Journal of Chromatography, 105 (1975) 415–417

CHROM. 8000

Note

A universal thin-layer chromatographic visualization reagent for drugs*

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(Received September 2nd, 1974)

Many different visualization reagents have been used with thin-layer chromatography (TLC) in drug screening in physiological fluids and for the identification of confiscated drugs. We wish to report that N,2,6-trichloro-*p*-benzoquinone imine (TCBI) can serve as a "universal" TLC visualization agent for many classes of drugs.

Gibbs[1] (used TCBI and also 2,6-dibromoquinone chlorimide for qualitative and quantitative photometric tests for phenols. These reagents have also been used as TLC visualizers for cannabinoids[2] and antioxidants[3], both of which contain phenolic groups. Aromatic amines have also been visualized with TCBI[4]. For the detection of barbiturates, Broich[5] *et al.* used three sprays consecutively: bicarbonate, dimethyl sulfoxide and TCBI. We have combined these three sprays into a single spray that provides color formation not only with barbiturates but with a wide variety of other drugs.

MATERIALS AND METHODS

Standard solutions of the drugs (1 mg/ml) obtained either as pure materials or as pharmaceutical formulations were prepared in either water, methanol or chloroform. The TLC plates (20 × 20 cm) were pre-coated with silica gel (Bakerflex IB2; J. T. Baker, Phillipsburg, N.J., U.S.A.) of 200 μm thickness. The developing solvent was ethyl acetate–methanol–ammonia (100:18:1.5).

Five microliters of each drug solution, corresponding to 5 μg, were spotted 1.5 cm from the bottom of an unactivated plate. The spots were air dried at room temperature using a hair dryer, and developed in an unsaturated tank. The solvent was allowed to travel 10 cm from the point of application. The plates were removed and dried in an oven at 110° for 5 min. The plates were lightly sprayed with the TCBI visualization reagent and placed in an 110° oven for 1 or 2 min. Occasionally, it was necessary to respray and reheat in order to optimize color development.

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* Paper II in the series "Studies in Laboratory-Use Reagents".

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VISUALIZATION REAGENT

A 0.1% solution of N,2,6-trichloro-*p*-benzoquinone imine (J. T. Baker) was prepared using a solvent consisting of 9 parts chloroform and 1 part dimethyl sulfoxide previously saturated with sodium bicarbonate. The reagent solution is stored in a brown bottle in the refrigerator and is stable for at least 4 months. Exposure of the solution to ammonia or other basic vapors causes darkening of the original light yellow color. In the event of discoloration or darkening, the solution should be discarded.

RESULTS AND DISCUSSION

The results of spraying various drugs with the TCBI visualization reagent are summarized in Table I. Colors were found for many classes of drugs, including amphetamines, anesthetics, antihistamines, barbiturates, decongestants, diuretics,

TABLE I

COLORS OF VARIOUS DRUGS SPRAYED WITH TCBI

Drug	*Color*	*Drug*	*Color*
Acetophenazine	yellow-green	Mephenytoin	blue
Amobarbital	blue	Mescaline	pink-brown
Amphetamine	gray-purple	Methadone	blue-green
Anileridine	brown-green	Methamphetamine	green
Apomorphine	blue-green	Methapyrilene	brown-green
Atropine	blue-green	Methyldopa	brown
Benzocaine	orange-brown	Methylphenidate	gray-green
Bufotenine	brown-green	Nicotine	gray-purple
Chlordiazepoxide	green	Nortryptiline	brown
Chloroquine	green	Oxazepam	blue
Chlorothiazide	gray-brown	Pentazocine	gray-green
Chlorpromazine	gray-purple	Perphenazine	gray-purple
Cocaine	green	Phendimetrazine	gray
Codeine	brown-green	Phenmetrazine	yellow-green
Dextromethorphan	gray	Phenobarbital	blue
Dicyclomine	green	Phentermine	green
Diethylpropion	gray-brown	Phenylephrine	green
Dimethyltryptamine	brown-green	Procaine	brown-green
Diphenylhydantoin	blue-gray	Promazine	purple
Diphenhydramine	blue-green	Promethazine	purple
Doxylamine	brown	Quinine	gray-green
Ephedrine	gray-green	Quinidine	green
Epinephrine	brown	Reserpine	brown
Ethinamate	orange-brown	Secobarbital	blue
Glutethimide	gray-green	Strychnine	green
Heptabarbital	blue	Sulfamerazine	gray
Heroin	yellow-green	Sulfathiazole	brown-blue
Hydrochlorothiazide	gray-purple	Tetrahydrocannabinol (Δ^9)	red-brown
Ibogaine	brown-green	Thiopropazate	blue
Lidocaine	green	Thioridiazine	gray-brown
Lysergic acid diethylamide	gray-brown	Trifluoperazine	blue-purple
Meperidine	gray-green	Trimeprazine	blue-gray
Mephentermine	green		

narcotics, psychoactive and sulfa drugs. The developed colors are stable for several days. Upon prolonged heating or storage, some of the colors become shades of brown and the background darkens slightly from its original light tan color.

TCBI should prove useful as a visualization reagent for confiscated drugs, for drugs in physiological fluids and for other types of organic compounds. Work is continuing on these and other applications.

ACKNOWLEDGEMENTS

The authors wish to thank H. Koharcheck and C. E. Ward for valuable technical assistance.

REFERENCES

1 H. Gibbs, *J. Biol. Chem.*, 72 (1927) 649.
2 C. Miras, S. Simos and J. Kiburis, U.N. *Bull. Narcotics*, 16 (1964) 13.
3 R. F. van der Heide, *J. Chromatogr.*, 24 (1966) 239.
4 L. Fishbein, *J. Chromatogr.*, 27 (1967) 368.
5 J. R. Broich, D. B. Hoffman, S. Andryauskas, L. Galante and C. J. Umberger, *J. Chromatogr.*, 60 (1971) 95.