These and other results demonstrate the close relationship of nicotinic acid and the amide to black tongue. The fact that nicotinic acid amide is an essential ingredient of the diet is not surprising since it is a component of certain coenzymes. However, the observation that a deficiency of this material may be the cause of black tongue is most interesting. Whether these compounds are equally effective in human pellagra can only be answered by clinical trials.

DEPARTMENT OF AGRICULTURAL CHEMISTRY
UNIVERSITY OF WISCONSIN
MADISON, WISCONSIN
C. A. ELVEHJEM
R. J. MADDEN
F. M. STRONG
D. W. WOOLLEY

RECEIVED AUGUST 16, 1937

A WATER-SOLUBLE LIGNIN SULFONIC ACID FROM AN EXTRACTED OAK LIGNIN

Sir:

The authors have succeeded in preparing a water-soluble lignin sulfonic acid from an *extracted* lignin by the following method: solvent-extracted, oak wood meal was acetylated by a modification of the method of Suida and Titsch [*Monatsh.*, **54**, 700 (1929)] and the isolated, acetylated lignin–carbohydrate complex hydrolyzed in cold aqueous acetone solution with sodium hydroxide. Filtration and acidification of the filtrate gave an oak lignin which could be separated into two fractions: (a) a chloroform-soluble (10%), and (b) a chloroform-insoluble fraction (90%). *Anal.* (a) OCH_3, 23.4%; (b) C, 63.9; H, 6.2; OCH_3, 20.6. The fully methylated lignins showed C, 65.2; H, 6.8; OCH_3, 37.6. The oak lignin was readily and completely soluble in sodium bisulfite cooking liquor at 100–125°. Treatment of the lignin sulfonic acid (OCH_3, 23.0) (collaboration of W. L. Hawkins) with alkali yielded a mixture of equal parts of vanillin and syringic aldehyde (total yield 4.6%). Its properties, as well as those of the lignin from which it is derived, are now being investigated thoroughly on account of the importance of such data for use in studies on the mechanism of sulfite pulp manufacture.

DIVISION OF INDUSTRIAL AND CELLULOSE CHEMISTRY
McGILL UNIVERSITY
MONTREAL, CANADA
HAROLD HIBBERT
W. H. STEEVES

RECEIVED AUGUST 9, 1937

THE NITROGEN ISOTOPE (N^{15}) AS A TOOL IN THE STUDY OF THE INTERMEDIARY METABOLISM OF NITROGENOUS COMPOUNDS

Sir:

Urey, Fox, Huffman and Thode [THIS JOURNAL, **59**, 1407 (1937)] have recently succeeded in concentrating the nitrogen isotope of atomic weight 15 (N^{15}). Professor Urey has kindly supplied us with a sample of ammonia enriched in N^{15}. It had a N^{14}/N^{15} ratio of 160 as compared to a normal of 266. All isotope analyses were carried out with a mass spectrometer. Glycine and hippuric acid were synthesized from this ammonia.

For metabolism studies of organic compounds with isotopes it is essential that the labelled atom be stable and not exchange with the same element of other compounds. We have studied the systems glycine–ammonia, hippuric acid–ammonia, hippuric acid–glycine, and tyrosine–glycine, and have found no exchange of the nitrogen.

Two groups of experiments on biological hippuric acid formation were carried out on rats with the new compounds. The urinary hippuric acid, after either feeding or injection of hippuric acid (N^{15}), contained a mixture of about one-third normal acid and two-thirds of the material fed. When glycine and benzoic acid were given together by the same methods, the urinary hippuric acid contained about two-thirds normal hippuric acid and one-third hippuric acid (N^{15}).

The experiments indicate that hippuric acid can be absorbed from the intestinal tract without being hydrolyzed, and furthermore suggest that glycine may be directly utilized for hippuric acid formation. The nitrogen isotope should prove to be as useful in the study of the intermediary metabolism of nitrogenous compounds as deuterium is in the study of fat and sterols.

DEPARTMENT OF BIOLOGICAL CHEMISTRY
COLLEGE OF PHYSICIANS AND SURGEONS
AND DEPARTMENT OF CHEMISTRY
COLUMBIA UNIVERSITY
NEW YORK, N. Y.
RUDOLF SCHOENHEIMER
D. RITTENBERG
M. FOX
ALBERT S. KESTON
SARAH RATNER

RECEIVED AUGUST 2, 1937

CATALYTIC ISOMERIZATION OF *n*-BUTANE AND ISOBUTANE

Sir:

Glasebrook, Phillips and Lovell have recently reported [THIS JOURNAL, **58**, 1944 (1936)] a low temperature, catalytic isomerization of *n*-pentane to isopentane in the presence of aluminum halides.