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Evaluation of Ethyl Glucuronide Immunoassay Urinalysis in Five Alcohol Dependent Outpatients

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Inaccurate patient-report of substance use is a common problem for addiction psychiatrists.[1] Accurate, low-cost, urine-based immunoassays are capable of detecting illicit drug use at least 72 hours after ingestion.[1–3] When used with self- and collateral-report immunoassays improve the detection of drug use.[1,3] Objective measurement of alcohol use lags behind drug use testing, relying on assessments of blood alcohol concentration (BAC) that are capable of detecting only very recent alcohol use (0–12 hours after use).[2] In outpatient settings alcohol breath-tests are frequently used as objective measures of use, despite their brief detection period. In a sample of adults receiving outpatient addiction treatment breath-tests identified alcohol use in only 4% of weeks assessed, while clinicians reported alcohol use by patients in 45% of weeks assessed.[3] Conversely, urinalyses of illicit drug use resulted in a 33% increase in detection of use, above and beyond clinician-report.[3] Relative to urinalyses of illicit drug use, breath-tests (and other measures of BAC), are of limited utility as clinical and research measures.

Ethyl-glucuronide (EtG), a metabolite of alcohol, has been extensively researched[4,5] using quantitative confirmatory analyses (GC/MS, LC/MS). Quantitative urinalyses are able to accurately identify moderate to high level alcohol consumption up to 80 hours after use and are used in a variety of clinical settings.[5] Less is known about the detection periods of lower-cost EtG immunoassay (EtG-I).[4] EtG-I is a potentially valuable objective measure of alcohol use that may be superior to measures of BAC, like breath-tests. The study aims were to determine 1) if EtG-I would detect higher rates of self-reported alcohol use than breath-tests across a four-day assessment period in 5 alcohol-dependent outpatients and 2) if agreement between EtG-I and self-report alcohol use would be comparable to agreement between urinalysis and self-report of drug use (75–80%).[1]

Five consecutive participants of a larger study of contingency management of stimulant use who met criteria for alcohol dependence, and reported drinking one or more days (M=5.0, SD=2.3) in the last 30 days, were selected. Participants were 3 males and 2 females with an

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Declaration of Interest

In the last year Dr. Ries has received grants/research support from the National Institutes of Health, SAMHSA/CSAT. He has served as a consultant/advisor for King County, Skagit County, and the Muckleshoot Tribe. He has served on the speakers bureau for Lilly, Bristol-Myers Squibb. Pfizer, Janssen, Astra-Zeneca, and Suboxone. He has served as editor for Mid-America ATTC, University of Missouri-Kansas City. All other authors have no disclosures to report.

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average age of 44 years (SD=10.4) with comorbid cocaine dependence (n=5), major depressive disorder (n=4), and schizophrenia (n=1). Four participants were prescribed psychotropic medications. To our knowledge, prescribed psychotropic medication and illicit drug use are not associated with inaccurate EtG tests.

Data were collected on Mondays and Fridays until up to seven samples were collected from each participant. Participants were asked to refrain from using products containing alcohol (e.g., hand sanitizer). Daily standard drinks was assessed for a four-day period using the Alcohol-Time-Line-FollowBack (ATLFB;[6]). BAC was measured using an Alco-Sensor-III (Intoximeters-Inc.) breathalyzer (positive breath-test BAC > 0.001). Urine analyses were conducted at Sterling Laboratories, Tacoma, WA using an Advia-2400 Chemistry System Analyzer (Siemens) and the DRI ethylglucuronide enzyme immunoassay (Thermo-Fisher Scientific). A cutoff level of 500ng/ml (recommended by previous research) was used.[4]

Table 1 summarizes all data gathered from participants. Alcohol use was reported during 14 of 30 four-day assessments, (M=1.67 standard drinks; SD=1.31). Alcohol use was detected by 0 (0%) breath and 11 (37%) EtG-I tests. EtG tests were positive in 9 of the 14 self-reported instances (64%). EtG did not detect self-reported drinking for lower levels of alcohol use (< 3 standard drinks/day) nor drinking that occurred greater than two days prior to EtG-I administration. EtG-I results were positive twice (in 1 participant) when drinking was not self-reported. Overall agreement between EtG-I and self-report was 77% (23/30 samples).

EtG-I was superior to breath-tests when used to detect self-reported drinking. EtG-I detected self-reported alcohol use in the two days prior to testing and when moderate to high level of alcohol was consumed. Data did not support previous concerns about the oversensitivity of EtG.[7] Rates of agreement between EtG-I and self-reported alcohol use (77%) were consistent with rates of agreement between immunoassays and self-reported use of illicit drugs.[1] Results provide initial evidence for EtG-I as an objective measure of alcohol use with clinical and research applications. Future research should investigate the accuracy of EtG-I in larger outpatient samples who are moderate to heavy drinkers using quantitative analyses (e.g., LC/MS) as a validity outcome.

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Table 1

Agreement between self-reported standard drinks assessed over 4 days and ethyl glucuronide immunoassay results across 5 subjects.

Subject	Sample Number	Self-reported Standard Drinks Day 4	Day 3	Day 2	Day 1	EtG* Result	BAC†	EtG* & Self-Report Agreement
1	1	0.00	0.00	0.00	0.00	−	0.00	Agree
	2	0.00	0.00	0.00	**2.80**	+	0.00	Agree
	3	0.00	**4.00**	**4.00**	**4.00**	+	0.00	Agree
	4	0.00	0.00	0.00	**20.00**	+	0.00	Agree
	5	0.00	0.00	0.00	0.00	−	0.00	Agree
	6	**2.80**	0.00	0.00	0.00	−	0.00	EtG did not detect self-reported use
	7	**5.60**	**5.60**	0.00	0.00	−	0.00	EtG did not detect self-reported use
2	1	0.00	0.00	0.00	0.00	−	0.00	Agree
	2	0.00	0.00	0.00	0.00	−	0.00	Agree
	3	0.00	0.00	0.00	**2.80**	+	0.00	Agree
	4	0.00	0.00	**2.80**	0.00	+	0.00	Agree
	5	0.00	0.00	**2.80**	0.00	−	0.00	EtG did not detect
	6	0.00	0.00	0.00	0.00	+	0.00	EtG detected use not self-reported
	7	0.00	0.00	0.00	0.00	+	0.00	EtG detected use not self-reported
3	1	0.00	0.00	0.00	0.00	−	0.00	Agree
	2	0.00	0.00	0.00	0.00	−	0.00	Agree
	3	0.00	0.00	0.00	0.00	−	0.00	Agree
	4	0.00	0.00	0.00	0.00	−	0.00	Agree
	5	0.00	0.00	0.00	0.00	−	0.00	Agree
	6	0.00	0.00	0.00	0.00	−	0.00	Agree
	7	0.00	0.00	0.00	0.00	−	0.00	Agree
4	1	0.00	0.00	0.00	0.00	−	0.00	Agree
	2	0.00	0.00	0.00	0.00	−	0.00	Agree

Subject	Sample Number	Self-reported Standard Drinks: Day 4	Day 3	Day 2	Day 1	EtG* Result	BAC†	EtG* & Self-Report Agreement
	3	0.00	0.00	0.00	0.00	–	0.00	Agree
	4	0.00	**4.00**	**3.00**	0.00	+	0.00	Agree
5	1	0.00	0.00	**1.60**	**1.60**	+	0.00	Agree
	2	**1.60**	**1.60**	**4.20**	**4.20**	+	0.00	Agree
	3	**4.20**	**2.00**	**1.60**	0.00	+	0.00	Agree
	4	**1.60**	0.00	**1.60**	**1.60**	–	0.00	EtG did not detect self-reported use
	5	0.00	0.00	**1.60**	**1.60**	–	0.00	EtG did not detect self reported use

*Note: EtG: Ethyl Glucuronide

†Note: BAC = Blood Alcohol Concentration