DIABETIC ACIDOSIS AND COMA IN THE MONKEY

EXAMINATION of the literature reveals only two recent studies on the influence of pancreatectomy in the monkey.[1,2] Both reports emphasize that the monkey does not develop the same degree of metabolic disturbance as occurs in the dog or cat following removal of the pancreas. Thus Collip, Selye and Neufeld state that the monkey can survive pancreatectomy for many months without insulin treatment; that ketonuria, which may be observed during the first few days following the operation, disappears later, irrespective of whether or not the animal is treated; that the depancreatized monkey shows a marked sensitivity to insulin and rapidly develops hypoglycemia on fasting, and finally that such animals lose weight rapidly. Similar observations were made by Chapman and Fulton who concluded that, unlike depancreatized carnivora, depancreatized monkeys do not die in typical diabetic acidosis. Both groups of investigators are of the opinion that the depancreatized monkey resembles in many respects the depancreatized-hypophysectomized dog.

During the past year we have conducted studies on depancreatized monkeys and our observations do not support the above conclusion. Rhesus monkeys were depancreatized under nembutal anesthesia. Within a few hours after the operation, insulin was administered and within twenty-four hours thereafter the animals were given food. Insulin therapy was continued for from a number of weeks to several months and the animals were permitted to eat freely, records being kept of the daily intake. The diet consisted of oranges, bananas and biscuits made with dog ration, pancreatin and ground peanuts. The diet was supplemented with adequate amounts of vitamin A and D concentrate. The insulin dosage was regulated so as to permit the urinary excretion of from 10 to 20 grams of glucose per day. Loss of weight did not occur on this régime. When the weight was stabilized for several weeks, both insulin and food were withdrawn. The blood sugar and acetone body content were determined at frequent intervals thereafter, as was the urinary excretion of these substances.

In this preliminary report we wish to draw attention to a rapid development of acetonemia following the withdrawal of insulin and food from depancreatized monkeys (Fig. 1). The acetonemia was accompanied by a decrease in the carbon dioxide combining power and a decrease in the pH of the blood. The development of the acidosis was accompanied by typical symptoms such as weakness, dehydration, Kussmaul breathing, and tarry vomitus. When the acetonemia reached about 175 mgm per cent., the animals became lethargic and in one instance a state of coma was present at this blood level.

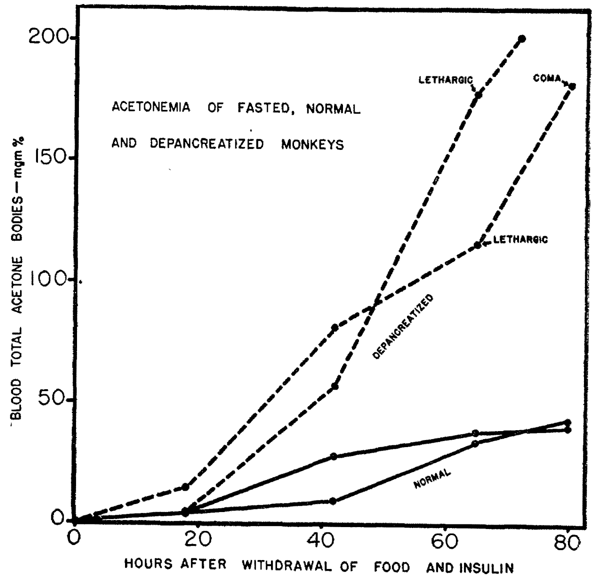

FIG. 1. Illustrating the acetonemia consequent to the withdrawal of food from normal and from depancreatized monkeys after insulin deprivation.

Fig. 1 depicts the acetonemia of two normal and two depancreatized monkeys subsequent to food and insulin withdrawal. Coma developed in one of the depancreatized monkeys, but insulin was not administered until the monkey had been in this state for 24 hours. The administration of insulin thereafter was ineffective in preventing the death of the animal.

It is obvious from the preceding that the depancreatized monkey can develop a severe acetonemia and the symptoms of diabetic acidosis after insulin withdrawal and that death in typical diabetic coma can ensue if insulin therapy is not instituted at a sufficiently early period of time. The similarity between the syndrome of diabetic acidosis and coma in man and that observed in the monkey is very striking and will be discussed in greater detail in another communication.

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[1] J. B. Collip, H. Selye and A. Neufeld, *Am. Jour. Physiol.*, 119: 289, 1937.
[2] S. W. Chapman and J. F. Fulton, *Am. Jour. Physiol.*, 123: 35, 1938.

EFFECT OF LIGHT ON GROWTH HABIT OF PLANTS

A POTTED plant of teosinte, *Euchlaena mexicana* Schr., became prostrate under greenhouse conditions at Cornell University, Ithaca, N. Y. When moved to a dark room it assumed an erect position in a few days. Placed back into the greenhouse it gradually became prostrate again. The seeds from this plant produced seedlings which responded to light in a similar way; they were prostrate in the sunlight and erect in weak light or in darkness. The growth habit could be changed at will by changing the light conditions.

Recently experiments were conducted at the Instituto Experimental de Agricultura, Caracas, Venezuela, to study the effect of light on *Panicum purpurascens,* Raddi.; *Alternanthera ficoidea,* Moq.; *Eleusine indica* (L.) Gaertn.; *Commelina cayennensis,* Rich.; *Portulaca oleracea,* L.; *Mimosa sensitiva,* L.; *Cynodon dactylon* (L.) Pers.; *Plantago major,* L.; *Echinochloa colonum* (L.) Link and others, which normally have a prostrate habit of growth under field conditions. Several plants of each genus which were prostrate in an open field were covered with a low roof of burlap bags or of cardboard boxes. In a few days they started to raise themselves and gradually became erect. When the protective coverings were removed, the plants became prostrate again. Then some of the shoots of each plant were covered and some left exposed to the sunlight. In every case the covered shoots became erect while the exposed ones remained prostrate.

Cuttings were made from prostrate plants and potted in an erect position. After they had taken root, some were placed toward the back of a box 24″ × 18″ × 18″ which was open only to the south, and others were placed in the front of the box. Those in the back received diffuse light, while those near the entrance received direct sunlight from one side only. Plants in the back of the box bent south toward the light, while those in the front bent north away from the light. In other words, the plants in the back row showed positive phototropism, while similar plants in the front row showed negative phototropism.

The experiment was repeated several times, using cuttings of most of the genera mentioned above and similar results were obtained. Young *Commelina* plants reacted quickly to changes in light conditions. The front and back rows curved toward each other as in the previous experiments; but a third row between the other two rows bent forward in the early morning while shaded from the sun by the east side of the box, and bent backward during the middle of the day while exposed to direct sunlight. In late afternoon the west edge of the box shaded the center row again and the plants straightened up. This pattern of growth was followed every clear day. On cloudy days the plants bent forward in early morning and stayed forward all day.

By means of a special apparatus, it was shown that direct sunlight is not necessary to produce negative curvatures; reflected light of high intensity will give similar results but not as quickly.

From these experiments and others which will be described in detail in another publication the author has concluded that certain plants which normally have a prostrate growth habit under field conditions are probably negatively phototropic to intense light. A possible explanation will be given later.

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SCIENTIFIC APPARATUS AND LABORATORY METHODS

A TECHNIQUE FOR CONTINUOUS MICROSCOPIC OBSERVATIONS

THE literature on anaerobic cultivation contains numerous descriptions[1] of apparatuses for the microscopic observation of the developmental processes of organisms requiring a low oxygen tension. The glaring defect in these techniques lies, not in their inadequacy, but in their relatively elaborate and complicated schemes of preparation and utilization.

In the course of the study of the morphology of the butyl alcohol-acetone organism, Mr. Eugene Gaughran, a graduate student in our laboratories, developed a method which, because of its simplicity and effectiveness, we have adopted as a standard technique.

The Gaughran method may be described succinctly as a simple hanging drop preparation in which the air has been replaced by a very inert oil of low viscosity and marked clarity. The oil preferred is a D.T.E. light turbine oil. This completely saturated oil is colorless in thin layers. It may be obtained from any of the large oil companies.

The procedure, which involves no meticulous care and takes less time than an ordinary fixed preparation, is as follows: The cavity of a depression-slide is filled with an excess of freshly heated (sterile) oil. A small portion of a semi-solid culture of the organism to be studied is transferred by pipette from the bottom of the culture tube to the center of a sterilized cover-slip. The cover-slip is inverted over the depression of the objective slide in a manner that will eliminate all

[1] Among the methods tried were those described by the following: M. A. Barber, *Jour. Exp. Med.,* 32: 295, 1920. H. Buchner, *Centbl. Bakt.* (etc.), 4: 149–151, 1888. J. Fortner, *Centbl. Bakt.* (etc.), 1 Abt. Orig. 108: 155–159, 1928. J. Fortner, *Centbl. Bakt.* (etc.), 1 Abt. Orig. 115: 96–99, 1929–1930. A. Itano and J. Neill, *Jour. Infect. Diseases,* 29: 78–81, 1921. H. Neumann, *Centbl. Bakt.* (etc.), 1 Abt. Orig. 114: 228–232, 1929. M. van Riemsdijk, *Centbl. Bakt.* (etc.), 1 Abt. Orig. 143: 265–270, 1939. L. Wamoscher and J. Vasarhelyi, *Centbl. Bakt.* (etc.), 1 Abt. Orig. 123: 250–255, 1932.