



September, 2025

BTNX Rapid Response™ Medetomidine Test Strip

1000 ng/mL

Introduction

Medetomidine, originally developed and introduced to the veterinary market in the late 1980s, is primarily used as a sedative, analgesic, and pre-anesthetic medication for animals. As an alpha-2 adrenergic agonist, it effectively induces sedation, muscle relaxation, and pain relief in various animal species, making it a valuable tool in veterinary procedures. Despite its intended use, the drug has occasionally found its way into illicit markets.

Dexmedetomidine, initially developed for human medical use in the 1990s, is widely utilized as a sedative and analgesic in clinical settings. As a highly selective alpha-2 adrenergic agonist, it provides sedation, pain relief, and anxiolysis, making it ideal for intensive care and surgical procedures. Its ability to maintain respiratory stability enhances its value in anesthesia and critical care. Levomedetomidine, the inactive enantiomer of medetomidine, exhibits significantly lower affinity for alpha-2 receptors and lacks comparable clinical efficacy. While dexmedetomidine is used in human pharmaceuticals, veterinary formulations commonly contain a racemic mixture of both isomers.

When dexmedetomidine misused recreationally, it can produce profound sedation, a sense of relaxation, and reduced anxiety, which appeal to individuals seeking intense sedative effects. However, its potent pharmacological properties pose significant health risks, including severe bradycardia (slowed heart rate), hypotension (low blood pressure), and respiratory depression. These effects are highly unpredictable and can be life-threatening, especially when combined with other central nervous system depressants like alcohol or opioids.

To address concerns about the illicit use of medetomidine, the Rapid Response™ Medetomidine Test Strip (MED-18S2-100) from BTNX has been developed for efficient screening of Medetomidine in liquid or powder samples by using dexmedetomidine as the calibrator. This test utilizes a selective antibody to detect the presence of dexmedetomidine. Like other harm reduction test strips, it operates on a competitive binding principle: if the target is present in the sample at a concentration exceeding the cut-off, a single-colored line will appear in the test region.

Positive - Medetomidine Detected

Only one colored line appears in the control region (C). No apparent colored line appears in the test region (T).

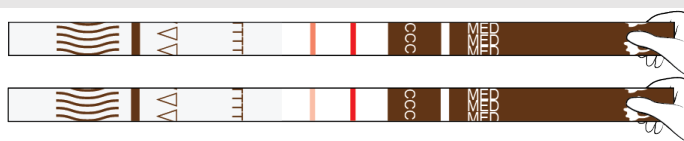


Negative – Medetomidine Could Not be Detected

Two colored lines appear on the membrane. One line appears in the control region (C) and another line appears in the test region (T). Even faint lines are considered negative. All negative results are presumptive. Confirmation should be performed using GC-MS or LC-MS analysis. There



is still a risk of overdose, even if dexmedetomidine is not present in your drugs.



Test Performance

Analytical Sensitivity

The following compounds were individually spiked into water to evaluate the detection capability of the Rapid Response™ Medetomidine Test Strip. The cut-off listed in the table represents the concentration at which a substance will begin to show a mix of positive and negative results.

| Compounds | Cut off |
|------------------------|------------|
| Dexmedetomidine | 1000 ng/mL |
| Medetomidine (racemic) | 1500 ng/mL |

Analytical Specificity

Important Note: The test cross reacts with Detomidine at 20 µg/mL.

Detomidine and medetomidine are both α2-adrenergic agonists commonly used in veterinary medicine. They are chemically related and share similar pharmacological properties.

The following compounds were spiked into water, respectively, to examine possible cross-reactivity. No false positive was observed at the concentration listed below.

| Compounds | Concentration |
|------------------------------------|---------------|
| Quinine | 5 mg/mL |
| Levamisole | 2 mg/mL |
| Caffeine | 5 mg/mL |
| Lidocaine | 5 mg/mL |
| Diphenhydramine | 5 mg/mL |
| Xylazine | 5 mg/mL |
| Codeine | 5 mg/mL |
| Heroin (Diamorphine Hydrochloride) | 5 mg/mL |
| Methamphetamine | 5 mg/mL |
| MDMA | 2 mg/mL |
| Acetaminophen | 5 mg/mL |
| Morphine | 5 mg/mL |
| Tramadol | 5 mg/mL |
| Ketamine | 5 mg/mL |
| Cocaine | 5 mg/mL |
| Oxycodone | 5 mg/mL |
| Methadone | 5 mg/mL |
| Meperidine | 5 mg/mL |



Third-Party Evaluations

Isomeric Determination of Medetomidine in Street Drug Samples (August 2024 – February 2025) and Implications for Immunoassay Test Strip Analysis

The study by the National Institute of Standards and Technology (NIST) examined the presence and isomeric composition of medetomidine in 100 illicit drug samples collected between August 2024 and February 2025 across five East Coast U.S. states. Medetomidine exists as mixture of the two optical isomers: dexmedetomidine (active) and levomedetomidine (inactive in humans). The study also evaluated the utility and limitations of BTNX's immunoassay-based medetomidine test strip in detecting racemic mixtures in complex street drug samples.

Test Sensitivity

The BTNX medetomidine immunoassay test strips demonstrated clear differences in sensitivity across the medetomidine isomers. Dexmedetomidine, the pharmacologically active isomer, was consistently detected with an approximate limit of detection (LOD) of 1 µg/mL, showing stable positive results across replicates. Racemic medetomidine mixtures, which reflect the composition of most street drug samples, were detected at a slightly higher threshold with an LOD between 1 to 10 µg/mL. In contrast, levomedetomidine alone did not produce consistent positive results at any concentration tested, indicating minimal sensitivity to this inactive isomer. Overall, the strips exhibit sufficient sensitivity to detect the concentrations of dexmedetomidine and racemic mixtures expected in real-world samples, aligning well with their intended harm-reduction application

| Concentration (µg/mL) | Medetomidine (Dex) | | | Medetomidine (Levo) | | | Medetomidine (Dex+Levo) | | |
|-----------------------|--------------------|----------|----------|---------------------|----------------|----------------|-------------------------|----------------|----------------|
| 200 | Not Tested | | | Positive | Faint Negative | Faint Negative | Not Tested | | |
| 100 | Positive | Positive | Positive | Positive | Faint Negative | Faint Negative | Positive | Positive | Positive |
| 50 | Not Tested | | | Faint Negative | Faint Negative | Faint Negative | Not Tested | | |
| 25 | Not Tested | | | Negative | Negative | Negative | Not Tested | | |
| 10 | Positive | Positive | Positive | Negative | Negative | Negative | Positive | Positive | Positive |
| 1 | Positive | Positive | Positive | Negative | Negative | Negative | Faint Negative | Faint Negative | Faint Negative |
| 0.1 | Negative | Negative | Negative | Negative | Negative | Negative | Negative | Negative | Negative |

Test Specificity

A comprehensive cross-reactivity panel of 77 compounds was evaluated, including common opioids (such as fentanyl, acetylfentanyl, heroin, methadone, oxycodone, sufentanil, and remifentanil), other α2-agonists and anesthetics (including xylazine, lidocaine, tetracaine,



procaine, cocaine, quinine, and diphenhydramine), as well as other drugs and adulterants frequently encountered in street samples (such as methamphetamine, MDMA, benzodiazepines, cannabinoids including Δ -8 THC and Δ -9 THC, caffeine, and acetaminophen). No cross-reactivity was observed with any of these analytes, and positive results occurred only with medetomidine standards (dexmedetomidine and racemic mixtures), confirming the high specificity of the BTNX test strips.

| Analyte | Concentration | Replicate 1 | Replicate 2 |
|---------------------------|---------------|-------------|-------------|
| Medetomidine (Dex + Levo) | 1 mg/mL | Positive | Positive |
| Medetomidine (Dex) | 1 mg/mL | Positive | Positive |
| Medetomidine (Levo) | 1 mg/mL | Negative | Negative |
| Water | N/A | Negative | Negative |
| 2C-B • HCl | 1 mg/mL | Negative | Negative |
| 4-ANPP | 0.5 mg/mL | Negative | Negative |
| 3,4-MDA | 1 mg/mL | Negative | Negative |
| 3,4-MDMA | 1 mg/mL | Negative | Negative |
| 6-Acetylmorphine | 1 mg/mL | Negative | Negative |
| Acetaminophen | 1 mg/mL | Negative | Negative |
| Acetyl Fentanyl • HCl | 1 mg/mL | Negative | Negative |
| Alprazolam | 1 mg/mL | Negative | Negative |
| Amphetamine | 1 mg/mL | Negative | Negative |
| Aniline • HCl | 1 mg/mL | Negative | Negative |
| Aspirin | 1 mg/mL | Negative | Negative |
| Benzocaine | 1 mg/mL | Negative | Negative |
| Benzoylcegonine | 1 mg/mL | Negative | Negative |
| Bromazolam | 1 mg/mL | Negative | Negative |
| BTMPS | 1 mg/mL | Negative | Negative |
| Buprenorphine • HCl | 1 mg/mL | Negative | Negative |
| Bupropion | 1 mg/mL | Negative | Negative |
| Caffeine | 1 mg/mL | Negative | Negative |
| Cocaine | 1 mg/mL | Negative | Negative |
| Codeine | 1 mg/mL | Negative | Negative |
| Deschloroketamine • HCl | 1 mg/mL | Negative | Negative |
| Dextromethorphan | 0.5 mg/mL | | |
| Diazepam | 1 mg/mL | Negative | Negative |
| Dimethylsulfone | 1 mg/mL | Negative | Negative |
| Diphenhydramine • HCl | 1 mg/mL | Negative | Negative |
| Ephedrine • HCl | 1 mg/mL | Negative | Negative |
| Etizolam | 1 mg/mL | Negative | Negative |
| Etomidate | 1 mg/mL | Negative | Negative |
| Eutylone | 1 mg/mL | Negative | Negative |



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|--|-----------|----------|----------|
| Fentanyl • C₆H₈O₇ | 1 mg/mL | Negative | Negative |
| Flubromazepam | 1 mg/mL | Negative | Negative |
| p-Fluorofentanyl | 0.5 mg/mL | Negative | Negative |
| Gabapentin | 1 mg/mL | Negative | Negative |
| Guaifenesin | 1 mg/mL | Negative | Negative |
| Heroin | 0.5 mg/mL | Negative | Negative |
| Hydroxyzine | 1 mg/mL | Negative | Negative |
| Ibuprofen | 1 mg/mL | Negative | Negative |
| Ketamine | 0.5 mg/mL | Negative | Negative |
| Lactose | 1 mg/mL | Negative | Negative |
| Levamisole | 1 mg/mL | Negative | Negative |
| Lidocaine | 1 mg/mL | Negative | Negative |
| Lisdexamfetamine • 2CH₄SO₃ | 1 mg/mL | Negative | Negative |
| LSD | 0.5 mg/mL | Negative | Negative |
| Mannitol | 1 mg/mL | Negative | Negative |
| Melatonin | 1 mg/mL | Negative | Negative |
| Methamphetamine | 1 mg/mL | Negative | Negative |
| Methadone | 1 mg/mL | Negative | Negative |
| o-Methylfentanyl • HCl | 0.1 mg/mL | Negative | Negative |
| Methylphenidate • HCl | 1 mg/mL | Negative | Negative |
| Metonitazene | 1 mg/mL | Negative | Negative |
| Naloxone • HCl | 1 mg/mL | Negative | Negative |
| Nicotine | 1 mg/mL | Negative | Negative |
| Noscapine | 1 mg/mL | Negative | Negative |
| N-Piperidiny Etonitazene | 0.5 mg/mL | Negative | Negative |
| Oxycodone | 0.5 mg/mL | Negative | Negative |
| Papaverine • HCl | 1 mg/mL | Negative | Negative |
| Phencyclidine • HCl | 1 mg/mL | Negative | Negative |
| Pentobarbital | 0.5 mg/mL | Negative | Negative |
| Phenacetin | 1 mg/mL | Negative | Negative |
| Phenethyl 4-ANPP | 0.5 mg/mL | Negative | Negative |
| Phentermine | 1 mg/mL | Negative | Negative |
| Phenylephrine | 1 mg/mL | Negative | Negative |
| Piracetam | 1 mg/mL | Negative | Negative |
| Procaine | 1 mg/mL | Negative | Negative |
| Protonitazene | 1 mg/mL | Negative | Negative |
| Quetiapine • ½C₄H₄O₄ | 1 mg/mL | Negative | Negative |
| Quinine | 1 mg/mL | Negative | Negative |
| Remifentanyl-HCl | 0.5 mg/mL | Negative | Negative |
| Sorbitol | 1 mg/mL | Negative | Negative |



| | | | |
|---|-----------|----------|----------|
| Sufentanil·C ₆ H ₈ O ₇ | 0.5 mg/mL | Negative | Negative |
| Theobromine | 1 mg/mL | Negative | Negative |
| Tramadol·HCl | 0.5 mg/mL | Negative | Negative |
| Xylazine | 1 mg/mL | Negative | Negative |
| Zolpidem | 0.5 mg/mL | Negative | Negative |
| Δ-8 THC | 0.5 mg/mL | Negative | Negative |
| Δ-9 THC | 0.5 mg/mL | Negative | Negative |

Results obtained using street drug samples (August 2024 – February 2025):

From August 2024 to February 2025, medetomidine was found in one hundred samples street samples. 25 of the samples were tested using BTNX Dexmedetomidine Test Strip, and the strip successfully detected dexmedetomidine in all of them, yielding an overall sensitivity of 100%.

| Sample # | Date Collected | Site # | Sample Type | Peak Area Ratio Dex/Levo (a.u.) | Test Strip Results* | Other Compounds in Sample |
|----------|----------------|--------|----------------|---------------------------------|---------------------|--|
| 11 | 08/2024 | 4 | Drug Product | 1.10 | Positive | Fentanyl; Tetracaine |
| 12 | 08/2024 | 4 | Drug Product | 1.04 | Positive | Fentanyl; Tetracaine |
| 17 | 08/2024 | 2 | Baggie Residue | 0.93 | Positive | Acetyl Fentanyl; Caffeine; Fentanyl; Tetracaine |
| 41 | 11/2024 | 3 | Unknown | 0.66 | Positive | BTMPS; Lidocaine |
| 42 | 11/2024 | 3 | Unknown | 0.96 | Positive | Caffeine; Fentanyl; Tetracaine |
| 44 | 11/2024 | 1 | Unknown | 0.98 | Positive | 4-ANPP; Fentanyl; Xylazine |
| 45 | 11/2024 | 1 | Unknown | 0.92 | Positive | BTMPS; Fentanyl; Lidocaine; Tetracaine |
| 49 | 12/2024 | 3 | Unknown | 0.94 | Positive | 4-ANPP; Acetaminophen; Fentanyl; Lidocaine; Tetracaine; Xylazine |
| 51 | 01/2025 | 3 | Unknown | 0.94 | Positive | 4-ANPP; Fentanyl; Lidocaine; Tetracaine |
| 56 | 01/2025 | 2 | Syringe | 0.80 | Positive | 4-ANPP; Fentanyl; |

| | | | | | | |
|----|---------|---|----------------|------|----------|--|
| | | | Residue | | | Lidocaine, Procaine |
| 57 | 08/2024 | 4 | Drug Product | 1.05 | Positive | BTMPS; Caffeine; Fentanyl; Lidocaine; Tetracaine |
| 58 | 08/2024 | 4 | Drug Product | 1.06 | Positive | Fentanyl; Procaine; Tetracaine; Xylazine |
| 59 | 08/2024 | 4 | Drug Product | 1.09 | Positive | Fentanyl; Lidocaine; Tetracaine |
| 60 | 09/2024 | 4 | Drug Product | 1.04 | Positive | Acetaminophen; Fentanyl; Fluorofentanyl |
| 61 | 09/2024 | 4 | Drug Product | 0.98 | Positive | Fentanyl; Lidocaine |
| 62 | 09/2024 | 4 | Drug Product | 1.03 | Positive | Fentanyl; Xylazine |
| 63 | 09/2024 | 4 | Drug Product | 1.06 | Positive | 4-ANPP; Fentanyl; Xylazine |
| 64 | 11/2024 | 4 | Drug Product | 1.03 | Positive | 4-ANPP; Fentanyl; Lidocaine |
| 65 | 01/2025 | 4 | Drug Product | 0.99 | Positive | BTMPS; Caffeine; Fentanyl; Lidocaine; Procaine; Tetracaine; Xylazine |
| 66 | 01/2025 | 4 | Drug Product | 0.98 | Positive | Caffeine; Lidocaine; Procaine; Tetracaine; Xylazine |
| 70 | 12/2024 | 2 | Baggie Residue | 1.04 | Positive | Fentanyl; Tetracaine |
| 84 | 11/2024 | 2 | Baggie Residue | 0.79 | Positive | 4-ANPP; Acetaminophen; Fentanyl; Lidocaine; Tetracaine; Xylazine |
| 86 | 11/2024 | 2 | Baggie Residue | 1.01 | Positive | Fentanyl; Tetracaine |
| 88 | 12/2024 | 2 | Unknown | 0.94 | Positive | Etomidate; Fentanyl; |



| | | | | | | |
|----|---------|---|-------------------|------|----------|-------------------------------|
| | | | | | | Lidocaine; Tetracaine |
| 93 | 01/2025 | 2 | Baggie Residue | 0.96 | Positive | 4-ANPP; Fentanyl; Xylazine |

References

1. Sisco, E., Ventura, M., & Shuda, S. A. (2025). *Isomeric determination of medetomidine in street drug samples (August 2024 – February 2025) and implications for immunoassay test strip analysis*. National Institute of Standards and Technology. <https://doi.org/10.26434/chemrxiv-2025-f4s1s>