Antibacterial activity of biotransformation product: 1S-(2-benzofuranyl)-ethanol

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Abstract

The antibacterial activity of purified 1S-(2-benzofuranyl)-ethanol, prepared via a biotransformation reaction using carrot strips and benzofuran-2-yl-methylketone, was analyzed using a modified procedure of the disk diffusion method. Ordinary filter paper was cut into disks with a diameter of 2 cm and impregnated with 1S-(2-benzofuranyl)-ethanol in amounts ranging from 10 to 50 mg. The agar plates were inoculated with 20, 40, or 50 µL aliquots of a 5 mL overnight culture containing E. Coli, BL21. The plates were incubated for 2 hours at 37°C to allow the bacteria to grow before the impregnated disks were placed on the agar plates. Controls were established using 10 to 50 mg of benzofuran-2-yl-methylketone. Results indicated 1S-(2-benzofuranyl)-ethanol was about twice as potent an antibacterial agent as benzofuran-2-yl-methyl ketone.

Methods

- Overnight 5 mL cultures of BL21 were prepared.
- The ketone and alcohol were each dissolved in ethyl acetate so the concentration of each was 0.311 mg/µL.
- Filter paper disks (2 cm) were impregnated with 5-50 mg of either the ketone or alcohol.
- 30 µL aliquots of the 0.311 mg/µL solutions were placed on the disks, the solvent was allowed to evaporate, and the method was repeated until the desired amount was achieved.
- 20-40 µL of overnight culture were spread on to an agar plate.
- The bacteria were allowed to grow for 2 hr. at 37°C before the impregnated disks were placed in the center of the agar plate.
- The plates were further incubated overnight at 37°C.
- The average distance of bacterial growth was measured.

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Former student collaborators: Cheyenne Massengale and David DeClerck

Table 1. Combined results of mass and growth inhibition distance (cm) of 20 and 40µl cultures.

<table>
<thead>
<tr>
<th>Mass (mg)</th>
<th>Alcohol inhibition (cm)</th>
<th>Ketone inhibition (cm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>9.55</td>
<td>0.50</td>
<td>0.27</td>
</tr>
<tr>
<td>19.1</td>
<td>0.69</td>
<td>0.33</td>
</tr>
<tr>
<td>28.6</td>
<td>0.65</td>
<td>0.38</td>
</tr>
<tr>
<td>38.0</td>
<td>0.68</td>
<td>0.30</td>
</tr>
<tr>
<td>46.7</td>
<td>0.65</td>
<td>0.33</td>
</tr>
</tbody>
</table>

Figure 1. Measuring the zone of inhibition

Figure 2. Sample of bacterial inhibition. Alcohol plate on left; ketone on right.

Table 2. Comparison of antibacterial properties. Average distance of bacterial growth inhibition (cm) using 20 µl and 40 µl cultures and 5 to 50 mg of compound.

<table>
<thead>
<tr>
<th>Benzofuran-2-yl-methyl ketone</th>
<th>1S-(2-benzofuranyl)-ethanol</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.32 cm</td>
<td>0.63 cm</td>
</tr>
<tr>
<td>% difference</td>
<td>49%</td>
</tr>
</tbody>
</table>

Discussion/Conclusion

These studies indicate 1S-(2-benzofuranyl)-ethanol is 49% more antibacterial than benzofuran-2-yl-methyl ketone. Future plans include performing antifungal studies on 1S-(2-benzofuranyl)-ethanol and its prochiral starting material, benzofuran-2-yl-methyl ketone; and comparing the antimicrobial properties of other prochiral ketones and their corresponding stereospecific alcohol.

References