A Metabolic Relationship Between the Aromatic Amino Acids

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The present work involves a further investigation of a \textit{Neurospora} mutant, C-86, previously mentioned by Lein, Mitchell and Houlanh (1) as one that can utilize anthranilic acid, indole, tryptophan, kynurenine, 3-hydroxyanthranilic acid, and nicotinic acid as supplements for growth. Mutant C-86, when crossed to a “wild-type” strain, was found to differ from this wild type strain, with respect to tryptophan biosynthesis, by a mutation at a single locus.

A number of compounds were tested for growth-promoting properties for this mutant. These included: 3,4-dihydroxyphenylalanine, anthranil, benzoic acid, aniline, \textit{p}-aminobenzoic acid, formylantranilic acid, isatoic acid, \textit{cis}-cinnamic acid, \textit{trans}-cinnamic acid, phloroglucinol, phenylacetic
acid, p-aminophenylacetic acid, β-phenylethyl alcohol, phenyl-DL-α-
alanine, β-phenylethylamine, salicylic acid, coumarin, coumaric acid, 2-carboxyindole, 3-carboxyindole, cinnamaldehyde, phenylalanine, and tyrosine. Of these compounds, phenylalanine, tyrosine, and trans-cinnamic acid were active in promoting the growth of C-86. The relative growths of this mutant on supplements of tryptophan, indole, anthranilic acid, phenylalanine, tyrosine and trans-cinnamic acid are given in Table I.

<table>
<thead>
<tr>
<th>µM</th>
<th>Dry wt. of mold—mg.—3 days growth</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Tryptophan</td>
</tr>
<tr>
<td>0.1</td>
<td>11</td>
</tr>
<tr>
<td>0.2</td>
<td>15</td>
</tr>
<tr>
<td>0.4</td>
<td>20</td>
</tr>
<tr>
<td>0.8</td>
<td>27</td>
</tr>
<tr>
<td>1.4</td>
<td>35</td>
</tr>
<tr>
<td>2.0</td>
<td>36</td>
</tr>
<tr>
<td>2.0</td>
<td>35</td>
</tr>
</tbody>
</table>

* Growth of mutant C-86 on supplements of trans-cinnamic acid at pH 5.6 and 25°C.

Neurospora mutant, 40008, which utilizes anthranilic acid, indole or tryptophan for growth, cannot use either phenylalanine, tyrosine, or trans-cinnamic acid. Apparently, strain C-86 has a genetic block which occurs at a point earlier in a reaction series involving tryptophan than does the block in strain 40008. This would imply that phenylalanine, tyrosine and trans-cinnamic acid are involved in the biosynthesis of tryptophan prior to the formation of indole or anthranilic acid in Neurospora. Another Neurospora strain, E-5212, utilizes phenylalanine for growth but none of the other substances found to promote the growth of strain C-86.

The evidence presented suggests the possibility of a common precursor to the aromatic amino acids.
Acknowledgments

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Reference


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