DXC (BNZG) BENZODIAZEPINE

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PURPOSE

To provide instructions for the qualitative determination of benzodiazepine on the DXC 600/800.

PRINCIPLE

BNZG reagent, when used in conjunction with UniCel® DxC 600/800 System(s) and SYNCHRON® Systems Drugs of Abuse Testing (DAT) Urine Calibrators, is intended for the qualitative determination of Benzodiazepine in human urine at a cutoff value of 200 ng/mL (oxazepam). The BNZG assay provides a rapid screening procedure for determining the presence of the analyte in urine. This test provides only a preliminary analytical result; a positive result by this assay should be confirmed by another generally accepted non-immunological method such as thin layer chromatography (TLC), gas chromatography (GC), or gas chromatography/mass spectrometry (GC/MS). GC/MS is the preferred confirmatory method.
Clinical consideration and professional judgment should be applied to any drug of abuse test result, particularly when preliminary positive results are used.

BACKGROUND

Clinical Significance

Benzodiazepines are a class of central nervous system depressants that are used as sedatives and hypnotics. The benzodiazepine compounds include chlordiazepoxide, diazepam, oxazepam, flurazepam, and nitrazepam. Measurements of benzodiazepines on the system are used in the diagnosis and treatment of benzodiazepine use and overdose, and in monitoring the presence of benzodiazepines to ensure appropriate therapy.

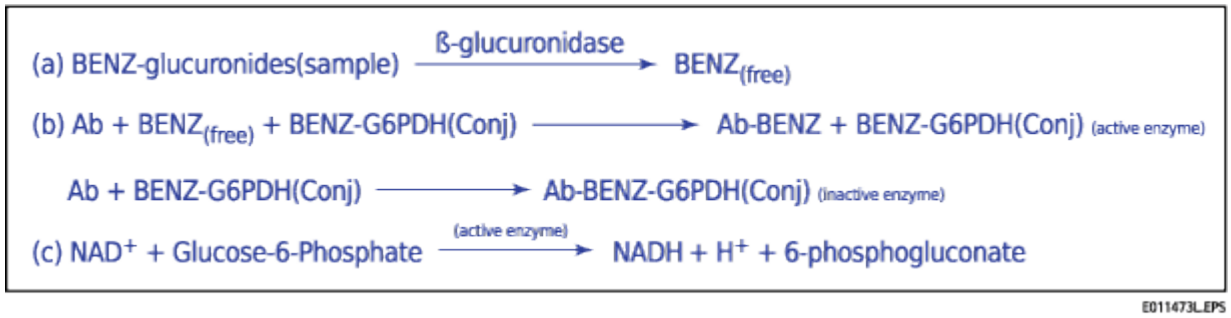
General Discussion

Benzodiazepines are widely used in the treatment of anxiety and insomnia, seizure disorders, alcohol withdrawal, and skeletal muscle spasticity. Benzodiazepine-derivatives have similar actions and effectiveness; it is the pharmacokinetic differences which are important in considering the choice of drug for treatment. Benzodiazepines are subject to widespread abuse, particularly diazepam (Valium) and chlordiazepoxide (Librium). Detection of benzodiazepines or their metabolites in urine can be used as an indication of their use.

Methodology

Benzodiazepine-glucuronides present in the urine sample are hydrolyzed on-line using β-glucuronidase enzyme. The free benzodiazepines are then assayed using a homogenous enzyme immunoassay method. The BNZG reagent is comprised of specific antibodies which can detect most Benzodiazepines in urine. A drug-labeled glucose-6-phosphate dehydrogenase (G6PDH) conjugate competes with any free drug from the urine sample for a fixed amount of antibody binding sites. In the absence of free drug from the sample, the drug-labeled G6PDH conjugate is bound by the specific antibody and the enzyme activity is inhibited. This reaction creates a direct relationship between the presence of drug and enzyme activity. The G6PDH enzyme activity is determined spectrophotometrically by measuring its ability to convert nicotinamide adenine dinucleotide (NAD) to NADH (reduced form).

The system automatically proportions the appropriate sample and reagent volumes into a cuvette. The ratio for BNZG is one part sample to 13 parts reagent. The system monitors the change in absorbance at 340 nanometers to calculate and express a reaction rate. A qualitative result is reported based on a comparison of the sample rate to the calibrated cutoff rate.



RELATED DOCUMENTS

R-PO-CH-0810	Quality Control Program General Laboratory
R-PO-CH-0809	Quality Control Westgard Rules Statistics
R-PR-AD-0540	Specimen Rejection/Cancellation Protocol
J-F-CH-0820	DXC 800 Controls
M-F-CH-0820	Chemistry Controls
J-F-CH-0826	DXC 800 Calibrators
M-F-CH-0826	Chemistry Calibrators

SPECIMEN

Type of Specimen

Freshly collected urine samples should be used for testing. Collect urine samples in glass or plastic (i.e., polypropylene, polycarbonate, polyethylene) containers. Urine samples should be collected in the manner routinely used for drug screening analysis. Samples should be at room temperature for testing.

Specimen Storage and Stability

If the sample cannot be analyzed immediately, it may be stored at +2°C to +8°C for up to 7 days. If longer storage is required or when a split sample collection method is used, samples should be stored frozen at -20°C or less.

Sample Type	Volume	Sample Stability
Urine	0.5mL	• Analyze at Room Temp • Refrigerated 7 days • Frozen (-20ºC) >7 days

Criteria for Unacceptable Specimens

See Specimen Rejection/Cancellation Protocol

Sample Volume

A filled 0.5 mL sample cup is the optimum volume. For optimum primary sample tube volumes in primary tube samples and minimum volumes, refer to the Primary Tube Sample Template for your system.

REAGENTS

Contents

Each kit contains the following items:
One BNZG reagent cartridge (1 x 250 tests)

Volume per Test	
Sample Volume	20 uL
Total Reagent Volume	260 uL
Cartridge Volumes	A 200 uL B 50 uL C 10 uL

Reactive Ingredients	
Antibody/Substrate Reagent: Polyclonal anti-benzodiazepines antibodies (goat) Glucose-6-phosphate (G6P) Nicotinamide adenine dinucleotide (NAD) Tris buffer	69mL
Enzyme Conjugate Reagent: Glucose-6-phosphate dehydrogenase (G6PDH) labeled with benzodiazepine analog derivative Tris buffer	18mL
β-glucuronidase (E. coli)	4mL

Also non-reactive chemicals necessary for optimal system performance.

Reagent Preparation

No preparation is required.

Acceptable Reagent Performance

The acceptability of a reagent is determined by successful calibration and by ensuring that quality control results are within acceptance criteria. Refer to the Quality Control section of this chemistry information sheet for Substance Abuse and Mental Health Services Administration (SAMHSA) guidelines.

Reagent Storage and Stability

BNZG reagent, when stored unopened at +2°C to +8°C, will remain stable until the expiration date printed on the cartridge label. Once opened, the reagent is stable for 60 days at +2°C to +8°C. Do not use beyond the manufacturer's expiration date. DO NOT FREEZE.

CALIBRATION

Calibrator Required

SYNCHRON Systems DAT Negative Urine Calibrator (0 ng/mL oxazepam)
SYNCHRON Systems DAT Multi-Drug Low (cutoff) Urine Calibrator (200 ng/mL oxazepam)
SYNCHRON Systems DAT Multi-Drug High Urine Calibrator (1000 ng/mL oxazepam)

Calibrator Preparation

No preparation is required.

Calibrator Storage and Stability

SYNCHRON® Systems Drugs of Abuse Testing (DAT) Urine Calibrators are stable until the expiration date printed on the calibrator bottles if stored capped in the original container at +2°C to +8°C. Calibrators should be at room temperature for testing.

Calibration Information

1. The DAT assays require three levels of calibrators. The calibration measures the separation between calibrators to ensure reagent integrity. **The calibration factor generated is non-functional of sample result calculation.**

2. The system must have a valid calibrator cutoff value in memory before controls or patient samples can be run. The cutoff value for each DAT chemistry represents the mean reaction rate of the Low Calibrator, and is reported in mA/min units on patient and control reports. Cutoff values are stored in memory until the next successful calibration.

3. Under typical operating conditions the BNZG reagent cartridge must be calibrated every 14 days and also with certain parts replacements or maintenance procedures, as defined in the UniCel DxC 600/800 System Instructions For Use (IFU) manual.

4. This assay has within-lot calibration available. For detailed calibration instructions, refer to the UniCel DxC 600/800 System *Instructions For Use* (IFU) manual.

5. The system will automatically perform checks on the calibration and produce data at the end of calibration. In the event of a failed calibration, the data will be printed with error codes and the system will alert the operator of the failure. For information on error codes, refer to the UniCel DxC 600/800 System *Instructions For Use* (IFU) manual.

TRACEABILITY

For Traceability information refer to the Calibrator instructions for use.

QUALITY CONTROL

See Related Documents J-F-CH0820 DXC 800 Controls & M-F-CH0820 Chemistry Controls

STEPS

1. If necessary, load the reagent onto the system.

2. After reagent load is completed, calibration may be required.

3. Program controls for analysis.

4. After loading controls onto the system, follow the protocols for system operation. To load samples manually refer to the FHS DXC Series Manual Sample Programming procedure. For detailed testing procedures, refer to the UniCel DxC 600/800 System *Instructions For Use* (IFU) manual.

CALCULATIONS

The system performs all calculations internally to produce the final qualitative result, reported as POSITIVE or NEGATIVE. The qualitative result is based on a comparison of the sample rate to the calibrated cutoff rate; a sample rate greater than or equal to the cutoff rate is reported as POSITIVE. A POSITIVE result (≥200 ng/mL) from this assay indicates only the presence of this analyte and does not necessarily correlate with the extent of physiological and psychological effects. A NEGATIVE test result indicates that this analyte is either not present, or is present at levels below the cutoff threshold of the test.

PERFORMANCE CHARACTERISTICS

Reference Range

Sample Type	Normal
Urine	"Not Detected"

Analyte	Normal Results	Suspect Results (Adulterated)
Creatinine	>20 mg/mL	<20 mg/mL

If results for Creatinine are outside normal parameters for urine drug testing, **DIL1** comment will be appended to screen results.

Reporting results

Result	Reported As
Negative	"Not Detected"
Positive	"Detected"

Relative Sensitivity and Specificity

One hundred fifty-eight urine specimens were collected and tested with BNZG and GC/MS. Two samples were negative with the new reagent, and positive by GC/MS. Both samples had borderline rates at 1.6% and 6.3% below the system rate cutoff. GC/MS showed that both samples contained α-hydroxy-alprazolam, and one sample also contained lorazepam. Ten samples were positive with the new reagent, and negative by GC/MS. Four of the ten samples had borderline rates at 0.6%, 1.7%, 3.6% and 5.2% above the system rate cutoff.

Relative Sensitivity (% agreement among positives): 98%
Relative Specificity (% agreement among negatives): 84%
Overall Agreement: 92%

LIMITATIONS

1. The test is designed for use with human urine only.

2. Do not dilute the urine samples since this is a qualitative assay. Dilution of samples may produce erroneous results.

3. Interference has been demonstrated from mefenamic acid, a nonopioid analgesic.

4. Adulteration of the urine sample may cause erroneous results. Alteration of a urine specimen may be detected by checking the appearance, temperature, pH, specific gravity, and creatinine levels of a sample. If adulteration is suspected, obtain another sample and forward both specimens to the laboratory for testing.

5. An effort should be made to keep pipetted samples free from gross debris. It is recommended that highly turbid specimens be centrifuged before analysis.

Cross Reactivity

Benzodiazepines and various potential interfering substances in a human urine matrix were tested for cross-reactivity with the systems BNZG assay. The following table summarizes the results obtained at the concentrations tested for each potential cross-reactant.

Compound	Concentration (µg/mL)	Effect
Oxazepam (cutoff)	0.2	Positive
Alprazolam	0.2	Positive
α-Hydroxy-Alprazolam	0.1	Positive
7-Aminoclonazepam	0.8	Positive
7-Aminoflunitrazepam	0.5	Positive
7-Aminonitrazepam	0.75	Positive
Bromazepam	0.3	Positive
Chlordiazepoxide	1.5	Positive
Clobazam	0.7	Positive
Clonazepam	0.3	Positive
Delorazepam	0.1	Positive
Desalkylflurazepam	0.1	Positive
N-Desmethylflunitrazepam	0.3	Positive
Diazepam	0.065	Positive
Flunitrazepam	0.2	Positive
Flurazepam	0.1	Positive
Halazepam	0.15	Positive
Lorazepam	0.4	Positive
Lorazepam Glucuronide	1.0	Positive
Lormetazepam	0.2	Positive
Medazepam	0.2	Positive
Midazolam	0.1	Positive
Nitrazepam	0.3	Positive
Nordiazepam	0.07	Positive
Oxazepam Glucuronide	0.7	Positive
Prazepam	0.2	Positive
Temazepam	0.2	Positive
Temazepam Glucuronide	0.4	Positive
α-Hydroxy-Triazolam	0.15	Positive
Triazolam	0.15	Positive
Acetaminophen	1000	Negative
Acetylsalicylic Acid	1000	Negative
Albuterol	1000	Negative
d-Amphetamine	1000	Negative
Caffeine	100	Negative
Codeine	1000	Negative
Dextromethorphan	1000	Negative
Diphenhydramine	500	Negative
Doxepine	1	Negative
Hydroxyzine	40	Negative
Mesoridazine	1000	Negative
Methadone	1000	Negative
Metronidazole	1000	Negative
Morphine	200	Negative
Oxaprozin	25	Negative
Pemoline	1000	Negative
Phencyclidine	1000	Negative

Compound	Concentration (µg/mL)	Effect
Promethazine	100	Negative
Propoxyphene	1000	Negative
Secobarbital	1000	Negative
Sertraline	500	Negative
Tramadol	1000	Negative
Trazodone	1000	Negative
Trimipramine	100	Negative
Trimethoprim	1000	Negative
Zolpidem	100	Negative

ADDITIONAL INFORMATION

For more detailed information on UniCel DxC Systems, refer to the appropriate system manual.

REFERENCES

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