

before the injection were, in cc. per min., 29.0 and 2.05; just after the injection they were, 26.0 and 1.93, *i. e.*, the adrenalin decreased the blood flow 3.0 cc. and the oxygen utilization 0.12 cc. per minute. We have another set of 9 experiments in which the adrenalin was given at just twice the rate used above, *i. e.*, 0.0008 mg. per cc. per minute for 5 minutes; the average rate of flow and of oxygen consumption just before these injections was 33.8 and 2.44, respectively; just after, the figures are, 27.6 and 2.14; *i. e.*, this dose of adrenalin slowed the rate of blood flow by 6.2 cc. per minute and the oxygen utilization 0.30 cc. per minute.

Although these decreases of oxygen utilization are not large they are 4 and 10 times greater than the change observed to occur spontaneously during an interval 2 or 3 times as long between normal samples; but even more significant, perhaps, is their constancy. Of the 18 pairs of normal samples, the oxygen consumption of the second was less than the first in 11 and greater in 7; of the 19 adrenalin experiments the oxygen consumption following the injection was less than the normal in 14, unchanged in 1, and greater in only 4.

These figures are derived from uncorrected oxygen contents; the determination of the oxygen capacity of 33 pairs of arterial-venous pairs gave an average venous capacity 0.46 vol. %, less than the arterial; this is not only opposite in sign to what has previously been reported (see 5) but also cannot be due to changes in cell volume, which, as an average of 27 determinations, was 55.07 for arterial, and 54.98 for the venous samples.

The effect of adrenalin on the carbon dioxide production was too variable and uncertain to justify speaking of it until further work is done.

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Dynamics of Insulin Secretion by the Pancreas and Epinephrine Secretion by the Suprarenal Gland.*

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Many authors have tried to prove that the pancreatico-duodenal vein is the carrier of the pancreatic hormone but nobody was able

* This paper has been partly supported by the Committee for Chemistrisatation of SSSR, Moscow.

to accomplish this for two reasons: (1) Blood was taken in artificial conditions of acute experiment;¹ (2) for detection of insulin no direct biological, but only unspecific and indecisive indirect tests² were used.

We obtained the blood from the pancreatico-duodenal vein of healthy dogs under quite normal conditions by means of angiostomical tubes.³ For detection of insulin we used the most sensitive biological test of Brugsch and Horsters⁴—hypoglycemic reaction of blood accompanied sometimes by paresis or paralysis of the legs of fasting white mice after intraperitoneal injection of the analyzed blood.

In our experiments the blood drawn from the pancreatico-duodenal vein of fasting angiostomised dogs before and after intravenous injection of 25-50 gr. of glucose was introduced in amounts from 0.2 to 1.0 cc. into the peritoneal cavity of white mice. Two to 3 hours after injection the mice were killed by decapitation and their blood sugar evaluated by the method of Hagedorn-Jensen. The results show in a definite way that in a fasting dog insulin cannot be detected in the pancreatico-duodenal blood even with very sensitive biological tests. After intravenous injections of glucose considerable amounts of insulin are present in the blood of the pancreatico-duodenal vein. There was in literature an uncertainty whether insulin is secreted in an active or in an inactive state; our experiments prove that it is secreted into the bloodstream in an active state.

Contrary to the insulin secretion of the pancreas the epinephrine secretion by the suprarenal glands seems to proceed continually in a fasting dog. We have successfully applied the Brugsch insulin test in our experiments for the detection of epinephrine in blood, hyperglycemic reaction resulting instead of the hypoglycemic one.

The hyperglycemic effect of the blood of the lumbalo-suprarenal vein of a fasting dog injected into the peritoneal cavity of fasting white mice proved to be very characteristic. After injection into the peritoneal cavity of white mice of the same amounts (1 cc.) of the blood taken from the femoral vein of the same dog there could be found no rise of the blood-sugar level.

The amounts of insulin contained in the pancreatic vein after injection of sugar amounts to approximately 0.01 unit per 100 cc., whereas the amount of epinephrine found in the lumbalo-suprarenal vein amounts to 0.00001%.

¹ La Barre, *C. E. Soc. Biol.*, 1929, ci, 144; 1927, xvii, 1801.

² Diedrich, *Arch. exp. Path. und Pharm.*, 1922, cxv, 336.

³ London, E. S., *Harvey Lectures*, 1927-28, 288.

⁴ Brugsch und Horsters, *Arch. exp. Path. und Pharm.*, 1930, cxlviii, 295.