SHORT COMMUNICATION

The effect of D-phenylalanine administered during the mating and lactation periods on gingivitis in plaque-susceptible rats

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Introduction

Previous study¹¹ has shown that 4% D-phenylalanine (D-PA) had a more preventive effect on gingivitis in the plaque-susceptible rats than 0.4% D-PA, and that D-PA which was given before onset of gingivitis had more effective results. The purpose of this study is to elucidate the influence of D-PA administered during the mating and lactation periods of plaque-susceptible rats²-6.

Materials and Methods

Animals Plaque-susceptible rats (SUS rats) bred at the animal laboratory of the Higashi Nippon Gakuen University were used.

Experimental Design Sixty-four SUS rats were divided into four groups: 1) Rats, whose parents had been fed a solid diet with 0.4% D-PA during the mating and lactation periods, were given a powder diet with 4% D-PA (the 1st group); 2) Rats, whose parents had been fed a solid diet with 0.4% D-PA during the mating and lactation periods, were given a powder diet without any additives (the 2nd group); 3) Rats, whose parents had been fed a solid diet without additives, were given a powder diet with 4% D-PA.

Table 1 Comparison in plaque index

<table>
<thead>
<tr>
<th>Age of rats</th>
<th>1st group (n=10)</th>
<th>2nd group (n=20)</th>
<th>3rd group (n=14)</th>
<th>4th group (n=20)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 M</td>
<td><strong>0.07±0.03</strong></td>
<td>0.16±0.07</td>
<td><strong>0.22±0.06</strong></td>
<td>0.81±0.13</td>
</tr>
<tr>
<td>2 M</td>
<td><strong>0.48±0.05</strong></td>
<td>0.74±0.04</td>
<td>0.71±0.08</td>
<td>1.02±0.09</td>
</tr>
<tr>
<td>3 M</td>
<td>0.82±0.15</td>
<td>1.15±0.09</td>
<td>0.99±0.11</td>
<td>1.45±0.07</td>
</tr>
</tbody>
</table>

* Mean±SE

* Significant difference; ** p<0.05; *** p<0.001.
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Table 2 Comparison in gingival index

<table>
<thead>
<tr>
<th>Age of rats</th>
<th>Gingival index</th>
<th>1st group (n = 10)</th>
<th>2nd group (n = 20)</th>
<th>3rd group (n = 14)</th>
<th>4th group (n = 20)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 M</td>
<td></td>
<td>0.32±0.13*</td>
<td>0.41±0.08</td>
<td>0.37±0.14</td>
<td>0.59±0.09</td>
</tr>
<tr>
<td>2 M</td>
<td></td>
<td>0.48±0.05</td>
<td>0.66±0.07</td>
<td>0.66±0.06</td>
<td>0.97±0.10</td>
</tr>
<tr>
<td>3 M</td>
<td></td>
<td>0.59±0.07</td>
<td>0.77±0.06</td>
<td>0.72±0.09</td>
<td>1.23±0.12</td>
</tr>
</tbody>
</table>

* Mean±SE
* Significant difference; * p<0.05; ** p<0.01; *** p<0.001.

Clinical Parameters and Assessments

The plaque index, the gingival index, and pocket probing depth were recorded twice a week for each rat. The average values of each group were compared and standard errors were analyzed statistically (Student's t-test).

Histopathological Study

The animals were anesthetized with an intraperitoneal injection of sodium pentobarbital (50 mg/kg). The mandibular tissue was excised, immediately fixed in a 10% neutral formaldehyde solution and decalcified by 5% nitric acid for 1 week. They were neutralized with 5% sodium sulfate for 1 day, washed with water, dehydrated, and embedded in paraffin, and then 5 to 6μm thick sections were stained with hematoxylin and eosin (H & E) for histopathological study.

Results and Discussion

The average values of the plaque indices of the 1st group were the lowest of the four groups at one-, two- and three-month-old and those of the 2nd group were lower than 3rd group at one- and two-month-old (Table 1). The average values of the gingival indices of the 1st group were the lowest of the four groups during every month, and were significantly lower than those of the 4th group at two- and three-months (Table 2). The average value of the pocket probing depth of the 1st group was the lowest of the four groups at 3 months, and was significantly (p<0.05) lower than that of the 4th group (Fig. 1).

The histopathological examination showed inflammatory cell infiltration into and beneath the gingival tissue including attachment epithelium in the 4th group (Fig. 2, B), and there was less inflammatory cell infiltration in the 1st group (Fig. 2, A) than the 4th group (Fig. 2, B).

These results suggest that D-PA given during the mating and lactation has a preventive effect on plaque accumulation from newborn to two-month-old SUS rats and reduced gingivitis.
Fig. 2 Photo of marginal gingiva for histopathological examination (H & E staining, magnification ×45).

A : SUS rats, whose parents had been fed a solid diet with D-phenylalanine during the mating and lactation periods, were given a powder diet with 4% D-phenylalanine (the 1st group).

B : SUS rats, whose parents had been fed a solid diet without additives, were given a powder diet without additives (the 4th group, the control group).

Reference


