rats. Conversely, in both types of experiment it is possible to cause a full return of the d.i. by giving 250 mgms of salt per day without any food. Similarly, excess NaCl administration is well known profoundly to aggravate an existing d.i.[6] All the above experiments were done with rats in the permanent phase of d.i. We have found, however, that the transient phase is not dependent on the rate of NaCl ingestion; it occurs even though the NaCl content of the diet has been previously reduced or, as is well known, in fasting.

Although the rate of ingestion of NaCl greatly influences the permanent phase of d.i., we do not think it exclusively responsible for the condition. If the NaCl intake is reduced to zero by fasting, a degree of d.i. still recurs at the time of the onset of the permanent phase. At this time, the fluid exchange of the d.i. animals rises to about three times normal, as contrasted with seven times normal when such animals are fed. In d.i. rats, therefore, a large portion of the abnormal fluid exchange which commences with the permanent phase can be ascribed to the return of the animal's appetites with consequent ingestion of NaCl in the animals' food.

Using Richter's[7] technique for determining appetites in the rat during deficiencies of various kinds, we have also found that there is in d.i. in the rat a considerable appetite for salt. Diabetic rats ingest approximately three times the quantity of salt that the normal rat ingests when given a choice between water and physiological saline to drink.

Summary: The severity of permanent diabetes insipidus in the rat is directly related to the amount of NaCl ingested; if little or no NaCl is taken in, the condition exists in only a mild form. The effect of fasting on diabetes insipidus can be attributed to the withdrawal of NaCl rather than to the withdrawal of food in general. Also, the diabetic rat shows a considerable appetite for NaCl. These findings, coupled with the fact that the diabetic animal is abnormally sensitive to NaCl administration, suggest that in diabetes insipidus the primary defect is some abnormality in NaCl metabolism.

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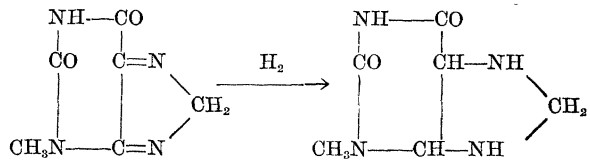
THE ATTEMPTED HYDROGENATION OF 3-METHYLXANTHINE[1]

THE observation by vanVeen and coworkers that *toxoflavin* $C_6H_6O_2N_4$ (I), the highly toxic substance produced by the bacterial action of *Bacterium cocovenenans* on certain food products originating in the commercial production of cocoanut oil in Java,[2] is reduced catalytically in the presence of platinum oxide to a purine containing a saturated glyoxaline ring (II), stimulated the authors to investigate the behavior of 3-methylxanthine (IV) on catalytic reduction.



I II

The graphical formula (I) proposed by vanVeen to express the structure of *toxoflavin* is isomeric with that of 3-methylxanthine (IV), and is the first representative of the desmotropic formulation for purine (III) to be described in the chemical literature.

III IV

It is a well-known fact that xanthine (V), 3-methylxanthine (IV) and several other alkylated xanthines undergo reduction electrolytically[3] with absorption of hydrogen at the 6-position of the purine cycle. This treatment leads to the hydrogenation of the carbonyl group (CO) to a methylene radical (CH_2) and formation of a desoxypurine derivative (VI). There was no attack by hydrogen on the imidazole cycle of the purine nucleus of the various xanthine compounds subjected to this electrolytic technique of reduction. Uric acid is also reduced in a similar manner.[4]

V VI

The authors now desire to report that it has been their experience that both xanthine (V) and 3-methylxanthine (IV) are extremely resistant to structural changes when subjected to hydrogenation in the pres-

[6] H. G. Swann, *Endocr.*, 24: 253, 1939.

[7] C. P. Richter, *Endocr.*, 21: 50, 1937; *ibid.*, 22: 214, 1938.

[1] Researches of pyrimidines, CLXII.

[2] vanVeen and Mertens, *Rec. trav. chim.*, 53: 402, 1934; vanVeen and Baars, *Kononklijke Akad. Wetenschappen Amsterdam*, 40: 6, 1937; vanVeen and Baars, *Rec. trav. chim.*, 57: 248, 1938.

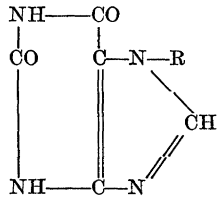
[3] Tafel and Weinschenk, *Ber.*, 33: 3370, 1900; Tafel and Ach, *Ber.*, 34: 1166, 1901. See also Johnson, "The Chemistry of Pyrimidines, Purines and Nucleic Acids," Gilman's "Organic Chemistry," Volume II. John Wiley and Sons, Inc., New York City, New York, 1938.

[4] Biltz, *Jour. pr. Chem.*, 145: 83, 1936.

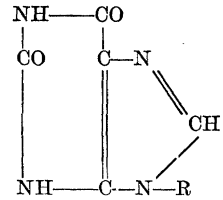
ence of certain catalysts. Both purines, suspended in glacial acetic acid, were recovered unaltered after exposure to hydrogen gas for 8 hours in the presence of Adam's platinum catalyst and under 1.5–2.0 atmospheres pressures. Reduction experiments were also applied by substituting absolute alcohol for glacial acetic acid as solvent and shaking in an atmosphere of hydrogen gas in presence of Raney nickel as the catalyst, under 160–200 atmospheres pressure at 200° for 10 hours. Both purines were partially destroyed by this treatment. In the case of 3-methylxanthine 60 per cent. of the purine was recovered unaltered. Its identity was established by the results of analysis (calc. for $C_6H_6O_2N_4$: N, 33.72 per cent. Found, N, 33.60 per cent.) and by conversion to caffeine by alkylation according to the directions of Emil Fischer.[5]

Exposure of xanthine (V) to catalytic hydrogenation at different hydrogen pressures and temperatures in the presence of copper-chromium-oxide catalyst led to such extensive decomposition of the purine that this reduction technique proved to be of no value and consequently was not applied with 3-methylxanthine. In none of our experiments did we obtain any evidence of the reduction of carbonyl to methylene in position —6, or any hydrogenation of the unsaturated imidazole nucleus of the xanthine molecule. These results are in marked contrast to those reported for *toxoflavin* (I) when exposed to the action of hydrogen under similar experimental conditions.

The resistance of hydrogenation of 3-methylxanthine (IV) is in accordance with the behavior of imidazoles which have previously been investigated. Although 2,4,5-triphenylimidazole[6] (lophin) is reduced with difficulty in the presence of platinum black[7] to 2,4,5-tricyclohexyl-4,5-dihydroimidazole, and 2,4,5-triphenyl-4,5,-dihydroimidazole to this same dihydro-derivative and finally to 2,4,5-tricyclohexylimidazoline, the same experimental conditions were ineffective when applied to imidazole itself, 2,4,5-trimethylimidazole, histidine, lysidine and to benzimidazole. The authors were also unable to hydrogenate benzimidazole-benzimide with Adam's platinum, Raney nickel or copper-chromium-oxide catalysts. It will be of interest to determine whether isomers of the xanthine (VII) and isoxanthine (VIII) types will differ in their behavior on catalytic reduction.



VII



VIII

TREAT B. JOHNSON,
JOSEPH C. AMBELANG,
Sterling professorship of chemistry research assistant, 1938–39
YALE UNIVERSITY

SCIENTIFIC APPARATUS AND LABORATORY METHODS

LABELING MUSEUM SPECIMENS

To workers engaged in museum or natural science activities the labeling of specimens is generally a necessary but time-consuming task. A quick and efficient method is always sought. The writer has developed a method which has proved to be very satisfactory.

The complete series of symbols to be used are hand-printed with black drawing ink or typed on strips of tough white or brown gummed paper. Brown or Cellophane "Scotch" tape may be used if the symbols are to be hand-printed, but the tape does not make as satisfactory a label as the gummed paper. Sufficient space is left between the symbols to permit cutting to the desired size. When completely marked the individual labels are cut from the strips. The single label is moistened on the gummed side and fastened to the specimen by a little pressure. A perfect attachment at this stage is not necessary as it serves only to hold the label while the "varnish" is being applied. By the time a number of labels have been attached to their respective specimens the first ones are entirely dry and are ready for the "varnish." A coating of Cenco Label Varnish[1] is applied so as to cover the paper label and to overlap about one sixteenth to one eighth of an inch on the adjacent portion of the specimen. The overlap serves as a seal of attachment. The dauber that is attached to the stopper of the bottle is too large and clumsy for this purpose. A small sliver of wood cut to a chisel end about one eighth of an inch across serves as the best means of application; although a small brush may be used. The "varnish" dries sufficiently upon application to prevent running so that it is not necessary to place the labeled portion of the specimen in better than an approximately horizontal position while drying. The specimens are ready for use in less than an hour but are generally let stand over night.

Recently two articles in this journal[2] described other

[5] Fischer and Bromberg, *Ber.*, 30: 221, 1897.

[6] Waser and Gratsos, *Helv. Chim. Acta.*, 11: 944, 1928.

[7] Willstatter and Waldschmid-Leitz, *Ber.*, 54: 113, 1921; Waser and Gratsos, *Helv. Chim Acta.*, 6: 200, 1923.

[1] This may be obtained in small bottles from the Central Scientific Company, Chicago, Ill.

[2] E. E. Jacobs and Mary Auten, SCIENCE, 84: 210, 1936; I. P. Tolmachoff, SCIENCE, 84: 464, 1936.