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6518

Utilization of Certain Sugars and Their Derivatives by Bacteria.

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In the experiments reported here we have studied the utilization by bacteria of a number of derivatives of the commoner sugars. The sugars used comprised several methyl glycosides, an amino sugar, a sugar acid, a sulphur-containing sugar, and 2 heptoses. The availability of these unusual sugars was compared with that of the common sugars from which they were derived.

All sugars were sterilized by filtration and added to suitable culture media to give a concentration of 0.5 to 1.0%. Each lot of medium containing a test sugar was then inoculated with about 25 representative species of the commoner bacteria. Fermentation of the sugar was determined by the usual methods of detecting acid and gas production.

It was found that when the hydrogen of the hydroxyl group attached to the number one carbon of the sugar molecule was replaced by a methyl group, the resultant modified sugar was distinctly more resistant to bacterial attack. Thus, of many bacteria which fermented glucose, only a few were able to make use of alpha methyl glucoside. Those able to ferment the methyl glucoside included: *Proteus, Bact. friedländeri, Bact. aerogenes,* pneumococci, several hemolytic streptococci, and a yeast.

Similar comparative tests with mannose and alpha methyl mannoside showed that the latter was not fermented by any of the organisms capable of using mannose. Two methyl pentoses, beta-methyl-l-arabinoside and beta-methyl-d-xyloside, were not used by those organisms capable of fermenting l-arabinose and d-xylose.

Two sugars containing 7 carbon atoms, alpha glucoheptose and

alpha glucoheptulose, were not fermented by any of the organisms. Glucosamine was used by most of the cultures which fermented glucose, with the exception of *Proteus* and 2 yeasts which gave negative results. Gluconic acid was also fermented by most of the glucose-splitting types, with the exception of the streptococci, pneumococci and the yeasts. Glucose ethyl mercaptal, a sulphur containing sugar, gave entirely negative results.

6519

A Microcrystallographic Study on Phosphates and its Practical Application.

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In precipitating phosphate solutions of a concentration of 1/20 to 1/200 of their molecular weight in a solution of the specific gravity of the urine, by using an ammonium magnesium sulphate reagent (Dowd's reagent), we find 8 different forms of crystals, changing gradually at certain amounts of the phosphorus. The form of these crystals can be used for an estimation of the amount of phosphorus in the urine.

Three cc. of the urine and 0.6 cc. of the reagent (10% solutions of magnesium sulphate, ammonium chloride, ammonium hydroxide, 20 cc. of each) are mixed and the crystals, which are formed after at least 10 minutes, are examined with the 4 mm. objective. The predominant crystal indicates the amount of phosphorus. By titrating dilutions of the urine in a 2.5% solution of sodium chloride and precipitating 3 cc. of the dilutions with 0.6 cc. of the reagent the amount of phosphorus in the urine can be calculated from the last dilution, in which the crystal type of the undiluted urine appears. (Crystal type I corresponds to 103 mg. of P in 100 cc. of urine, type II, 93 mg., and so on; type VIII indicates that there are less than 10 mg. of P in 100 cc.) The specific gravity of the urine or the 24 hour specimen may be used for the calculation of the total output of phosphorus during one day. The presence of considerable amounts of urea or of sugar change the form of the crystals in a typical way.