



Clinical Update: January 2024

## BIODETECT™: IDENTIFYING NON-URINE SUBSTANCES

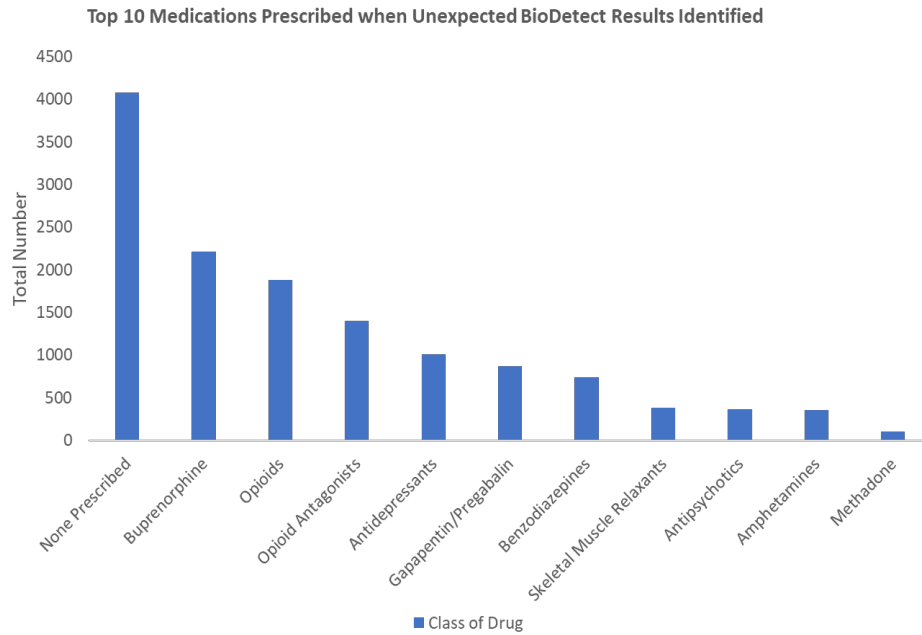
Healthcare providers rely on medication adherence test results to assist in measuring compliance and evaluating recent substance use. Providers must remain aware of specimen substitution attempts to avoid misuse and diversion going unidentified. Aegis's expanded validity measure called BioDetect™ assists with identification of substituted and synthetic urine specimens. Through the identification of unique markers expected in human urine, healthcare providers have greater insight into an individual's medication adherence.

### **Synthetic Urine<sup>1, 2-4</sup>**

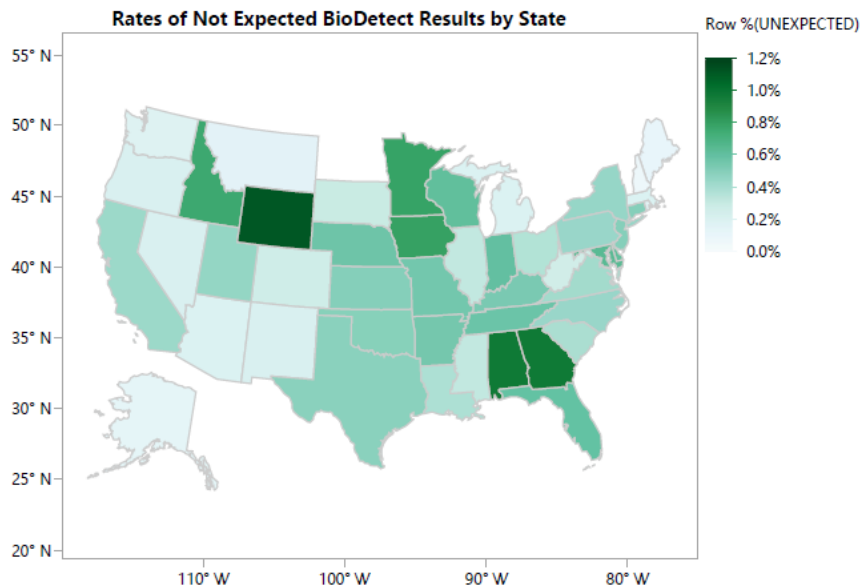
Synthetic urine, also known as "fake urine," is one mechanism of substitution and is typically manufactured to include creatinine, specific gravity, physiological pH levels, or other specimen validity parameters in the samples.<sup>1</sup> Synthetic urine products have a similar color, density, and temperature making them a common method to substitute urine tests. Common ingredients in synthetic urine may include uric acid, sodium and potassium chloride, urea, phosphorus sodium, purified or distilled water, and creatinine. Many of the products come with instructions, heating pad, and temperature indicators and are available in powder and liquid formulations. These products are alarmingly accessible and sold in smoke shops, on reputable sites like Amazon, or directly from the manufacturer's website. A 2020 market search submitted ten synthetic urine samples for testing at five forensic drug testing laboratories to be analyzed for similarities and differing factors compared to authentic urine.<sup>2</sup> These samples proved difficult to detect as synthetic using standard assays including LC/MS/MS.

### **BioDetect™ Testing at Aegis**

Individuals may substitute a specimen to mask the use of non-prescribed substances or may spike a prescribed drug into the substituted specimen to appear compliant with prescribed medications. This can create difficulty for providers, who are utilizing routine specimen validity testing, to adequately identify aberrant behaviors. Aegis's BioDetect™ test includes unique markers expected to be present in routinely analyzed human urine. Thus, when an authentic urine specimen is provided, it is expected the components of the BioDetect™ test will be present. BioDetect™ testing is included on all urine samples to improve a provider's ability to identify samples that are not consistent with routinely analyzed human urine. The noncompliance to prescription medications in addition to an unexpected BioDetect™ result on an Aegis urine sample is always alarming. The chart below demonstrates the frequency of the top 10 prescribed medications by class in samples with unexpected BioDetect™ results at Aegis. The data includes a total of 1,969,559 urine samples collected from January 2022 to October 2023, with 8960 (0.45%) samples reporting with unexpected BioDetect™ results.



The following illustration categorizes the same data set by the percent of urine specimens with Unexpected BioDetect™ results by state. States with overall low sample volume were excluded.



Individuals in various treatment settings may rely on urine substitution as one of several different methods of adulteration to “pass” a urine drug test. Use of non-urine substances, such as sample substitution with synthetic urine to mask aberrant behaviors, may complicate interpretation of results. When the latter occurs, medication non-adherence and substance use may go unnoticed, and an individual receiving treatment may be at risk for



negative outcomes.<sup>5</sup> BioDetect™ provides information to identify aberrant behaviors to both guide risk stratification and determine causes of non-adherence.<sup>6</sup>

### Pain Management

The results below represent an Aegis urine sample in a pain management setting that reflects noncompliance with prescribed medications. The sample has concomitant unexpected BioDetect™ results demonstrating inconsistency with routinely analyzed human urine informing the provider the drug results cannot be applied to objectively assess medication adherence. The unexpected BioDetect™ results provide direction to identify diversion or substance use and to determine causes of non-adherence.<sup>6</sup> The opioid epidemic is particularly impactful on those requiring chronic opioid therapy to manage debilitating pain, where medication non-adherence and substance use may go unnoticed, and individuals receiving treatment may be at risk for negative outcomes.<sup>5</sup> Data accumulated by the U.S. Department of Health and Human Services (HHS) from 2020 showed 1.6 million individuals had an opioid use disorder, over 10 million individuals misused prescription opioids, and over 70,000 individuals died from drug overdose. HHS reported approximately 75% of all drug overdose deaths in 2020 involved an opioid.<sup>7</sup> Though progress has been made over the past few years to curtail the epidemic, there still remains an unfortunate uptick in overdoses and hospitalizations secondary to opioid use.<sup>8</sup> Growing availability of novel psychoactive substances (NPS), including designer opioids, has further complicated this issue, as use of substances of varying concentrations and strengths can significantly increase the risk for overdose when taken in combination with prescription drugs. As providers navigate this landscape, identification of sample substitution or synthetic urine is of particular importance to guide their treatment decisions.

#### Medication(s) Prescribed

Alprazolam, Amphetamine, Gabapentin, Hydromorphone, Tramadol

#### Medication Compliance

Drug and/or Metabolites	Result Interpretation	Result	Comment
Tramadol	NON-COMPLIANT	<100 ng/mL	Test result indicates patient may not be taking drug prescribed.
Hydromorphone	NON-COMPLIANT	<100 ng/mL	Test result indicates patient may not be taking drug prescribed.
Gabapentin	NON-COMPLIANT	<5 mcg/mL	Test result indicates patient may not be taking drug prescribed.
Alprazolam	NON-COMPLIANT	<50 ng/mL	Test result indicates patient may not be taking drug prescribed.
Amphetamine	NON-COMPLIANT	<250 ng/mL	Test result indicates patient may not be taking drug prescribed.



Result	Comment
NOT EXPECTED	Test result is not consistent with routinely analyzed human urine. Please contact the Clinical Team at 1-877-552-3232 for additional information.

#### Specimen Validity Testing

Tested For	Comment	Result	Normal Range
Creatinine	NORMAL	48.4 mg/dL	20 - 370 mg/dL
pH	NORMAL	7.71	4.5 - 9.0

### Opioid Use Disorder (OUD)/Substance Use Disorder (SUD)



The Aegis report below illustrates a urine sample collected at an SUD clinic with unexpected BioDetect™ results, prescribed buprenorphine and naloxone above our upper limit of quantification, and buprenorphine with low metabolites. The individual that submitted this sample may have substituted the specimen to mask the presence of another ingested substance. These findings may suggest post collection addition of the buprenorphine/naloxone product to the urine in an effort to appear compliant. Without BioDetect™, the possibility of relapse in addition to noncompliance may not have been considered and the risk for negative outcomes may have been missed. Due to the inclusion of the BioDetect™ testing on this sample, the provider had additional information to guide risk stratification and to consider possible referral for additional treatment. Identification of appropriate medication use, substance misuse, and medication diversion is of particular importance and is a key to both effective care and mitigation of risk for overdose. The rate of increase in adults in the US with substance use disorder is startling as it doubled from 20.4 million people in 2019 to 40 million people in 2020.<sup>9</sup> The 2022 National Survey on Drug Use and Health (NSDUH) now reporting 48.7 million people aged 12 or older (or 17.3 percent of the population) met criteria for having a substance use disorder.<sup>10</sup>

**Medication(s) Prescribed**

Buprenorphine, Naloxone

**Medication Compliance**

Drug and/or Metabolites	Result Interpretation	Result	Comment
Naloxone	PRESENT	>5,000 ng/mL	Test result is consistent and expected with prescribed drug.
Buprenorphine	SEE COMMENT	>5,020 ng/mL	Low metabolite concentration suggests possible adulteration. For additional information, please consult clinical scientists at 1-877-552-3232.



Result	Comment
NOT EXPECTED	Test result is not consistent with routinely analyzed human urine. Please contact the Clinical Team at 1-877-552-3232 for additional information.

**Specimen Validity Testing**

Tested For	Comment	Result	Normal Range
Creatinine	NORMAL	24.2 mg/dL	20 - 370 mg/dL
pH	NORMAL	7.24	4.5 - 9.0

**Behavioral Health**

Many individuals with mental illness fail to take their medication because of their lack of awareness of their illness or due to adverse effects of the prescribed therapy. Substitution of the urine sample may mask self-medication with a non-prescribed substance, diversion, or use of illicit substances, and if not recognized, could cause serious harm. Action can be taken to provide assistance to the individual that submitted the sample and the relationship between this individual and the provider can be enhanced when the results are used to improve communication.<sup>11</sup> Mental illness is becoming more prevalent as 59.3 million adults in the US experienced any mental illness (AMI) in 2022<sup>10</sup> compared to 45 million adults in 2016<sup>12</sup>, and 8.3% (21 million) of American adults had at least one major depressive episode in 2021 compared to 7.8% of adults in 2019.<sup>13</sup> The information offered by BioDetect™ allows providers to appropriately assess and treat each individual specifically in the behavioral health setting.



**Medication(s) Prescribed**

Gabapentin, Hydroxyzine PRN, Sertraline

**Medication Compliance**

Drug and/or Metabolites	Result Interpretation	Result	Comment
Gabapentin	NON-COMPLIANT	<5 mcg/mL	Test result indicates patient may not be taking drug prescribed.
Sertraline	NON-COMPLIANT	<50 ng/mL	Test result indicates patient may not be taking drug prescribed.
Hydroxyzine	PRN - NOT PRESENT	<2 ng/mL	Test result is consistent and expected with prescribed drug.



Result	Comment
NOT EXPECTED	Test result is not consistent with routinely analyzed human urine. Please contact the Clinical Team at 1-877-552-3232 for additional information.

**Specimen Validity Testing**

Tested For	Comment	Result	Normal Range
Creatinine	NORMAL	51.6 mg/dL	20 - 370 mg/dL
pH	NORMAL	7.93	4.5 - 9.0

**BioDetect™ Testing at Aegis**

Aegis has a long history of developing clinically innovative testing solutions to give providers insight to make better treatment decisions. BioDetect™ was developed to identify samples that are not consistent with routinely analyzed human urine. Using BioDetect™ to identify these specimens provides clinically relevant information to the healthcare provider seeking to make more informed treatment decisions and improve treatment outcomes. Manufacturers of synthetic urine are bolstering techniques to “beat” a drug test, including supplementing products with creatinine to pass routine specimen validity testing. Synthetic urine has become alarmingly accessible and at-risk individuals receiving treatment for chronic pain, opioid use disorder, substance use disorder, or behavior health may seek to mask non-prescription drug use or medication diversion through urine sample substitution. Aegis continues to provide clinicians greater insight regarding potential substitution to mitigate risk and make treatment decisions with greater confidence.

**NOTICE:** The information above is intended as a resource for health care providers. Providers should use their independent medical judgment based on the clinical needs of the patient when making determinations of who to test, what medications to test, testing frequency, and the type of testing to conduct.



## References:

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