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STUDIES ON SHARK MUSCLE  
PART 3. PUTREFACTION AND INDOL CONTENT OF SHARK MEAT

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**Introduction**

The curve representing the accumulation of ammonia in the shark meat which is stored at the temperature range of 5° to 20°C is not a sigmoid curve. It turns once at a certain point and then forms a step. Beyond this step, the meat which had seemed fresh in spite of its vigorous ammoniacal odor, showed the putrefactive appearance and developed putrefactive odor such as that of indol. In order to explain this changing of odor chemically and to observe the putrefactive phenomenon of shark meat, studies were made on the formation of ammonia as well as that of indol within samples of shark meat at 37°, 20° and 11° to 13° C.

**Experimental**

The shark meat samples in this experiment were from "Hoshizame" fish (*Mustelus manazo* BLEEKER) and "Dochizame" fish (*Triakis scyllium* MUELIER et HENLE), both most commonly found in Japan. Fine meat of these species of shark (after being separated from skin, connective tissue, blooded muscle etc.) was taken and minced twice. Samples, respectively, were then placed in containers, closed tightly and stored at a certain fixed temperature. At intervals, parts of the samples were taken out to be used to determine the ammonia and indol content. The ammonia as cited in this paper means strictly all the volatile basic nitrogen obtained, by the ordinary aeration method. The quantitative analysis of indol is made by TANIKAWA's method described as follows<sup>(1)</sup>: weigh out 100gm of sample, and place it with 200 c.c. of distilled water in a one liter flask. As an antifforming agent, liquid paraffin is added. Heat the flask in boiling saturated solution of sodium chloride until 500 c.c. of distillate is obtained by vapour distillation. Add 100 c.c. of concentrated hydrochloric acid to make acidic, then add 120 c.c. ether to dissolve its indol content. Wash the ether part with 25 c.c. of 2.5% caustic soda; then wash it again with 25 c.c. of 2% hydrochloric acid. Transfer the ether into a beaker and add to it 10 c.c. of distilled water. Heat the beaker on a water bath to 40°C so as to evaporate its ether. An aquatic solution of indol is thus obtained. This is used for the determination of indol. Take 5 c.c. of this sample solution into a test tube and determine indol content with colorimetric method using EHRlich's reagent.

The observed value is indicated as the logarithmic index of indol content in mg in 100 gm of shark meat. Since the curve of ammonia accumulation of shark meat at a certain temperature seems to indicate the changing phases in freshness of the meat at that temper-

ature<sup>(3)</sup>, so the quantitative values of indol are indicated on the ammonia curve as shown in Fig. 1.

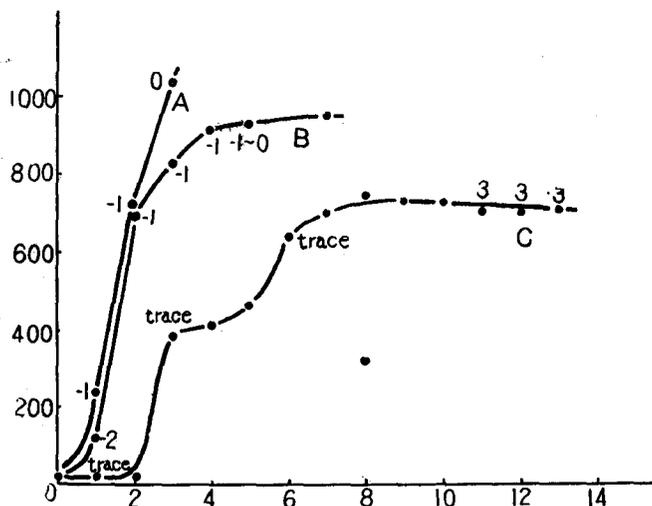


Fig. 1 Indol content of shark meat, stored at various temperatures:

A, dochizame, 37°; B, hoshizame, 20°; C, hoshizame, 11° to 13° C.

A point ". ." which is marked in this figure shows a basic nitrogen content, and numeral on the point shows an indol content. (Unit: logarithmic index of indol mg%)

Ordinate: volatile basic nitrogen (mg%).

Abscissa: time (days).

### Observation

From Fig. 1, it is clear that ammonia developing speed is greater as the temperature is raised, and the same may be said of indol. At 11° to 13°C., the amount of indol is rather smaller when compared with the ammonia content. According to the results obtained by CLOUGH's investigation<sup>(3)</sup>, when the indol content of a meat sample reaches to 0.0015 mg%, the meat is regarded to be on the point of putrefaction. If this limit is applied to the shark meat, the meat which is kept at a temperature 11° to 13°C though its ammonia content is remarkably large, putrefies only after rather

a long time. At or above a temperature of 20°C shark meat putrefies at a speed six times greater than at 11° to 13°C, as far as its indol content is concerned.

Generally speaking, the putrefactive odor of shark meat is noticeable, if its indol amount reaches more than 0.1 mg%, but when in a lesser amount, it can not be detected owing to the remarkable odor of ammonia.

In Fig. 1, "trace" means an indole content less than ca. 0.0009 mg%, the quantitative analysis of which is hard to determine by this experimental operation. With such an amount of indol, no putrefactive features except ammoniacal odor are found.

Judging from the indol content, the results obtained are the same as those observed histochemically<sup>(4)</sup>. At 11° to 13°C, up to the step of the curve, it is hardly to be regarded as a remarkable putrefaction. Therefore, at room temperature of less than 20°C, the putrefaction of shark meat is not said practically to be occurring though the meat is losing its freshness, as long as its ammonia accumulation curve does not reach that peculiar step.

### Summary

So far as indol content is concerned, the shark meat which is preserved at temperatures below 20°C, hardly shows putrefactive features, though it does have plentiful ammonia

content.

**Literature cited**

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