STUDIES ON THE SOURCE OF SHELLFISH POISON
IN LAKE HAMANA*
III.—POISONOUS EFFECTS OF SHELLFISHES FEEDING
ON *PROROCENTRUM* SP.

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Introduction

In the previous papers^{4), 5)} the writer has noted that the most poisonous shellfishes in Lake Hamana were gorged with the *Prorocentrum* cells and the similar toxin to the human mass poisoning was obtained from the shellfishes in Lake Hamana and in Shiba Port during the "red-tide" caused by the abundance of *Prorocentrum* sp. The present work was undertaken to study the toxicity of shellfishes, in Lake Hamana feeding on plankton including small amount of *Prorocentrum* sp., and in other localities feeding on considerable amount of the same species of Dinoflagellata, although the human poisoning occurred in neither case.

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Materials and Methods

- 1) Little-neck clams (*Venerupsis semi-*

Fig. 1. Location of shellfish sampling stations in Kanazawa, Kanagawa Prefecture.

1. Kanazawa Branch Station.
2. Shiba Port.
3. Hirakata.
4. Nozima.

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*decussata**) obtained from Nozima (Fig. 1) in Kanazawa, Kanagawa Prefecture, often contained similar *Prorocentrum* cells in their gut to those fed by the shellfishes in Lake Hamana when human poisoning occurred. In particular, all specimens collected on the 28th of March in 1962 were gorged with these cells.^{2), 3)} Therefore, the midgut-gland of these shellfishes was extracted as stated in the previous paper³⁾ (70% ethanol was used instead of methanol). Total amount of the midgut-glands of 14 clams was 2.1 g, and the final extractive thus obtained was dissolved in 2.1 cc of distilled water and was used as the injection.

2) Oysters (*Ostrea gigas*) obtained at the same time as above from Hirakata (Fig. 1) in Kanazawa were shown to feed on the plankton including similar species of Dinoflagellata as above.^{2), 3)} Total amount of the midgut-glands of 8 oysters was 4 g, the extract of which was dissolved in 1.2 cc of distilled water and was used as the injection.

3) Most specimens of *Venerupis semidecussata* collected from the east side of the Hamanako Branch Station⁴⁾ on the 22th of February in 1963 were revealed to feed on the plankton including small amount of *Prorocentrum* cells. Therefore, noxious substance was extracted, as usual, from the midgut-glands (4.1 g) of these 28 clams. The final extractive was dissolved in 2 cc of distilled water and was used as the injection.

Results

L 406. (Figs. 1, 3). This mouse (15 g) was intraperitoneally administered with 0.7 cc of the injection from above mentioned 1st material and was killed 2 days after administration. Injuries are as follows:

Liver. Centrilobular degeneration is revealed: Parenchymal cells about the central veins are lightly stained with irregularly shaped nuclei. Some cells are binucleate. Small amount of fatty infiltration is observed.

Kidney. Tubule epithelium is somewhat degenerated with fatty infiltration.

Heart. Fatty infiltration is shown.

L 408. (Fig. 2). This mouse (13 g) was intraperitoneally injected with 1 cc of above noted material and was killed 5 days after that inducing following evident changes:

Liver. Centrilobular degeneration is observed with slightly stained parenchymal cells, the nuclei of which are irregularly shaped. Some mitotic figures are found about the central veins. Considerable fatty degeneration is noted, in particular, in the midzonal area of the lobules. Parenchymal cells in the periportal area are rather sound.

Kidney. Tubule epithelial cells are degenerated with partial fatty infiltration.

Heart. Partial fatty degeneration is observed.

L 423. This mouse (25 g) was killed 3 days after intraperitoneal administration of 0.2 cc of the injection from above noted 2nd material. Histological findings are as follows:

* This is to be called *Tapes japonica*. However, in the present series of reports the author wishes to use *Venerupis semidecussata* instead, for the sake of convenience.

Liver. Centrilobular degeneration is evident: That is, parenchymal cells are slightly stained with irregularly shaped nuclei, and some of which are binucleate. Mitotic figures are scattered in the midzonal area. Considerable amounts of fat are found about the central veins. Periportal parenchymal cells are rather sound.

Kidney. Tubule epithelium is evidently damaged. Fatty infiltration is also observed in the small area.

Heart. Fatty degeneration is seen.

L 425. This mouse was administered with 0.9 cc of the above mentioned injection and was killed 6 days after that revealing following pathological changes:

Liver. Centrilobular degeneration is evident with slightly stained parenchymal cells. Many binucleate cells are also found there with irregularly shaped nuclei. Fat drops are observed about the central veins. Periportal parenchymal cells are rather sound.

Kidney. Tubule epithelium is considerably degenerated. Fatty infiltration is noted in the small area.

Heart. Fatty degeneration is revealed.

L 451. (Figs. 4, 5). The mouse (17 g) was intraperitoneally administered with 1 cc of the injection from above described 3rd material and was killed 2 days after that. Pathological findings are:

Liver. Centrilobular degeneration is rather prominent. That is, liver parenchymal cells are vacuolar and light stained with irregularly shaped nuclei. Fatty degeneration is evidently observed in the central and midzonal area of the lobules. Periportal parenchymal cells are rather sound.

Kidney. Tubule epithelium is degenerated with fatty infiltration.

Conclusion

When the shellfishes, *Venerupis semidecussata* and *Ostrea gigas*, obtained from Kanagawa Prefecture were observed to feed on similar species of *Prorocentrum* sp. as reported in the previous papers, the noxious extract from the shellfishes induced the damages to mice resembling those produced by the injection of sublethal doses of "Venerupin", the shellfish poison. Likewise, these shellfishes of Lake Hamana feeding on plankton including some amounts of the same species of Dinoflagellata also caused the slight change as stated above, although there occurred no shellfish human poisoning.

References

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Explanation of Plate I

Abbreviation: c, central vein

- Fig. 1.** Liver, centrilobular degeneration. Mouse (L 406) killed 2 days after intraperitoneal administration of 0.7 cc of the injection from 1st material. MAYER's hematoxylin and eosin stain, $\times 150$.
- Fig. 2.** Liver, centrilobular degeneration, Mouse (L 408) killed 5 days after intraperitoneal administration of 1 cc of the above described injection. MAYER's hematoxylin and eosin stain, $\times 150$.
- Fig. 3.** Liver, highly magnified portion about the central vein of the section illustrated in Figure 1. MAYER's hematoxylin and eosin stain, $\times 600$.
- Fig. 4.** Liver, centrilobular degeneration. Mouse (L 451) killed 2 days after intraperitoneal administration of the injection from 3rd material. MAYER's hematoxylin and eosin stain, $\times 150$.
- Fig. 5.** Liver, highly magnified portion about the central vein of the section illustrated in Figure 4. MAYER's hematoxylin and eosin stain, $\times 600$.