mg. %. Typical effects of subliminal, stimulating and inhibitory concentrations are shown in Fig. 1.

These studies are being continued and will be presented in detail in a subsequent paper.