New Color Test for Heroin

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▶ **A new color test for heroin produces an intense color (10 γ of heroin can be easily detected) that is not affected by any known diluents or adulterants. It is easily adapted to field use.**

HEROIN (diacetylmorphine), as the hydrochloride salt, is the most widely used illicit narcotic in the United States. It occurs in 1 to 10% concentration at the retail level and in 30 to 100% concentration at the wholesale level. The usual diluents are lactose and mannitol. The usual adulterants are quinine and procaine. Specific legislation has been enacted to deal with the heroin problem (Narcotic Control Act of 1956) and thousands of seizures are made annually by the Bureau of Customs, the Bureau of Narcotics, and local police.

Several color tests for heroin are known (*1*, *2*). The most widely used color-producing reagents are Marquis' reagent, which gives a purple color with opium alkaloids, and concentrated nitric acid, which gives a characteristic change of colors from pale yellow to green with heroin.

Marquis' reagent is very sensitive (1 γ is detectable), but it does not discriminate among the several opium alkaloids; in addition it gives the purple opium color with certain nonnarcotic medicinals, including some common antihistamines.

The nitric acid test for heroin is specific (no compound has been found to date which shows the same color changes as heroin), but it is not very sensitive (400 γ are required) and often may not be obtained on adulterated, diluted samples containing as much as 5 to 10% heroin. The presence of monoacetylmorphine, a common impurity in crude heroin, may mask the heroin color even at the 30% heroin level.

The present test produces an intense color (10 γ of heroin can be easily detected) which is not affected by the presence of any known diluents or adulterants and which is easily adapted to field use.

EXPERIMENTAL

A solution of nitric and phosphoric acids was prepared by mixing 12 ml. of concentrated nitric acid and 38 ml. of 85% phosphoric acid. Ten drops of this solution were placed in a 5-ml. glass-stoppered centrifuge tube and 3.25 ml. of chloroform, ACS, containing 0.5% ethyl alcohol, were added. The heroin was introduced by placing it on a small (4-mg.) pledget of cotton in the stem of a microfunnel and washing it into the centrifuge tube with a small amount of chloroform. As little as 0.05 ml. of chloroform was sufficient to dissolve a 10-mg. sample of heroin hydrochloride completely; an additional 0.05 ml. of chloroform was used to wash the heroin through.

The centrifuge tube was stoppered and shaken vigorously for 30 seconds. In the presence of heroin the bottom nitric–phosphoric acid layer acquired a color which slowly deepened over a 10-minute period. The color at the end of 10 minutes was a function of the amount of heroin in the sample. Ten micrograms of heroin produced a light yellow color, 1 mg. produced a yellow-brown color, and 10 mg. produced a dark red-brown color. A blank gave a light green color. For samples containing less than 1% heroin, a trace of green somewhat obscured the yellow heroin color. When there was any green present, the tube was shaken again for 30 seconds and the color was observed as soon as it settled. A blank was colorless and 10 γ of heroin hydrochloride showed a definite yellow color.

DISCUSSION

The color formation requires the presence of nitric acid, phosphoric acid, and alcohol. The alcohol is present as a stabilizer in chloroform. The optimum quantity of alcohol for this test is 16 mg., corresponding to 3.25 ml. of chloroform containing 0.5% alcohol.

Marquis' reagent and this color test were tried on the following substances: acetophenetidin, acetylsalicylic acid, amobarbital, amphetamine sulfate, antipyrine, caffeine, chlorprophenpyridamine maleate, cocaine hydrochloride, codeine hydrochloride, codeine phosphate, doxylamine succinate, ephedrine hydrochloride, ethylmorphine hydrochloride, lactose, mannitol, meperidine hydrochloride, methadone hydrochloride, monoacetylmorphine hydrochloride, morphine sulfate, phenidamine tartrate, phenobarbital, procaine hydrochloride, quinine hydrochloride, secobarbital sodium, and sucrose.

A positive purple Marquis test was obtained with codeine hydrochloride, codeine phosphate, doxylamine succinate, ethylmorphine hydrochloride, monoacetylmorphine hydrochloride, morphine alkaloid, morphine hydrochloride, and morphine sulfate. This new test gave a positive heroin color with antipyrine. No single substance in the above list responded to both this test and Marquis' reagent.

A mixture of antipyrine and codeine hydrochloride, which is occasionally encountered, has been found to respond to both this test and Marquis' reagent. The antipyrine may be eliminated by giving the 10-mg. sample, contained on the microfunnel, a preliminary wash with 0.3 ml. of 1,1,1-trichloroethane, a solvent in which heroin hydrochloride is substantially insoluble and which dissolves the antipyrine quantitatively. Preliminary treatment with 1,1,1-trichloroethane is prescribed in the field test issued by the Bureau of Customs.

Somewhat similar but less intense colors are obtained by substituting a mixture of 2 drops of saturated sodium nitrate solution and 10 drops of concentrated sulfuric acid for the nitric-phosphoric mixture.

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LITERATURE CITED

(1) United Nations, *Bulletin on Narcotics* V, 28 (1953).
(2) United States Treasury Department, Internal Revenue Service, Publ. **341**, 13 (November 1956).

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