

FENTANYL AND FENTANYL DERIVATIVES(1): ADULTERATED HEROIN SAMPLES FROM CRYPTOMARKETS

A DOCUMENT BY:

DOCTOR X AND HIS CHEMICAL BROTHERS & SISTERS

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

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1.- KEY POINTS

- ✓ This is the first of a series of periodic reports that will analyze 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 derivatives.**
- ✓ Fentanyl and fentanyl derivatives 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 derivatives 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 **Purities of heroin purchased in cryptomarkets have a wide variability in concentration.** We have detected different **fentanyl derivatives 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 derivatives 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

Launching 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 “proof of quality” by any batch, vendor or shop. **All economic benefits 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. A high potential of abuse, risk of respiratory depression and death in case of overdose, transmission of infections derived from route of use 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 programmes (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 oxycodone, tramadol, 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 DERIVATIVES

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) can 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 derivatives 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 derivatives

NOW TRENDING:

NEW DESIGN DRUGS AT LOW PRICES: PSYCHOSTIMULATORS, OPIATES, PSYCHEDELICS, DISSOCIATIVES, CANNABINOIDS AND NEW CHEMICALS

BLOG CANNABINOIDS DISSOCIATIVE NEW NEW CHEMICALS OPIATES

PSYCHEDELICS RETAIL STIMULANTS

BUY 4-FLUOROISOBUTYRYL FENTANYL

Admin | May 11, 2017 | New Opiate | 43 Comments



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

4-FIBI, p-FIBI, 4-Fluoroisobutyryl fentanyl, para-Fluoroisobutyryl

RECENT POSTS

- Buy 2 Methylamphetamine
- Buy W-15-04
- Buy Mitragnin-03
- Buy U-47700
- Buy Fentanyl Carbonate

RECENT COMMENTS

- Philip on Buy 4-Fluoroisobutyryl fentanyl
- JON on Buy Acetyl fentanyl
- Joe on Buy MDPHP
- Daniel on Buy Mitragnin-03
- Admin on Buy U-47700 new

ARCHIVES

- January 2018

FOLD

4-METHOXYMETHYL FENTANYL POWDER (R-30490)



R-30490 (also known as 4-Methoxymethyl fentanyl) is an opioid analgesic related to the highly potent animal tranquilizer carfentanyl, 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 μ -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 powder, 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 DERIVATIVES

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 derivatives and heroin in the same sample.(DEA, 2016). A Canadian study suggested that up to 73% of illicit fentanyl use was unbeknownst to the user (Amlani et al,2014)

In Europe 287 seizures of fentanyl or fentanyl derivatives were reported in 10 different countries in 2015 (EMCDDA 2017). Additionally, a number of cases of **death or severe toxicity** related to different fentanyl derivatives as cyclopropylfentanyl (EMCDDA, 2018), furanylfentanyl (EMCDDA 2017), 4-fluoroisobutyrylfentanyl (EMCDDA 2017) or acetylfentanyl (EMCDDA 2016) have been also reported. But, 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 derivatives does not seem to be a relevant problem**, at least to the extent seen in America.

Data available from Australia also (Luke, 2017) suggest low rates of heroin adulteration with fentanyl.

The role of China and other South Eastern Asia countries as producers of clandestine fentanyl and fentanyl derivatives 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 kind 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-Hétu et al, 2017). Studies show that while the proportion of drug market operations 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 than “street drugs” is one of the main motivations for 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.

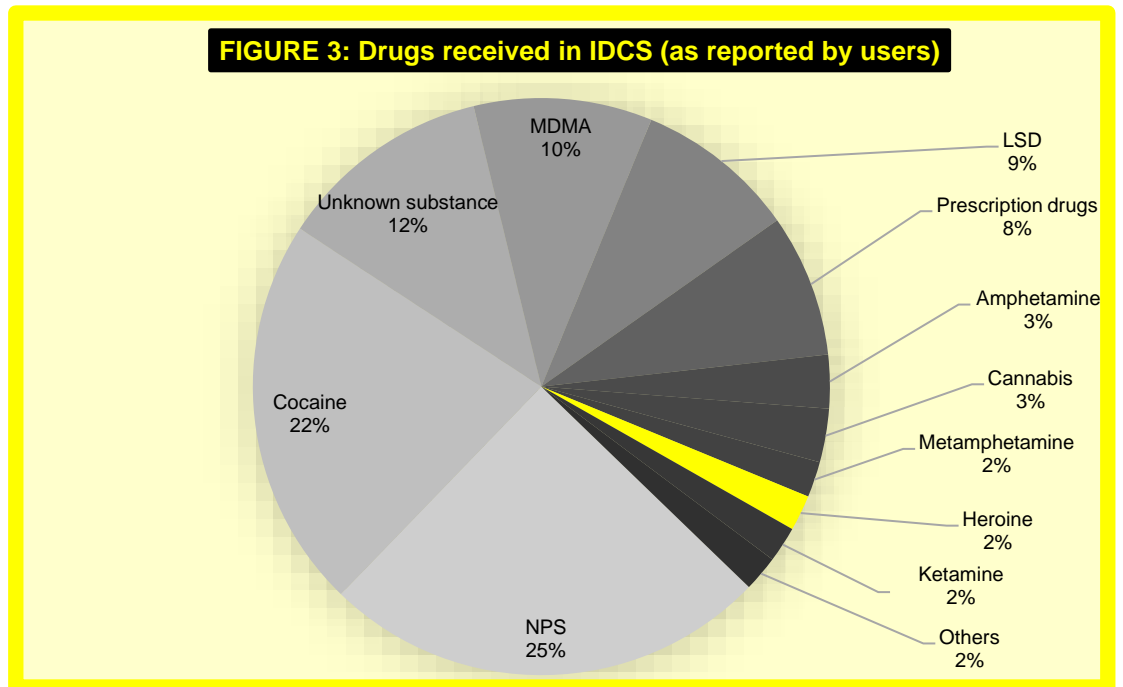
4.-GLOBAL TEST RESULTS FROM EC-IDCS

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 in agreement with other NGOs and institutions.
- ✓ Samples received in our headquarters in Spain in which the user reports direct procedence 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**, 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 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.

These data are shown in order to offer a general view but we have not analysed them because they are not representative of the market:

- ✓ Samples are **heterogeneous in their origin**: (62.03% IDCS users; 10,18% samples received by Spanish users purchased in cryptomakets, 27,79% NGOs)

- ✓ **Quantification of samples was not possible in all cases**, mainly because of the way they were delivered. Samples received from Harm Reduction Services from NGOs, **did not have a large enough quantity to offer a quantitative analysis the minimum amount of substance required to perform a quantitative analysis in order to have an accurate result.**

4.2.- HEROIN SAMPLES FROM CRYPTOMARKETS

All samples delivered from cryptomarkets were collected, classified and tested following a **specific protocol** developed by Energy Control. Identification and quantification (when possible) of substances and adulterants were performed **through gas chromatography coupled to mass spectrometry and 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.**

Country of origin (reported by users and verified by postal stamps) and year of testing are shown in Tables 1 and 2

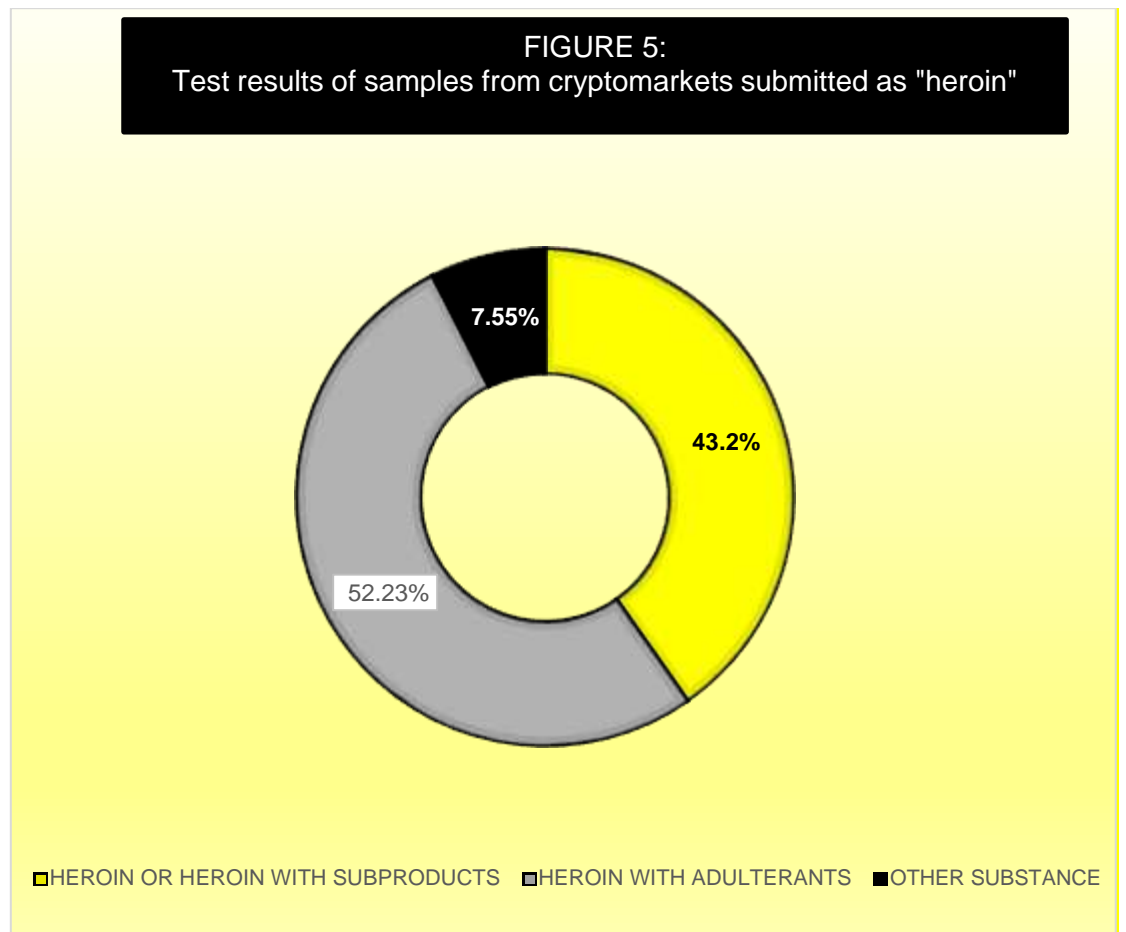
TABLE 1: SAMPLES LABELLED AS HEROIN FROM CRYPTOMARKETS BY PROCEDENCE

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 contained any amount of heroin (this includes samples with adulterations) Mean concentration of heroin is $39.2 \pm 27.44 \%$

In 5 samples no heroin was detected.

Heroin or heroin with different synthesis by-products (6-MAM, acetylated codeine, morphine...) were the unique compounds detected in 29 samples (43.2%) 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. In our sample a significant proportion of heroines 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 can 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 derivatives, 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 DERIVATIVES AND PERFORMED ACTIONS

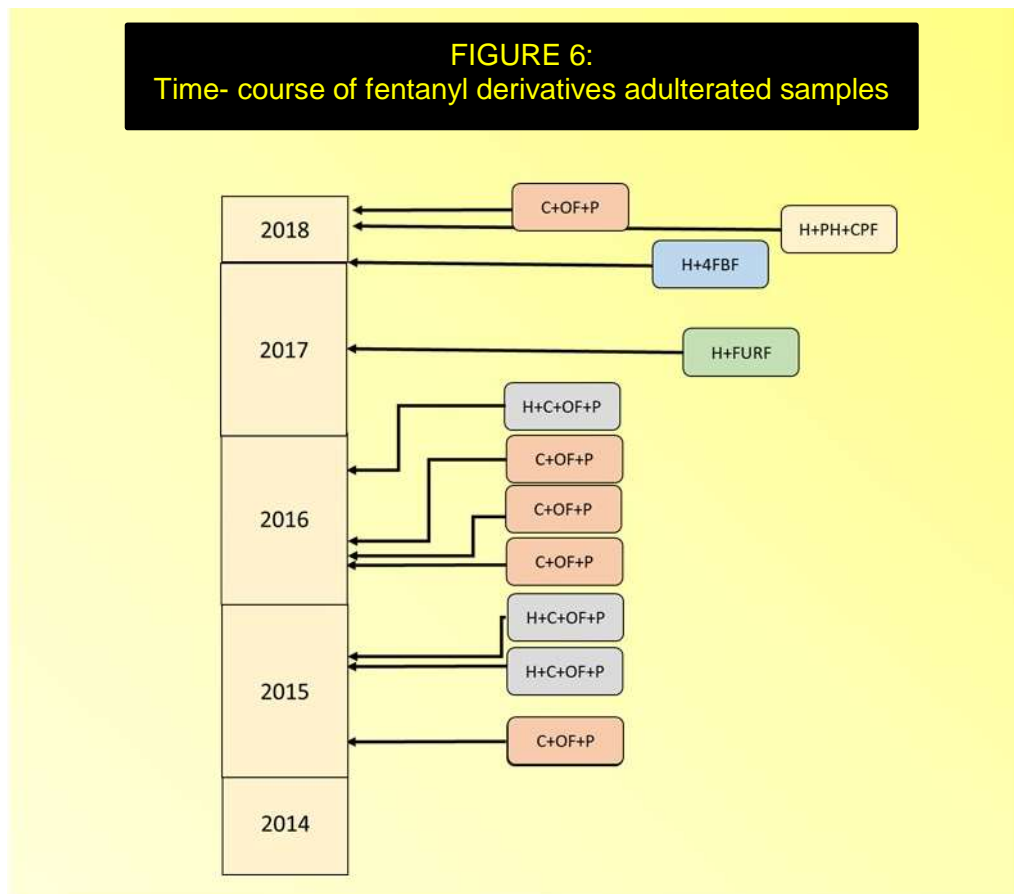
Table 3 summarizes the **test result** of the sample and country of precedence. Quantification of the fentanyl derivative was not possible for technical reasons (lack of available reference standard). In all cases the user was contacted by e-mail in order to warn about specific risks and obtain more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

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

Reference	Test result	Precedence	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%) + Cyclopropylfentanyl	Spain	Yes
109029	Caffeine + Ocfentanil+ Paracetamol	Spain	Yes

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

Other three fentanyl derivatives have been detected since July 2017, always combined with heroin Heroin + Furanylfentanyl (H+ FURF), Heroin + 4-Fluorobutylfentanyl H+ 4FBF), Heroin + Cyclopropylfentanyl (v H+ 4FBF:)



In some cases, users communicated to us the specific vendors or markets where they purchased these samples. The inclusion of these 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 were based in personal communications from users. Some of them could be considered as “trustworthy” but we had no irrefutable proof.
- ✓ The unique way to obtain certain evidences would be purchasing samples from suspected vendors by ourselves. But, as an NGO we are not authorized to purchase illegal substances in cryptomarkets.
- ✓ Our IDCS is a tool 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 “control of quality” of vendor or markets.

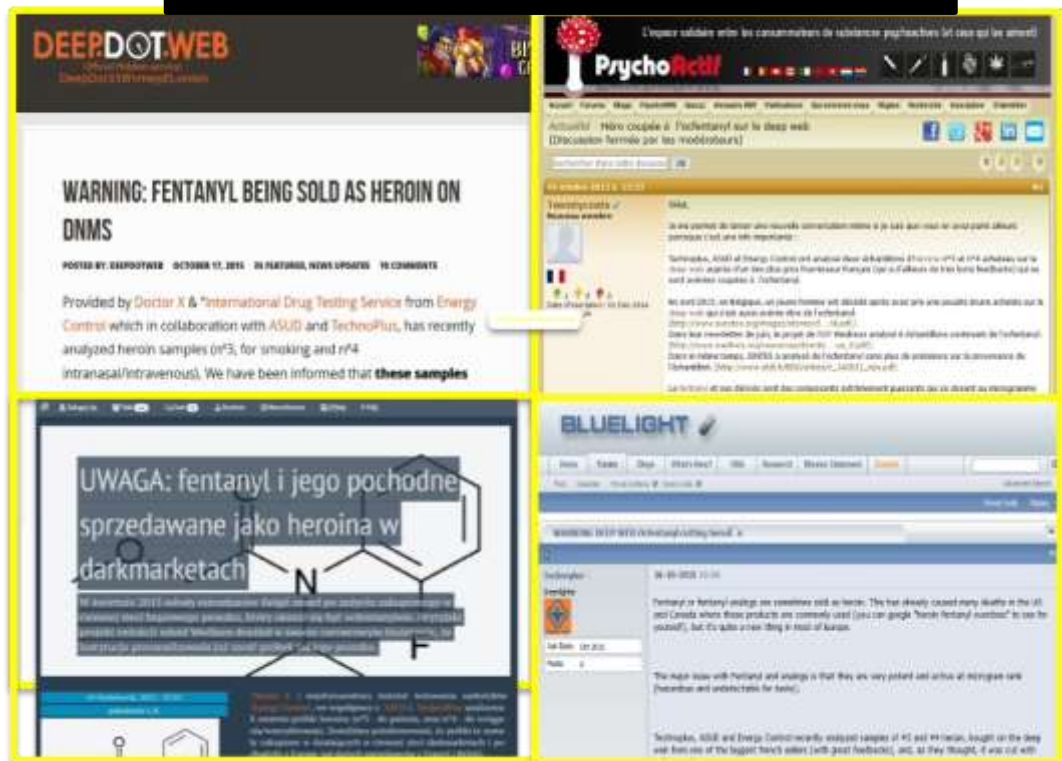
As a harm reduction service, our aim is to contribute to protecting the health of drug users. And since the unintended use of fentanyl derivatives purchased as heroin involve serious risks, a **series of actions were implemented in order to warn users and monitor this phenomenon that will be shown through 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 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 in 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:
Time- course of fentanyl derivatives 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 he was offering this adulterated heroin.

The other vendor **seems to be still 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. **He figures as a “trusted vendor” with an overall 4.6/5 rating and runs his own virtual shop in Deep Web.** 15 of 32 commentaries on this vendor shop in a popular blog about Deep Web (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 accidentally obtained irrefutable evidences 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 can not 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 than 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, 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 derivatives in samples being sold as heroin in cryptomarkets during a 4 years period. This suggests that this is not an anecdotal, punctual finding. Scientific reports about drug testing samples from cryptomarkets is very limited (Rhumorbarbe D et al 2016, Caudevilla et al 2016, van der Guowe et al, 2017). But to 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 us that their adulterated samples were purchased in small quantities (1 gram). **But at least three alleged vendors of these products offer batches of heroin between 100 gr - 1 kg. These vendors are allocated in Europe, where adulteration of fentanyl adulterated heroin is still not a relevant problem.** It is not clear if adulterated batches are only offered in small quantities or if these adulterations are 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 derivatives 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 overdosage. **The addition of fentanyl or fentanyl derivatives even in small dosages, enhances toxicity** dramatically (Solis et al, 2017). Common routes for heroin (intravenous, smoked, intranasal) have a very quick onset and facilitate overdosage.

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. Samples from cryptomarkets are 67, and fentanyl derivatives have been detected in 11. **So we can't estimate the extent to which our data is representative of cryptomarkets as a whole.** It is possible that this indicate 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 derivatives (furanylfentanyl, cyclopropylfentanyl and 4-fluorobutylfentanyl) **has 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 derivatives is another limitation** to consider, mainly due to the wide range of new fentanyl analogs 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, spread alerts, and even detect fraudulent vendors (Quintana et al, 2017; Gilbert et al 2017).** Some cryptomarkets have played an active role facilitating harm reduction work (Caudevilla, 2016), have banned have prohibited sales of research chemicals or fentanyl derivatives (Gilbert et al, 2017). Regardless of Law Enforcement actions and respecting current laws, this approach should be considered as a complementary strategy to preserve Public Health.

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