

Adulterants and drugs-of-abuse testing: an update

By Amitava Dasgupta, PhD

There are two categories of products that are commercially available in order to “beat” drug tests. The first category includes taking specific fluids or tablets (hydrochlorothiazide, a diuretic), along with substantial water intake to flush out drugs and metabolites. Many of these products can produce diluted urine, thus reducing concentrations of abused drugs/metabolites. Common products are Absolute Detox XXL drink, Absolute Carbo Drinks, Ready Clean Drug Detox Drink, Fast Flush Capsules, and Ready Clean Gel Capsules.

The second category of products is *in vitro* urinary adulterants: Stealth, Klear (nitrite), Clean ADD-IT-ive (glutaraldehyde), and Urine Luck (pyridinium chlorochromate, [PCC]), which are available through the Internet.¹ Home test kits are available commercially to test for certain drugs. Synthetic urine is also available from these Internet sites, for example, Quick Fix Synthetic Urine.

Common household chemicals as urinary adulterants

Schwarzhoff and Cody studied the effect of 16 different adulterating agents: ammonia-based cleaner, L-ascorbic acid, Visine eye drops, Drano, golden-seal root, lemon juice, lime solvent, Clorox, liquid hand soap, methanol, sodium chloride, tribasic potassium phosphate, toilet-bowl cleaner (Vanish, Drackett Products), white vinegar, ionic detergent (Multi-Terge), and whole-blood anticoagulated with EDTA on the FPIA (fluorescence polarization immunoassay) for testing abused drugs in urine. Approximately half of the agents (ascorbic acid, vinegar, bleach, lime solvent, Visine eye drops, and golden-seal tea) tested caused false-negatives. Both cannabinoid and opiate assays were susceptible to bleach, and actual degradation of THC (tetrahydrocannabinol) was confirmed by gas chromatography-mass spectrometry (GC/MS) analysis. The PCP (phencyclidine) and benzoylcegonine (BE, the metabolite of cocaine) analysis were affected by alkaline agents.²

Specimen-integrity tests

The temperature of the urine should be within 90.5°F to 98.9°F, specific gravity between 1.005 and 1.030, the pH between 4.0 and 10.0, and creatinine concentration should be 20 mg/dL to 400 mg/dL. Use of household chemicals such as bleach, acid, soap, detergent as well as adulteration with vinegar, alter the pH of urine to a value outside the physiological range. Newer urine adulterants, however, such as Urine Luck, UrinAid, Klear, and Whizzies, cannot be detected by routine specimen-integrity tests.



Adulteration product “Urine Luck”

The active ingredient of “Urine Luck” is 200 mmol/L of PCC, which — when added to the urine — decreased the response rate for all EMIT II drug screens. For the Abuscreen (Abbott Laboratories, Abbott Park, IL) immunoassay, morphine and THC assays were affected. This adulterant did not alter GC/MS confirmation of methamphetamine, benzoylcegonine, and PCP. Apparent concentrations of opiates and THC as determined by GC/MS were, however, reduced.³

Wu, et al, also described a urine spot test to detect PCC. The indicator solution (10 gm/L of 1,5-diphenylcarbazide in methanol) is colorless when prepared. Two drops of indicator solution is added to 1.0 mL of urine. If a reddish-purple color develops, the test is positive. Addition of a few drops of PCC adulterated urine to approximately 0.5 mL of potassium-iodide solution, followed by addition of a few drops of 2N hydrochloric acid leads to liberation of iodine from potassium iodide — another spot test for PCC. Addition of four to five drops of 3% hydrogen peroxide in approximately 200 µL of urine adulterated with PCC caused rapid formation of a dark-brown color and a dark-brown precipitate appeared on standing.⁴

Adulteration of urine with nitrite-containing agents

The product “Klear” comes in two microtubes containing 500 mg of white crystalline material, which is potassium nitrite. The presence of Klear in urine may destroy marijuana metabolite.⁵ Both duration of nitrite exposure and the urine matrix affect the THC-COOH (cannabis metabolite) assay. Drug metabolites are destroyed more effectively in acidic pH.

Addition of a few drops of nitrite-adulterated urine specimen to 0.5 mL of 1% potassium permanganate solution, followed by addition of a few drops of 2N hydrochloric acid, turns a pink permanganate solution colorless with effervescence. Another spot test to detect nitrite uses 1% potassium-iodide solution. Addition of a few drops of nitrite-adulterated urine to 0.5 mL of potassium-iodide solution, followed by addition of a few drops of 2N hydrochloric acid, results in immediate release of iodine from the colorless potassium-iodide solution.⁴

Stealth as a urinary adulterant

Stealth consists of two vials: one containing a powder (peroxidase) and another vial containing a liquid (hydrogen peroxide). Both products are added to the urine specimen. Stealth is capable

of producing false-negative results using Roche ONLINE and Microgenics's CEDIA immunoassay methods when marijuana metabolites, LSD (lysergic acid diethylamide), and opiates (morphine) are present in the urine at 125% to 150% of cutoff values. Valtier and Cody described a rapid color for Stealth. Addition of 10 μ L of urine to 50 μ L of TMB (tetramethylbenzidine) solution, followed by addition of 500 μ L of 0.1 M phosphate buffer solution, caused a dramatic color change of the specimen to dark brown.⁷

Glutaraldehyde as an adulterant to urine

Glutaraldehyde is available under the trade name of "UrinAid." The manufacturer, (Byrd Laboratories, Topanga, CA), sells this product for \$20 to \$30 per kit. Each kit contains 4 mL to 5 mL glutaraldehyde solution. A 10% solution of glutaraldehyde is available from pharmacies as over-the-counter medication for treatment of warts. Glutaraldehyde at a concentration of 0.75% volume can lead to false-negative screening results for a cannabinoid test using the EMIT II drugs-of-abuse screen. Amphetamine, methadone, benzodiazepine, opiate, and cocaine metabolite tests can be affected at glutaraldehyde concentration between 1% and 2%, using EMIT immunoassays. At a concentration of 2% by volume, the assay of cocaine metabolite is significantly affected (apparent loss of 90% sensitivity). A loss of 80% sensitivity was also observed with the benzodiazepine assay.⁸

On-site adulteration-detection devices (dipsticks) for urine specimens

Standard urinalysis test strips, such as Multistix from Bayer Diagnostics and Combur-Test from Roche Diagnostics, are sometimes used to detect the presence of adulterants in urine. Among various pads in the test strip, however, only pads for detection of nitrite, pH, and specific gravity have some value. Peace and Tarani evaluated the performance of three on-site devices — Intect 7 (Branan Medical Corp.), MASK Ultrascreen (Kacey Inc.), and Adulta-Check 4 (Sciteck Diagnostics). Intect 7 can simultaneously test for creatinine, nitrite, glutaraldehyde, pH, specific gravity, PCC, and bleach. Ultrascreen tests for creatinine, nitrite, pH, specific gravity, and oxidants. AdultaCheck 4 tests creatinine, nitrite, glutaraldehyde, and pH. The authors adulterated urine specimens with Stealth, Urine Luck, Instant Clean ADD-IT-ive, and Klear at their optimum usage concentration and concluded that Intect 7 was most sensitive and correctly identified adulterants.⁹

Adulteration of hair and saliva specimen for drug testing

Hair and saliva are considered as alternative specimens to urine for drugs-of-abuse testing. Several products are available for sale through the Internet that present claims that by washing hair with these shampoos, a person can pass a drug test. Clear Choice Hair Follicle Shampoo, sold for \$35 (www.beatanydrugtest.com), claims to remove all residues and toxins within 10 minutes of use. The chances of adulteration of saliva specimen are very low to non-existent. A mouthwash is available commercially (www.ipassedmydrugtest.com), claiming that rinsing the mouth twice with this product can help a person escape saliva-based drug testing, which is a popular method of testing by insurance companies. Wong, et al, studied in detail the effect of commercially available adulterants and foodstuffs on oral-fluid drug testing and reported that these products are not capable of destroying drugs of abuse in saliva specimen.¹⁰ □

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