FATAL DRUG OVERDOSES INVOLVING CARFENTANIL: A SERIES OF 434 CASES AT THE PALM BEACH COUNTY MEDICAL EXAMINER OFFICE, 2016-2018

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Accidental Drug Fatalities in Palm Beach County, Florida, 2005-2017

Heroin Deaths in the U.S. Are Skyrocketing

Number of drug poisoning deaths involving heroin in the U.S. (2001-2017)
This isn’t your grandfather’s heroin...

- Soluble “cutting agents”
- Snorting is common
- Drug combinations
  - Heroin
  - Fentanyl
  - Fentanyl analogs
  - Cocaine
  - Alprazolam

Could it get any worse? Yes, it did.

Ohio coroner links elephant tranquilizer to series of overdose deaths

Tuesday, September 12, 2017

By Steve Hembender

(Enquirer) - At least eight people in the Cincinnati area who died of heroin drug overdoses since mid-July had traces of a drug used to tranquilize elephants in their bodies, a coroner said Tuesday.

At least five other overdose deaths since mid-July are suspected to be connected to heroin laced with carfentanil, Hamilton County Coroner Lakshmi Sammarco told a news conference.

Shanks KG, Behonick GS. Detection of carfentanil by LC-MS-MS and reports of associated fatalities in the USA. J Analytical Tox, 2017;41:466-472.


Carfentanil

- Mu (µ) opioid receptor agonist
- Used to immobilize large wildlife
- Used by Russian Special Forces during the Moscow Theater Hostage siege
- Converted to norcarfentanil in liver and excreted in urine
- Blood concentration measured in pg/ml making detection a challenge
- Will not be detected with standard toxicology procedures
- Intoxication treated with naloxone

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Relative strength of opioid drugs

<table>
<thead>
<tr>
<th>Fentanyl Analog</th>
<th>Compared to Morphine</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fentanyl</td>
<td>100x</td>
</tr>
<tr>
<td>Acetyl-Fentanyl</td>
<td>10x</td>
</tr>
<tr>
<td>Salicyl-Fentanyl</td>
<td>&lt; 20x</td>
</tr>
<tr>
<td>Propoxyphene</td>
<td>25x</td>
</tr>
<tr>
<td>Butyl-Fentanyl</td>
<td>20 to 25x</td>
</tr>
<tr>
<td>Acetylsalicyl</td>
<td>100x</td>
</tr>
<tr>
<td>3-Methyl-Fentanyl</td>
<td>400x, tren and 6000x saline inactive</td>
</tr>
<tr>
<td>Carfentanil</td>
<td>10,000 to 100,000x</td>
</tr>
</tbody>
</table>

Schueler, H. Emerging synthetic fentanyl analogs. Acad Forensic Path 2017, 7:36-40

Carfentanil: Challenge in the Lab

Carfentanil is extremely hard to detect in blood. It is measured in pg/ml. Other opioids are commonly measured in mg/L (heroin) or ng/ml (fentanyl).

Carfentanil Deaths in Palm Beach County
51-year-old man outside business parking lot

45-year-old heroin and cocaine user found at home

30-year-old woman with history of heroin use
23 year old man found in his car at gas station

Body cavity fluid negative for drugs (including carfentanil), ethanol = 0.066 g/dL.

Methods

- Retrospective review of all accidental drug fatalities where carfentanil was detected
- July 2016 – April 2018
- Majority of cases had complete autopsies
- Screening, detection and quantitation by LC/MS/MS
- Scene investigation and drug residue testing done in selected cases
- All cases reviewed during weekly peer review meetings

Gender

<table>
<thead>
<tr>
<th>Carfentanil Deaths</th>
<th>Non-carfentanil Deaths</th>
</tr>
</thead>
<tbody>
<tr>
<td>86%</td>
<td>14%</td>
</tr>
<tr>
<td>Men</td>
<td>Women</td>
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</table>

<table>
<thead>
<tr>
<th>Carfentanil Deaths</th>
<th>Non-carfentanil Deaths</th>
</tr>
</thead>
<tbody>
<tr>
<td>99%</td>
<td>1%</td>
</tr>
<tr>
<td>Men</td>
<td>Women</td>
</tr>
</tbody>
</table>
Race

- Carfentanil Deaths: 92% White, 6% Black, 2% Other
- Non-carfentanil Deaths: 92% White, 7% Black, 1% Other

Carfentanil Deaths:
- Mean age 36 years
- Median age 33 years
- Range 18-77 years

Non-carfentanil deaths:
- Mean age 39 years
- Median age 36 years
- Range 17-81 years

Age Distribution

- Carfentanil Deaths and Non-carfentanil Deaths age distribution chart
Autopsy Findings: Carfentanil deaths

- Fresh needle punctures (37%)
- Needle “tracks” (19%)
- Foam in airway (28%)
- Pulmonary edema (89%)
  - Right lung: mean weight 736 gms
  - Left lung: mean weight 664 gms
- Dilated bladder (19%)
Summary

- Carfentanil is a synthetic opioid, at least 10,000x more powerful than morphine/heroin.
- Introduced into the “heroin” supply in Palm Beach County resulting in hundreds of deaths between 2016 and 2018.
- Deadly in small concentrations (pg/ml) and difficult to detect in postmortem blood.
- Similar epidemiology to other opioid fatalities.
- Potentially lethal co-intoxicants common while “pure” carfentanil overdose fatalities seen in minority of cases.