

# **FENTANYL AND FENTANYL ANALOGUES (1): ADULTERATED HEROIN SAMPLES FROM CRYPTOMARKETS**

**A DOCUMENT BY:**

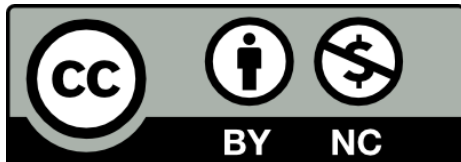
**DOCTOR X AND HIS CHEMICAL BROTHERS & SISTERS**

**TECHNICAL REPORTS 001.- APRIL 2018**

*This report is dedicated to Ms. Nuria Calzada, High Priestess of Energy Control and our heroin(e)*

This work is licensed under a Creative Commons Attribution-NonCommercial 4.0 International CC BY-NC 4.0. This publication may be reproduced in whole or in part and in any form for educational, research or non-profit purposes without special permission, provided citation of the source is made. No use of this publication may be made for resale or any other commercial purpose whatsoever without prior permission in writing from Energy Control International

Energy Control International would appreciate receiving a copy of any publication that uses this report as a source.



**DoctorX** is Fernando Caudevilla.(Family Physician. Drug Expert MSc)

Chemical Brothers & Sisters are (in alphabetical order):

**Admiral Tryptamine** is Xoán Carbón (Chemist AD)

**Daddy Poppy** is Iván Fornís(Biologist MSc)

**Lady K.** is Cristina Gil (Pharmacist MSc)

**Madame DMA** is Mireia Ventura (Pharmacist MSc, PhD)

**Miss Nexus** is Ana Muñoz (Public Health MSc)

**Super Paper** is Claudio Vidal (Psychologist. MSc)

Suggested citation:

DoctorX and his Chemical Brothers & Sisters. Fentanyl and fentanyl analogues (1): Adulterated heroin samples from cryptomarkets. Technical Reports 001. Energy Control International (ABD). Spain. April 2018. URL available in:

Contact: doctorx@energycontrol.org

Energy Control International is a Project from ABD (Asociación Bienestar y Desarrollo), a Spanish Non-Governmental Organization. Most of our programmes (both National and International) are able to operate thanks to the altruistic and generous work of our volunteers. You can consider supporting our work with a donation in:

<https://energycontrol-international.org/donations/>

1.- KEY POINTS	3
2.-ENERGY CONTROL INTERNATIONAL / INTERNATIONAL DRUG CHECKING SERVICE (IDCS)	4
3.- RECENT TRENDS IN ADULTERATED HEROIN:	6
3.1.- FENTANYL AND FENTANYL ANALOGUES	7
3.2.- AVAILABLE DATA ABOUT HEROIN ADULTERATED WITH FENTANYL AND FENTANYL ANALOGUES	9
3.3.- THE ROLE OF CRYPTOMARKETS:	10
4.-GLOBAL TEST RESULTS FROM EC-IDCS	12
4.1.- HEROIN SAMPLES (GLOBAL DATA)	13
4.2.- HEROIN SAMPLES FROM CRYPTOMARKETS	14
5.- HEROIN ADULTERATED WITH FENTANYL ANALOGUES AND PERFORMED ACTIONS	18
5.1.- SAMPLES CONTAINING OCFENTANIL (2015-2018):	21
5.2.- SAMPLE CONTAINING CYCLOPROPYLFENTANYL (2018)	23
6.- CONCLUSIONS	24
7.- REFERENCES	27

## 1.- KEY POINTS

---

- ✓ This is the first of a series of periodic reports that will analyse and discuss the results of our Energy Control-International Drug Checking Service (EC-IDCS). **This report is focused on the problem of heroin adulterated with fentanyl and fentanyl analogues.**
- ✓ Fentanyl and fentanyl analogues are **opioids with high potency**. Non-medical use of clandestine products containing these substances is extremely dangerous. (\*)
- ✓ **In North America (US and Canada), adulteration of heroin with fentanyl or fentanyl analogues is very frequent.** The exponential rise of overdoses and deaths in the last 3 years in these countries seems related to the unintended use of these adulterants.
- ✓ In some European countries (as Estonia) and Australia abuse of fentanyl is a health problem. Seizures of fentanyl and its derivatives have been reported in many countries. However, at this time, **adulteration of heroin with these substances is uncommon in Europe and Australia.**
- ✓ It has been argued that cryptomarkets are perceived as “safer” (higher purities, less adulterants) sources for illegal drugs. Nevertheless, according to our data, heroin is a noticeable exception **the average purity of heroin purchased in cryptomarkets has a wide variability.** We have detected different **fentanyl analogues in 11 samples purchased in cryptomarkets, 10 of which were purchased from European vendors.**
- ✓ We think this situation can **potentially** lead to **severe public health problems.** We discuss this hypothesis and its limitations in this report, and we suggest possible actions to face this hazard.

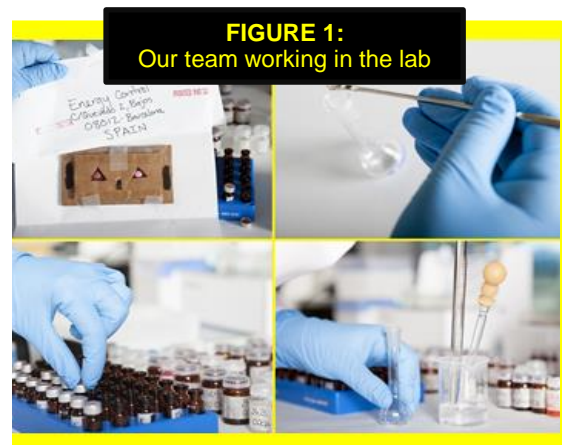
(\*) This report is focused on the adulterated heroin issue. Data from drug testing results about fentanyl and fentanyl analogues will be covered in our next report.

## 2.-ENERGY CONTROL INTERNATIONAL / INTERNATIONAL DRUG CHECKING SERVICE (IDCS)

Drug checking services are useful tools for reducing numbers of drug-related incidents, monitoring new substances or patterns of use, and providing information and assessment to drug users. In Spain, the non-governmental organisation **Energy Control (ABD)** has offered its drug checking service since 1999 as part of an integrated harm reduction service for recreational drug users.

Recreational users that would not usually seek help or advice from substance abuse organisations can receive personal advice and test their drugs at checking points (in clubs, raves, etc.) or in Energy Control's offices in Spain. This service is supported and financed by the Spanish Government Delegation to the National Plan on Drugs and the regional authorities. It is part of the EU Early Warning System operated by the EMCDDA and Europol.

In April 2014, Energy Control (ABD) launched a pilot study to adequate methodology and objectives of our Drug Checking Service into a worldwide, international setting. As our National Service, TEDI (Brunt et al, 2016) guidelines were used as a reference.



Main objectives of IDCS are:

- ✓ Contact drug users that would not normally approach drug prevention programs and which are usually concerned with how the consumption, adulteration and purity of their products affect their health
- ✓ Use this service as an educational and harm reduction tool by getting in touch with users and providing them with individual and personalized information about the substance they may consume
- ✓ Monitor the illegal market detecting new trends of drugs and drug use and make this information available to all stakeholders involved

The launch of our pilot study coincided with the emergence of cryptomarkets, so drug users who purchased substances in these markets were the original target population. A detailed explanation about protocols and results is available and has been published (Caudevilla, 2016).

The experience was evaluated as positive, so we decided to establish our Energy Control International Project as permanent. Since then, our International Drug Checking Service (IDCS) has been in constant growth and improvement.

Our webpage, with a system to order tests for drug testing and pay with Bitcoin, Bank Transfer, and PayPal, was launched in September 2016 (<https://energycontrol-international.org> )

**Monitoring and detecting new trends in cryptomarkets is still one of the main objectives, although we can test a wide range of controlled substances, prescription drugs, and NPS.** We only accept samples from final users, so our results can never be used as a “certificate of quality” for any batch, vendor or shop. **All economic proceeds obtained through our IDCS are re-invested in the project.** You can read more about our research activity in our webpage (<https://energycontrol-international.org/research/>).

### **3.- RECENT TRENDS IN ADULTERATED HEROIN:**

---

Opiates, particularly heroin, represent a significant proportion of drug-induced health problems in the world. Their high potential of abuse, risk of respiratory depression and death in case of overdose, transmission of infections derived from route of administration in lack of adequate sanitary conditions, and a strong association with low socioeconomic status explain this situation.

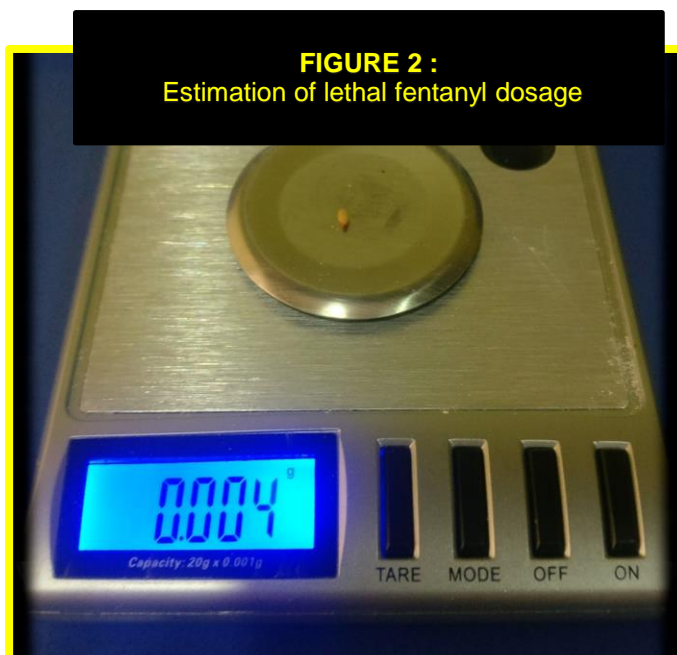
Despite clear scientific evidence regarding the efficacy of harm reduction strategies such as needle exchange or methadone/buprenorphine substitution programs (Mattick et al, 2009; Mattick et al, 2014; Larney et al 2017), coverage remains low in many countries. Methadone treatments are forbidden in Russia, and countries such as the Phillipines, Sri Lanka, Kenya, or Zambia still criminalize the possession of injecting equipment for illegal drug use. These practices represent a shameful and flagrant violation of basic Human Rights.

Misuse of prescription opioids is an emerging Public Health problem. Purchasing buprenorphine, fentanyl, or tramadol online is easy, and in most cases cheaper when compared to pharmacies. This problem is particularly relevant in the US,: in 2016 more than 11 million Americans misused prescription opioids, nearly 1 million used heroin, and 2.1 million were addicted to prescription opioids or heroin (NIDA, 2017).

### 3.1.- FENTANYL AND FENTANYL ANALOGUES

Health problems associated with fentanyl are particularly frequent and relevant. **Fentanyl is a synthetic opioid, available as a prescription drug**, with similar properties to its pharmacological family (analgesia, sedation, potential of abuse, euphoric effects...). It is **extremely potent** (about 100 times the potency of morphine) and active in the range of micrograms.

It is almost impossible to safely measure a dose of non-prescription, clandestine samples of unknown purity. **The lethal dose of fentanyl in humans is unknown, but estimations from animal studies indicate that a 2 mg dosage** (the weight of half a sesame grain) would likely be fatal (EMCDDA, 2012). (Figure 2)



The rapid appearance of novel fentanyl analogues that have not been approved for medical use, in the context of New Psychoactive Substances (NPS) markets, exacerbates the problem even more. Fentanyl analogues discovered between the 1960s-90s but never approved for human use (acetylfentanyl, butyrfentanyl, furanylfentanyl, ocfentanil...)

are easily available on several websites (FIGURE 3). Some of these drugs have been recently placed under international control, but novel analogues appear quickly. 14 fentanyl analogues were reported to the UNODC early warning advisory on new psychoactive substances between 2012 and 2016 in East Asia, America and Europe. Carfentanyl, which was first synthesized in



1974 and remains the most potent commercially available opioid in the world, is not under international control.

FIGURE 3:

Websites offering fentanyl analogues

The screenshot displays a website interface for purchasing various drugs. At the top, a navigation bar lists categories: BLOG, CANNABINOIDS, DISSOCIATIVE, NEW, NEW CHEMICALS, OPIATES, PSYCHEDELICS, RETAIL, and STIMULANTS. The main content area features a large banner for "BUY 4-FLUOROISOBUTYRYL FENTANYL" with a search bar and a list of recent posts including "Buy 2-Methylamphetamines", "Buy W-19-04", "Buy Mitragnin-d3", "Buy U-49900", and "Buy Fentanyl Carbamate". Below the banner, there is a section for "4-METHOXYMETHYL FENTANYL POWDER (R-30490)" which includes a chemical structure diagram and a detailed description of the compound's properties and legal status. The text describes R-30490 as a highly potent animal tranquilizer carbamate, related to fentanyl, and notes its use in research and its potential for abuse. It also mentions that R-30490 is not under international control and is available for sale.

**BUY 4-FLUOROISOBUTYRYL FENTANYL**

admin | May 15, 2017 | new, Opiates | 42 Comments

4-Fluoroisobutyl fentanyl is an excellent designer drug of the opiate class. Has a long lasting soothing and anesthetic effect, characteristic of all opiates. 4-Fluoroisobutyl fentanyl is a very new opiate and is allowed in many countries and passes customs free.

4-FIBI, p-FIBI, 4-Fluoroisobutyl fentanyl, para-Fluoroisobutyl

**4-METHOXYMETHYL FENTANYL POWDER (R-30490)**

R-30490 (also known as 4-Methoxymethylfentanyl) is an opioid analgesic related to the highly potent animal tranquilizer carbamate, and with only slightly lower potency. It was first synthesized by a team of chemists at Janssen Pharmaceutica led by Paul Janssen, who were investigating the structure-activity relationships of the fentanyl family of drugs. R-30490 was found to be the most selective agonist for the  $\mu$ -opioid receptor out of all the fentanyl analogues tested, but it has never been introduced for medical use in humans, although the closely related drug sufentanil is widely used for analgesia and anesthesia during major surgery [1][2][3][4].

Side effects of fentanyl analogs are similar to those of fentanyl itself, which include itching, nausea and potentially serious respiratory depression, which can be life-threatening. Fentanyl analogs have killed hundreds of people throughout Europe and the former Soviet republics since the most recent resurgence in use began in Estonia in the early 2000s, and novel derivatives continue to appear.

UPAC name

R-30490, legal status Legal status identifiers

**R-30490 for sale**

Based on the last data there are a lot of various new research chemicals which are not always well explored and are not confident to purchase them online. At our online vendor we can guarantee the highest possible quality of legal powders, both salts and designer drugs from the provided range of products. Our web-site is not only research chemicals supplier but also research chemicals producer with several high-equipped laboratories and professionally qualified staff of scientists. They check out every substance made in every laboratory and test it to improve. So that you can be sure the agents here are of the best purity.

### **3.2.- AVAILABLE DATA ABOUT HEROIN ADULTERATED WITH FENTANYL AND FENTANYL ANALOGUES**

**This problem is particularly relevant in United States and Canada.** (Kevin, 2017; WHO, 2017; Precupeck 2017). Since 2015, fentanyl-related deaths have increased by 540 percent across the United States (Dowel, 2017). The number of substances containing fentanyl analysed in the United States has increased dramatically over the period of 2014-2015, with a 253% increase of reports showing fentanyl or fentanyl analogues and heroin in the same sample (DEA, 2016). A Canadian study suggested that in up to 73% of illicit fentanyl use cases, the user was not aware they were taking fentanyl (Amlani et al, 2014).

**In Europe 287 seizures of fentanyl or fentanyl analogues were reported in 10 different countries in 2015 (EMCDDA 2017).** Additionally, a number of cases of **death or severe toxicity** related to different fentanyl analogues like cyclopropylfentanyl (EMCDDA, 2018), furanylfentanyl (EMCDDA 2017), 4-fluoroisobutyrylfentanyl (EMCDDA 2017), or acetylfentanyl (EMCDDA 2016) have also been reported. According to information provided about characteristics and circumstances of seizures in these EMCDDA reports, **most samples were described as “liquids”, “pills” or “sachets of powders”.** Although fentanyl abuse is a problem in some regions of Europe (Mounteney, 2012), **adulteration of heroin with fentanyl or fentanyl analogues does not seem to be a prevalent problem,** at least to the extent seen in America.

Data available from Australia also (Luke, 2017) suggests low rates of heroin adulteration with fentanyl. **The role of China and other South Eastern Asian countries as producers of clandestine fentanyl and fentanyl analogues is pointed out by many reports (UNODC, 2017; EMCDDA 2017, EMCDDA 2018)** but there is no available data on patterns of use and adulteration of heroin in these areas of the world.

### **3.3.- THE ROLE OF CRYPTOMARKETS:**

---

The **impact of cryptomarkets** is another important element to consider, as they provide easy, secure access to any illicit drug. Cryptomarkets have been defined as marketplaces that host multiple sellers or ‘vendors’, provide anonymity through their being hosted on the hidden web, use cryptocurrencies for payment, and aggregate and display customer feedback ratings and comments (Barratt et al, 2016).

The closing of Silk Road, the first operative cryptomarket, in October 2013, was followed by an explosive growth of these kinds of virtual platforms that put vendors in contact with drug buyers. As of March 2018 there are at least 18 active markets and 7 shops offering illegal drugs operating through onion services (data from <https://dnstats.net/>). **There is no evidence that Law Enforcement activity has a significant impact on this growing phenomenon** (Buskirk et al, 2017; Décary-Héту et al, 2017). Studies show that while the volume of drug market operations executed through the Internet remains small, vendors, markets, and operations grow quickly. Revenues have doubled since 2013 and the total number of transactions has tripled. The number of listings for drugs has grown by 5.5 times. (Kruithof et al, 2016).

In cryptomarkets, there is a predominance of drugs typically associated with recreational use (cannabis, MDMA, psychedelics). **It is estimated that heroin represents 2.7 % of all drug listings, although it generates 6% of total revenue** (Kruithof et al, 2016). A “wholesale phenomenon” (sales for listings priced over USD \$1000.00) **has also been described for heroin** (6-12% of listings) (Aldridge, 2016, Kruithof et al, 2016).

**Expectation of a higher purity** from cryptomarkets than from “street drugs” is one of the main motivations listed by cryptomarket users (Barrat et al, 2014; Barratt et al 2016). Some results from our IDCS (Caudevilla et al, 2016)

support this idea, although other studies have not found relevant differences in purity, at least compared with regional markets (van der Guowe et al, 2017). In any case, adulteration of products sold on cryptomarkets with highly toxic substances seems uncommon according to available data.

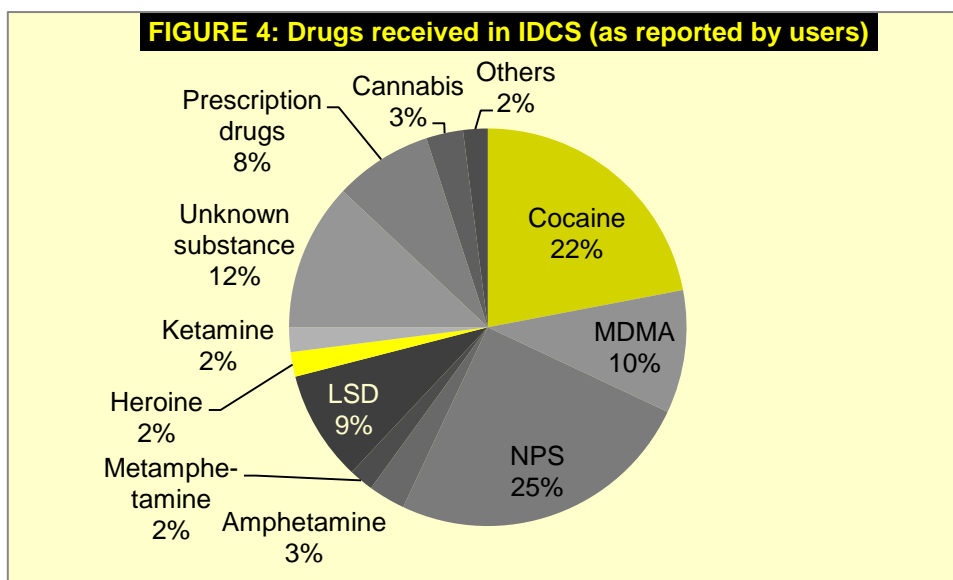
## 4.-GLOBAL TEST RESULTS FROM EC-IDCS

Results presented in this report are based on samples tested in EC-IDCS from the beginning of the project (June 2014) to the date of this publication (April 2018). A total of **3.430 samples** have been tested in this period of time.

This includes:

- ✓ Samples received by postal mail through our International website
- ✓ Samples tested from collaborations with other NGOs and institutions.
- ✓ Samples received in our headquarters in Spain in which the user reports having purchased them from cryptomarkets

Figure 3 shows the most frequent types of substances received for testing. Samples are divided into these categories according to **the information provided by the user** (what the user expects the sample to be), not the definitive laboratory test result. The categories “NPS” and “prescription drugs” (n:1116, 34.72 %) includes a range of 191 different substances.



#### **4.1.- HEROIN SAMPLES (GLOBAL DATA)**

---

**108 samples** (3,14%) were submitted as “heroin” and analysed in our IDCS, mainly from the EU zone (n = 38, 35.18%), USA (n = 29, 26.85%) and Canada (n = 7, 6.48%).

**Heroin was detected in 97 of the samples.** 3 samples contained only caffeine and 1 contained only alprazolam. **The analysis of 3 samples revealed a mixture of ocfentanyl, caffeine and paracetamol.** In two additional samples, heroin mixed with these adulterants was identified. The relevance of these results is discussed in next paragraph.

This data is shown in order to offer a general view, but some limitations must to be considered:

- ✓ Samples are **heterogeneous in their origin**: (62.03% IDCS users; 10,18% samples received by Spanish users purchased in cryptomarkets, 27,79% NGOs).
- ✓ **Quantification of samples was not possible in all cases.** Samples received from Harm Reduction Services from NGOs **aren't usually large enough to offer a quantitative analysis (the minimum amount of substance required to perform a quantitative analysis is around 30 mg).**

## 4.2.- HEROIN SAMPLES FROM CRYPTOMARKETS

All samples received from cryptomarkets were collected, classified and tested following a **specific protocol** developed by Energy Control. Identification and quantification (whenever possible) of substances and adulterants were performed **through gas chromatography coupled to mass spectrometry and/or liquid chromatography coupled to mass spectrometry** (Gine et al, 2014 ;Quintana et al, 2017).

Of 108 samples submitted as “heroin”, **67 were purchased from cryptomarkets.**

The country of origin (as reported by users and verified by postal stamps) and year of testing can be seen in Tables 1 and 2

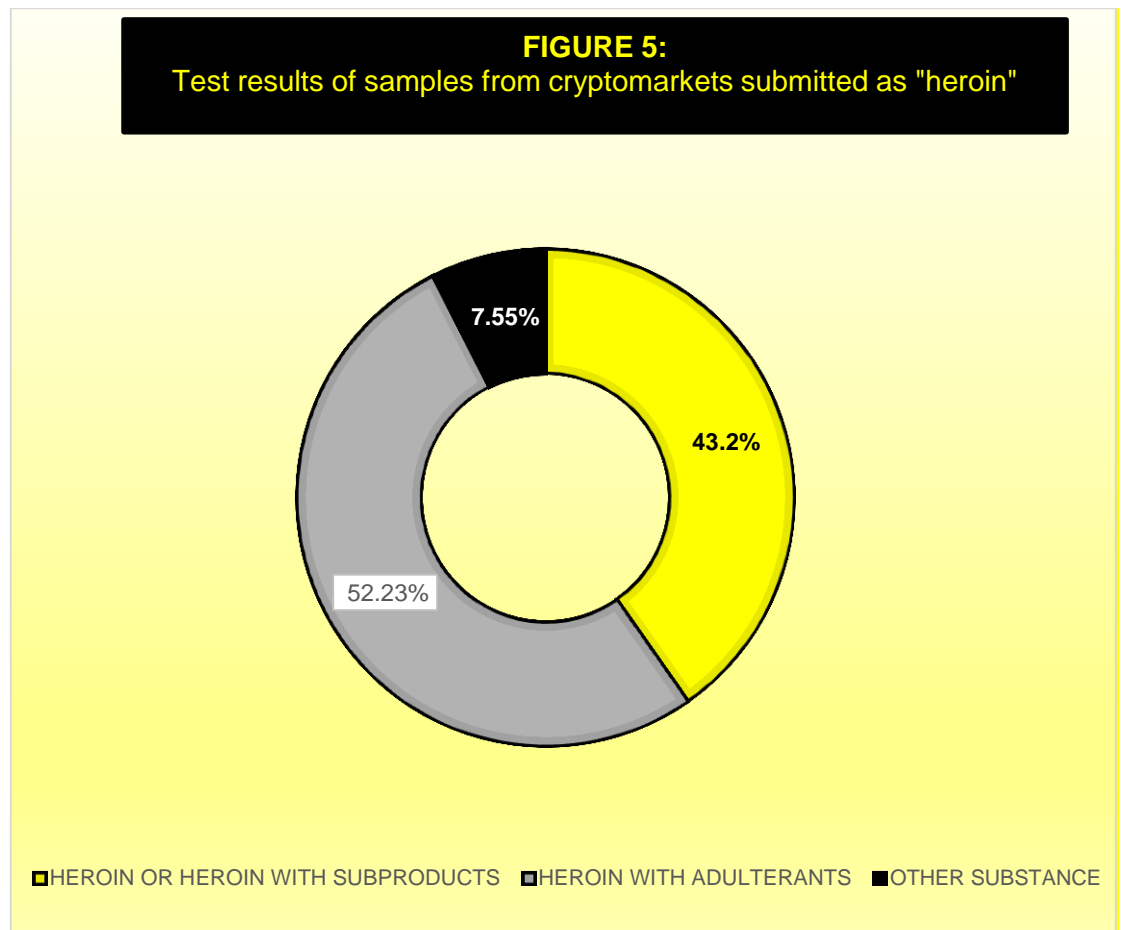
**TABLE 1: SAMPLES LABELLED AS HEROIN FROM CRYPTOMARKETS BY PROCEDENCE**

STATE	n
USA	19
Germany	15
Canada	7
Australia	6
Spain	4
Ireland	3
Poland	3
Finland	2
UK	2
Malta	2
Belgium	1
France	1
Netherlands	1
Sweden	1

**TABLE 2: SAMPLES LABELLED AS HEROIN FROM CRYPTOMARKETS BY YEAR**

Year	n
2014 (Jun-Dec)	0
2015	8
2016	25
2017	29
2018 (Jan-March)	5

An overview of test results is shown in Figure 5:





62 samples (92,53%) of samples analysed contained heroin (this includes samples with adulterations) Mean concentration of heroin is  $39.2 \pm 27.44 \%$ .

In 5 samples no heroin was detected.

**29 samples (43.2%) contained only heroin or heroin + synthesis by-products (we consider these to be opiates like morphine and codeine which are part of the initial “precursors”, or opiates like acetylated codeine or 6-MAM, which result from side-reactions in the heroin synthesis).** In all other samples (52.23%), one or more adulterants were identified. Caffeine, paracetamol and phenacetin were the most common adulterants, as it is shown in Table 3.

**TABLE 3: ADULTERANTS DETECTED IN SAMPLES PURCHASED IN CRYPTOMARKETS n:67**

Substance	n
No adulterants	29
Caffeine	17
Paracetamol	12
Phenacetine	8
Ocfentanil	8
DXM	6
Cocaine	2
Quinine	2
4-Fluorobutylfentanyl (4-FBF)	1
Cyclopropylfentanyl	1
Diltiazem	1
Furanylfentanyl	1
Ketamine	1
Lidocaine	1
Trimetoprim	1

Common problems in relation to heroin stem from variations in purity, as well as the presence of toxic adulterants. A significant quantity of heroin samples contained no adulterants, and **purity varied from 2% to 89%.**

Most adulterants found did not involve significant risk of additional toxicity or were present in low amounts. Caffeine was found in concentrations below 5% except in 1 sample: (id.102994, March 2017, Germany. Test result: Heroin: 14%, Caffeine: 74%). Paracetamol concentration was below 30% in all cases.

In the 2 samples containing cocaine or ketamine, these were also present in very low concentrations (1-2%).

DXM (dextromethorphan) was detected in 6 samples. 4 samples contained concentrations below 10% but **in 2 samples concentration of this drug was high enough to be considered dangerous** (id.102294, Jan 17, Poland. Test result: Heroin: 23%, Caffeine: 2%, DXM 43%), (id. 108163, Mar 18, Germany. Test result: Heroin: 35%, caffeine: 7%, DXM: 49%).

However, **the most remarkable result was the identification of fentanyl analogues, in some cases mixed with heroin or with other adulterants**. A detailed discussion will be shown in the next section

## 5.- HEROIN ADULTERATED WITH FENTANYL ANALOGUES AND PERFORMED ACTIONS

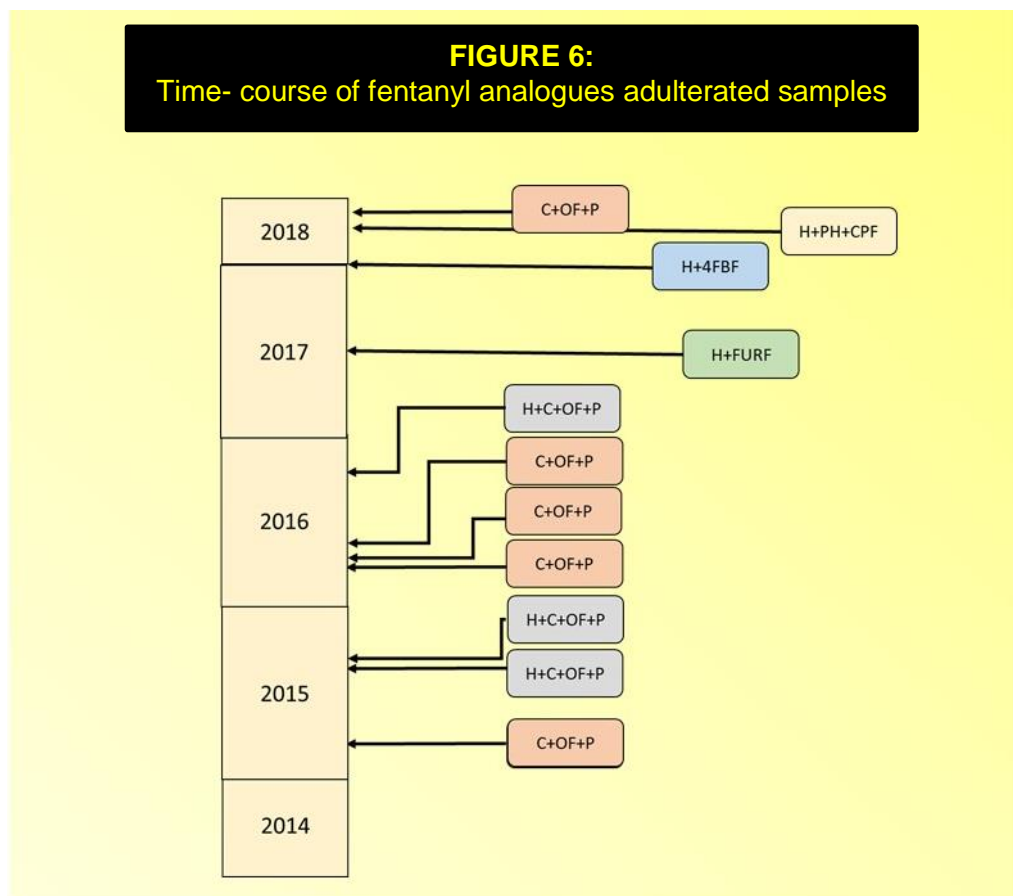
Table 3 summarizes the **test result** of the sample and country of origin. Quantification of fentanyl analogues was not possible for technical reasons (lack of available reference standard). In all cases the user was contacted by e-mail in order to warn about specific risks and obtain more information to follow-up and evaluate the phenomenon..

**TABLE 3: RESULTS FROM SAMPLES DELIVERED FROM CRYPTOMARKETS AS “HEROIN” ADULTERATED WITH FENTANYL ANALOGUES**

Reference	Test result	Procedence	Additional information about market/ vendor
92745	Caffeine + Ocfentanil+ Paracetamol	Spain	No
94843	Heroin (16%) + Caffeine (26%) + Ocfentanil+ Paracetamol (32%)	France	Yes
94849	Heroin (3%) + Caffeine (27%) + Ocfentanil+ Paracetamol (33%)	France	Yes
97106	Caffeine + Ocfentanil+ Paracetamol	UK	Yes
97527	Caffeine + Ocfentanil+ Paracetamol	Spain	No
97581	Caffeine (29%) + Ocfentanil+ Paracetamol (23%)	France	Yes
100029	Heroin + Caffeine + Ocfentanil+ Paracetamol	Malta	No
104335	Heroin (8%) + Furanylfentanyl	Ireland	No
107458	Heroin (7%) + 4-Fluorobutylylfentanyl	Spain	Yes
108763	Heroin (21%) + Cyclopropylylfentanyl	Spain	Yes
109029	Caffeine + Ocfentanil+ Paracetamol	Spain	Yes

Figure 6 shows the temporary course of detection of samples of heroin adulterated with fentanyl analogues and mixtures of fentanyl analogues with other substances. The first sample was detected from a Spanish user in March 2015 (C+O+P: Caffeine + Ocfentanil+ Paracetamol). This combination (which sometimes includes heroin, (H+ C+O+P) is the most frequent and repeated.

**Three other fentanyl analogues have been detected since July 2017,** always combined with heroin: Heroin + Furanylfentanyl (H+ FURF ), Heroin + 4-Fluorobutylfentanyl H+ 4FBF ), Heroin + Cyclopropylfentanyl (H+ CPF:)



In some cases, users communicated to us the specific vendors or markets where they purchased these samples. The inclusion of this data in warnings launched by Energy Control International and published in different

websites and forums generated a deep debate in our team. Finally, we decided not to make this data public for various reasons:

- ✓ Our data was based on personal statements from users. Some of them could be considered “trustworthy” but we had no irrefutable proof.
- ✓ The only way of obtaining evidence would be to purchase samples from suspected vendors by ourselves. However, as an NGO we are not authorized to purchase illegal substances in cryptomarkets.
- ✓ Our IDCS is a tool built into a harm reduction structured program for final drug users. A single test result is only representative for the sample obtained by the user. Our objectives do not include “quality control” of vendors or markets.

As a harm reduction service, our aim is to contribute to protecting the health of drug users. And since the unintended use of fentanyl analogues purchased as heroin involves serious risks, a **series of actions were implemented in order to warn users and monitor this phenomenon that will be shown through two examples in the next section.**

## 5.1.- SAMPLES CONTAINING OCFENTANIL (2015-2018):

The first sample containing a mixture of **caffeine, ocfentanil and paracetamol** was submitted to our office in **Madrid in March 2015** (ref 92745), by a user who reportedly purchased it as heroin in a cryptomarket. Unfortunately, we could not get any additional information.

In September 2015, the staff of **Techno+** (a French NGO working in harm reduction) expressed suspicion to us regarding samples of heroin sold by French vendors on different cryptomarkets. Analyses revealed a mixture of heroin + caffeine + paracetamol. (ref 94843) so we **decided to launch a warning on Oct 2015 using specific channels to target population at risk** (websites and blogs related to cryptomarkets, deep web forums, drug forums...).(Figure 7)

**FIGURE 7:**  
Timeline of fentanyl-analogues-adulterated samples



**Users that delivered these samples revealed to us the names of the specific marketplaces and vendors that allegedly offered these products. All of them pointed to two vendors located in France and Belgium.** For reasons explained previously, we decided not to include this data in the warning text. When we analysed commentaries in forums and blogs that posted our warning, **information provided by users of forum was concordant with the information we received from sources.**

One of the vendors disappeared (or maybe was banned) from the marketplaces where they were offering this adulterated heroin.

The other vendor **seems to still be active.** According to our trusted sources of information this vendor (or a vendor using an identical nickname and settled in Belgium) is offering heroin in one of the most popular marketplaces. **They figure as a “trusted vendor” with an overall 4.6/5 rating and run their own virtual shop in the Deep Web.** 15 of 32 commentaries on this vendor’s shop in a popular blog about Deep Web ([www.deepdotweb.com](http://www.deepdotweb.com)) mention suspicions of fentanyl adulteration or mention “extremely” or “strange potent effects”.

More details are available in a published investigation report ([Quintana et al, 2017](#)).

## **5.2.- SAMPLE CONTAINING CYCLOPROPYLFENTANYL (2018)**

In March 2018 we tested a sample from a Spanish user that had bought 1 gr of heroin #4 in the biggest cryptomarket at the time. **The product was delivered from the United Kingdom.** The analysis revealed the presence of heroin and cyclopropylfentanyl (ref 108763).

In this case we obtained irrefutable evidence about the marketplace and vendor. This vendor's rating was **4.78/5 out of 350 ratings**. It is noticeable that **40 of 153 of the commentaries agreed on the extreme potency of the effects or hypothesised the presence of fentanyl**. According to statistics provided by the cryptomarket, **217 heroin samples from this vendor were delivered between January and March 2018.**

On March 6th we sent a message to the vendor using the cryptomarket mail system. We received no answer. **On March 28 the vendor disappeared from the market.**

We cannot establish a direct cause-effect relation between our message and the vendor vanishing. We do not even know if the account is temporarily inactive or deleted. But this case was a particular cause of concern for us, **as this vendor was offering variable amounts of heroin, varying from 1 gram to 1 kilogram (\*)**. If all the samples sold by this vendor contain the same composition as the sample analysed by us, the potential impact on users could be dramatic).

(\*) Number of samples delivered, rating and commentaries were collected on 14/3/18 from data available in his profile.. We could not analyze more data from this vendor (number of sales by weight) because on disappearance of all data from his profile, that remains hidden or closed in our last visit to this marketplace (15/4/18)



## 6.- CONCLUSIONS

Motivations for the use of cryptomarkets include **perception of safety, higher purity of substances and reduced risk for frauds and adulteration**. This is probably related to a characteristic intrinsic to these virtual spaces (administrators control, rating systems, and organized communities) that provide a partial way to exercise control on “controlled substances”. In fact this is one of the key points that explain the success, growth and continuous improvement of cryptomarkets. The efficacy of these systems is relatively high but not perfect.

**In this report we show the presence of different fentanyl analogues in samples being sold as heroin in cryptomarkets during a 4 year period. This suggests that it is not an anecdotal, punctual finding.** Scientific information about drug testing samples from cryptomarkets is very limited (Rhumorbarbe D et al 2016, Caudevilla et al 2016, van der Guowe et al, 2017). To the best of our knowledge, this is the first report about this phenomenon.

There are many reasons to consider this situation as a public health problem:

- ✓ Drug users have reported to us that their adulterated samples were purchased in small quantities (1 gram). **Nevertheless, at least three alleged vendors of these products offer quantities of heroin between 100 gr -1 kg. These vendors are located in Europe, where adulteration of fentanyl-adulterated heroin is still not a widespread problem.** It is not clear if adulterated batches are only offered in small quantities or if these adulterations are also present in wholesale amounts.

- ✓ Fentanyl has an extremely narrow safety limit. Despite this, 50 years of human experience and enough data about toxicology and long term effects make therapeutical dosing possible. **This is not the case for many fentanyl analogues with similar or higher potency than fentanyl and limited or non-existing experience in humans.**
- ✓ As shown in this report, **purity of heroin in tested samples is highly variable.** This involves significant risks of overdose. **The addition of fentanyl or fentanyl analogues, even in small dosages, increases toxicity** dramatically (Solis et al, 2017). Common routes for heroin (intravenous, smoked, intranasal) have a very quick onset and facilitate an overdose.

Our report has some limitations to consider:

- ✓ The most relevant is the **small size of the sample.** Heroin represents 3% of all samples delivered to IDCS between January 2014 and March 2018. 67 samples are from cryptomarkets, and fentanyl analogues have been detected in 11 of those samples. **As such, we can't estimate the extent to which our data is representative of cryptomarkets as a whole.** It is possible that this indicates an emerging trend, but maybe users who notice "strange or potent effects" send samples to our IDCS more frequently.
- ✓ Heroin contaminated with 3 different fentanyl analogues (furanlylfentanyl, cyclopropylfentanyl and 4-fluorobutylfentanyl) **have been detected in the last 9 month period** (Jul 17-March 18). The interpretation and significance of this fact is uncertain.

- ✓ We don't know if vendors are aware of this problem, if batches contain the same products for a long period of time, or if wholesale composition is the same as in the small quantities checked by our service
- ✓ The **difficulty of quantifying fentanyl analogues is another limitation** to consider, mainly due to the wide range of new fentanyl analogues and the impossibility to have all the reference standards in our laboratory. **However, qualitative analysis by a gold standard technique (GC/MS), confirms the presence of these substances.**

Some studies (Quintana et al., 2016, Rhumorbarbe D et al 2016) suggests that adulteration is a real threat not only at the street level, but also for users that buy substances in cryptomarkets, and suggest the need for harm reduction initiatives in this setting.

Energy Control International is concerned about this problem and we are planning **specific actions in order to warn the sectors involved. A protocol to detect fentanyl-adulterated heroin through a reduced fee/free campaign is also being considered by our team.**

This work necessarily includes **specific actions involving the cryptomarkets community. Forums have played an important role in providing valuable information, spreading alerts, and even detecting fraudulent vendors** (Quintana et al, 2017; Gilbert et al 2017). Some cryptomarkets have played an active role in facilitating harm reduction work (Caudevilla, 2016) and have banned sales of research chemicals or fentanyl analogues (Gilbert et al, 2017). Beyond Law Enforcement actions and respecting current laws, this approach should be considered as a complementary strategy to preserve Public Health.

## 7.- REFERENCES

---

Aldridge, J. Décary Héту D, Hidden wholesale: The drug diffusing capacity of online drug cryptomarkets. *Int J Drug Policy*. 2016 Sep;35:7-15.

Amlani, A., McKee, G., Khamis, N., Raghukumar, G., Tsang, E., Buxton, J.A. (2015) Why the FUSS (Fentanyl Urine Screen Study)? A cross-sectional survey to characterize an emerging threat to people who use drugs in British Columbia, Canada. *Harm Reduction Journal*, 12, 54.

Barratt MJ, Ferris JA, Winstock AR. Safer scoring? Cryptomarkets, social supply and drug market violence. *Int J Drug Policy*. 2016 ;35:24-31

Barratt MJ, Ferris JA, Winstock AR. Use of Silk Road, the online drug marketplace, in the United Kingdom, Australia and the United States 2014. *Addiction*. 2014 May;109(5):774-83.

Brunt T, Nagy C, Bücheli A, Martins D, Ugarte M, Beduwe C, Ventura M. Drug Testing in Europe: Monitoring Results of the Trans European Drug Information (T.E.D.I) Project. *Drug Testing and Analysis* 2016. DOI 10.1002/dta.1954

Caudevilla F. The emergence of deep web marketplaces: a health perspective. In: *The internet and drug markets (European Monitoring Centre for Drugs and Drug Addiction: Insights 21)* Publications Office of the European Union, Luxembourg 2016

Caudevilla, F., Ventura, M., Fornís, I., Barratt, M.J., Iladanosa, C.G., Quintana, P. et al. Results of an international drug testing service for cryptomarket users. *International Journal of Drug Policy*. 2016; 35: 38–41

DEA (Drug Enforcement Administration), Diversion Control Division, National Forensic Laboratory Information System: 2015 Annual Report (Springfield, Virginia, 2016).

Décary-Héту, D. & Giommoni, L. Do police crackdowns disrupt drug cryptomarkets? A longitudinal analysis of the effects of Operation Onymous. *Crime Law Soc Change* (2017) 67: 55. <https://doi.org/10.1007/s10611-016-9644-4>

Dowell D, Noonan RK, Houry D. Underlying Factors in Drug Overdose Deaths. *JAMA*. 2017;318(23):2295–2296. doi:10.1001/jama.2017.15971

European Monitoring Centre for Drugs and Drug Addiction (012). Fentanyl in Europe EMCDDA Trendspotter Study: Report from an EMCDDA expert meeting 9 to 10 October 2012. Lisbon, Portugal.

European Monitoring Centre for Drugs and Drug Addiction (2016), EMCDDA–Europol Joint Report on a new psychoactive substance: N-phenyl-N-[1-(2-phenylethyl)piperidin-4-yl] acetamide (acetylfentanyl), Joint Reports, Publications Office of the European Union, Luxembourg

European Monitoring Centre for Drugs and Drug Addiction (2017), EMCDDA–Europol Joint Report on a new psychoactive substance: N-(4-fluorophenyl)-N-(1-phenethylpiperidin-4-yl) isobutyramide (4-fluoroisobutyrylfentanyl; 4F-iBF), Joint Reports, Publications Office of the European Union, Luxembourg.

European Monitoring Centre for Drugs and Drug Addiction (2017), Report on the risk assessment of N-phenyl-N-[1-(2-phenylethyl)piperidin-4-yl]-furan-2-carboxamide (furanylfentanyl) in the framework of the Council Decision on new psychoactive substances, Risk Assessments, Publications Office of the European Union, Luxembourg.

European Monitoring Centre for Drugs and Drug Addiction (2018), EMCDDA–Europol Joint Report on a new psychoactive substance: N-phenyl-N-[1-(2-phenylethyl)piperidin-4-yl]cyclopropanecarboxamide (cyclopropylfentanyl) Joint Reports, Publications Office of the European Union, Luxembourg.

Gilbert M, Dasgupta N. Silicon to syringe: Cryptomarkets and disruptive innovation in opioid supply chains. *Int J Drug Policy*. 2017;46:160-167

Giné CV, Espinosa IF, Vilamala MV New psychoactive substances as adulterants of controlled drugs. A worrying phenomenon? *Drug Testing and Analysis* 2014;6(7-8):819-24

Kruihof, K, Aldridge J, Décarry Hétu D, Sim M, Dujso E, and Hoorens S, Internet-facilitated drugs trade: An analysis of the size, scope and the role of the Netherlands. WODC, Ministerie van Veiligheid en Justitie, 2016.

Larney S, Peacock A, Leung J, et al. Global, regional, and country-level coverage of interventions to prevent and manage HIV and hepatitis C among people who inject drugs: a systematic review. *The Lancet Global Health*. 2017;5(12):e1208-e1220..

Mattick RP, Breen C, Kimber J, Davoli M. Methadone maintenance therapy versus no opioid replacement therapy for opioid dependence. Cochrane Database of Systematic Reviews 2009, Issue 3. Art. No.: CD002209.

Mattick RP, Breen C, Kimber J, Davoli M. Buprenorphine maintenance versus placebo or methadone maintenance for opioid dependence. Cochrane Database of Systematic Reviews 2014, Issue 2. Art. No.: CD002207

Mounteney, J., Evans-Brown, M., Giraudon, I. (2012) Fentanyl in Europe. EMCDDA Trendspotter Study. European Monitoring Centre for Drugs and Drug Addiction. Luxembourg City, Luxembourg

National Institute on Drug Abuse(NIDA) "Federal Efforts to Combat the Opioid Crisis: A Status Update on CARA and Other Initiatives". (25 October 2017).

Prekupec MP, Matthew P., Peter A. Mansky, and Michael H. Baumann. "Misuse of Novel Synthetic Opioids: A Deadly New Trend." JAMA 2017 11(4): 256–265.

Quintana P, Ventura M, Grifell M, Palma A, Galindo L, Fornís I, Gil C, Carbón X, Caudevilla F, Farré M, Torrens M. The hidden web and the fentanyl problem: Detection of ocfentanil as an adulterant in heroin. Int J Drug Policy. 2017 Feb;40:78-83.

Rhumorbarbe D, Staehli L, Broséus J, Rossy Q, Esseiva P. Buying drugs on a Darknet market: A better deal? Studying the online illicit drug market through the analysis of digital, physical and chemical data, Forensic Science International 267,(2016) 173-182

Rodda LN, Pilgrim JL, Di Rago M, Crump K, Gerostamoulos D, Drummer OH. A Cluster of Fentanyl-Laced Heroin Deaths in 2015 in Melbourne, Australia.; J Anal Toxicol. 2017 41(4):318-324

Shanks KG, Behonick GS. Detection of Carfentanil by LC-MS-MS and Reports of Associated Fatalities in the USA. J Anal Toxicol. 2017 Jul 1;41(6):466-472. doi: 10.1093/jat/bkx042.

Solis E, Cameron-Burr KT, Kiyatkin EA. Heroin Contaminated with Fentanyl Dramatically Enhances Brain Hypoxia and Induces Brain Hypothermia. eNeuro. 2017;4(5):ENEURO.0323-17.2017. doi:10.1523/ENEURO.0323-17.2017.

United Nations Office on Drugs and Crime, World Drug Report 2017

Van Buskirk J, Bruno R, Dobbins T, Breen C, Burns L, Naicker S, Roxburgh A. The recovery of online drug markets following law enforcement and other disruptions. Drug Alcohol Depend. 2017 ;173:159-162

van der Gouwe, D., Brunt, T. M., van Laar, M., and van der Pol, P. (2017) Purity, adulteration and price of drugs bought on-line versus off-line in the Netherlands. Addiction, 112: 640–64