

## Research paper

## The hidden web and the fentanyl problem: Detection of ocfentanil as an adulterant in heroin



Pol Quintana<sup>a,b</sup>, Mireia Ventura<sup>a,b,1,\*</sup>, Marc Grifell<sup>a,b,c,1</sup>, Alvaro Palma<sup>b,c</sup>,  
Liliana Galindo<sup>b,c</sup>, Iván Fornís<sup>a</sup>, Cristina Gil<sup>a</sup>, Xoán Carbón<sup>a</sup>, Fernando Caudevilla<sup>a</sup>,  
Magí Farré<sup>b,e,f</sup>, Marta Torrens<sup>b,c,d</sup>

<sup>a</sup> Energy Control, Associació Benestar i Desenvolupament, Barcelona, Spain

<sup>b</sup> Hospital del Mar Medical Research Institute-IMIM, Barcelona, Spain

<sup>c</sup> Institut de Neuropsiquiatria i Addiccions, Hospital del Mar. Parc de Salut Mar, Barcelona, Spain

<sup>d</sup> Departament de Psiquiatria, Universitat Autònoma de Barcelona, Bellaterra, Spain

<sup>e</sup> Departament de Farmacologia, de Terapèutica i de Toxicologia, Universitat Autònoma de Barcelona, Bellaterra, Spain

<sup>f</sup> Servei de Farmacologia Clínica, Hospital Universitari Germans Trias i Pujol (IGTP), Badalona, Spain

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## ABSTRACT

**Background:** The popularization of anonymous markets such as Silk Road is challenging current drug policy and may provide a new context for old issues, such as adulteration of heroin with fentanyl derivatives. The aims of this paper are to report the presence of ocfentanil, a novel, potent, non-controlled fentanyl analog, in samples sold as heroin in the hidden web, and to summarize the effects reported by users.

**Methods:** In 2015, four samples allegedly bought as heroin in cryptomarkets of the hidden web were sent to Energy Control for analysis. Energy Control is a Spanish harm reduction NGO that offers anonymous drug checking with the purpose of adapting counselling to the specific substances present in the drug and monitor the drug market. Identification was performed by GC/MS and LC/MS/MS. We contacted the submitters of the samples and performed an Internet search to retrieve additional information.

**Results:** One sample contained ocfentanil, caffeine and heroin. Three samples contained the aforementioned substances plus paracetamol. Two out of the four contacted users reported distinct short acting, opioid-like effects. No fora discussion could be found about the effects of ocfentanil, neither web pages nor individuals advertising the substance.

**Conclusion:** We report the presence of a new substance detected in the hidden web as an adulterant of heroin, ocfentanil. It has short acting opioid-like effects, roughly the same potency as fentanyl, and can be injected, snorted or smoked. Severe side effects have been associated with its use, including one death. No discussion about this substance could be found in the Internet, which suggests this substance has not been sold as such. Available data about purities of drugs purchased in cryptomarkets suggest that adulteration is not a severe problem and this agrees with users' perceptions. However, this study 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.

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## Introduction

During the last decade, the Internet has posed two major challenges to the current drug policy. On the one hand, it has

fostered the dissemination of New Psychoactive Substances (NPS), defined as “substances of abuse, either in a pure form or a preparation, that are not controlled by the 1961 Single Convention on Narcotic Drugs or the 1971 Convention on Psychotropic Substances, but which may pose a public health threat” (United Nations Office on Drugs and Crime, 2015). This implies that they can be distributed and sold under the label “not for human use”, “research chemical”, legal highs” or others, as they are not subject to world-wide law enforcement. Usually little to no scientific information is available about their effects or risks when they

\* Corresponding author at: Associació Benestar i Desenvolupament, Carrer Quevedo n°2, 08012 Barcelona, Spain.

E-mail address: [mireia@energycontrol.org](mailto:mireia@energycontrol.org) (M. Ventura).

<sup>1</sup> Coauthors.

reach the market. It is worth noting that NPS sold in the Internet are increasingly being used to adulterate controlled substances sold in conventional black markets (Gine, Espinosa, & Vilamala, 2014; Hondebrink, Nugteren-van Lonkhuyzen, Van Der Gouwe, & Brunt, 2015).

On the other hand, controlled substances can also be sold through the Internet. The deep web can be defined as the Internet content not accessible by traditional search engines, such as Google (Bergman, 2001). This ranges from email inboxes and university intranet, to networks such as Tor, which require specific software and configurations to be accessed. Tor allows both user and website anonymization, contributing to the existence of a subset of the deep web known as the hidden web, where illicit drugs can be bought and sold using websites known as cryptomarkets (anonymous markets). The product is paid using anonymous currencies such as BitCoin, and sent to the customer by conventional mail (Barratt, Ferris, & Winstock, 2014). The most popular was Silk Road, launched in February 2011 and shut down by the FBI in October 2013 (Soska & Christin, 2015). However, this operation has failed to stop the phenomenon and since then several other cryptomarkets have emerged, suggesting a high degree of resilience to disruptions (Soska & Christin, 2015).

These new phenomena could transform long standing issues such as the presence of fentanyl derivatives in the drug market. Fentanyl is a synthetic opioid with analgesic and reinforcing effects. It has been used in medicine since the 1960s and has several desirable qualities for anaesthesiology and intensive care, such as: high potency (active doses start at 0.05 mg), rapid onset, and short duration of effects. Since its conception by Paul Janssen in the sixties, numerous derivatives have been synthesized and described in literature (hereinafter “fentanyl”). Some derivatives appeared at the end of the 1970s as designer drugs and produced epidemics of opiate overdoses and deaths (alpha-methylfentanyl, China white) (Buchanan & Brown, 1988). Ocfentanil is one of those derivatives: a potent, non-controlled fentanyl analog first described in a patent from 1986 (Bao-Shan Huang et al., 1986) and evaluated in humans in 1989 (code name A-3217) but never marketed (Fig. 1). It exhibits analgesia and respiratory depression in a dose-related manner. Both effects peak at 6 min; analgesia largely disappears after one hour, while respiratory depression tends to last longer (Glass, 1989). Effects of 3 mcg/kg of ocfentanil are considered similar to those of 5 mcg/kg of fentanyl, with respect to cardiovascular response to tracheal intubation (Fletcher,

Sebel, Murphy, Mick, & Fein, 1991). Such potency poses a high risk of overdose if used recreationally, due to the difficulty to dose properly.

Unfortunately, some of the attributes that make these drugs valuable medicines are also responsible for their remarkable potential for abuse, dependence, and overdose. Misuse of fentanyl is a major and growing concern in several countries such as the USA (United States Drug Enforcement Administration, 2015; Mercado-Crespo, Sumner, Spelke, Sugerman, & Stanley, 2014), Canada (Fischer, Jones, Urbanoski, Skinner, & Rehm, 2014), Australia (Roxburgh et al., 2013), and Estonia (European Monitoring Center for Drugs and Drug Addiction, 2014), where it is endemic. In the USA, fentanyl-related deaths have recently been shown to be on the rise (NDEWS, 2015). Communication of previously non-reported adverse effects of fentanyl illicit use, such as chest wall rigidity, may be related to its increase in availability and in intravenous route of administration (Burns, DeRienz, Baker, Casavant, & Spiller, 2016). Reports about marketing through the conventional Internet of non-controlled derivatives of fentanyl, such as butyrfentanil and 4-fluoro-butyrfentanil (Backberg, Beck, Jonsson, & Helander, 2015), and the presence of acetylfentanyl and butyrfentanyl in cryptomarkets (Caudevilla et al., 2016), are especially disturbing due to the high harm associated with these substances (Mounteney, Giraudon, & Denissov, 2015). Another worrying trend is the use of fentanyl derivatives to adulterate heroin, which started three decades ago (Buchanan & Brown, 1988), and has persisted until today (Mounteney et al., 2015).

This case study features an old problem (adulteration of heroin with fentanyl derivatives) in a new context (the hidden web) with a novel substance (ocfentanil). The aims of this paper are to report the presence of ocfentanil in samples sold as heroin in the hidden web, summarize the effects reported by users, and discuss the implications of these findings.

## Methods

### Collection of samples

For this study, we selected all heroin samples allegedly bought from the hidden web and submitted by users to a Spanish non-governmental organization (NGO) for analysis, whose chemical composition contained ocfentanil. Energy Control is a harm reduction project belonging to the NGO “Asociación Bienestar y Desarrollo.” Energy Control’s aim is to provide information and counselling to people who intend to consume drugs. Energy Control offers a free and anonymous drug checking service to Spanish nationals and charges a fee for international samples. Spanish nationals can bring their samples to one of the 4 Energy Control headquarters (Madrid, Catalonia, Balearic Islands and Andalucía), send them by mail, or submit them during outreach work in nightlife settings, such as music festivals, clubs, and underground raves. Energy Control’s drug checking service has a three-fold purpose: (1) make contact with drug users that would not normally approach drug programs and which are usually concerned with how the consumption, adulteration, and purity of their products affect their health; (2) use this service as an educational and harm/risk reduction tool by getting in touch with consumers and providing them with individual and personalized information about the substance they may consume; (3) monitor the illegal market detecting new trends of drugs and drugs use and make this information available to all stakeholders involved. Additionally, analysis of both national and international samples received, although not being an exact reflection of the market, contributes to our understanding of what is happening at the street level.

As ocfentanil was being detected, the result was sent to the users who submitted the sample, along with a warning about the

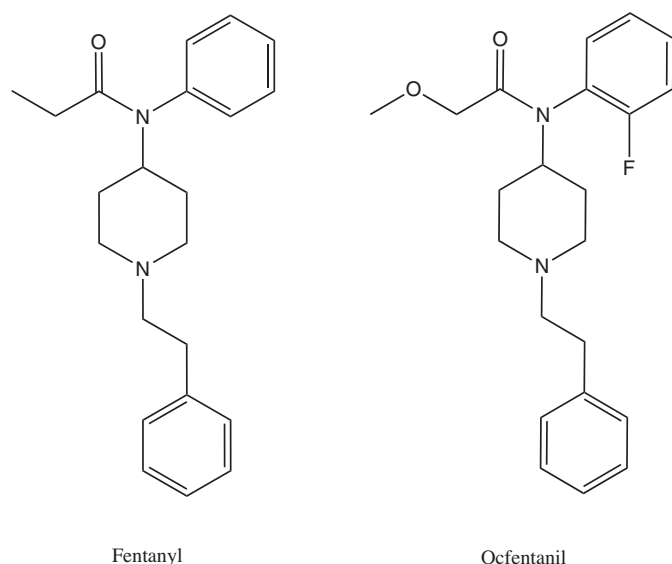


Fig. 1. Chemical structure of fentanyl and ocfentanil.

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