ART. II.—*On certain Changes in the Composition of the Nitrogenous Constituents of Meat-extracts.*

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DURING the processes of manufacture of meat-extract considerable changes in the composition of the nitrogenous constituents take place. In the first place, the meat from which the extract is prepared is in contact with hot water for some time, and this, in conjunction with the sarcolactic and other flesh acids, and with the salts present in muscular tissue, causes a certain amount of hydrolysis to take place. The collagen of the muscle-fibre on hydrolysis yields gelatine, and by further hydrolysis soluble gelatin and other gelatinoids; similar action on the albumin yields small amounts of albumoses. Secondly, during the concentration of the extract-liquor by evaporation further changes in composition take place.

A liquor showing the following analysis was concentrated :—

	Per Cent.
Moisture	95·02
Organic matter	4·07
Mineral salts	0·91
Acidity, as lactic acid	0·50
Total nitrogen	0·488
Insoluble and coaguable proteids	0·165
Proteoses	0·838
Peptone-like bodies and polypeptides	Nil
Total meat bases	0·886
Ammonia	0·054

Calculating these results to correspond with an extract containing 20 per cent. of water, the following composition is shown :—

Moisture	20·00
Organic matter	65·60
Mineral salts	14·40
Acidity, as lactic acid	8·00
Total nitrogen	7·82
Insoluble and coaguable proteids	2·65
Proteoses	13·34
Peptone-like bodies and polypeptides	Nil
Total meat bases	14·19
Ammonia	0·85

After concentrating the liquor in the usual way by open-pan evaporation for forty-eight hours at 212° Fahr. the composition of the resulting extract calculated on a 20-per-cent.-moisture basis is as follows :—

Moisture	20·00
Organic matter	60·48
Mineral salts	19·52
Acidity, as lactic acid	10·30
Total nitrogen	7·92
Insoluble and coaguable proteids	1·16
Proteoses	12·37
Peptone-like bodies and polypeptides	8·69
Total meat bases	12·53
Ammonia	0·80

It is thus apparent that some considerable change had taken place in the composition of the material.

A portion of the same original liquor was concentrated under a partial vacuum of 15 in. at 180° Fahr. for three hours and a half, and the composition of the resulting extract calculated to a 20-per-cent.-moisture content shows :—

	Per Cent.
Moisture	20·00
Organic matter	63·04
Mineral salts	16·96
Acidity, as lactic acid	8·20
Total nitrogen	7·86
Insoluble and coaguable proteids	2·63
Proteoses	13·08
Peptone-like bodies and polypeptides	0·31
Total meat bases	13·76
Ammonia	1·08

It is seen that when the liquor is evaporated under vacuum there is some change in the composition of the resulting extract—the proportion of the organic matter decreases, while the mineral salts increase ; otherwise the composition of the vacuum-evaporated extract is very nearly that of the original liquor calculated to a 20-per-cent.-moisture content, the acidity, insoluble and coaguable proteids, proteoses, and total meat bases being present in about the same amounts in each case. In the original liquor there were no peptone-like bodies, whereas in the vacuum-concentrated extract there were found 0·31 per cent. of these substances.

The extract concentrated in the open pan is very different in composition from either the original liquor or the vacuum extract : the proportion of the organic matter has decreased, and the mineral salts increased considerably ; the total nitrogen remains about the same, but the forms in which the nitrogen is present have undergone considerable change ; about three-fifths of the insoluble and coaguable proteids have been rendered soluble and converted to other nitrogenous substances ; there is a decrease in the amounts of proteoses and meat bases ; while against these decreases there is found 8·69 per cent. of peptone-like bodies which are absent in the original liquor, and present in the vacuum extract to only 0·31 per cent. The acidity has increased by over 2 per cent.

The peptone-like bodies and polypeptides are bitter in taste, and it is found that extracts containing relatively large amounts of these bodies have a decidedly bitter taste. Samples containing 16·58 per cent., 12·02 per cent., 14·65 per cent., and 13·43 per cent. of peptone-like bodies were found to be bitter, while in samples containing 8·44 per cent., 8·60 per cent., 8·69 per cent., and 5·09 per cent. of these bodies no bitter taste could be noticed.

As but very small amounts of peptone-like bodies are present in vacuum-concentrated extract, and but little change in the composition of nitrogenous bodies is found, it is probable that the prolonged action of heat on the nitrogenous material in the presence of the normal flesh acids and salts, the amount of which increase as the evaporation proceeds, is the cause of the marked change in composition found in the open-pan-concentrated extract. The so-called "burned" flavour sometimes found in meat-extracts is doubtless due to the same cause, for in vacuum-concentrated extract no such undesirable flavour is noted.

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