Chemical studies on the Freshness of Whale Meat. II.

On comparison between whale meat and beef
on deteioration of freshness and autolysis.

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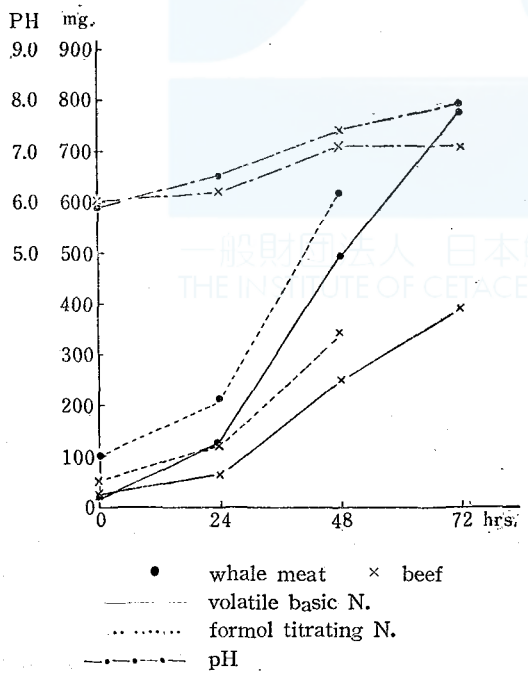
In the previous paper (this bulletin, p. 17) the author reported that the freshness of whale meat can be evaluted by determining the volatile basic nitrogen, i. e. ammonia nitrogen, or formol titrating nitrogen, as various workers have done on other kinds of meat. Although it cannot be said that the freshness of whale meat and that of other kinds of meat can be compared by the absolute quantity of these nitrogen in a definite quantity of meat, yet taking into consideration the fact that the volatile basic substances and the formol titrating sudstances are products in every stage of deterioration of freshness or putrefaction, the author believes that a comparison of the readiness of deterioration of freshness or putrefaction in whale and other meat can be made by comparing the condition of increase in the amounts of the two kinds of nitrogen with lapse of time. For this purpose, a piece of flesh of sei-whale (Iwashi-kujira ; *Balaenoptera borealis*) and a piece of beef were stood at room temperature in summer and changes in the amount of volatile basic nitrogen, formol titrating nitrogen and a change in pH value with lapse of time were determined. Results obtained are listed in Table I and summarized in Fig. 1. As shown in Fig. 1, the amounts of these nitrogen, especially that of volatile basic nitrogen, makes a greater increase during the course of the deterioration of freshness in sei-whale than in beef. Formol titra-

Fig. 1.

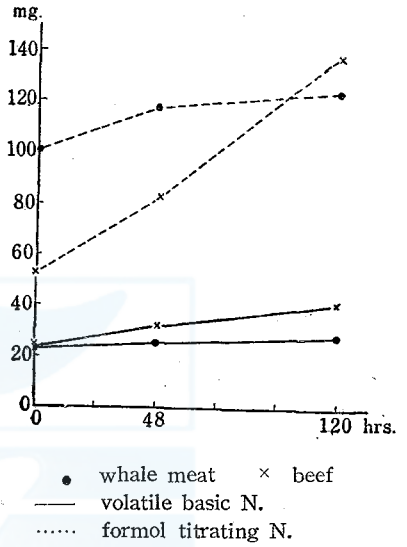


ting nitrogen in sei-whale meat was far greater than beef in absolute quantity but the rate of increase in beef was slightly above that of sei-whale meat. Increase of pH value was more rapid in sei-whale meat than in beef. This may be due to a large production of volatile basic substances in sei-whale meat.

From these results, it can be said that the freshness of sei-whale meat is more readily deteriorated than that of beef, provided that the kind of bacteria attacking meat is not brought into question.

At the same time, autolysis which plays a part in the deterioration of freshness in company with bacterial action was compared in both meat. The results obtained are shown in Table II and summarized in Fig. 2.

Fig. 2



Increase in the amount of nitrogen resulting from autolysis was found to be very small compared to that found when in united action with bacteria which mentioned above. Increase of both kinds of nitrogen was found to be greater in beef than in sei-whale meat during the process of autolysis.

Experimental

a) Deterioration of freshness at room temperature.

A piece of sei-whale meat preserved in an ice chamber for three days after dissection and a piece of beef stored in a refrigerator by a butcher were used as materials in the present experiments.

Each material was divided about equally into several Petri' dishes and let stood at room temperature in August. Every 24 hrs. the content of a dish for each material was minced and thoroughly pounded in a mortar. 4 g of each meat thus treated was weighed into a test-tube and 6 cc of absolute alcoholic 0.01 N H_2SO_4 was added to prevent subsequent decay. Samples thus obtained were put to the determination of volatile basic nitrogen and formol titrating nitrogen as mentioned in the previous report.

The determination of pH value was made as follows: 2 g of minced

material was pounded in a mortar with 10 cc of distilled water, allowed to stand for a short time, and the pH value of the supernatant liquid was determined with Toyo pH test-paper (methyl red and phenol red) and its standard table of change of colour which had been corrected with buffer.

Results obtained were as follows:

Table I.

Time (hrs.)	Volatile basic N*		Formol titrating N*		pH	
	Sei-whale meat	Beef	Sei-whale meat	Beef	Sei-whale meat	Beef
0	16.5	21.3	102	52	5.9	6.0
24	128	64.4	211	123	6.5	6.2
48	493	250	616	345	7.4	7.1
72	776	392			7.9	7.1

(* in mg/100 g)

b) Autolysis.

Materials used were the same as in a).

Each material was minced, thoroughly pounded in a mortar, and several samples of 2 g each were placed in glass bottles.

These bottles were corked after the addition of 18 cc each of distilled water saturated with chloroform, and allowed to stand at room temperature. At start and after 48 and 120 hrs., 30 cc each of absolute alcoholic 0.01 *N* H_2SO_4 were added in each bottle to prevent subsequent progress of autolysis. Samples obtained in this manner were put to the determination of the two kinds of nitrogen.

Formol titrating nitrogen.— The sample was transferred to a beaker, heated in a gently boiling water bath for about 15 min., and the supernatant clear liquid was filtered into an Erlenmeyer's flask. 10 cc of distilled water was added to the meat residue in the beaker, heated in a water bath for 5 min., and filtered as before. After the washing of the precipitate was repeated twice more, 1 cc of 20% sulfosalic acid was added to the combined filtrate and washings in the flask. The mixture was allowed to stand overnight, and filtered into a 50 cc volumetric flask. The residue on the filter was washed, and the combined filtrate and washings were diluted to the marking. 20 cc of the solution thus obtained was put to the formol titration.

Volatile basic nitrogen.— 20 cc of the solution obtained above was subjected to the aeration method as described in the previous report.

Results obtained were as follows:

Table II,

Time (Hrs.)	Volatile basic N*		Formol titrating N*	
	Sei-whale meat	Beef	Sei-whale meat	Beef
0	22.8	23.9	101	52.1
48	25.4	32.0	118	82.2
120	28.1	41.0	124	138

(* in mg/100 g)

In concluding this report, the author wishes to express his deepest gratitude to Dr. Tsutomu Maruyama for his kind guidance throughout the experiment and to Prof. Dr. Shichiro Akiya for his kind advices given during the work. Further, the author wishes to thank Mr. T. Tawara and Mr. R. Fukazaaw who helped him in the experiment, and to Mr. R. Nagaura and Mr. T. Nishihara for their assistance in providing the opportunities for obtaining materials for the present experiment.

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