

Note on Hesse's Experiments on Products of Putrefaction of Beer Yeast, and on the Probability that some of the Compound Ureas are usually Present in Common Urea. By WILLIAM K. SULLIVAN.

Since the publication of my paper in the first number of this journal—"Observations on some of the Products of the Putrefaction of Vegetable and Animal Substances and their Relation to Pathology", p. 202,—I have learned that Professor Hesse has been likewise studying the same subject, and has arrived at results almost identical with mine. He has published an account of his experiments on the products of the putrefaction of beer yeast in the *Journal für Praktische Chemie*, No. 16, 1857. The acids he found were acetic, propionic, butyric, caprylic, and pelargonic. He is of opinion that formic acid was also present. The bases, besides ammonia, were trimethylamine, monethylamine, monamylamine, and one whose composition agreed with that of monacrylamine, but whose crystalline form appeared to indicate that it was a different substance. The platinum salt of some other base was also obtained, but no definite results as to its constitution could be found. He does not mention the presence of valeric acid, which is singular, considering that amylamine was formed, and that amylic alcohol is a constant product of fermentation. I have invariably found it present in the products of putrefaction of all the substances, whether vegetable or animal, that I have examined.

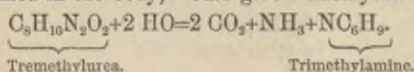
In connection with this subject, I may be pardoned for mentioning here what I had quite forgotten when writing the article above mentioned, namely, that I had read a short paper before the Pathological Society of Dublin in the beginning of 1850, upon the products of the putrefaction of brain, in which I announced that, in addition to a base having the properties possessed by trimethylamine, I obtained one in which one equivalent of hydrogen was replaced by  $C_{10}H_{11}$ , the supposed radical valyle, or in other words the base, now called monamylamine. The only published record of this fact which I can lay hands upon at the moment, is a note in a Review by Dr. Lyons, on the Pathology of the Kidney, in the *Dublin Quarterly Journal of Medical Science*, p. 388, No. XVIII., May, 1850, and which I shall give here:—

"Some interesting observations on the new ammonias were laid before the Dublin Pathological Society at one of its recent meetings, by Mr. William K. Sullivan, chemist to the Museum of Irish Industry, etc. Mr. Sullivan has observed that in the breaking up of the constituents of the brain during the process of putrefaction, a large quantity of valerianic acid is produced and at the same time ammonia, but an ammonia, in which part of the hydrogen is replaced by a carbo-hydrogen: in this instance valyle, the carbo-hydrogen of valerianic acid, was the one which had been substituted. Mr. Sullivan is further of opinion that such bodies may occur in the animal organism also, and that their ureas (that is, combinations having the same relations to these ammonias that common urea has to the ordinary ammonia) will be found of frequent occurrence in abnormal conditions of the blood and urine".

It is gratifying to find that so important a fact as the formation during putrefaction of compound ammonias, and even of one not otherwise known at the time, should be so completely verified by so competent an observer as Professor Hesse.

Before passing from this subject I may also observe that Dr. Odling of London has mentioned to me, that he had found Amine bases in exhalations from sewers.

The circumstance of having read the paper to the Pathological Society was accidentally recalled to my memory in reading a notice in Liebig's and Kopp's *Jahresbericht* for 1856, of the interesting discovery of Dessaignes of trimethylamine in human urine. In consequence of the peculiar smell of the carbonate of ammonia evolved during the evaporation of urine, he submitted large quantities to distillation. The distillate, smelling strongly of ammonia and of sea fish, became red on being supersaturated with hydrochloric acid; on evaporation a quantity of salammoniac first separated. The mother-liquor was evaporated to dryness, the dried mass exhausted with alcohol, and the solution treated with bichloride of platinum, by which, after several crystallizations, beautiful crystals of the double salt of hydrochlorate of trimethylamine with chloride of platinum were obtained. Its composition was verified by analysis. Sixty-five litres of fluid obtained by distillation from urine already concentrated gave 2,200 grm. of chloride of ammonium and only 17 grm. of the platinum double salt, equivalent to 3.7 grm. of trimethylamine. In the notice alluded to (p. 524) it is observed that Dessaignes left it undetermined whether the trimethylamine existed ready formed in the urine, or appeared in it as a product of decomposition. Now I think the suggestion contained in the note above quoted from the *Dublin Quarterly Journal of Medical Science*, with regard to the probable formation of compound ureas in the animal body, points to its true source. Common urea in solution in urine decomposes, producing carbonic acid and ammonia,  $C_2H_4N_2O_2 + 2HO = 2CO_2 + NH_3$ . Under the same circumstances, trimethylurea, if it be formed in the body, would give trimethylamine. Thus:



It is impossible to overrate the importance in a physiological, as also in a pathological, point of view of this question of the probable formation in the body of compound ureas, now especially that Dessaignes' observation places it almost beyond doubt. This must plead my excuse for referring to my observations of eight years ago, and which, I regret, have been allowed to lie so long barren. Now that our knowledge of the compound ammonias and compound ureas is so complete, it is to be hoped that physiologists will seek for these bodies in urine, etc. The chemistry of that fluid is evidently not yet exhausted.