



Toxic Adulterant Alert

Substance use disorder treatment providers, clinicians, outreach workers, and public health agencies should be aware of the following information. Lidocaine, like the other local anesthetics (LA) discussed in this report, is a synthetic compound useful in medical procedures as an anesthetic, usually available as an over-the-counter (OTC) topical cream, transdermal patch, or injectable solution administered in a medical procedure. The numbing sensation is caused by the blockade of neuronal sodium channels, thus reducing the transmission of pain signals. Because local anesthetics produce a numbing sensation, they may be added in minor amounts to reduce the discomfort involved with injecting or snorting drugs. While lidocaine is the LA most frequently combined with illicit drugs, other LA compounds that could be added to drug samples include benzocaine, procaine, tetracaine, mepivacaine, and bupivacaine.

Cocaine is a naturally-occurring alkaloid that is extracted and purified from the leaf of the coca plant. Unlike lidocaine, cocaine is a stimulant, which is used for its euphoric properties. The data reviewed for this report, from both toxicological samples as well as from seized drug samples, shows that lidocaine was the most frequently observed LA adulterant. Furthermore, lidocaine was coexistent most often with cocaine samples. It is speculated that lidocaine is added to cocaine (and other drugs) either to simply add mass, to enhance the euphoric effect, or to relieve the physical pain associated with injections. In a moderate dose lidocaine may enhance the stimulant effects of cocaine, as it has been observed to produce synergistic effects in rats when combined with cocaine², however is not clear if the effect would similarly translate to humans or if other LAs would have similar properties. Nevertheless, the combination of cocaine and LAs is dangerous due to the increased toxicity³, which can lead to seizures, bradycardia, hypotension, myocardial depression, and cardiac arrhythmias⁴.

Table 1: Positivity in CFSRE's Seized Drug Testing and Sample Count, Total and by US State (2016 - 2021; n = 2151)

Compound	Total (Positivity)	State									
		CA	DC	FL	IL	KY	NH	OH	PA	TX	VT
Benzocaine	104 (4.8%)	1.7%	2.2%	10.0%	2.2%	9.6%	5.0%	5.3%	0.0%	0.0%	9.6%
Lidocaine	660 (30.7%)	45.5%	53.3%	58.5%	15.5%	20.0%	45.0%	32.4%	34.0%	4.0%	36.4%
Procaine	156 (7.3%)	1.7%	13.0%	8.0%	1.5%	6.0%	9.0%	6.2%	10.4%	2.2%	22.0%
Total Samples	2151	176	92	200	406	250	200	225	106	274	250

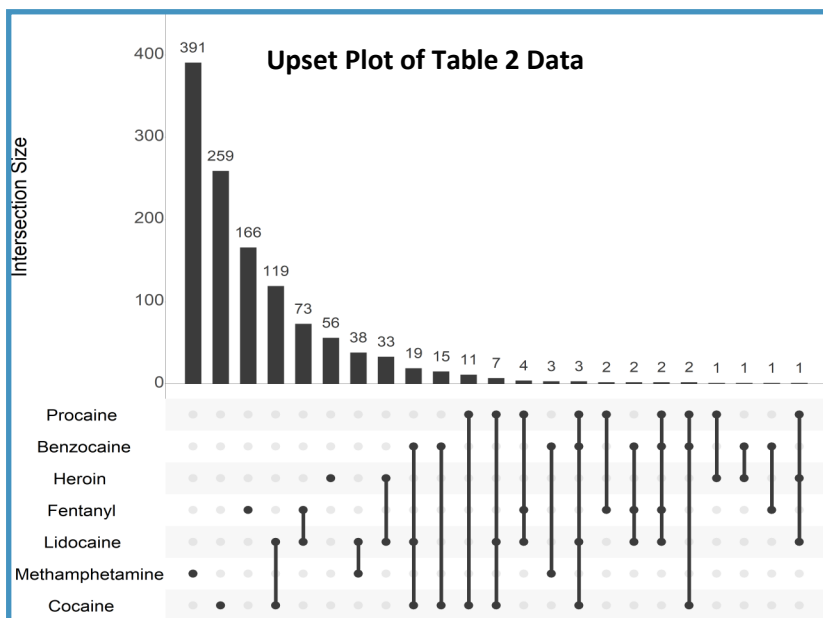
Procaine is identified less frequently in forensic samples than lidocaine; this is the case for both toxicology samples and drug materials. Procaine's lower prevalence in the illicit drug market may be due the greater use of lidocaine than procaine in clinical practice, though that is not to suggest that the source of lidocaine in illicit drug is necessarily from diverted medical products. Procaine has a shorter duration of action compared to lidocaine. It may be that the longer duration of action for lidocaine leads to its favor as an adulterant, though that was not examined as part of this report.

Benzocaine, is most commonly available in the medical market as a topical product. Benzocaine is occasionally observed as an adulterant in combination with illicit drugs, albeit to a lesser extent in than lidocaine. In large doses benzocaine can cause methemoglobinemia⁵, which reduces the delivery of oxygen to vital organs by changing the function of hemoglobin.

Among samples tested by CFSRE, other LAs such as tetracaine, mepivacaine, prilocaine, and bupivacaine are rarely (or never) encountered in combination with illicit drugs.

Table 2: Occurrences of drugs in combination with LA compounds in CFSRE's Seized Drug Testing in the US (2016 - 2021; n = 2151)

Combination	Observations
Cocaine without LA	259
Cocaine, Lidocaine	119
Cocaine, Benzocaine, Lidocaine	19
Cocaine, Benzocaine	15
Cocaine, Procaine	11
Cocaine, Lidocaine, Procaine	7
Cocaine, Benzocaine, Lidocaine, Procaine	3
Cocaine, Benzocaine, Procaine	2
Fentanyl without LA	166
Fentanyl, Lidocaine	73
Fentanyl, Lidocaine, Procaine	4
Fentanyl, Benzocaine, Lidocaine	2
Fentanyl, Benzocaine, Lidocaine, Procaine	2
Fentanyl, Procaine	2
Fentanyl, Benzocaine	1
Heroin without LA	56
Heroin, Lidocaine	33
Heroin, Benzocaine	1
Heroin, Lidocaine, Procaine	1
Heroin, Procaine	1
Methamphetamine without LA	391
Methamphetamine, Lidocaine	38
Methamphetamine, Benzocaine	3





Local Anesthetics in International Casework

Benzocaine positivity in cocaine among countries contributing to the International Toxic Adulterants Database



Table 3: Benzocaine positivity in cocaine among countries contributing to the International Toxic Adulterants Database

Country	Positive	Seizures	Positivity
Argentina	13	4060	0.32%
Brazil	2	216	0.93%
Chile	1	6575	0.02%
El Salvador	6	34	17.65%
Nigeria	1	70	1.43%
Paraguay	20	1946	1.03%
Uruguay	6	7209	0.08%

Lidocaine positivity in cocaine among countries contributing to the International Toxic Adulterants Database

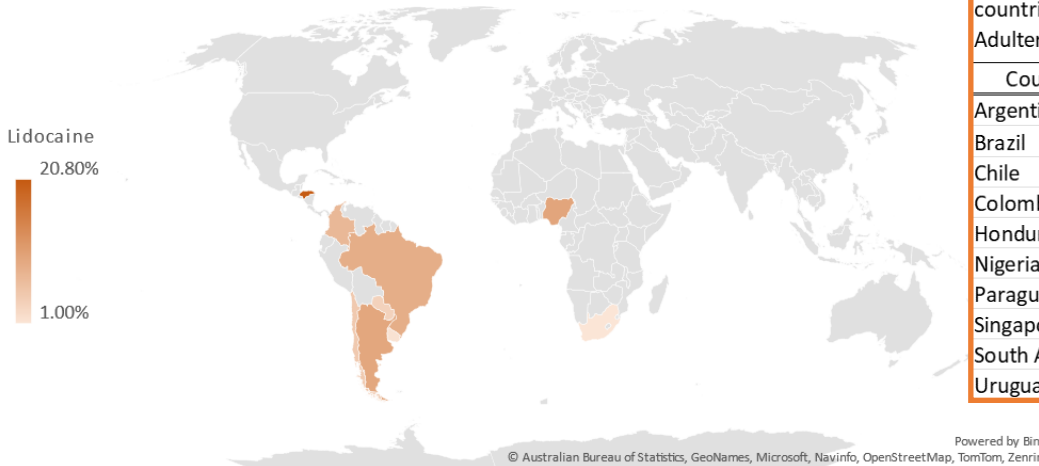


Table 4: Lidocaine positivity in cocaine among countries contributing to the International Toxic Adulterants Database

Country	Positive	Seizures	Positivity
Argentina	396	4060	9.75%
Brazil	19	216	8.80%
Chile	322	6575	4.90%
Colombia	472	6484	7.28%
Honduras	47	226	20.80%
Nigeria	7	70	10.00%
Paraguay	70	1946	3.60%
Singapore	3	20	15.00%
South Africa	2	200	1.00%
Uruguay	99	7209	1.37%

Procaine positivity in cocaine among countries contributing to the International Toxic Adulterants Database



Table 5: Procaine positivity in cocaine among countries contributing to the International Toxic Adulterants Database

Country	Positive	Seizures	Positivity
Argentina	1	4060	0.02%
Chile	13	6575	0.20%
Colombia	4	6484	0.06%
Honduras	14	226	6.19%
Singapore	1	20	5.00%
South Africa	1	200	0.50%

*Due to the image scaling, Singapore is not visible on the figures included on this page.



Recommendations for Clinicians

- Adulteration of street drugs contributes to the uncontrolled intake of significant amounts of LAs.
- The use of drugs mixed with LA compounds can lead to toxicity.
- Because cocaine is the drug most frequently adulterated with LA compounds, patients using large amounts of cocaine have the highest potential for being over-exposed to LAs from illicit drug sources.
- Pay attention for signs and symptoms of cardiotoxicity or methemoglobinemia from LA in users of cocaine and to a lesser extent, users of heroin/fentanyl.

Indicators of Cardiotoxicity

- Bradycardia or tachycardia
- Abnormal heart rhythms
- Low blood pressure
- Altered mental status (depressed level of consciousness)

Indicators of

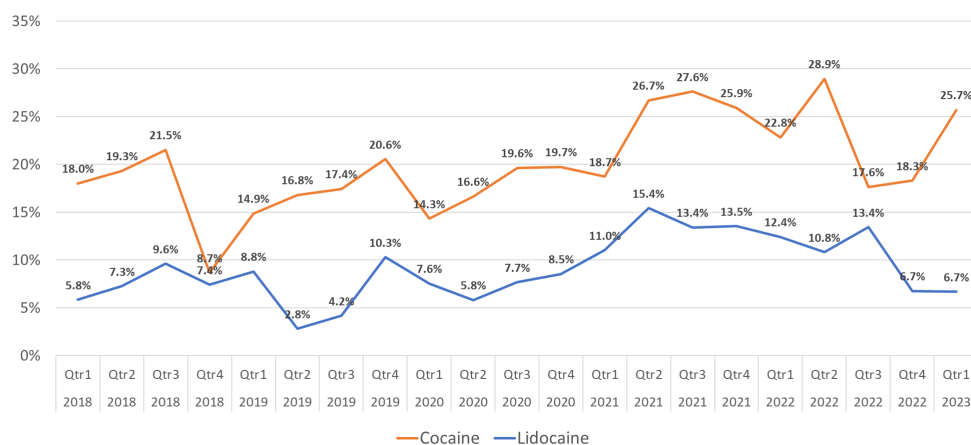
Methemoglobinemia

- Cyanosis (blue skin color)
- Low blood oxygen
- Distressed breathing
- Headache
- Dizziness
- Delirium
- Seizures

Recommendations for forensic practitioners

- Assess laboratory scope and capabilities for analyzing lidocaine, procaine and benzocaine in post-mortem, forensic, and clinical toxicological cases.
- Consider reporting on the frequency and co-occurrence with drugs with stakeholders in the jurisdiction.
- In post-mortem investigations, look for elevated levels of lidocaine in conjunction with positive cocaine or fentanyl.

Positivity Rates Among NPS Discovery Monitored Toxicology Samples (n = 12,166)



References and Related Articles:

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5. Rodriguez, L. F., Smolik, L. M., & Zbehlik, A. J. (2016). Benzocaine-Induced Methemoglobinemia: Report of a Severe Reaction and Review of the Literature. *Annals of Pharmacotherapy*, 28(5), 643–649. <https://doi.org/10.1177/106002809402800515>

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The opinions, findings, recommendations, and conclusions expressed in this publication are those of the authors and do not necessarily reflect those of the U.S. Department of State or the U.S. Department of Justice. More information on lidocaine or other local anesthetics as adulterants is available by contacting mandi.mohr@cfsre.org.