Waters Lab Highlights

An Internal Communication of Applications and Techniques

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LITERATURE CORNER

INEXPENSIVE, RAPID SCREENING METHOD FOR METHAMPHETAMINE IN URINE BY COLOR REACTION IN A SEP-PAK® C_{18} CARTRIDGE

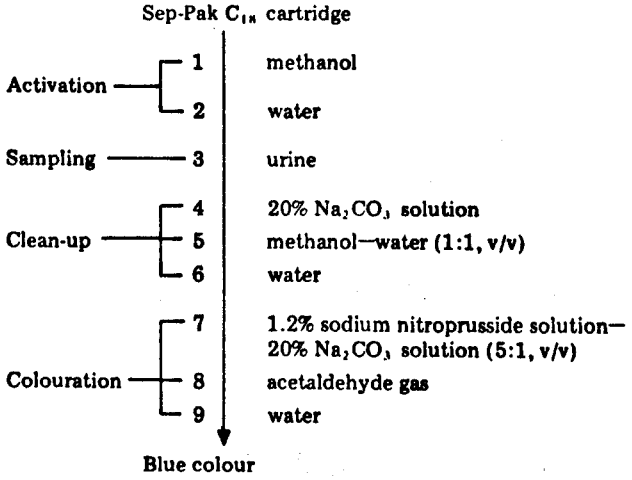
Widespread abuse of methamphetamine ("speed") has resulted in a need for a rapid and specific screening procedure for this drug. Until recently, TLC or GC analysis following a laborious, time-consuming extraction procedure has been used. Newer techniques based on radioimmunoassay, enzyme multiple immunoassay, and the haemagglutination inhibition promise high sensitivity and specificity but require special instruments, antisera, and sensitized blood cells.

Researchers at the National Institute of Police Science in Japan (1) have developed a simple screening method for methamphetamine in urine using color development on a SEP-PAK^R cartridge. Methamphetamine is selectively retained on the resin and color is developed with Simon's reagent (2).

A C_{18} SEP-PAK^R cartridge is activated with 6 ml methanol, followed by 10 ml water (all flow rates estimated to be ≃ 5 ml/min unless otherwise specified). A 5 ml urine sample is adjusted to pH 9.0 with sodium carbonate and loaded onto the SEP-PAK^R cartridge. Subsequently, 2 ml of Na_2CO_3 (20%), 5 ml of H_2O- MeOH (1:1), and 1 ml of water are passed through the cartridge to selectively elute colored components from the urine.

The color is developed by adding 0.2 ml of the reagent (consisting of 1.2% sodium nitroprusside in 20% sodium carbonate), followed by ≃20 ml of acetaldehyde vapor, obtained from the headspace of a vial containing 1 ml of acetaldehyde; finally, 1 ml of water was added slowly (≃ 0.5 ml/min.), and the color observed. As little as 0.5 μg/ml produces a visible blue color. The scheme for the screening procedure is shown in Figure 1..

FIGURE 1: SCREENING TEST FOR METHAMPHETAMINE IN URINE



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Results of screening tests on methamphetamine abuse suspects were compared with results obtained by TLC, GC and GC/MS (see Table 1). Since certain drugs and metabolites produce a positive coloration with Simon's reagent (e.g. No. 4), positives are confirmed by GC/MS.

COMPARISON OF RESULTS OBTAINED BY THE SCREENING TEST

WITH THOSE OBTAINED BY TLC, GC AND GC-MS

- = NEGATIVE: + = POSITIVE

SAMPLE NO	SCREENING TEST	TLC	GC-MS	GC METHAMPHETAMINE IN URINE (µg/ml)
1	-	-	-	0
2	-	-	-	0
3	-	-	-	0
4	+	-	-	0
5	+	+	+	0.1
6	+	+	+	0.2
7	+	+	+	2.5
8	+	+	+	3.3
9	+	+	+	25.0
10	+	+	+	29.5
11	+	+	+	31.7
12	+	+	+	32.6
13	+	+	+	72.8
14	+	+	+	115.4
15	+	+	+	130.2

1. S. Suzuke, et. al.,J. Chromatogr. 267(2), 381-387 (1983).
2. F. Feigl, Spot Tests in Organic Analysis, Elsevier, Amsterdam, 7th Ed., 1966, p. 251.