DIFFERENTIATION OF PCP, TCP, AND A CONTAMINATING PRECURSOR PCC, BY THIN-LAYER CHROMATOGRAPHY

Alexander T. Shulgin
1483 Shulgin Road
Lafayette, California

Carmen Helisten
PharmChem Research Foundation
Palo Alto, California

BACKGROUND

Analyses of drugs alleged to be mescaline or synthetic THC have often shown them to be phencyclidine (Sernyl, PCP). This base has also been encountered as a component in drug mixtures involving marijuana and LSD. Recently a pharmacologically related analog thienylcyclohexylpiperidine (TCP) has appeared in the place of, or in admixture with, PCP.

In the illicit synthesis of both PCP and TCP, the intermediate 1-piperidinocyclohexanecarbonitrile (PCC) is usually employed. This material has extraction properties that are extremely similar to those of both PCP and TCP, resulting in the preparation of a contaminated product. As a toxicological problem, this contaminant may contribute to the toxic aspects of these two drugs and its presence or absence might be of value in the treatment of cases of overdosage. From the forensic point of view, the ability to detect this precursor should be potentially valuable in two ways: 1. It will help establish the synthetic procedure employed in the manufacture of the drug in question, and 2. As PCC is not found as a contaminant in preparations intended for clinical application, its presence will establish the unlicenced nature of this manufacture.

Attempts to effect this analysis by conventional GLC procedures are thwarted by the thermal instability of PCC. Under ordinary chromatographic conditions, HCN is split out of the molecule resulting in the formation of the enamine cyclohexylpiperidine. This process occurs during actual passage through the GLC column resulting in an inconsistent spectrum that depends upon column conditions, quantities injected, and the nature of the contamination of the injected sample. A further complication is the inherent instability of this enamine in that, if hydrolytic conditions are encountered, it further degrades to its two components piperidine and cyclohexanone. Both of these latter chemicals are invariably lost under the solvent peak on GLC analysis. Attempts to analyze these mixtures by conventional TLC procedures (activated plates, heated spot application) result in immediate and complete degradation of PCC to these same components.

OBJECTIVE

To provide a chromatographic procedure for the separation and localization of PCP, TCP, and PCC in a single extraction and analysis.
MATERIALS

TLC plates: E.Merck, 0.25 mm Silica Gel 60 prepared glass plates which have been deactivated by open-air storage for at least 48 hrs prior to use.

Solvent system: Benzene, acetone and pyridine, in the ratio of 16:8:1.

Visualization reagents: Ninhydrin (0.8% in acetone) and iodoplatinate (4 g chloroplatinic acid and 24 g KI in 1 l. water diluted, after standing, with 1 l. methanol).

PROCEDURE

Approximately one dosage unit of the drug to be analysed is suspended in four drops of anhydrous methanol, and broken up to a fine powder. No external heat is employed. An unactivated TLC plate is appropriately marked (origins located for at least four sample applications, i.e., reference PCP, reference TCP, reference PCC, and the unknown). The site of application of the unknown sample is wetted with a drop of the chromatographic solvent mixture. As soon as the apparent dampness has disappeared, but before the residual discoloration is also lost (the spot is still chalky white against a dull white background), about 5 ul of the methanolic extract is applied. Similar care is needed for the reference PCC solution. The solutions of the two standard drugs PCP and TCP may be applied in the conventional manner except that there must be no heating of the plate.

After air drying, the chromatogram is developed for about 10 cm, air dried until largely free of pyridine smell, then heated in an air oven at 110° for 10 min. While still hot it is sprayed with ninhydrin, and the developed colors noted. The plate is allowed to cool, and oversprayed with iodoplatinate. The following Rf's and colors should be observed:

<table>
<thead>
<tr>
<th>Compound</th>
<th>Rf</th>
<th>Ninhydrin color:</th>
<th>Iodoplatinate color:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Piperidine (decomposition product of PCC)</td>
<td>0.00</td>
<td>purple</td>
<td>unchanged, fading to a bleached spot on standing</td>
</tr>
<tr>
<td>PCP</td>
<td>0.24</td>
<td>none</td>
<td>grey, permanent</td>
</tr>
<tr>
<td>TCP</td>
<td>0.49</td>
<td>purple</td>
<td>unchanged, fading to a bleached spot on standing</td>
</tr>
<tr>
<td>PCC</td>
<td>0.70</td>
<td>purple</td>
<td>unchanged, fading to a bleached spot on standing</td>
</tr>
</tbody>
</table>