



In this paper the terms white, black, Asian/Indian and coloured refer to demographic markers and are not meant to signify inherent characteristics. The demographics of substance use are important in AOD-related research as accurate user profiles can assist in identifying vulnerable sectors of the population and in the planning and implementation of effective prevention and intervention programmes.

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## TOXICOLOGICAL SCREENING FOR DRUGS OF ABUSE IN SAMPLES ADULTERATED WITH HOUSEHOLD CHEMICALS

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**Objectives.** Urine samples that tested positive for two drugs of abuse, namely cannabis and methaqualone, were re-assayed in the presence or absence of common household chemicals: Jik (sodium hypochlorite), Dettol (chloroxylenol), G-cide Plus (glutaraldehyde), Perle Hand Soap, ethanol, isopropanol and peroxide (20 volumes). These chemicals are frequently used for the adulteration of urine samples.

**Setting.** Department of Pharmacology, University of Stellenbosch.

**Methods.** Household chemicals, at three different concentrations, were added to urine samples that tested positive for methaqualone and cannabis. Samples were re-analysed on an ETS Plus Analyser (Syva Company, San Jose, Ca.) using Emit drugs-of-abuse urine test reagents.

**Results.** Most of the chemicals tested influenced the outcome of positive toxicological screening results for these drugs. G-cide (glutaraldehyde) and Perle Hand Soap had the largest effect (false-negative) on the methaqualone test. Dettol (chloroxylenol) and Perle Hand Soap had the largest effect on the cannabis test. Higher concentrations of the adulterant were not always an indication of the extent of modification of the test result. The addition of certain chemicals (ethanol, isopropanol and peroxide) to the urine samples tested for methaqualone interfered with the test to such an extent that it gave invalid test results.

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The toxicology laboratory at Tygerberg Hospital is a 24-hour laboratory responsible for testing specimens for drugs of abuse as well as therapeutic drug monitoring. Cannabis and methaqualone (Mandrax) are two of the most frequent drugs of abuse that test positive in our laboratory. We investigated the influence of household chemicals used to adulterate test results of urine samples that tested positive for these drugs, and report here on our results.

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Numerous factors influence the interpretation of toxicological screening results for drugs of abuse. *In vitro* use of adulterants to invalidate drug assays have been described for chemicals such as pyridinium chloroformate ('Urine Luck'),<sup>1</sup> sodium chloride,<sup>2</sup> glutaraldehyde,<sup>3</sup> household chemicals<sup>4</sup> and other chemicals.<sup>5</sup> The influence of therapeutic drugs on drug screening results<sup>6,7</sup> as well as the dilution of specimens for drug testing have also been reported.<sup>8</sup> In these reports, various analytical systems were used based on various immunological assay principles.

## METHODS

Assays were performed using Syva Emit drugs-of-abuse urine reagents on an ETS Plus Analyser (Syva Company, San Jose, Ca.). Urine tests for the presence of cannabis and methaqualone (Mandrax) were performed. The positive cut-off value for cannabis was set at 75 ng/ml, and for methaqualone at 300 ng/ml. These values were obtained by using the Abbott X-systems calibrator (Abbott GmbH Diagnostika, Wiesbaden-Delkenheim, Germany) for cannabinoids for the cannabis test, and Emit calibrator B level 1 for the methaqualone test.

The tests for cannabis and methaqualone were done on drug-positive urine samples collected from patients. Seven household chemicals, namely 4.95% mass per mass (m:m) sodium hypochlorite (Jik), 4.8 g/100 ml chloroxylenol (Dettol), 2% glutaraldehyde solution (G-Cide Plus), 99% ethanol (Merck), liquid hand soap (Perle Hand Soap) and hydrogen peroxide (30 volumes, Merck) were added in four different concentrations (5%, 10%, 20%, 40% volume per volume (v:v)) to the urine samples respectively. Jik and Dettol were obtained from a local supermarket, G-cide from G-cide (Pty) Johannesburg, Perle Hand Soap from Prime Cleaning Suppliers, Cape Town, and the other reagents from Merck, Montague Gardens, Cape Town. To verify that dilution of the urine samples, when the adulterant was added, did not result in a negative test result, samples were divided into two groups. One group was diluted with the same volume of drug-free urine as the volume of adulterant added to the second group. The samples with the added drug-free urine were pre-analysed to ensure that they still tested positive. Tests on the group with the added adulterants (four different concentrations) were done in triplicate and statistical calculations were done on the results. Test results, after the addition of the chemical, were calculated as percentage of the initial value (absorption rate) of the positive test result. The initial positive test results were determined by ultraviolet (UV) absorption values at 340 nm as described in the ETS Plus Analyser instruction manual. These values were all higher than the positive control (cut-off) value. If the calculated percentage value of the samples with the added chemicals was lower than the initial positive value it was considered a false-negative value. The opposite result was considered a false-positive value.

## RESULTS

Table I illustrates the influence of various household chemicals on the test for methaqualone. The samples ( $N = 12$ ) for each adulterant were at four different adulterant concentrations (v:v), namely 5%, 10%, 20% and 40%, done in triplicate. Isopropanol, ethanol and peroxide addition at any concentration made the methaqualone drug test unable to perform and gave invalid test results. The addition of glutaraldehyde (Spearman rank correlation 0.902) and hand soap (Spearman rank correlation 0.69) gave the most significant false-negative test results with increased addition.

Table I. Influence of adulterants on methaqualone assay

Adulterant	Sample size (N)	Slope	
		(% change per % adulterant)	Spearman rank correlation
Jik	12	-0.126	-0.390
Dettol	12	-0.222	-0.430
Glutaraldehyde	12	-0.384	-0.902*
Soap	12	-0.136	-0.690†

\* Significant at 1% level  
† Significant at 5% level.

Table II illustrates the influence of adulterants on the test for cannabis. Jik, isopropanol, ethanol and peroxide did not influence the test significantly, not even at higher concentrations. The addition of Dettol (Spearman rank correlation 0.68) and hand soap (Spearman rank correlation 0.633) altered the test result significantly with increased concentration.

Table II. Influence of adulterants on cannabis assay

Adulterant	Sample size (N)	Slope	
		(% change per % adulterant)	Spearman rank correlation
Jik	12	0.019	0.060
Dettol	12	-0.951	0.860*
Glutaraldehyde	12	-0.075	-0.450
Isopropanol	12	0.044	0.340
Ethanol	12	0.000	0.000
Soap	12	-0.328	-0.633†
Peroxide	12	-0.028	-0.080

\* Significant at 1% level  
† Significant at 5% level.

## CONCLUSION

Chemicals added to adulterate the outcome of urine screening results for the test for cannabis and methaqualone do not always result in false-negative results, nor is the extent of result modification proportional to the amount of the added chemical. G-cide, Dettol and Perle Hand Soap had the largest



influence (false-negative results) on these urine drug tests. Hand soap, which is commonly available in most public toilets, gave false-negative results for both tests.

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## PREVALENCE OF CHILDHOOD DISABILITY IN RURAL KWAZULU-NATAL

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**Objective.** To determine the prevalence of disability in children under 10 years of age in the Manguzi subdistrict, in order to inform the development of an appropriate rehabilitation service.

**Setting.** Twelve areas within the rural Manguzi subdistrict of the Jozini-Uthungulu district in the far north-east of KwaZulu-Natal.

**Design.** A descriptive study in two stages. The first stage identified children under the age of 10 years reported with a disability. For this stage, 12 community health workers (CHWs) were trained to use a validated '10-question' screening tool with probes, adapted to include the under-2-year age group. The second stage involved confirmation of actual disability by the Manguzi rehabilitation team.

**Results.** A total of 2 036 children were screened. Of these children, 168 were reported with a disability giving an overall rate of 83/1 000 (95% confidence interval (CI): 71 - 95). The overall confirmed prevalence rate for children with disabilities under 10 years was 60/1 000 (95% CI: 50 - 71). The most prevalent disabilities were mild perceptual or learning disability (17/1 000), followed by cerebral palsy (10/1 000), hearing loss (10/1 000), moderate to severe perceptual disability (6/1 000) and seizure disorders (4/1 000).

**Conclusion.** The prevalence of disabilities among children aged under 10 years is high. This has major implications for health, rehabilitation, welfare and educational services in rural areas. These implications must be addressed in order to develop appropriate rehabilitation services for children in rural areas.

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The national Department of Health (DOH) has made services for children under the age of 6 years a priority. It has been proposed that childhood disability is an index of the health status of the child. Childhood disability is one of the major chronic conditions among children, which has major implications for the health and other needs of a community.

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