made only after extensive testing, which would be done at the expense of the interested producer. This is the procedure now in effect in the United States applicable to the certified food colors.

General feeling in the conference was that food colors offered the best starting point for any international legislative approach. Reith pointed out a number of international inconsistencies in this field: in The Netherlands, "harmless" dyes may be added to food, but no list of such dyes is specified. In the United Kingdom the law provides only a list of prohibited dyes; in the United States and Canada a list of permitted dyes is given.

In Germany, since 1949 a special commission has been studying carcinogenic effects of synthetic dyestuffs. After rigorous testing a number of synthetic dyestuffs have now been shown to have no carcinogenic properties, said H. Druckrey, Freiburg University Clinic. On the other hand, there are numerous dyestuffs which now must be rejected as dangerous. The carcinogenic action, according to experience to date, is bound up with specific structure of various kinds. Minor changes, for example a shift in the methyl group, can cause or eliminate carcinogenic action in dyestuffs.

Druckrey predicted that within a short time chemical constitution would be definitely correlated with carcinogenic action. Already it has been determined that, for example, introduction of an acidic group into a basic azo dye practically eliminates carcinogenicity. Sulfation may also have a similar action, but breaking of the azo bridge can produce a toxic compound.

The German professor read a proposal for international restrictive legislation on food additives, that had been unanimously adopted by an international conference on the subject, held in Bad Godesberg in May of this year. An important point in this proposal was the suggestion that an international list of permitted food colors be prepared; 13 synthetic dyes were proposed, together with a number of dyes of natural origin. Specimens of the approved dyes should be exchanged on an international basis. The proposal went on to lay down a procedure for admittance of additional food additives to the approved list.

The Bad Godesberg proposal was unanimously endorsed by the Nutrition Congress, with the suggestion that the matter be referred to the International Union of Nutritional Sciences. A joint committee of the WHO and FAO studying food additives meets in November of this year and will undoubtedly consider the proposal.

# German Study Reveals Lead in Yeast from Sulfite Liquor

AMSTERDAM.—Samples of torula yeast produced from spent sulfite liquor have been found to contain toxic amounts of lead, according to Karl-Heinz Wagner, Institute for Nutritional Science, Giessen, Germany. Test animals fed samples of yeast of this type showed accumulation of lead not only in the liver but also in the bone structure. Wagner made his report before the Third International Congress on Nutrition, held here Sept. 13 to 17.

At Giessen, biological evaluation of different kinds of yeast indicated that animals fed torula yeast showed slower growth rates than animals fed dry brewers' yeast. Although histological examinations gave the impression of a poisoning, the first assumption was that the difficulty was due to action of unknown protein compounds in the yeast. However, when human beings were fed samples of the yeast, changes took place in the blood chemistry analogous to changes observed in heavy metal poisoning. The degree of poisoning paralleled the quantity of yeast ingested.

On analysis, the torula yeast samples were found to contain arsenic, antimony, lead, and iron. The presence of lead in the blood of humans who had consumed the yeast samples was established by polarographic methods.

Wagner made an urgent plea for rigid control of commercially produced torula yeast. A determination of heavy metal content should be required for cattle feed as well as human food, said Wagner.

In the discussion following his lecture, Wagner's findings were sharply criticized by a representative of Zellstofffabrik Waldhof. Waldhof is probably the world's largest producer of torula yeast. Many feeding tests have been carried out over a number of years without any injurious effects, said the Waldhof spokesman. While admitting that higher contents of lead were possible in yeast samples produced shortly after the war, he indicated that important processing changes had been made since then and that recent production contained completely harmless quantities of heavy metals. He suggested that yeast for feed purposes should have a lead content not exceeding 10 to 20 p.p.m.

The torula yeast process, utilizing spent liquor from sulfite pulp mills, was perfected in Germany just prior to and during the last war. Zellstofffabrik Waldhof was the most successful of the German firms working on the process and has evolved a unique aeration technique for the fermentation. The first commercial feed yeast plant to use spent sulfite liquor in the United States started production in 1948 at Rhinelander, Wis. Since that time, several other yeast plans of similar design have gone into production.

# Carbohydrates as Chemical Raw Materials?

NEW YORK.—Sooner or later, as petroleum, natural gas, and other fossil sources of basic organic chemical raw materials are consumed, the chemical industry will have to turn to replenishable raw materials, such as carbohydrates. To many the day when this will become necessary is something for treatment in science fiction by those who dream of the far distant future, but others feel that even now we should be working to find more industrial uses for carbohydrates.

Probably the foremost proponent of research on industrial applications for carbohydrates is Henry B. Hass, Sugar Research Foundation, whose interest is in sucrose and its by-products. At the symposium on sources of carbohydrate raw materials at the 126th National ACS meeting here recently, he said that what has already been done with starch should now be done with sugar. He was, of course, referring to starch's many industrial applications which consume greater volumes than food uses.

Sugar is the pure organic chemical produced in greatest quantity. Its chemical structure and the behavior of its chief functional groups are well known yet very little sugar is used as a starting point for chemical manufacturing processes, with the exception of sorbitol.

Hass said research could turn up other useful sugar derivatives, such as a synthetic detergent derived from sugar which has already been prepared on a laboratory scale. Sugar's great solubility and the fact that it is taken up by living organisms at a rapid rate suggest

many other applications. For example, it might be possible to make sucrose derivatives with toxic functional groups to obtain pesticides.

That petroleum derivatives are used for the water soluble portion of surface active agent molecules is directly attributable to the vast amount of research carried out by the petroleum industry, according to Hass. In this and many other cases sugar might be a better starting material, he suggests.

Sugar producing capacity has outstripped consumption and it would not be difficult to double world production. Sugar cane yields per acre (including bagasse, molasses, etc. as well as sugar) are high—12 tons per year—and crop rotation is not necessary. This means efficient use of the land.

By-products from sugar refining are also important. Molasses was formerly used in great quantity by the fermentation industries, but this use has declined; there is now only one major producer of fermentation industrial alcohol. Loss of this outlet is being made up by the increasing use of molasses in cattle feed. Monosodium glutamate is also being made from molasses.

Sugar is not the only carbohydrate which might serve as a chemical raw material. Starch has already been mentioned, and forest products may become more important in the future. Waste products such as oat hulls and corn cobs now feed the furfural industry.

One serious question to be taken into account when considering moving the base of the organic chemical industry to agricultural products is whether it is safe to count on agricultural sources with world population growing the way it is. Hass's answer to this is that there are large areas of virtually undeveloped land in the world, such as most of the continent of Africa, so this need not be a problem in any forseeable time.

## Government

### USDA Has Openings For Chemists in Utilization Research

Expansion of USDA's research on the utilization of Southern farm crops has created a number of job openings for chemists and physicists in such applied and fundamental fields as cotton, vegetable oils, fatty acids, terpenes, and resin acids.

Salary range for these positions is from $3410 to $7040. Those interested can obtain application blanks from any Post Office and file them with the Regional Director, Eighth U. S. Civil Service Region, 1114 Commerce St., Dallas 2, Tex.

## Industry

### Cyanamid Claims Bristol Infringing on Aureomycin Patent

American Cyanamid has announced filing a patent infringement suit in the U. S. District Court for the Northern District of New York against Bristol Laboratories. Cyanamid claims infringement by Bristol of its patent covering chlortetracycline, sold by Cyanamid's Lederle Laboratories Division under its trade name Aureomycin.

Cyanamid's complaint, filed late last month claims that Bristol, which has a plant at Syracuse, is making and selling an antibiotic composition (under the trade name Polycycline) which contains material covered by Cyanamid's patent, and that in making its product Bristol uses processes and methods covered by Cyanamid's patent.

The complaint asks for damages and an injunction against future infringement.

### Solvay's Chloromethane Plant Starts Producing at Moundsville

Start-up of production of its chloromethane plant at Moundsville, W. Va., has been announced by Solvay Process Division, Allied Chemical & Dye Corp.

The new plant, which has been under construction for over a year, will produce methyl chloride, methylene chloride, chloroform and carbon tetrachloride.

Uses for methyl chloride include preparation of greenhouse sprays. Biggest outlet for methylene chloride is as a nonflammable solvent for paint and varnish removers, but it is also used to formulate aerosol propellants.

Chloroform also finds use in production of certain aerosol propellants and in addition is used in manufacture of penicillin as well as other antibiotics. Principal use for carbon tetrachloride today is in manufacture of refrigerants and propellant compounds.

Methyl chloride will be sold in tank car lots, f.o.b. Moundsville, W. Va., freight equalized with recognized producing points. Methylene chloride, chloroform and carbon tetrachloride are being offered on a delivered price basis. These products may be obtained in drums or in tank car quantities.

In addition to its four new products, Solvay has been producing chlorine and caustic soda at Moundsville since last December, and is now also making by-product muriatic acid and anhydrous hydrogen chloride at that location.

## Research

### Ohio Orchard Tests with Antibiotics Among Most Conclusive

An error of omission occurred in the story on the use of antibiotics to control orchard disease in the Sept. 1 issue on pages 904 and 906. Two paragraphs and a table were omitted referring to the work at the Ohio Agricultural Experiment Station, which was started in 1952 and is said to be the most conclusive of the work presented so far. The omitted material is presented below.

As a result of very striking and favorable results obtained last year, H. F. Winter and H. C. Young, Ohio Agricultural Experiment Station, planned and conducted extensive experiments during the 1954 season. These consisted of controlled experiments involving the inoculation of the trees as well as the application of one or more formulations of streptomycin in 12 different commercial apple and pear orchards in all sections of Ohio. In the controlled tests, streptomycin, Terramycin, and tetracycline were employed, and five different formulations of streptomycin were also tested.

Results obtained in five of the seven Jonathan apple orchards used in 1954 are summarized in the table (insufficient blight for comparison purposes developed in the other two orchards):

**1954 Fireblight Studies in Commercial Jonathan Apple Orchards**

(Infections per tree)

| Material Used | Orchard No. 1 4-yr. trees | Orchard No. 2 18-yr. trees | Orchard No. 3 15-yr. trees | Orchard No. 4 35-yr. trees | Orchard No. 5 18-yr. trees* |
|---|---|---|---|---|---|
| Agri-Mycin | 0.0 | 0.01 | 1.6 | 3.7 | 1.3 |
| Streptomycin liquor | ... | 0.03 | ... | ... | ... |
| Streptomycin STS | ... | ... | ... | ... | ... |
| Streptomycin STB | ... | ... | 2.3 | ... | ... |
| Check | 11.1 | 20.4 | 39.3 | 377.0 | 24.5 |

Natural infection—no inoculation.

Materials at dosages to give 100 p.p.m. of major antibiotic were applied full bloom, and at petal fall.

* Applied as 5X concentrate.