quotient shows no oxidation of the administered carbohydrate, despite pronounced ketone- and nitrogen-sparing effects.

Carbohydrate values of the tissues obtained after the last respiration periods on this dog are shown in Table II, which includes, as controls, average figures previously reported from this laboratory.[6] It is evident that the administration of glucose caused deposition of appreciable amounts of glycogen, both in muscle and in liver. From the carbohydrate values obtained on the tissues, calculations, although only approximate, indicate that all the injected sugar can be accounted for.

TABLE II

TISSUE CARBOHYDRATES OF DEPANCREATIZED DOGS

Animal	Tissue	Glycogen mg. per cent.	Total fermentable carbohydrate plus lactic acid mg. per cent.
Nephrectomized-depancreatized, after 75 gm. glucose intravenously	Muscle	416	938
	Liver	845	2,982
Fasting depancreatized[6]	Muscle	71	266
	Liver	79	454

Some explanation other than carbohydrate oxidation must, therefore, be advanced for the nitrogen-sparing and ketolytic effects observed. It should first be pointed out that decreased protein catabolism is judged in this type of experiment solely on the basis of changes in blood non-protein nitrogen; any unmeasured retention of urea in the liver or in the muscles would give a false picture. Secondly, since protein is ketogenic in pancreatic diabetes, any lowering of protein breakdown might account for some of the ketone sparing. In any case, these changes may be attributed fully as well to the high glucose concentrations produced as to glycogen deposited. These experiments indicate that neither formation of glycogen nor establishment of high tissue carbohydrate levels facilitates the oxidation of sugar by the depancreatized dog.

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BRAIN METABOLISM DURING THE HYPOGLYCEMIC TREATMENT OF SCHIZOPHRENIA[1]

THE most interesting and perhaps the most important advance in the treatment of mental disease in many years is Sakel's[2] new treatment of schizophrenia. The amelioration which occurs as a result of his insulin treatment must be ascribed to functional changes in the brain. It is therefore of fundamental importance to examine the physiological effects induced in the brain after the intramuscular injection of large doses of insulin.

The present communication presents data concerning these changes in patients with schizophrenia receiving the insulin treatment. Though the investigation is not yet completed, the observations made thus far are adequate to indicate a possible mechanism for the alleviation. Cerebral metabolism was studied by determining the glucose and oxygen contents of the blood traversing the brain, blood samples being collected practically simultaneously from the internal jugular vein and the femoral artery. It was thus demonstrated that the oxygen utilization of the brain and therefore its metabolic rate are decreased during severe hypoglycemia. The average utilization of oxygen before the injection of insulin was 7.09 vol. per cent. (eighteen observations). During hypoglycemic coma the average cerebral uptake was 2.46 vol. per cent. (eleven observations), a fall of approximately 65 per cent. The average glucose uptake simultaneously decreased from 13.0 to 2.2 mg per cent. Since the brain oxidizes only carbohydrate,[3] insulin, in reducing the blood sugar, deprives the brain of its foodstuff. A diminished oxygen utilization is therefore secondary to lack of substrate.

This partial deprivation of energy of the brain finally leads to hypoglycemic coma; in most instances a necessary phase in the alleviation of schizophrenia. In the course of the production of this coma abnormal reflexes such as the Babinski appear finally to be succeeded by complete areflexia. The present studies also reveal that the Babinski sign appears at the time when a definite decrease in the oxygen utilization is noted; a more prolonged period of diminished energy supply leads to complete areflexia.

It is true that the metabolism of the entire brain, and perhaps the cord as well, is depressed as a result of hypoglycemia. However, the oxidations of different parts of the brain proceed at varying rates and since the energy requirements of the cerebral hemispheres are greater than those of the brain stem, medulla or cord, a diminished supply of energy would first be manifested in the functions of the hemispheres with

[6] W. H. Chambers, M. A. Kennard, H. Pollack and M. Dann, *Jour. Biol. Chem.*, 97: 525, 1932.

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[2] K. T. Dussik and M. Sakel, *Zeit. f. d. ges. Neur. Psych.*, 155: 351, 1936.

[3] H. E. Himwich and L. H. Nahum, *Amer. Jour. Physiol.*, 101: 446, 1932.

symptoms of cortical depression and subcortical release such as sweating, one of the earliest signs, and the Babinski. When hypoglycemia is prolonged further, the other parts of the central nervous system are progressively affected. The significance of the differential depression of the various parts of the central nervous system awaits further analysis. Nevertheless, the present results reveal the primary importance of the reduced metabolism of the brain in the alleviation of schizophrenia.

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CHEMICAL CHANGES OF FRUITS RIPENED IN THE PRESENCE OF ETHYLENE

THE physiological reactions of fruits ripened in the presence of ethylene have been interpreted in various ways. In some cases it has been considered that ethylene has a definite chemical effect, since more sugar, less starch and increased rate of respiration were observed in the treated fruit. In other cases, the experience has been that the effects of ethylene, if any, were more of a physical nature, since the only results observed after treatment were possibly an increased rate of softening and more rapid color development.

In experiments with pears and certain other fruits, the writer has found that ethylene definitely affects certain phases of the metabolism as well as the chemical composition of the fruit. These effects, however, have been obtained only during a definite stage in the life of the fruit. Thus, pears picked and treated with ethylene while still containing starch in the tissues had more reducing and total sugars and less starch than the untreated fruit. Pears treated at later stages of maturity or after being held in cold storage for short periods of time until the starch had disappeared, showed no increase in sugars as a result of ethylene treatment.

After starch hydrolysis has been completed in the fruit, it has been found that there is still a period of short duration when the softening of the fruit can be markedly accelerated by ethylene. That this increased rate of softening in the presence of ethylene is due to an acceleration of the pectic changes occurring in the cell walls is indicated. Before being ripened, pear fruits normally contain approximately 0.8 to 0.9 per cent. insoluble protopectin, but less than 0.1 per cent. of soluble pectin. During ripening the protopectin in the cell walls is hydrolyzed with a corresponding amount of soluble pectin appearing in the juice. These changes are accompanied by a definite softening of the tissues of the fruit. It has been found that these pectic reactions occur much more rapidly in the presence of ethylene than when this gas is withheld from the atmosphere surrounding the fruit. Thus, pears will contain 60 to 85 per cent. of the total pectin in the soluble form at the end of four to six days of treatment, while only a very small amount of soluble pectin has developed in the untreated fruit during this period.

Further evidence that ethylene accelerates the rate of protopectin hydrolysis has been obtained with fruits other than the pear. Gooseberries, for example, contained 54 per cent. of the total pectin in the soluble form at the end of four days' ethylene treatment, while the untreated fruit contained less than 0.1 per cent. of this amount. Green peaches exposed for a three-day period to an atmosphere containing ethylene developed five times more soluble pectin than the untreated lot.

A very marked pectic change resulting from ethylene treatment was observed in the rind of the Ponderosa lemon. Before treatment the rind of samples of this fruit, picked in a green condition, contained approximately 3 per cent. protopectin, but less than 0.1 per cent. soluble pectin. At the end of a fourteen-day period, the soluble pectin in the rind of the treated fruit had increased over 40 per cent., while the insoluble protopectin had decreased a corresponding amount. In the untreated fruit, however, there was only a slight increase in pectin and no noticeable decrease in protopectin.

The results of these experiments indicate that certain ripening changes, such as softening of the tissues, formerly referred to as "physical" in nature, are really a result of chemical changes which can be influenced by ethylene treatment.

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SCIENTIFIC APPARATUS AND LABORATORY METHODS

A NEW TYPE OF GNOMONIC RULER

A MODIFICATION of existing gnomonic rulers has been devised in this laboratory in an effort to shorten the time necessary to obtain gnomonic projections from Laue patterns. The method developed is suitable for such projection purposes and is capable of being applied to numerous similar problems. The design and operation of the ruler can be most clearly observed by examining the schematic diagram given in Fig. 1. The ruler consists of a plate so mounted on the Laue pattern that the entire ruler can be rotated about the center of the pattern, a straight edge always passing through the center. On this plate at a fixed distance from the center point of the pattern