Effects of tryptophan and portocaval anastomosis on activity and brain tryptophan metabolism

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Chronic portocaval anastomosis in the rat increases brain tryptophan and tyrosine, and thus 5-hydroxytryptamine (5-HT) (Curzon, Kantamaneni, Fernando, Woods & Cavanagh, 1975) and octopamine synthesis anastomosis also showed significantly less ambulation than sham-operated animals, and midbrain tryptophan, 5-HT and 5-HIAA were all significantly raised. Ambulation by anastomosed rats was not significantly decreased further by tryptophan, although midbrain tryptophan and 5-HT (but not 5-HIAA) rose significantly. Ambulation was significantly decreased and all biochemical measures significantly increased in tryptophan-treated anastomosed rats when compared with the sham-operated group given saline. Brain tryptophan rose more strikingly in anastomosed rats than in sham-operated animals given tryptophan.

These results are suggestive of an association between raised brain tryptophan, and/or 5-HT turnover, and central disturbances in liver failure.

### Table 1 Effects of tryptophan and portocaval anastomosis on activity and midbrain tryptophan metabolism

<table>
<thead>
<tr>
<th>Group</th>
<th>Rats</th>
<th>Injected</th>
<th>Ambulation</th>
<th>Tryptophan</th>
<th>Midbrain 5-HT</th>
<th>5-HIAA</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Sham (7)</td>
<td>0.9% NaCl</td>
<td>73 ± 16</td>
<td>4.28 ± 0.26</td>
<td>1.15 ± 0.04</td>
<td>1.25 ± 0.14</td>
</tr>
<tr>
<td>2</td>
<td>Sham (7)</td>
<td>Tryptophan</td>
<td>18 ± 8</td>
<td>5.73 ± 0.41</td>
<td>1.26 ± 0.03</td>
<td>1.63 ± 0.16</td>
</tr>
<tr>
<td>3</td>
<td>PCA (6)</td>
<td>0.9% NaCl</td>
<td>29 ± 11</td>
<td>9.76 ± 1.05</td>
<td>1.37 ± 0.03</td>
<td>3.37 ± 0.26</td>
</tr>
<tr>
<td>4</td>
<td>PCA (7)</td>
<td>Tryptophan</td>
<td>24 ± 7</td>
<td>16.23 ± 1.92</td>
<td>1.59 ± 0.06</td>
<td>4.58 ± 0.56</td>
</tr>
</tbody>
</table>

PCA = portocaval anastomosis. Singly-housed rats were injected with 0.9% NaCl or L-tryptophan (20 mg/kg i.p.), placed in an open field and their behaviour observed by closed circuit television between 15 and 95 min after injection, a method based on that of Taylor (1976). They were then killed and determinations made as described by Curzon et al. (1975). Number of rats shown in parentheses. Results are expressed as mean ± s.e. mean. The number of areas entered (ambulation) were counted and values compared by the Mann-Whitney U test. Midbrain determinations were compared by Student's t test.

(James, Hodgman, Funovics & Fischer, 1976). These changes may be responsible for central disturbances in human liver failure (for review of evidence see Curzon & Knott, 1977). The role of tryptophan was investigated by giving the amino acid to rats with portocaval anastomosis.

Anastomosis or sham operation was performed on male Sprague-Dawley rats (mean body weight ± s.d. (n) 341 g ± 27 (28)) using the method described by Funovics, Cummins, James, Shuman & Fischer (1975). Animals were caged singly 3 weeks after the operation and the experiment indicated in Table 1 was performed 4 weeks later.

Tryptophan (20 mg/kg i.p.) significantly decreased ambulation (but not rearing, turning, head-lifting or grooming) in sham-operated rats and significantly increased midbrain tryptophan (Table 1). 5-HT and its metabolite 5-hydroxyindoleacetic acid (5-HIAA) did not rise significantly. Rats with portocaval

### References


