ic areas to the periphery of the liver lobules argues in favor of the presence in the blood stream of some toxinous material (as yet unidentified), which produces a necrosis in those cells of the liver lobule first encountered by this afferent blood. The necrotic mucosal conditions observed in the intestine, beginning at the ampulla of Vater and extending to the proximal portion of the large intestine, point towards an altered chemical constitution of the bile rather than pancreatic secretion. Deductively this seems referable rather to the altered hepatic features in view of the absence of any observable histologic pancreatic changes. The kidney changes may well be referred to the elimination function of this organ as regards the altered chemical constituent of the blood. There exists a striking parallelism between the conditions observed in these experiments and those noted as the result of extreme burns from various sources of external heat and, therefore, seem to substantiate the conclusions of Christie and Loomis that the changes effected are the result of a true heating condition of the body brought about directly as the result of the oscillating current.

4411

The Transportation of Carbon Dioxide by Paraffine Oil and Some Other Substances.

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In a previous paper[1] the use of luminous bacteria as an oxygen indicator was described. Some rough estimates of the passage of oxygen through a number of substances were given, as determined by the length of luminescent columns of bacteria. The properties of several of these substances, notably dry collodion, were of interest and these and some others were selected for further study with reference to carbon dioxide. In this case the time in hours required for one atmosphere of carbon dioxide to decolorize 1 cm. of phenolphthalein in NaOH agar is used for comparison. It is clearly recognized that this is not a quantitative method for the study of diffusion as there is a concentration gradient of carbon dioxide in the colorless portion of the phenolphthalein as well as through the membrane closing the tube. Nevertheless, it makes a very striking demonstration for class use and does give a qualitative expression for

[1] Hill, Samuel E., *Science*, 1928, lxvii, 374.

the passage of carbon dioxide. The proper methods of quantitative study may be found in the papers of Krogh[2] and of Northrop,[3] to mention only two.

In the earlier experiment temperature control was relied on to minimize convection currents, since the experiments could run for only a short time. With the phenolphthalein, NaOH, agar system the agar was used to prevent convection currents in the solution into which the carbon dioxide diffused, but it at once became evident that convection currents in the lighter oils were assisting in the transportation of carbon dioxide, and a method was sought for reducing or eliminating them. The most efficient found was that of cutting disks of blotting paper which exactly fitted the inside of the test tubes used, saturating these with paraffine oil, and packing them tightly in the tube to the required depth. An easier method and one almost as efficient was that of saturating cotton with oil and packing it in the tube. The difference in the relative amounts of carbon dioxide carried by the oil when convection currents were permitted and when they were restrained may be seen by reference to the table.

TABLE I.

Time required in hours for carbon dioxide at one atmosphere pressure to change color of indicator in 1 cm. of test solution.

EXP. 1.		EXP. 2.	
Open control	13	Open control	12
Paraffine oil, 2 cm.	15	Dry collodion	13
Paraffine oil, 1.5 cm.	16	Rubber dam	13.5
Light oil, 1.5 cm.	22	Thicker rubber dam	18
Heavy oil, 1.5 cm.	60	Paraffined rubber dam	49
Rubber stopper, 1.5 cm.	81	Beeswax	102
Paraffine oil in blotting paper, 1.5 cm.	115	Sealing wax	
Water in blotting paper, 1.5 cm.	36	Solid paraffine, 1 cm.	
Paraffine oil in cotton, 1.5 cm.	112	Vaseline, 1 cm.	
Water in cotton, 1.5 cm.	35	DeKhotinsky cement	
Cotton, 1.5 cm.	14	Picein cement	
		Paraffined cork	
		2 mm. Paraffine on linen	

In general those substances found impermeable or relatively impermeable to oxygen were impermeable to carbon dioxide also, the most striking differences being observed with rubber and dry collodion. A trace of passage of oxygen through dry collodion was found and a trifle more through rubber, whereas carbon dioxide passed with the greatest ease through both.

[2] Krogh, August, *J. Physiol.*, 1919, lii, 391.

[3] Northrop, John H., *J. Gen. Physiol.*, 1927, xi, 233; 1929, xii, 435.

Kruse,[4] in a study of oxygen exclusion by various oils, ascribed the greater efficiency of the heavier oil to its higher viscosity. In the present study, the introduction of cotton or blotting paper reduces convection currents to a minimum without the high viscosity associated with heavy oils. The rate of passage of carbon dioxide through the heavy oil is then greater than through paraffine oil, whereas when convection is permitted the paraffine oil carries the greater quantity. When high viscosity and absence of convection currents are associated, as in the case of vaseline and solid paraffine, the rate of transportation of carbon dioxide becomes negligible.

The substances used to close the tubes were less than 1 mm. thick except where otherwise noted. The tubes were kept in an atmosphere of carbon dioxide for 14 days, and those substances which allowed no carbon dioxide to pass in that time may be considered impervious under any ordinary conditions. Rubber, as noted by many previous observers, is quite worthless against carbon dioxide, as even a rubber stopper 1.5 cm. thick allowed appreciable amounts to pass.

4412

Antitryptic Titre in Pregnancy and in Hyperthyroidism.

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Since it is known that the normal blood serum contains substances which inhibit the action of enzymes, and that the titre of such substances varies, there is ground for supposing that this property of the blood plays some physiological rôle. Specifically it might be conjectured that it affects catabolism and that in conditions where changes in metabolism are an outstanding feature correlated changes in antienzyme titre would be found, and that these might have etiological import. Indeed, fragmentary observations of changes occurring in pathological conditions have been made.[1, 2, 3]

With this thought in mind we investigated two conditions in which metabolic changes were prominent: (1) pregnancy, (2) toxic hyper-

[4] Kruse, T. K., *J. Phar. and Exp. Ther.*, 1926, xxvii, 243.

[1] Meyer, K., *Berl. klin. Wchnschr.*, 1909, xlvi, 1064.

[2] Gräfenberg, E., *München. med. Wchnschr.*, 1909, lvi, 702.

[3] Thaler, H., *Wien. klin. Wchnschr.*, 1909, xxii, 850.