Analysis of 7-Hydroxymitragynine and Mitragynine in Urine Workplace Drug Testing Specimens at CRL

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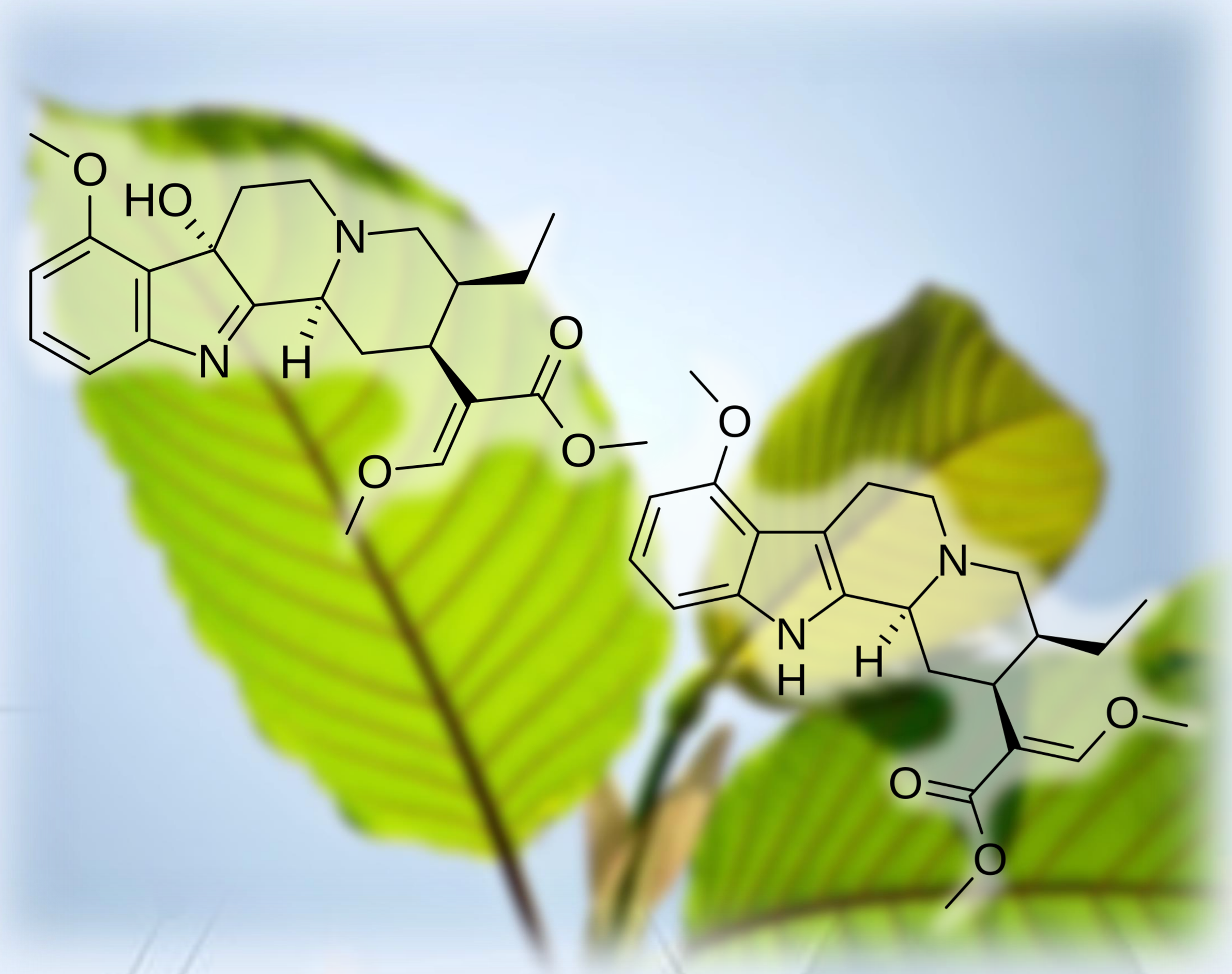
INTRODUCTION

Mitragyna speciosa, or kratom, is a plant native to Southeast Asia that has been used for centuries for its dose-dependent effects, counteracting fatigue and improving work productivity as a psychostimulant, and relieving pain and substituting for opium as a sedative analgesic. Kratom became widely available in the United States in the early 2000s, reached mainstream status around 2015, and was noted as a public health concern by the US Drug Enforcement Administration in 2016. The two main psychoactive components in kratom are mitragynine and 7-hydroxymitragynine (7-OH), both of which affect μ-, δ-, and κ-opioid receptors. Due to increased affinity at the μ-opioid receptor, 7-OH is estimated more than 20-times stronger than mitragynine, and at least 13-times more potent than morphine. In certain kratom strains, mitragynine can comprise up to 66% of total alkaloids; 7-OH makes up less than 2% of naturally occurring plant alkaloids, but is also a product of mitragynine metabolism. Semi-synthetic concentrates of 7-OH became commercially available in the United States in 2023 and subsequently surged in popularity due to potency and accessibility.

Figure A: Mitragynine (left) and 7-Hydroxymitragynine (right) Structures



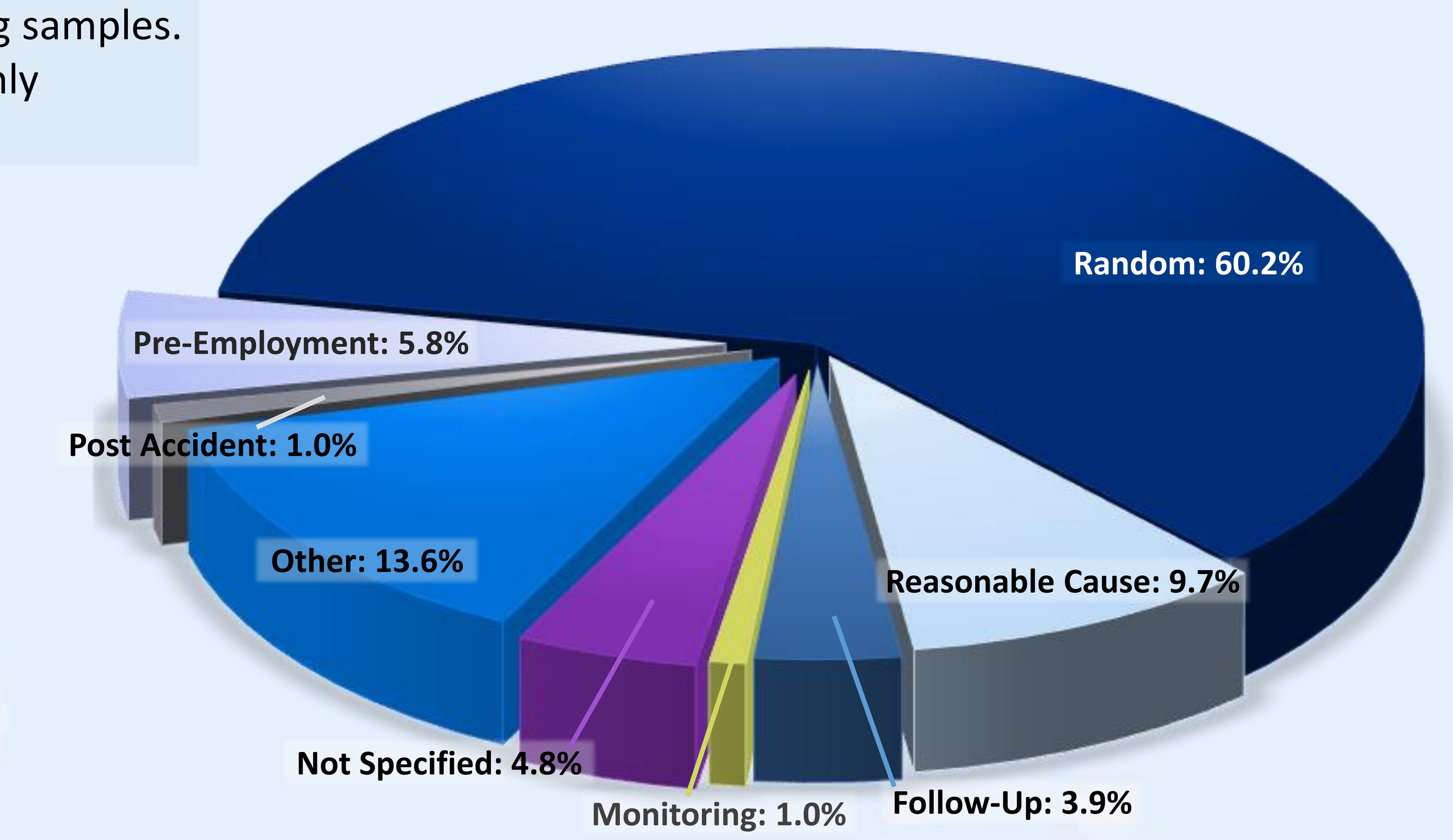
OBJECTIVE

Determine the prevalence of 7-OH and mitragynine in non-regulated workplace drug testing samples, and show the effect of 7-OH on confirmation rates and positive-reporting samples. Evaluate analyte confirmations categorized by reason for test, and measure monthly positivity rates over the study period from November 2025 to June 2026.

METHODS

In August 2025, 1012 random urine specimens were de-identified and analyzed for 7-OH and mitragynine. This initial study yielded 10 positives for both 7-OH and mitragynine, and one positive for only 7-OH. Given the 0.99% positivity rate for mitragynine and the 1.09% positivity rate for 7-OH, 7-OH was added to the existing mitragynine analytical panel and made available for client request in November 2025. For each analyte, cutoff concentrations for both the screen and confirmation assays were client dependent, either 5.0 ng/mL or 10.0 ng/mL. For the following study, reported results and accompanying demographic information were reviewed for urine drug testing samples analyzed for mitragynine and 7-OH at CRL from November 2025 through June 2026.

Figure D: Reported Positives Categorized by Reason for Test



At 60.2%, Random drug screens accounted for the most reported positives of all reasons for testing. The reason for test 'Other' contributed 13.6% of positives, and tests for 'Reasonable cause' added 9.7% of positive results. Pre-employment drug screens made up 5.8% of confirmed positive tests, and 3.9% of positives were considered 'Follow-up' tests; 4.8% of positives were labeled as 'Not Specified,' and the remaining 2% of reported positives were from 'Monitoring' and post-accident testing. See Figure D (above) for categorization of all positive samples by test reason. See Figure E (below) for proportion of analyte positives for each reason for test.

RESULTS

Evaluation of data from November 2025 through June 2026 revealed a positivity rate of 1.3%, and the overall confirmation rate for the 7-OH/mitragynine panel was 96.3%. Of reported positives, 69.9% confirmed for both analytes, 20.4% were positive for only 7-OH, and 9.7% were solely mitragynine positives. See Figure B.

Figure C: Positive 7-OH Sample Concentrations compared to Mitragynine Concentrations

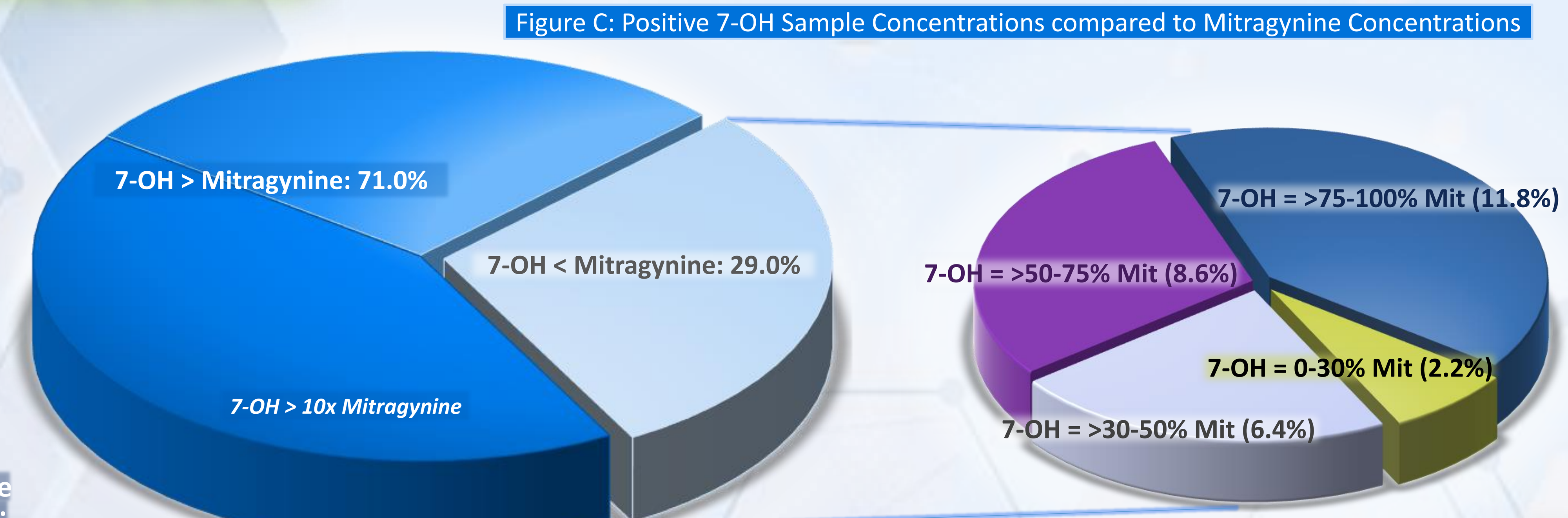
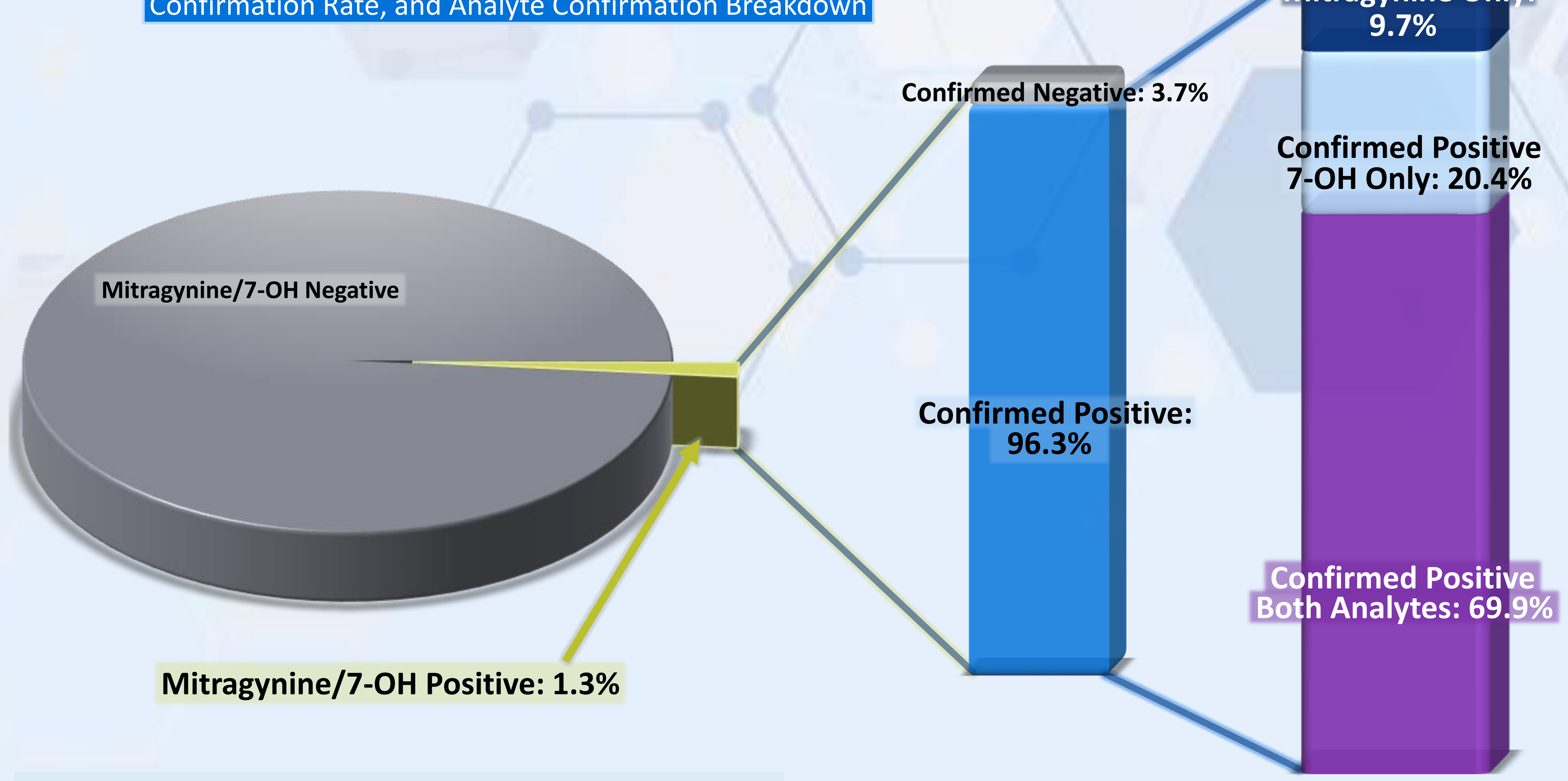
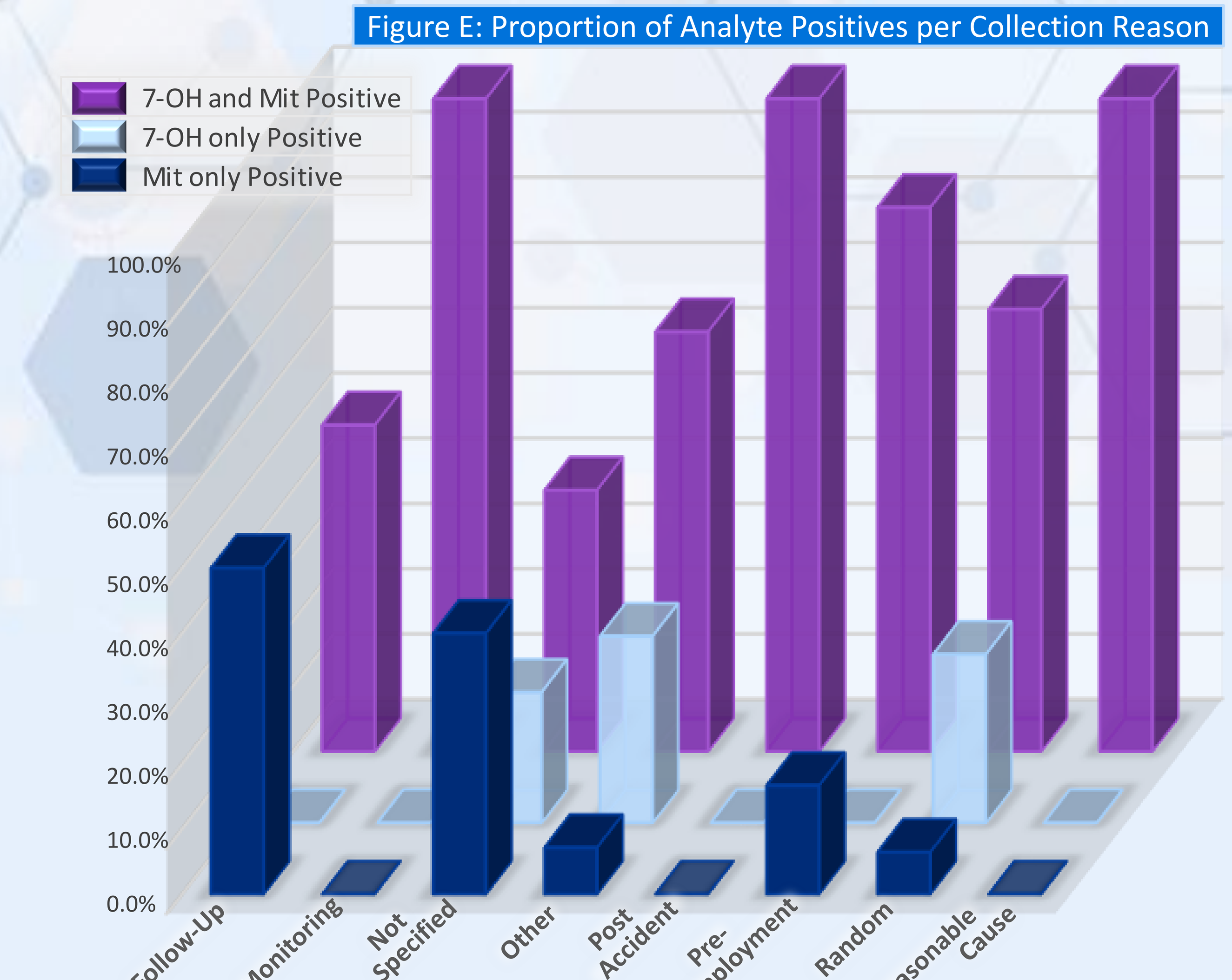


Figure B: Mitragynine and 7-Hydroxymitragynine Positivity Rate, Confirmation Rate, and Analyte Confirmation Breakdown



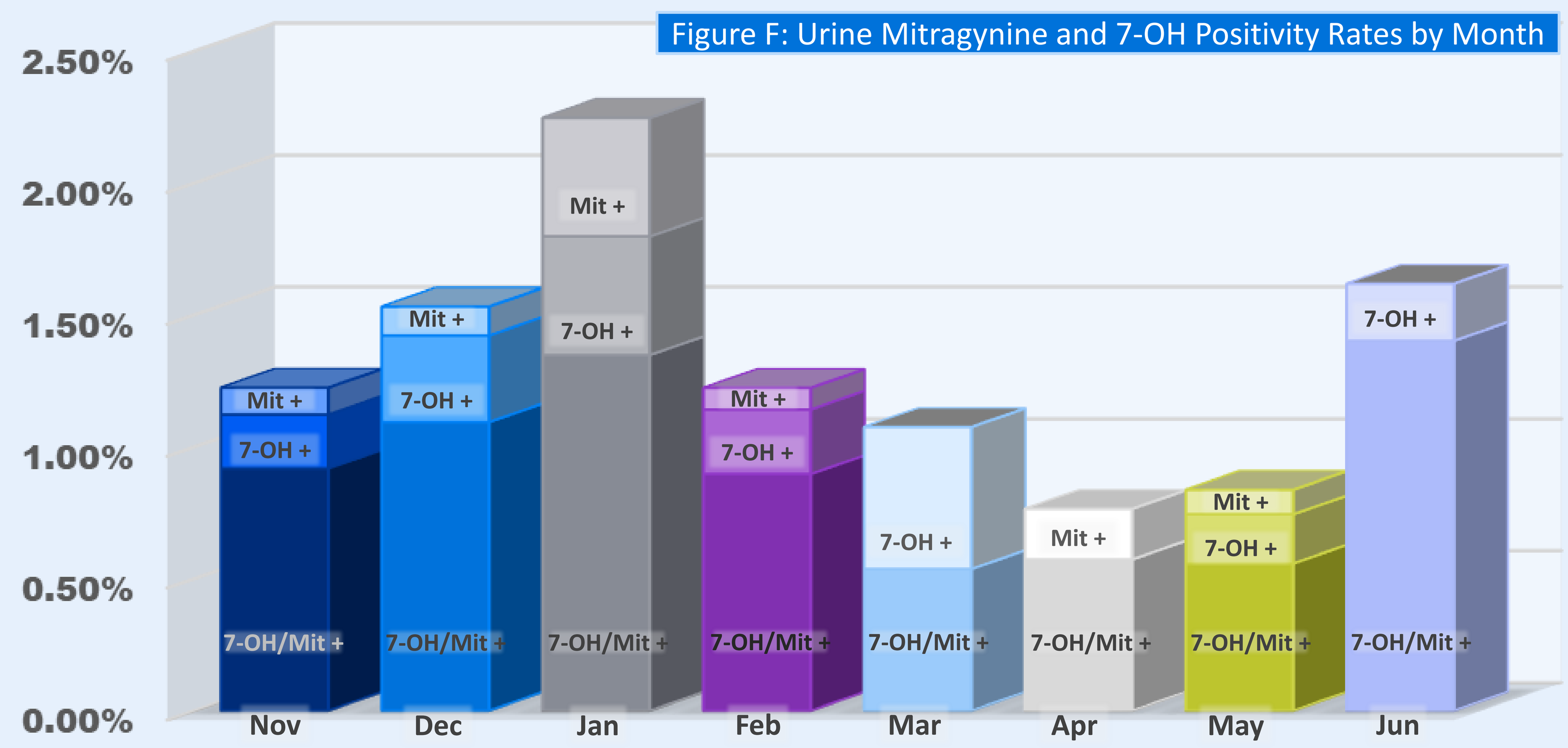
Limited study research available suggests that as a result of controlled dosing with the kratom plant, concentrations of 7-OH in urine are typically 24-27% of corresponding mitragynine concentrations, with reasonably parallel urinary renal clearance kinetics. Notably, only 29.0% of confirmed 7-OH positives had concentrations less than corresponding mitragynine concentrations; a mere 2.2% of 7-OH positives had concentrations 30% or less than corresponding concentrations of mitragynine. In fact, of the 71.0% of 7-OH positives with levels greater than corresponding mitragynine values, 60.6% had 7-OH concentrations more than 10-times higher than mitragynine concentrations. Taking established dosage study research into consideration, it could be a rational assumption that higher 7-OH-to-mitragynine urinary levels would indicate the use of a concentrated 7-OH or mixed mitragyna-alkaloid product; however, the significant majority of 7-OH-to-mitragynine concentrations only truly indicates that more pharmacokinetic studies are warranted. Refer to Figure C (above) for expansion of 7-OH-to-mitragynine concentration comparisons for the reported 7-OH positives in this study.

Figure E: Proportion of Analyte Positives per Collection Reason



Overall positivity rates for each month are shown on Figure F. January 2026 exhibited the highest positivity rate with 2.25%; while the number of tests performed that month (890) was marginally fewer than other months (998 average), the number of reported positives in January exceeded the number of reported positives for all other months. The lowest positivity rate was seen in April 2026, with 0.76%; despite more testing performed (1046) than average, there were fewer reported positives than all other months in the study. April was also the only month with a greater number of mitragynine than 7-OH single-analyte positives. Both January and June had greater numbers of reported positives for both analytes compared to single-analyte positives.

Figure F: Urine Mitragynine and 7-OH Positivity Rates by Month



DISCUSSION

With a more than 1% positivity rate for randomly-selected, previously unscreened specimens, and an even greater rate of confirmation among client requested sample testing, the presence of 7-OH and mitragynine in urine workplace drug testing samples alludes to a serious public safety threat that is not being addressed. In 2026, the legality of kratom and its derivatives continues to evolve, with temporary Schedule 1 status pending for 7-OH and other synthetic mitragynine/7-OH analogs, and controlled substance classification for both mitragynine and 7-OH in nine states. Regardless of legal standing, more employer drug testing programs should consider the inclusion of 7-OH and mitragynine due to substantial intoxication effects, addiction potential, and community and personal welfare.

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DISCLOSURE

No relevant financial or nonfinancial relationships to disclose.

CRL.