

contents and pancreatin were added to nucleic acid solutions and precipitates formed in the usual way. The following figures were obtained:

Mixtures.	Ratio of sol. k.	1.0	0.9	0.8	0.7	0.6	0.5
		mm.	mm.	mm.	mm.	mm.	mm.
I Urine and nucleic acid.....	0.23	11.7	12.6	13.7	15.1	16.7	19.4
II Pancreatin and nucleic acid.....	0.11	11.2	12.1	13.5	15.2	17.1	19.3
III Stomach contents and nucleic acid....	0.19	12.0	12.9	14.2	15.7	18.5	21.0

These figures are the average of 5 or 6 readings. In addition to 0.05 g. of nucleic acid, solution I contained 2 cc. of urine; solution II 0.02 g. of pancreatin, and solution III 2 cc. of filtered stomach contents. As may be seen, the curves with the mixtures run practically the same as nucleic acid alone.

To determine the presence of nucleases and their relative activity, solutions of nucleic acid were incubated with pancreatin, and the digestion determined by comparing at intervals with known amounts of nucleic acids and precipitating in both cases with 0.2% solution of egg albumin.

Solution I.—Contained 0.05 g. of nucleic acid, 2.5 cc. of 2% pancreatin solution (Mercks) 2.5 cc. of 2% tricesol, made up to 50 cc. with distilled water. *Solution II* was made in the same manner, except that it contained 5 cc. of 2% pancreatin solution (Eimer & Amend).

Pancreatin.	NUCLEIC ACID DIGESTED.					
	0 time. Per cent.	1 hr. Per cent.	2 hrs. Per cent.	3 hrs. Per cent.	4 hrs. Per cent.	5 hrs. Per cent.
I Merck.....	0.0	38.0	65.0	75.3	76.8	78.3
II Eimer & Amend.....	0.0	21.5	28.5	33.0	(33.0)	41.5

III. Summary.

The nephelometer can be used for the study of digestion of yeast nucleic acid, when a 0.2% solution acid egg albumin is used as a precipitant. This reagent is not appreciably affected in dilute solutions by most substances met with in physiological work, and will easily detect one part yeast nucleic acid in 1,000,000 parts of water.

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A PROPOSED MODIFICATION OF THE KOBER METHOD FOR QUANTITATIVE AMMONIA DISTILLATION BY AERATION.

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The method outlined by P. A. Kober and S. S. Graves under the title, "Quantitative Ammonia Distillation by Aeration" in *THIS JOURNAL*¹ seemed of such great value that it was given a series of trials by the writer.

For this purpose ammonium sulfate, 99.80% (NH₄)₂SO₄, was used. The details of the method employed are as follows: A weighed quantity of ammonium sulfate was placed in a Kjeldahl flask of 800 cc. capacity

¹ *THIS JOURNAL*, 35, 1594 (1913).

and 20 cc. of concentrated sulfuric acid (1.84 sp. gr.) were added, followed by an addition of 80 cc. of distilled water. The mixture was cooled and the flask connected with an absorption bottle containing a slight excess of standard sulfuric acid. A suction pump was attached and air drawn through at a slow rate while 60-90 cc. of a saturated solution of sodium hydroxide were drawn into the Kjeldahl flask, which was given a rotary motion in order to cause thorough mixing of the solutions. In nearly every case the heat of neutralization was utilized. Air was then drawn through at a rapid rate.

The rate of aeration was determined by means of the apparatus suggested in the above mentioned paper (p. 1597). The most powerful pump at my disposal allowed a rate of only 360 liters of air per hour, which is a slower rate than that of pump A used by Kober and Graves; however, the authors state, on page 1598: "400 to 600 liters of air seems to be sufficient for the average amount of ammonia obtained in Kjeldahl work. If a weaker pump is used, or if larger quantities of ammonia are to be distilled, more aeration must be used." Consequently more aeration was employed in my experiments by carrying on the aeration for various lengths of time, ranging from one and one-half to five hours.

AMMONIUM SULFATE DETERMINED BY AERATION ALONE.

Amt. of (NH ₄) ₂ SO ₄ taken. G.	(NH ₄)SO ₄ equivalent to ammonia recovered by aeration alone.		Time of aeration. Hours.
	G.	Per cent.	
0.2508	0.2286	= 91.16	1.5
0.2558	0.2154	= 84.21	1.5
0.2485	0.2088	= 84.03	3
0.2505	0.2180	= 97.02	4
0.2503	0.2247	= 89.77	5
0.2078	0.1790	= 86.14	1.5
0.2023	0.1810	= 89.47	1.5
0.2011	0.1863	= 92.65	1.5
0.4003	0.3713	= 92.76	3
0.4024	0.3793	= 94.25	2
0.3990	0.3873	= 97.06	4
0.4018	0.3410	= 84.87	3
0.4000	0.3555	= 88.87	2

A large number of determinations were made, and in no case could all the ammonia be recovered by this method of aeration. In each case quantities of ammonia varying, in round numbers, from 3% to 15% were found to be retained in the residual liquid in the Kjeldahl flask. This was shown to be the case by titration of the excess of standard acid in the absorption bottle in the usual manner. In two instances aeration was carried on from four to five hours and here from 11% to 12% of the ammonia failed to be drawn over. The amount of ammonia in the residual liquid in the Kjeldahl flask was determined in one of two ways: by transferring the liquid to another flask and subjecting it to steam distillation,

or by applying a low flame to the Kjeldahl flask and continuing the aeration for one hour longer. Either of these two ways allowed all of the ammonia to be recovered.

These results are at variance with those of the authors of the previously mentioned article, and I am unable to account for the large quantities of ammonia which remained in the residual liquid. Possibly under the conditions of the experiments, a double salt of ammonia is formed which fails to give up all of the ammonia by aeration alone. Possibly the lower rate of aeration may account for the failure. I hope to be able to investigate this point further.

This failure to recover all of the ammonia, by aeration alone, suggested a modification of the method has been carefully tried out and which it is desired to offer. The modification consists in utilizing the heat of neutralization and in heating the liquid in the Kjeldahl flask over a low flame during the entire period of aeration. Pieces of zinc may be added to prevent bumping. It is well also to use a larger amount of water than the original method calls for. The outlet tube of the Kjeldahl flask should be provided with a glass trap to prevent carrying over of the sodium hydroxide. This modification will allow all of the ammonia to be recovered from ammonia sulfate in one and one-half hours. The liquid in the absorption bottle naturally becomes quite hot from the steam, but no loss of ammonia occurs, provided the standard acid is present in excess. When the absorption of ammonia is complete the absorption bottle may be cooled and the excess of standard acid titrated in the usual manner.

AMMONIUM SULFATE RECOVERED BY MODIFIED METHOD.

Amt. of (NH ₄) ₂ SO ₄ taken. G.	(NH ₄) ₂ SO ₄ equivalent to ammonia recovered by aeration and heating. G. Per cent.	Time of aeration. Hours.
0.2020	0.2015 = 99.76	1.5
0.2013	0.2009 = 99.80	1.5
0.4023	0.4017 = 99.86	1.5

It seems to me that this modification is of especial value in those instances where a powerful suction pump is not available, as the time of distillation by aeration can be shortened to one and one-half hours, or possibly less, by the application of gentle heat during the period of aeration.

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NOTE.

The Survival of Amylase in Dried Fodders.—The wide distribution of amylase in green plants is well known, and the literature on this subject has become quite extensive. No work seems to have been recorded, however, on the fate of this enzyme when the plant is subjected to the