16.0 CHEMICAL COLOR TESTS

16.1 Application
Color tests produce characteristic color reactions that can indicate the presence of particular functional group(s). These tests are presumptive and should be used in combination with Category A tests for identification of legally significant substances.

16.2 Sampling Equipment
Spot plates (both disposable and porcelain), disposable test tubes, or weigh boats can be utilized when conducting chemical color tests. Porcelain spot plates will be thoroughly cleaned using a soap and water wash followed by a methanol or ethanol rinse.

16.3 Reagent Preparation
16.3.1 The following color test reagents will have a one year expiration date from the date it is prepared. These reagents will be prepared using the instructions listed below:

- **Cobalt Thiocyanate**
  Dissolve 6.8 grams of cobalt chloride and 4.3 grams of ammonium thiocyanate in 100 mL of high purity/RO water.

- **Dillie-Koppanyi**
  Reagent 1: Dissolve 0.1 grams cobalt acetate in 100 mL of methanol plus 0.2 mL of glacial acetic acid.
  Reagent 2: Mix 5 mL of isopropylamine in 95 mL of methanol.

- **para-Dimethylaminobenzaldehyde (p-DMAB)**
  Dissolve 1 gram of p-dimethylaminobenzaldehyde in 100 mL of ethanol. Add concentrated hydrochloric acid to sample + p-DMAB at time of test.
  *For p-DMAB spray (Elrich’s reagent) – add 100 mL of concentrated hydrochloric acid to the above solution. Solution must be made fresh.*

- **Duquenois-Levine**
  Dissolve 0.3 mL of acetaldehyde and 2 grams of vanillin in 100 mL of 95% reagent alcohol.

- **FPN**
  Mix 5 mL of aqueous 5% ferric chloride solution with 45 mL of 70% perchloric acid: high purity/RO water (1:5) and 50 mL of nitric acid: high purity/RO water (1:1).

- **GHB color test reagent**
  Mix 50 mL of concentrated sulfuric acid and 50 mL of high purity/RO water. Add 0.25 gram of chromium trioxide and mix thoroughly.
16.3.2 4-Aminophenol color test

16.3.2.1 The two 4-Aminophenol reagents will have an expiration date of 3 months from the date of preparation.

16.3.2.2 Reagent Preparation

Reagent 1: Mix 300 mg of 4-aminophenol with 5 mL of 2N HCl and 995 mL of ethanol
Reagent 2: Mix 30 g of NaOH pellets with 300 mL of high purity water and 700 mL of ethanol

16.3.3 Marquis color test

16.3.3.1 Marquis can be prepared and used for up to one (1) month provided it is stored in accordance with the guidelines outlined in the most recent edition of Clarke’s Analysis of Drugs and Poisons. However, it may be prepared and discarded more frequently at the unit supervisor’s discretion.

16.3.3.2 Mix one (1) part of formaldehyde solution with nine (9) equal parts of sulfuric acid.

16.4 Color Test Reagent Quality Assurance

Positive and negative controls will be performed before a chemical color test reagent is placed into stock. The stock and any color test reagents remaining at the analysts’ work stations will be re-verified quarterly. Verifications will be documented in the appropriate logbook. Reagents that do not produce the expected results will be discarded.

Positive and negative control verifications are outlined in the following table.

<table>
<thead>
<tr>
<th>Reagent</th>
<th>Controls</th>
<th>Expected Action</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cobalt thiocyanate</td>
<td>Positive – cocaine standard</td>
<td>Immediate blue color</td>
</tr>
<tr>
<td></td>
<td>Negative – inositol standard</td>
<td>No color change</td>
</tr>
<tr>
<td>Marquis</td>
<td>Positive – methamphetamine standard</td>
<td>Orange color going to brown</td>
</tr>
<tr>
<td></td>
<td>Negative – inositol standard</td>
<td>No color change</td>
</tr>
<tr>
<td>Duquenois-Levine</td>
<td>Positive – THC standard</td>
<td>Purple color that will extract into CHCl3 layer</td>
</tr>
<tr>
<td></td>
<td>Negative – reagent blank</td>
<td>No color change</td>
</tr>
<tr>
<td>FPN</td>
<td>Positive – promethazine standard</td>
<td>Pink color fading rapidly</td>
</tr>
<tr>
<td></td>
<td>Negative – inositol standard</td>
<td>No color change</td>
</tr>
<tr>
<td>Kompanyi</td>
<td>Positive – pentobarbital standard</td>
<td>Purple color upon addition of Kompanyi reagent 2</td>
</tr>
<tr>
<td>------------------------</td>
<td>----------------------------------</td>
<td>-----------------------------------------------</td>
</tr>
<tr>
<td>Negative – inositol standard</td>
<td>No color change</td>
<td></td>
</tr>
<tr>
<td>p-dimethylaminobenzyl aldehyde (Erlich’s)</td>
<td>Positive – LSD standard</td>
<td>Light purple color</td>
</tr>
<tr>
<td>Negative – inositol standard</td>
<td>No color change</td>
<td></td>
</tr>
<tr>
<td>GHB Color Test</td>
<td>Positive – GHB standard</td>
<td>Green color going to pale blue</td>
</tr>
<tr>
<td>Negative – water</td>
<td>No color change</td>
<td></td>
</tr>
<tr>
<td>4-Aminophenol</td>
<td>1st Positive – Cannabidiol standard</td>
<td>Pink / dark pink upon addition of reagent 2</td>
</tr>
<tr>
<td>2nd Positive – THC standard</td>
<td>Blue upon addition of reagent 2</td>
<td></td>
</tr>
<tr>
<td>Negative – reagent blank</td>
<td>No color change</td>
<td></td>
</tr>
</tbody>
</table>

Color test procedural blanks will be performed daily by the analyst before use in casework. The results of the blank will be documented in the case notes by describing the color or the lack thereof.

16.5 Testing Procedures

The proper testing protocols for the color test reagents in use are listed below.

- **Cobalt Thiocyanate**
  Add reagent directly to sample
  If cocaine base is suspected: Add 0.1 N HCl to sample, then add reagent.

- **Dillie-Kompanyi**
  Add equal amounts of reagent 1 and reagent 2 directly to sample

- **para-Dimethylaminobenzaldehyde**
  Add reagent followed by concentrated HCl to sample

- **Duquenois-Levine (modified)**
  Add equal amounts of reagent and concentrated HCl to sample, then add CHCl₃

- **Marquis**
  Add reagent directly to sample
• **FPN**
  Add reagent directly to sample

• **GHB color test reagent**
  Add reagent directly to sample

• **4-Aminophenol**
  Add equal amounts of reagent 1 and reagent 2 directly to sample. Evaluate color change within one minute.

### 16.6 Interpretation and Documentation

16.6.1 Only positive test results can be used to meet the minimum requirements for the identification of a controlled substance. Negative results will be documented in the case notes as well.

16.6.2 The most recent edition of *Clarke’s Analysis of Drugs and Poisons* (formerly known as *Clarke’s Isolation and Identification of Drugs*), other reputable literature sources, and/or in-house color tests performed on primary reference standards will be used as references for test results.

16.6.3 If the resulting color is atypical, the analyst should consult other scientific literature, a fellow scientist, and/or the TBI FCU Technical Leader for assistance.

16.6.4 Refer to the Documentation chapter for preparation and casework documentation requirements.