Cytoplasmic Polyhedrosis of
_Porthesia xanthocampa_

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INTRODUCTION

A cytoplasmic polyhedrosis of _Porthesia xanthocampa_ was described by OBA3). In May of 1965, the authors discovered the cytoplasmic polyhedrosis of this insect in the mulberry field of Aichi-ken Sericultural Experiment Station. The descriptions and characteristics of the disease are presented below.

MATERIALS AND METHODS

Observation on the symptoms of the infected larvae was made on the larvae inhabiting in the mulberry field. The polyhedra, which were collected from heavily infected midguts, and washed with distilled water by repeated centrifugations, were used for observation of the morphology of the polyhedra. The shapes and sizes of these polyhedra were observed with the ordinary light microscope. Pathological and anatomical researches of the infected midgut were made by preparing paraffin sections.

The concentration of polyhedral suspension used for the inoculation into test insects was determined with the haemacytometer before each experiment. Polyhedral suspensions with $10^5$/ml for spring experiment and $10^6$/ml for fall experiment were first prepared and then each of them was diluted with sterile distilled water. Administration of the polyhedra _per os_ was done by feeding the newly hatched larvae of _Bombyx mori_ and _Porthesia xanthocampa_ with mulberry leaves smeared with the suspension of the polyhedra concerned.

Two F₁ hybrid strains, N124×C122 (Futo) and N124×C124 of the silkworm were used in this study. Diagnosis of the diseased larvae was made by microscopic examination of the midguts.

RESULTS AND DISCUSSIONS

1. Symptoms of infected larvae Out of 220 old larvae of _Porthesia xanthocampa_, which were collected from the field, 64 larvae were infected with the cytoplasmic polyhedrosis virus. The affected larvae usually became somewhat dark yellowish in colour. In the late stage of the infection, the midgut changed to whitish in colour.
Fig. 1. Diseased larvae of *Porthesia xanthocampa* infected with the cytoplasmic polyhedrosis

Fig. 2. Midgut of the larvae of *Porthesia xanthocampa*
A: Infected midgut
B: Healthy midgut

Fig. 3. The cytoplasmic polyhedra of *Porthesia xanthocampa* almost similar to those of the other species of the lepidoptera with cytoplasmic polyhedrosis (Fig. 2). The diseased larvae became flaccid (Fig. 1).

2. **The inclusion bodies** A number of the polyhedra were found within the infected midgut epithelial cells. The size and the shape of the polyhedra are shown in the photograph (Fig. 3). As shown in the figure 3, it was observed that there was a wide variation in the size of polyhedra. Although the average size was about 1.5 microns, there were many which were less than 1 micron and a few which were more than 4 microns. While the shapes of larger polyhedra were seen as hexagonal and testradgona1 having blunt corners, the shape of smaller ones could not be definitely determined but were looking spherical in outline.

When the formation of the polyhedra within infected midgut epithelial cells was observed in the section preparation, it was found that the polyhedra were formed
3. Virus infectivity In the first experiment, pathogenicity of the cytoplasmic polyhedrosis virus of *Porthesia xanthocampa* was examined for newly hatched larvae. As shown in Table 1, the cytoplasmic polyhedrosis virus of *Porthesia xanthocampa* has a considerable infectivity for newly hatched larvae of the same kind of insect, and it was shown that almost all of the tested larvae were infected with this virus in the concentration of $2.26 \times 10^3/ml$ polyhedral suspension. The incubation period from infection to death was 7 to 14 days during summer. Symptoms of the infected larvae were similar to those of the larvae which were observed on the field, and a number of the polyhedra were formed within the epithelium of the midgut of larvae.

In the next experiment, the infectivity of this virus for silkworm larvae was examined. As shown in Table 2, silkworm larvae were not susceptible to infection *per os* with the cytoplasmic polyhedra of *Porthesia xanthocampa*. OBA reported that the cytoplasmic polyhedrosis virus of *Porthesia xanthocampa* was transmissible to the silkworm. However, such a result could not be obtained in this experiment. On the other hand ISHIKAWA and ASAYAMA defined that the cytoplasmic polyhedrosis within the cylindrical cells, and most of the cells observed contained small polyhedra and a few cells contained large ones (Fig. 4, 5).
Table 1. Pathogenicity of the cytoplasmic polyhedrosis virus of *Porthesia xanthocampa* to newly hatched larvae of *Porthesia xanthocampa*

<table>
<thead>
<tr>
<th>Suspension of polyhedra</th>
<th>No. of tested larvae</th>
<th>7</th>
<th>8</th>
<th>9</th>
<th>10</th>
<th>11</th>
<th>12</th>
<th>13</th>
<th>14</th>
<th>Mortality</th>
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<tr>
<td>2.26×10⁴/ml</td>
<td>25</td>
<td>□</td>
<td>□</td>
<td>□</td>
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<td>□</td>
<td>100</td>
</tr>
<tr>
<td>2.26×10⁴/ml</td>
<td>28</td>
<td>□</td>
<td>□</td>
<td>□</td>
<td>□</td>
<td>□</td>
<td>□</td>
<td>□</td>
<td>□</td>
<td>100</td>
</tr>
<tr>
<td>Control</td>
<td>25</td>
<td>□</td>
<td>□</td>
<td>□</td>
<td>□</td>
<td>□</td>
<td>□</td>
<td>□</td>
<td>□</td>
<td>4</td>
</tr>
</tbody>
</table>

- Diseased larvae

Table 2. The infectivity of cytoplasmic polyhedrosis virus of *Porthesia xanthocampa* to silkworm larvae, *Bombyx mori* L.

<table>
<thead>
<tr>
<th>No. of experiment</th>
<th>Suspension of polyhedra</th>
<th>No. of larvae tested</th>
<th>No. of infected larvae</th>
<th>No. of nonvirus deaths</th>
<th>No. of healthy larvae</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 (Spring)</td>
<td>10⁴/ml</td>
<td>20</td>
<td>0</td>
<td>0</td>
<td>20</td>
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<tr>
<td></td>
<td>Control</td>
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<td>0</td>
<td>0</td>
<td>20</td>
</tr>
<tr>
<td>2 (Fall)</td>
<td>2.26×10⁴/ml</td>
<td>28</td>
<td>0</td>
<td>1</td>
<td>27</td>
</tr>
<tr>
<td></td>
<td>2.26×10⁴/ml</td>
<td>23</td>
<td>0</td>
<td>2</td>
<td>21</td>
</tr>
<tr>
<td></td>
<td>Control</td>
<td>20</td>
<td>0</td>
<td>2</td>
<td>18</td>
</tr>
</tbody>
</table>

Virus of *Bombyx mori* has no infectivity for the larvae of *Porthesia xanthocampa*.

As this virus has no infectivity for the silkworm larvae, it may be possible to use this virus for the control of *Porthesia xanthocampa* larvae in the mulberry field.

**Summary**

1. In May of 1965, the cytoplasmic polyhedrosis of *Porthesia xanthocampa* was found in old larvae in the mulberry field at Aichi-ken Sericultural Experiment Station.
2. It was observed that there is wide variation in the size of the polyhedra. The average was about 1.5 microns, but many were less than 1 micron and a few were more than 4 microns. The shapes of larger polyhedra were seen as hexagonal and
tetragonal having blunt corners, but the shape of smaller ones could not be definitely determined but were looking spherical in outline.

3. It was shown that the cytoplasmic polyhedrosis virus has a considerable pathogenicity for the larvae of *Porthesia xanthocampa*, and the incubation period from infection to death was 7 to 14 days during summer.

4. The cytoplasmic polyhedrosis virus of *Porthesia xanthocampa* has no infectivity for silkworm larvae.

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**REFERENCES**