

abscesses, a study of the localization of brominated derivatives of the dye T1824, in abscess tissue and organs was made. The mono-brominated dye was found to be best suited for future study. It was concentrated to a much lesser degree in liver, kidney and spleen and to a somewhat higher degree in the abscess than the di- and tetra-brominated compounds. The mechanism for the localization of the dye derivatives based on physico-chemical processes is discussed.

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#### **Histological Demonstration of Vitamin A in the Human Liver by Means of Fluorescence Microscopy.**

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It has been shown<sup>1</sup> that in liver and adrenal of rats there is a green fluorescence which fades during irradiation. This was attributed to presence of Vitamin A. Bodies showing morphologically similar green fading fluorescence were visualized in human organs. They gave histochemical reactions identical with those observed in normal rats or in Vitamin A deficient rats realimented with Vitamin A. These reactions are: solubility in alcohol, acetone, and mineral oil, and insolubility in water, acids, alkalis, glycerin, and reducing agents. The green fluorescence was not visible after treatment with oxidizing agents or prolonged fixation, especially at temperatures above 20°C.

The characteristic fluorescence, attributed to the presence of Vitamin A, was studied in 113 human livers by means of fluorescence microscopy. There was great variation in amount and distribution of the green fluorescing bodies. This observation agrees with chemical determinations made by Moore<sup>2</sup> and others. Usually the Kupffer cells showed small fluorescing droplets. After staining with phosphin 3 R they revealed silver-gray fluorescence. This was also found if staining was applied after fading of the green fluorescence. This indicated the presence of a carrier substance of lipoid character. The silver-gray fluorescence was absent after acetone treatment. In in-

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<sup>1</sup> Popper, H., *Proc. Soc. Exp. Biol. and Med.*, 1940, **43**, 133.

<sup>2</sup> Moore, T., *Biochem. J.*, 1937, **31**, 155.

fectious diseases the number of green fluorescing Kupffer cells was generally increased. A local increase was noted on the edge of various infiltrations and sometimes in the granulation tissue of cirrhosis (5 cases). The number was diminished in starvation and acute hepatitis.

In epithelial cells green fading fluorescence may be present in 4 sites. (1) It is present in fat droplets, as those which occur in physiological fatty infiltration. The smaller the droplets, the brighter was the fluorescence. In severe fatty infiltration the fluorescence was reduced. In hepatitis traces were found. (2) It is present in minute droplets which did not give a distinct Sudan 3 reaction, but which were acetone-soluble and demonstrable by phosphin 3 R. When few in number these droplets were regularly distributed along the edge of the cells as pearls on a string; larger quantities were irregularly distributed in the cytoplasm. (3) Lipofuscin revealed a green fluorescence, but after fading or alcohol treatment a weaker red brown fluorescence appeared. This was located in the center of the cells in form of angular bodies. (4) The cytoplasm showed a slight green fluorescence which faded to blue and disappeared after treatment with lipid solvents.

The distribution of the green fluorescence in epithelial cells varies. At present definite rules are not established. It was diminished in exhausting diseases, also in definite liver cell damage as in acute hepatitis (2 cases) or decompensated cirrhosis (3 cases). In these cases the Kupffer cells also showed little fluorescence. In obstructive jaundice (3 cases), in toxic hepatic edema and within a liver abscess the epithelial cells were poor in the fluorescence, whereas the Kupffer cells were rich. A localized absence of green fluorescence in epithelial cells was frequently observed, *e. g.*, in the dark cells at the periphery of the lobules in congested livers. The liver of newborn or premature infants showed little green fading fluorescence. In the vicinity of proliferative fluorescing Kupffer cells the epithelial cells contained many fluorescing inclusions.

The histological picture suggests that Vitamin A is transmitted from the Kupffer cells to the epithelial cells and disappears from the latter only after reduced nutrition. Sometimes the transmission to the epithelial cells is impaired with consequent retention in the Kupffer cells. Thus, observation of fluorescence permits a study of the behavior of Kupffer cells.

In addition, the characteristic green fluorescence was found in the following sites in the human body: (1) It was found in the epithelial cells of the fascicular and glomerular layer of the adrenals. The

variations in the amount run parallel with that of the liver. The fluorescence in adrenals is completely absent in the newborn infant. (2) It was found in the cells of the corpus luteum of the ovary, and the tubular and Leydig cells of the testes. (3) The normal kidney did not show the fluorescence, but it was found in 2 cases of nephritis. (4) It was found in small but varying amounts in the fat cells in different organs and in fat tissue. This was not in obvious relation with the amount in the liver.

## 11155

### Effect of Variation of Blood Pressure on the Autonomic Nervous System.

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In our studies of the autonomic and somatic nervous system<sup>1</sup> we have frequently observed in the cat an inverse relation between blood pressure and pupillary diameter. The only reference in the literature to this phenomenon of which we are aware is a brief remark by Koch<sup>2</sup> that endosinusal pressure and pupillary diameter are indirectly related. Since his observations were not published in full, a brief report of our experiments seems appropriate. We have found regularly that in anesthetized cats (pentothal 40 mg/kg or chloralose 100 mg/kg) a rise of blood pressure produced by the injection of small amounts of adrenalin (5 to 20  $\gamma$ /kg) is attended by a constriction of both the normal and of the acutely sympathectomized pupil. A similar effect may be brought about by raising the blood pressure by infusion of Ringer's solution (Table I). Occasionally it was observed that the increased parasympathetic tone as evidenced by the pupillary constriction in both sympathectomized and normal pupils was accompanied by a relaxation of the nictitating membrane. If on the other hand, blood pressure was lowered by amylnitrite, a dilation of the pupil occurred. This was observed to take place both after the removal of the adrenals and after the sectioning of the cervical sympathetic. From these observations we conclude that an increase

<sup>1</sup> Gellhorn, E., and Darrow, C. W., *Arch. Internat. Pharmacodyn.*, 1939, **62**, 114; Darrow, C. W., and Gellhorn, E., *Am. J. Physiol.*, 1939, **127**, 243.

<sup>2</sup> Koch, E., *Klin. Wochenschr.*, 1932, **11**, 225.