SHORT COMMUNICATION

The effect of D-phenylalanine on the plaque accumulation and gingivitis status in plaque-susceptible rats

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Introduction

Previous studies have shown that D-phenylalanine has a preventive effect on dental caries and enhances immune-responses of mice1-3). However, there is no information concerning the possible relation between periodontal disease and D-phenylalanine. In this study, we examined the effect of D-phenylalanine on the plaque accumulation and gingival status of our animal model, plaque-susceptible rats4-8).

Materials and Methods

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

Experimental Design Newborn rats were randomly divided into three groups and three-month-old rats were divided into two groups. The first group of 20 newborn rats were fed a powder diet without any additives (Control), the second group of 13 rats were fed a powder diet with 0.4% D-phenylalanine (D-PA), and the third group of 14 rats with 4% D-PA.

One group of 10 three-month-old rats were fed a powder diet with 4% D-PA and another 10 rats fed a powder diet without any additives.

There were no significant differences among the average values of the body weight of these groups at the start and end of an experimental period.

Clinical Parameters and Assessments The plaque index5) and the gingival index7) scores were recorded twice a week for each rat. The average index scores of each group were compared and standard errors were analyzed statistically (Student’s t-test).

Results and Discussion

Tables 1 and 2 show the effect of the D-PA containing diet on the plaque and gingival indices of the newborn SUS rats. The average values of the plaque indices of the third group (4% D-PA group) were the lowest of the three groups at one, two, and three months after administration of D-PA, and were significantly lower than those of the control group. At one month, the mean of the plaque indices for 4% D-PA was significantly lower than that for 0.4% D-PA, but at two and three months, this difference was not statistically significant. The average values of the gingival indices of the third group were significantly lower than those of the control group at two and three months.

Fig. 1 shows the effect of D-PA on the gingival status of the 3-month-old plaque-susceptible rats at one, two, and three months after the administration of D-PA. Both the
plaque and gingival indices of the experimental group decreased at one month, while those of the control group increased with the progress of the experiment. However, there was no significant difference between the experimental group and the control.

These results suggest that D-PA has a preventive effect on gingivitis status in newborn SUS rats, but significantly no remedial value on severe gingivitis in 3-month-old SUS rats. The 4% D-PA containing diet was more effective than the 0.4% D-PA containing diet to decrease plaque accumulation.

Reference


Table 1 Effect of D-PA concentration in diet on plaque index

<table>
<thead>
<tr>
<th>Age of rats</th>
<th>Plaque Index</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>I: Control Group (n = 20)</td>
</tr>
<tr>
<td>1 M</td>
<td>0.81±0.13*</td>
</tr>
<tr>
<td>2 M</td>
<td>1.02±0.09</td>
</tr>
<tr>
<td>3 M</td>
<td>1.45±0.07</td>
</tr>
</tbody>
</table>

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

Table 2 Effect on D-PA concentration in diet on gingival index

<table>
<thead>
<tr>
<th>Age of rats</th>
<th>Gingival Index</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>I: Control Group (n = 20)</td>
</tr>
<tr>
<td>1 M</td>
<td>0.59±0.09*</td>
</tr>
<tr>
<td>2 M</td>
<td>0.97±0.10</td>
</tr>
<tr>
<td>3 M</td>
<td>1.23±0.12</td>
</tr>
</tbody>
</table>

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

Fig. 1 Effect of D-phenylalanine on severe gingivitis in 3-month-old rats

