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Fentanyl is used in Mexico's northern border: current challenges for drug health policies

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ABSTRACT

Background and Aims Results from a recent study among 750 heroin users in three Mexico's northern border cities revealed an increase in white powder availability (also known as China white) and preference for this product among heroin users, as well as a general perception of increased overdose cases among this population. Here, we questioned whether those findings reflect an increased presence of heroin laced with fentanyl, which is associated with greater risks of overdose but that, until now, has not been described in Mexico. **Design** We tested fentanyl using highly sensitive test strips in syringe plungers, metal cookers and drug wrappings associated with heroin use. **Setting** Three injection sites in Tijuana, Baja California, México. **Participants** Eighty-nine heroin users who interchanged paraphernalia for new syringes. **Measurements** We tested 59 residues of 'pure' white powder. The rest were white powder with black tar ($n = 5$) or white powder with crystal meth ($n = 9$), black tar with crystal meth ($n = 1$), black tar only ($n = 13$) and crystal meth only ($n = 2$). **Findings** Users believed that they consumed either white powder heroin, white powder heroin with crystal meth, white powder with black tar heroin or black tar heroin only. Analyses revealed that 93% ($n = 55$) of the 'pure' white powder samples had fentanyl. All ($n = 9$) the white powder samples mixed with crystal meth and 40% ($n = 2$) of the white powder with black tar were also laced with fentanyl. **Conclusions** In a sample of 89 heroin users in Mexico, most white powder heroin users were unknowingly exposed to fentanyl, with fentanyl detected in 93% of white powder samples.

Keywords China white, drug checking, fentanyl, heroin, Mexico's northern border, white powder.

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INTRODUCTION

Mexico shares a porous border with the United States because of economic exchange, migration, constant mobility among populations and drug use dynamics. Heroin use has increased in both countries; in particular, there has been an increase in heroin laced with fentanyl misuse and fatal overdose cases in the United States [1]. According to the latest National Household Survey on Drug Use (2016) in Mexico, the annual prevalence of heroin use in the general population is 0.1% (approximately 130 000 individuals) [2], and data of injected heroin users have been documented in every state, with Sonora, Baja California and Chihuahua being the most severely affected [3].

Between October 2017 and March 2018, we conducted a rapid assessment study in treatment centers and consumer sites among 750 heroin users in three northern border cities: Tijuana, Baja California (Tij), San Luis Río Colorado, Sonora (SLRC) and Ciudad Juárez, Chihuahua (CJ). The aim was to determine heroin use patterns, associated risk practices and overdose cases [4]. We found that 83.2% of the respondents used black tar heroin, 20.6% brown powder and 7.7% white powder heroin. Tij was the city where white powder use was more prevalent (13%), followed by SLRC (8%) and CJ (2%). Regarding fentanyl, most users said that they had no information about it. Only nine of the 750 people interviewed mentioned having ever used fentanyl: four in the United States, two in Tij and one in CJ. Those users described fentanyl as a white

powder with stronger, more pleasant effects than heroin [4]. Among those who did not report fentanyl use, there was nevertheless a general perception that heroin had become more potent and had caused more overdose cases. We questioned whether this perceived increase was related to the presence of fentanyl in heroin doses, which is associated with greater risk of overdose but that, at present, has not been described in Mexico; therefore, in the present study we determined if heroin, in its different presentations (white power, black tar and a mixture of both), is laced with fentanyl in Tijuana.

MATERIALS AND METHODS

First, we identified three locations known for white powder injection in Tijuana. Due to security reasons, we avoid exposing users and researchers to handling drugs for analysis. Instead, our research team collected paraphernalia weekly, from March 2018 to July 2019, through a needle exchange program. Then, we tested fentanyl in a convenience sample of 89 drug residues extracted from syringe plungers, metal cookers and drug wrappings. Of these samples, 59 were 'pure' white powder. The rest were white powder with black tar ($n = 5$) or with crystal meth ($n = 9$), black tar with crystal meth ($n = 1$), black tar only ($n = 13$) and crystal meth only ($n = 2$). For drug checking, we used 46 BTNX (Ontario, Canada) [5] and 34 CERTUM (China Diagnostic) [6] fentanyl test strips, originally designed to be used in urine testing. There is evidence that BTNX fentanyl strips are highly effective in detection of fentanyl and fentanyl analogues in street drug samples (FORECAST Study, 2018) [7], with sensitivity and specificity close to 100% and a minimal detection level of 130 ng/ml, which is comparable to Raman spectroscopy (i.e. TruNarc) machine and Fourier-transform infrared spectroscopy machine (i.e. Bruker Alpha). The CERTUM strips have an even lower fentanyl detection level (20 ng/ml), but there is less scientific evidence supporting their use. To counteract this limitation, we blindly cross-checked five samples with both fentanyl strips that were randomly selected and found identical results.

The procedure for testing was as follows: (1) a pipette was used to extract the liquid drug residue directly from metal cookers, syringe plungers or drug wrappings; (2) the drug residue was diluted in 30 ml of purified water and thoroughly mixed; (3) BTNX testing strips were directly placed in this solution; for Certum strips, three drug drops were placed on the testing cassette. After approximately 1 minute, the results were read and interpreted (one line: positive, two lines: negative).

The research team was trained to handle paraphernalia and to perform the extraction maneuver in accordance with the safety protocol of the Official Mexican Standard on Infectious Bio-Hazardous Residues Management (RPBI) in order to avoid accidental needle-stick injuries. All the information captured was anonymous and restricted solely to the sampling of the substance used, the paraphernalia tested, date and place. The study was approved by the Ethics and Research Committee of the National Institute of Psychiatry Ramón de la Fuente Muñiz.

RESULTS

We found that 93% of the China white samples had fentanyl (55 of 59), as did all samples of white powder mixed with crystal meth (nine of nine) and 40% of white powder with black tar (two of five). Pure black tar samples had no fentanyl. According to virtually all users, China white has become more available and is gradually replacing black tar in injection locations. The cost of white powder is equivalent to a dose of heroin black tar, which is approximately $2.5 $US.

From November 2018 to April 2019 our research team witnessed 20 overdose cases, and intervened to reverse them with 0.4 mg/ml naloxone hydrochloride (Hospira, Inc. Lake Forest, IL, USA). In 10 cases, naloxone had to be injected twice. We were able to recover the paraphernalia associated with five of these overdoses and all five were positive for fentanyl. These cases were additional to the 89 originally selected.

DISCUSSION

This study has not been pre-registered on a publicly available platform and the results should be considered exploratory. Our findings show that, unbeknown to PWID, the white powder used in Tijuana as heroin (usually referred as China white) is frequently laced with fentanyl. These data agree with international evidence showing that fentanyl may be present in users' doses without their knowledge [8,9]. The finding that 93% of the white powder samples tested positive for fentanyl, but none of the black tar samples did, suggests that black tar is more difficult to adulterate, which could explain why the white powder presentation is replacing the black tar heroin that has been traditionally used in this region. In recent months, several newspapers have pointed out Tijuana as a destiny city in the traffic route of fentanyl to California [10–12]; with this field study, we provide evidence that fentanyl is also being used.

One of the most accurate routes for the early detection of drugs recently incorporated into the market are field studies with drug checking, harm reduction strategies, epidemiological surveillances and public health monitoring [13–15]. Our results confirm the usefulness of drug checking in residues from syringe plungers [16], and standardized the procedure in order to use fentanyl strips to residues obtained from metal cookers and drug wrappings. This is

convenient, because the use of paraphernalia instead of drugs lowers the risk for users and research teams, especially in locations permeated by insecurity and violence.

In the present study, test strips were effective for fentanyl detection in heroin samples and novel in the Mexican context. Drug checking should extend to other border cities to undertake studies with a larger scope, because fentanyl-related overdoses and other associated damages are likely to spread. Additional studies are also required to confirm the presence not only of this opioid, but also of more potent analogues and other adulterants. As this pilot study shows, other severe forms of damage are caused to the health of people who inject drugs (PWID), such as severe skin lesions.

These results have several implications for health drug policies in Mexico. They constitute an epidemiological warning that should force government institutions and civil society organizations to act in a coordinated, rapid and effective way to support and protect PWID from the fatal consequences of fentanyl use. Also, these results highlight the importance of developing an early surveillance system for the systematic detection of fentanyl use, fatal and non-fatal overdose cases and admission to and discharge from treatment.

Declaration of interests

None.

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References

1. Centers for Disease Control and Prevention. Understanding the Epidemic [internet]. USA: Centers for Disease Control and Prevention, National Center for Injury Prevention and Control, Division of Unintentional Injury Prevention; 2018 Available at: https://www.cdc.gov/drugoverdose/epidemic/index.html (accessed 27 August 2019).
2. Villatoro J. A., Resendiz E., Mujica R., Bretón M., Cañas V., Soto I. S. *et al*. Encuesta Nacional de Consumo de Drogas, Alcohol y Tabaco (ENCODAT) 2016–2017: Reporte de Drogas (National Survey on Drug, Alcohol and Tobacco Consumption (ENCODAT) 2016-2017:Drug Report). [internet], version 1.0. Mexico City: INPRFM y la Secretaría de Salud (National Institute of Psychiatry Ramon de la FuenteMuñiz) 2017. Available at: https://drive.google.com/file/d/1zIPBiYB3625GBGIW5BX0TT_YQN73eWhR/view (accessed 20 August 2019).
3. Health Secretary, National Addictions Council. Observatorio Mexicano de Drogas (Mexican Drug Observatory). Informe sobre el consumo de drogas inyectables (Report on injecting drug use 2017) 2017 [internet]. Mexico: National Addictions Council. Available at: https://www.gob.mx/salud/conadic/acciones-y-programas/observatorio-mexicano-de-drogas-omd (accessed 27 August 2019).
4. Fleiz C., Domínguez M., Villatoro J. A., Vázquez F., Zafra E., Sánchez R., *et al. Cuqueando la chiva: Contextos del consumo de heroína en la frontera norte de México (Cuqueando la chiva: Contextsof heroinuse on the northern border of Mexico)*, 1st edn. Instituto Nacional de Psiquiatría Ramón de la Fuente Muñiz (National Institute of Psychiatry Ramon de la Fuente Muñiz): Mexico City; 2019.
5. BTNX Inc. Rapid response Fentanyl *(FYL)* test strip [internet]. Canada: 2018. Available at: http://www.btnx.com/Product?id=2002 (accessed 25 August 2019).
6. Certum Diagnostics. Prueba para FYL en tira (orina) [FYL test on strip (urine)]. CERTUM Diagnostics: Nuevo León; 2018. Available at: https://drive.google.com/file/d/18Vl1svSpJ5ZvqtrZSEhQW_rP-5zIfoQ5/view (accessed 29 August 2019).
7. Johns Hopkins Bloomberg School of Public Health. Fentanyl overdose reduction checking analysis study [internet]. United States; 2018. Available at: https://americanhealth.jhu.edu/sites/default/files/inline-files/Fentanyl_Executive_Summary_032018.pdf (accessed 3 August 2019).
8. Amlani A., McKee G., Khamis N., Raghukumar G., Tsang E., Buxton J. A. 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 Reduct J* 2015; **14**: 12–54.
9. Ciccarone D., Ondocsin J., Mars S. Heroin uncertainties: exploring users' perceptions of fentanyl-adulterated and substituted heroin. *Int J Drug Policy* 2017; **46**: 146–55.
10. Espino M. Detectan 13 rutas de tráfico de fentanilo, droga más potente que la heroína [Mexican authorities detect 13 fentanyl trafficking routes] [internet]. México: El Universal (The Universal); 2019. Available at: https://www.eluniversal.com.mx/nacion/detectan-13-rutas-de-trafico-de-fentanilo (accessed 28 August 2019).
11. Gandaria M. Fentanilo, la nueva epidemia que infectará a México [Fentanyl, the new epidemic that will infect Mexico] [internet]. Mexico: El Sol de México (The Sun of Mexico); 2019. Available at: https://www.elsoldemexico.com.mx/mexico/sociedad/fentanilo-epidemia-frontera-estados-unidos-3102057.html (accessed 28 August 2019).
12. AFP. Autoridades de EU incautan 115 kilos de fentanilo en frontera con México [US authorities seize 115 kilos of fentanylborder with Mexico] [internet]. Mexico: El Universal (The Universal); 2019. Available at: https://www.eluniversal.com.mx/mundo/autoridades-de-eu-incautan-115-kilos-de-fentanilo-en-frontera-con-mexico (accessed 28 August 2019).
13. Tupper K. W., McCrae K., Garber I., Lysyshyn M., Wood E. Initial results of a drug checking pilot program to detect fentanyl adulteration in a Canadian setting. *Drug Alcohol Depend* 2018; **190**: 242–5.
14. Beletsky L. 21st century cures for the opioid crisis: promise, impact, and missed opportunities. *Am J Law Med* 2018; **44**: 359–85.

15. Martins D., Barratt M. J., Pires C. V., Carvalho H., Vilamala M. V., Espinosa I. F., *et al*. The detection and prevention of unintentional consumption of DOx and 25x-NBOMe at Portugal's boom festival [internet]. *Hum Psychopharmacol* 2017; **32**; e2608, https://doi.org/10.1002/hup.2608

16. Néfau T., Charpentier E., Elyasmino N., Duplessy-Garson C., Levi Y., Karolak S. Drug analysis of residual content of used syringes: a new approach for improving knowledge of injected drugs and drug user practices. *Int J Drug Policy* 2015; **26**: 412–9.