CHEMISTRY

Cane Sugar Synthesized

A method for building up synthetic sucrose has been discovered for the first time, and used to make two new sugars never known before.

➤ FOR FINDING the key to the sugar molecule, which enabled them to build up synthetic cane sugar for the first time from simpler compounds, Drs. W. Z. Hassid, M. Doudoroff and H. A. Barker, research workers at the University of California, have been awarded the first intermediate $5,000 Sugar Research Foundation prize from the National Science Fund of the National Academy of Sciences.

Coincidentally, it was learned that two sugars never found in nature have been invented by these scientists.

Cane sugar is a double molecule, built up of two simpler sugar molecules. Many earlier attempts to link up the simpler sugars have failed because the role of phosphate compounds in building up the more complex molecule was not appreciated. The California scientists succeeded, with the aid of an enzyme obtained from a culture of the bacterium *Pseudomonas saccharophila,* in combining glucose phosphate with fruit sugar to make the same sugar we get from sugar cane or sugar beets. The phosphorus compound pulls the two simple sugars together, then steps out of the picture. Until the experiments of Dr. Hassid and his colleagues, the part played by the phosphate group was not known to be essential.

Two New Sugars

Having found the key to the problem, the research group has since used this new method to make two other sugars unknown in nature and never seen or tasted by man before.

Three kinds of double sugars, in addition to cane sugar, are known in nature. One of these is lactose, or milk sugar. Another is maltose, formed in sprouting grain, which feeds beer yeasts and contributes to the flavor of malted milk. The third is cellobiose, formed by chemical treatment of wood. These three kinds of sugar are made up of pairs of similar molecules.

One of the new synthetic sugars made by the California scientists follows essentially the same pattern. Glucose phosphate was made to combine with sorbose to make glucosido-sorboside, an unknown product, instead of glucosido-fructoside, the material for which your grocer collects ration stamps.

But sorbose, the unusual constituent of the new sugar, is not very different from glucose. Similar arrangements of the same atoms make up its molecule. The two differ only in whether certain groupings of atoms occur on the right side or the left side of the molecular structure. Such differences make some alteration in how fast sugars dissolve and how sweet they taste, but chemically sorbose and glucose are two of the possible 16 sugars of the same pattern. Linking these sugars results in double sugars of the maltose, lactose, cellobiose type.

"Tagged Atom" Technique

The second new sugar formed by Dr. Hassid and his co-workers is built more on the pattern of cane sugar. The simple sugar which is joined to the glucose phosphate is ketoxylose. The structure of ketoxylose is similar to that of the fructose half of the cane sugar molecule. Both are ketoses, whose structure is fundamentally different from that of glucose, although both contain equal numbers of the same carbon, hydrogen and oxygen atoms.

Now that the simple sugars, which can be put together chemically, have been synthesized to double sugars by the new process, the research group hopes to be able to use the new "tagged atom" technique, made available by atomic research, to learn what use is made by the body of the two halves of the sugar molecule.

Each half could be studied separately as it undergoes transformation to blood sugar, which plays such an important part in nutrition and body chemistry. The newly appreciated importance of phosphorus compounds in sugar synthesis can also be followed by the introduction of compounds of the radioactive phosphorus isotope into the reactions discovered by Drs. Hassid, Doudoroff and Barker.

The synthesis of sucrose or of the new sugars will find no use in increasing the food supply. These researches will not lessen the sugar shortage.

New compounds of the many sugar-like substances already known, and perhaps others, to be formed by modifications of known processes, will bring to research workers many opportunities to learn how the growing plant builds up the carbohydrates upon which we in common with all animal life depend for food.

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PHYSICS

Electron Microscope's Magnification Doubled

➤ THE USEFUL magnifying power of the electron microscope has been increased from 100,000 diameters to more than 200,000 diameters by an improved magnetic lens developed by Dr. James Hillier, aided by Perry C. Smith, at the RCA laboratories.

This great step forward in the conquest of the sub-microscopic world was disclosed in a paper communicated to the American Institute of Physics (*Journal of Applied Physics,* April). Dr. Hillier reported that he had succeeded in improving the magnetic lenses that focus the electron beams to such an extent that it is now possible to distinguish particles separated by as short a distance as 13 Angstrom units, or about 50 billionths of an inch. This means roughly that 50,000 distinct particles could be recognized in a distance equal to the width of a hair. Dr. Hillier pointed out, however, that numerous technical problems still await solution before such high resolving power will be available to scientists generally.

Just how much this new development will affect science is difficult to predict, but it is thought that structural details of large molecules and the action of drugs on bacteria will be among the things that will become visible. Actual visual pictures of molecular structure will open vast new fields in organic chemistry, the science that has already given us nylon, rayon and other plastics, as well as synthetic rubber and life-saving drugs. In the field of medicine, it is certain that our new knowledge of the finer structure of viruses and living cells will aid us greatly in our fight against such still unconquered diseases as infantile paralysis and cancer.

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