

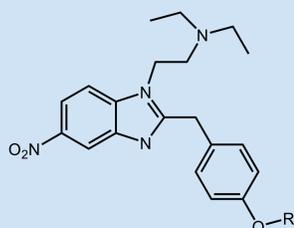
A national wastewater monitoring campaign for nitazene analogues and veterinary sedatives in wastewater: Temporal results from Australia

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Background

- Nitazenes are highly potent opioids not approved for therapeutic use (Fig 1).
 - Metabolites often retain opioid receptor activity.
 - Nitazenes have infiltrated illicit fentanyl markets associated with fatalities.¹
- Xylazine is a veterinary sedative but has increasingly been found mixed with fentanyl.
 - Xylazine causes necrosis and off-site skin lesions.
 - Naloxone does not reverse the effects of xylazine overdose.
- The extreme potency and sporadic use of nitazenes, often unwittingly, make these compounds challenging to detect.
- Most patients receiving emergency care between 2020-4 in Australia were unaware and had no intention of using nitazenes.¹
 - Self reporting of nitazene use is problematic.
 - Users of stimulants and heroin are at risk of overdose due to adulterations of their drug of choice with nitazenes.
- Wastewater analysis is widely applied to measure such compounds of concern.



R= methyl, ethyl, isopropyl, pyrrolidino, piperidinyl, etc.

Figure 1: Nitazene general structure.

Aims

- ☐ To use wastewater to assess the presence of xylazine and nitazenes across Australia
- ☐ To determine changes in nitazene and xylazine use over a 1-year period.

Methods

- Wastewater was collected from 20 capital city and 35 regional catchments across Australia.
- A mid-week and 2 weekend samples were collected from each site, where possible.
- Capital cities were sampled every alternate month over a year and regional centres every quarter.
- Analytes were isolated from wastewater using solid phase extraction (Fig 2).
- The targeted LC-tandem mass spectrometry method included 12 nitazenes, xylazine and its metabolite².
- Site populations were calculated using catchment maps and census units to normalise data.

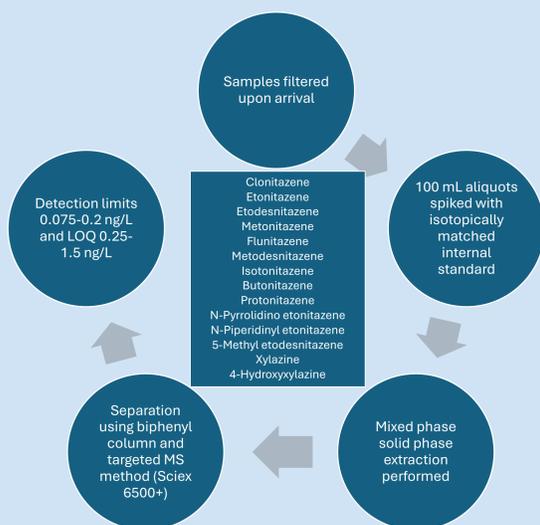


Figure 2: Sample treatment procedure.

Results

- Nitazenes were detectable but not quantifiable in most instances, while xylazine was mostly quantifiable (Fig 3).
- The results were expressed as the detection frequency of nitazenes and xylazine for each collection period total and capital city, regional sample-subsets (Fig 4).
- No appreciable differences in nitazene detection frequencies were observed between capital city and regional areas (Fig 4 A)
- Xylazine was generally detected more frequently in regional jurisdictions compared to the capital cities (Fig 4 B).
- The daily population normalised mass loads of xylazine were highly variable across sites, but, declined over the course of the study (Fig 5).

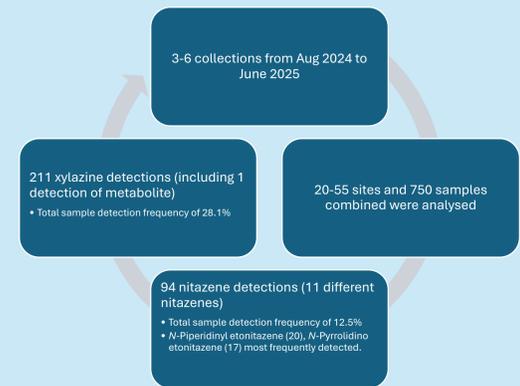


Figure 3: Sampling campaign and results

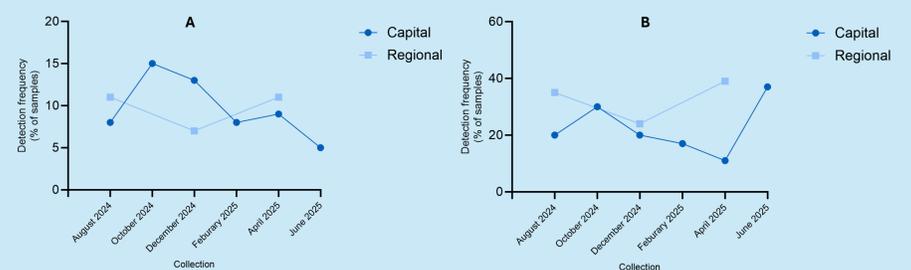


Figure 4: Detection frequency of (A) total nitazene and (B) xylazine as percentage of samples collected

percentage of samples collected

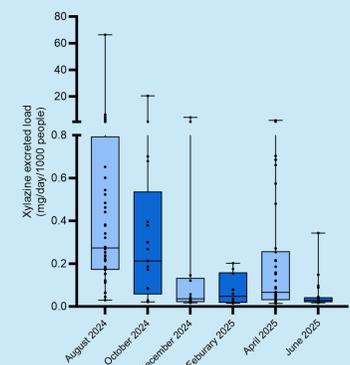


Figure 5: Normalised daily mass load of xylazine

Discussion

- Despite the high potency of nitazenes, several analogues were found across different jurisdictions.
- The types of nitazenes found in wastewater are similar to those reported in discarded drug paraphernalia³ or drug checking services and community alerts (The Know).
- N-Piperidinyl etonitazene and N-pyrrolidino etonitazene were most frequently detected, potentially due to their lower reported potencies.
- Site-specific differences exist.
- Xylazine use declined over the course of the study.
- As the method mainly included parent drug, drug consumption cannot be distinguished from cases of disposal.
- The method cannot determine polydrug or intentional use.

Conclusion

- Wastewater analysis is a sufficiently sensitive tool to measure nitazene use on a population scale.
- Xylazine use is widespread across Australia and higher in regional parts of the country.
- New nitazene analogues are constantly emerging and need to be added to the method.
- Wastewater monitoring is complementary to other indicators of emergence and spread of harmful substances in the community.

Acknowledgments

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References

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