Journal of Chromatography, 238 (1982) 261–263
Elsevier Scientific Publishing Company, Amsterdam — Printed in The Netherlands

CHROM. 14,563

Note

Thin-layer chromatographic analysis of 1-(1-phenylcyclohexyl)pyrrolidine in urine

ROBERT D. BUDD*
Rancho Los Amigos Hospital, Downey, CA 90242 (U.S.A.)
(Received November 20th, 1981)

1-(1-Phenylcyclohexyl) pyrrolidine (PHP) is growing in popularity on the U.S. drug scene as a replacement for phencyclidine (PCP), as the operators of illicit drug laboratories try to beat the legal restrictions being placed on the chemicals required for the synthesis of PCP[1]. Because of its growing abuse[1] and because of its overdose potential[2], toxicology laboratories are being more and more frequently required to analyze for its presence. A procedure for the analysis of PHP is needed. To meet this need, a thin-layer chromatography (TLC) procedure for the determination of PHP in urine samples has been developed.

PROCEDURE

PHP is analyzed by TLC as follows. To a 50-ml conical centrifuge tube, add 15 ml of the urine sample to be tested, 2 ml of 2 *M* Tris buffer, and 20 ml of isopropanol–chloroform (5:95). Cap and shake the tube at slow speed on a horizontal platform shaker for 15 min. After the extraction, aspirate and discard the top, urine layer, then filter the organic layer into a 40-ml conical centrifuge tube. Add two drops of 1% HCl–methanol and then evaporate the organic layer to dryness in a 70°C water-bath under nitrogen. Reconstitute the residue in 0.1 ml of methanol and spot the resulting solution on a Merck silica gel G TLC plate. Develop the plate in an unsaturated tank containing 100 ml of a solvent system of *n*-hexane–acetone–diethylamine (70:30:1). After development, air-dry the plate and spray it with acidified iodoplatinate to visualize the purple-gray PHP spots.

RESULTS AND DISCUSSION

The TLC method described allows rapid, accurate determination of PHP in urine samples down to a level of 1.0 μg/ml. PHP is readily separated from other drugs of abuse (particularly PCP), metabolites, and urinary substances by the *n*-hexane–acetone–diethylamine (70:30:1) solvent system (Table I).

Other solvent systems (Table I) have been tried, but found to be not quite as good as the *n*-hexane–acetone–diethylamine solvent system. The ethyl acetate–methanol–diethylamine solvent system is slightly more sensitive, but PHP is subject to

* Present address: Los Angeles County Medical Examiner-Coroner, Los Angeles, CA, 90033, U.S.A.

0021-9673/82/0000–0000/$02.75

TABLE I

TLC SEPARATION OF PHP FROM OTHER DRUGS AND METABOLITES

I, *n*-Hexane–acetone–diethylamine (70:30:1); II, ethyl acetate–methanol–diethylamine (90:10:1.6); III, ethyl acetate–*o*-dichlorobenzene–methylene chloride–methanol–concentrated ammonium hydroxide (40:20:25:15:0.7).

Drug	R_F *values on solvent systems*		
	I	*II*	*III*
PHP	0.61	0.32	0.65
Benzoylecgonine	0.01	0.03	0.04
Caffeine	0.48	0.49	0.63
Cocaine	0.52	0.55	0.79
Codeine	0.20	0.20	0.35
Methadone	0.71	0.35	0.61
Methadone metabolite*	0.56	0.30	0.46
Methaqualone	0.63	0.88	0.85
Morphine	0.15	0.16	0.19
Nicotine	0.37	0.26	0.58
Norpropoxyphene	0.28	0.23	streak**
PCP	0.86	0.58	0.79
Propoxyphene	0.64	0.59	0.77

* 2-Ethylidene-1,5-dimethyl-3,3-diphenylpyrrolidine.
** 0.15–0.30.

interference from methadone and its major metabolite. The ethyl acetate–*o*-dichlorobenzene–methylene chloride–methanol–concentrated ammonium hydroxide solvent system is nearly as sensitive, but PHP is subject to interference from caffeine which is found in a large proportion of the general population due to the use of coffee, tea, and colas. If the simultaneous analysis of another drug(s) is important, either of the other two solvent systems may be advantageous for this purpose.

Several parts of the procedure are quite critical. (1) It is important that the initial extraction be done at slow speed to minimize emulsion formation and avoid a centrifugation step. (2) It is critical that the acidic methanol be added before the

TABLE II

DETECTION LIMITS

PHP concentration (μg/ml)	*Samples run*	*Samples in which PHP was detected*	*%*
5	10	10	100
2.5	10	10	100
1.0	10	10	100
0.75	10	8	80
0.50	10	4	40
0.25	10	1	10
0.1	10	0	0

concentration step. This converts PHP to a hydrochloride which is much higher boiling and, therefore, less likely to be lost.

PHP, when present in levels on the order of 5 μg/ml or more can be detected by the Roche radioimmunoassay PCP procedure[3,4]; however, some method to differentiate PHP from PCP is still needed. Due to its insensitivity to PHP, radioimmunoassay is only of use in PHP overdose cases.

If further confirmation of a positive result is required, the sample can be analyzed using another TLC solvent system (such as the ethyl acetate–methanol–diethylamine solvent system) or the sample can be analyzed by a gas–liquid chromatography procedure[2].

The TLC procedure described obtained good sensitivity and reliable results (Table II). It is well suited for the analysis of urine samples on a large-scale basis. Two technicians can analyze 250–300 samples in an 8-h day.

REFERENCES

1 R. D. Budd, *New Engl. J. Med.*, 303 (1980) 588.
2 G. R. Nakamura, E. C. Griesemer, L. E. Joiner and T. T. Noguchi, *Clin. Toxicol.*, 14 (1979) 383–388.
3 *Abuscreen. Radioimmunoassay for Phencyclidine (PCP)*. Roche Diagnostics, Nutley, NJ, 1979.
4 R. D. Budd, *Clin. Toxicol.*, 18 (1981) 1033–1041.