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GC-MS confirmation of Xylazine (Rompun), a veterinary sedative, in exchanged needles

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Abstract

In order to assess the extent of Xylazine (Xyz) injection in Puerto Rico, two waves of used-syringe collections were performed. In the first, syringes were gathered, anonymously and without additional information; in the second, a short interview, also anonymous, was administered. We found Xyz in 37.6% of the collected syringes; the majority of the Xyz-containing syringes came from ranching communities. Syringes containing Xyz more frequently also contained “speedball” than those without (90.6% and 66.7%, respectively). Self-reports of Xyz injection deviated markedly from actual detection: only 50% (self-described users) and 22% (self-described non-users) of the collected syringes contained the drug. With a high prevalence of skin ulcers (38.5% vs. 6.8%, $p < 0.001$), Xyz users were more likely to be in poor health compared to non-users. Surprisingly, though a higher percentage of Xyz users than non-users had college-level educations (23.1% vs. 5.5%), they were more likely to be homeless (64.1% vs. 37%).

Keywords

xylazine; speedball; injection; Puerto Rico

1. INTRODUCTION

Injection drug use is widespread in Puerto Rico (PR) and has been associated with a number of social, economic, criminal, and health problems with “speedball”, a cocaine/heroin mixture, being the drug of choice (Hansen et al. 2004; Finlinson et al. 2005; Perez et al. 2005; Colon et al. 2006). The use and consequences of speedball are well documented (Colon et al. 2001; Alegria et al. 2004; Finlinson et al. 2006), but the extent to which it is co-injected with other drugs is not.

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Employees of a local health-risk reduction program visiting a shooting gallery observed that several injecting drug users (IDUs) were disoriented and had trouble standing; many had open skin ulcers. As part of an existing needle-exchange program (NEP), syringes were collected from the IDUs. Analyzing the contents of the syringes by gas chromatography/mass spectroscopy (GC/MS) revealed the presence of heroin, cocaine, and Xylazine (Xyz), a veterinary analgesic, sedative, and muscle relaxant.

In order to assess the extent of Xyz use in PR, two waves of syringe collections were performed and the contents of the syringes analyzed. The results reveal varying degrees of Xyz/speedball abuse in different parts of PR.

Though there are reports on acute toxicity induced by Xyz injection or inhalation (Spoerke et al. 1986; Mittleman et al. 1998; Capraro et al. 2001; Hoffmann et al. 2002), and a single case report of Xyz-Ketamine abuse (Arican et al. 2004), no information exists regarding the prevalence of chronic Xyz abuse and its resulting health consequences, particularly when co-used with speedball.

2. MATERIALS AND METHODS

2.1. Used-syringe collection

Used syringes were collected in two waves from IDUs at 29 sites located in 11 municipalities (Arecibo – 1 site, Cidra – 1, Coamo – 3, Guayama – 2, Guánica – 2, Juana Díaz – 1, Loiza – 1, Mayagüez – 1, Ponce – 6, San Juan – 8, and Yauco – 3). Two NEPs managed the collection procedures: the PR Community Research Initiative and Proyecto Amor que Sana. The first wave ran from October to November, 2005; the second, March – April, 2007.

After the first wave, 22 sealed containers containing exchanged syringes (without identifying information) were delivered to the laboratory by NEP staff members. Ten syringes each were chosen at random from 21 containers; an additional 50 syringes were taken from Arecibo, where the evidence for Xyz abuse was first detected.

In the second wave (targeting eight of the 11 original towns), two syringes and a short questionnaire were received from each of the 117 participants; the syringes and questionnaires were matched solely by coded numbers, assuring anonymity—thus exempting the study protocol from the full review requirements of the Institutional Review Board of the Ponce School of Medicine (FWA00000345). Containers and questionnaires were delivered to the laboratory. All of the syringes collected were tested.

In both waves, each syringe (together with second-wave questionnaire) was assigned a bar-code number. Data entry and analysis were conducted using the bar-codes.

2.2. Drug detection/identification

The contents of each syringe were extracted with methanol; drugs were identified by a modification of our GC/MS procedure (Tellado et al. 1997). Briefly, the extracts were evaporated overnight at 40°C and derivatized with 50 µl of N, O-bis(trimethylsilyl)-trifluoroacetamide (BSTFA) and 50 µl of acetonitrile by heating 30 min at 60–70°C. GC/MS analysis was performed by an Agilent 6890 Series GC System coupled with an Agilent 5973 Network Mass Selective Detector, using ultra-pure-grade Helium as the flow gas sent through an HP-5MS capillary column. Data were acquired in full-scan mode; compounds were identified from the program data bank.

2.3. Interview data

Participants in the second wave answered a short, anonymous questionnaire that ascertained the respondent's age, gender, education, municipality of residence and length of residence at current address, and years of drug injection; in addition, respondents were asked to assess their health. Questions were asked to evaluate awareness of the effects and side effects of Xyz. Participants were asked whether, to their knowledge, their syringes contained Xyz. Finally, the NEP staff conducting the interviews recorded whether the participants had visible skin ulcers; if no ulcers were visible, participants were asked about ulcers in clothed areas.

2.4. Statistical analyses

Categorical variables were compared using Z-test. Continuous variables were compared using one-way analysis of variance (ANOVA) or the t-test.

3. RESULTS

3.1. The presence of Xyz in syringes

No drugs were detected in 2/260 of the first wave samples and 5/117 pairs of syringes collected in the second wave; these samples were excluded. Xyz was found in 100/258 (38.7%) of the first and in 39/112 pairs (34.8%) of the second wave samples. ANOVA revealed consistent patterns of drug use from one collection wave to the next. No significant between-site differences were found except in San Juan, which was subdivided into two sectors based on the frequency of Xyz use: 12/35 (34%) in four sites, and 35/38 (92%) in another four. Xyz use was highly prevalent in the "cattle-farming" towns of Arecibo (98%), Yauco (100%), and Guánica (100%), but was significantly less so ($p < 0.001$) in other areas such as Ponce (8.6%) and Cidra (10%).

3.2. The co-presence of other drugs

GC/MS analysis demonstrated that Xyz was most often used in combination with speedball. Out of 139 syringes containing Xyz, speedball was found in 126 (90.6%); cocaine (without heroin) was co-present in only 10 (7.2%), heroin (without cocaine) in 3 (2.2%). [From this point forward, all references to cocaine and heroin refer to one or the other and not a combination of both (i.e., speedball).] In contrast, speedball, cocaine, and heroin was found in 154 (66.7%), 74 (32.2%) and 3 (1.3%) of 231 syringes without Xyz, respectively.

When present, Xyz levels varied greatly (from $10^4 \sim 10^5$ to $>10^7$ units) from city to city. Generally, greater quantities of Xyz were found in the syringes collected from municipalities having a higher prevalence of Xyz use.

3.3. Demographic comparisons of Xyz users and non-Xyz users

Characteristics of IDUs returning syringes with Xyz (Xyz users) and those returning syringes without (non-Xyz users) are shown in Table 1. Regarding age, age at first injection, and number of injections per day, there was no significant differences between the two groups. Compared to non-users, however, Xyz users were more likely to have a college education ($p = 0.05$), and to be homeless ($p = 0.006$). Xyz users were also more likely, though statistically not significant, to be female ($p = 0.111$). Non-Xyz users in contrast were likely to have middle school education ($p = 0.03$) but more often possessed their own houses ($p = 0.029$). Of the syringes collected from self-described Xyz users, only 49% (26/53) contained the drug; interestingly, 22% (13/59) of the syringes from self-described non-users also contained Xyz. Regardless of their claims, IDUs whose syringes contained Xyz were more likely to complain of poor health than those whose syringes did not (29/39 vs. 39/73; $p = 0.04$). The former also had a higher incidence of skin ulcers than the latter (15/39 vs. 5/73; $p < 0.001$). When comparing self-described users to

actual users, 34/53 (64.1%) and 28/39 (72%) complained of poor health; 12/53 (22.6%) and 15/39 (38.5%) had skin ulcers, respectively. Proven Xyz abuse was somewhat more directly associated with poor health conditions than self-described use. Slightly higher prevalence of skin ulcer was noted in homeless (than total) Xyz users (12/25 vs. 14/39) or non-Xyz users (3/27 vs. 5/73).

4. DISCUSSION

Xyz, a veterinary analgesic, sedative, and muscle relaxant, is used on large animals such as horses and cattle. A recent survey (Hewson et al. 2007) revealed Canadian veterinarians' widespread use of Xyz for pain reduction and for improving the well-being of large animals after surgery, as it induces a sleep-like state characterized by decreased respiratory and heart rates.

An anecdotal case report of (human) Xyz use describes a patient who experienced attacks of fatigue, faintness, and blurred vision (Lewis et al. 1983). Another report details the effects of differing doses of Xyz (Haigh 1988): total collapse leading to respiratory arrest (high dose); feeling "woozy" and numb and losing control of one's limbs (low dose); feeling "hyper" or experiencing peculiar sensations for several hours (minute dose).

Xyz users in our study were observed to suffer physical dysfunctions comparable to those seen in lower doses. Such feelings of "wooziness" may account for the complaints of bad health, while the reported analgesic effects could explain the skin ulcers. Indeed, users of Ketamine (another veterinary analgesic) were reported to have a high incidence of skin ulcers; presumably, the pain of infections resulting from repeated scratching and cutting under the influence of the drug goes unnoticed (Micallef et al. 2003; Wolff & Winstock 2006; <http://www.clearhavencenter.com/substance-abuse-treatment-resources/signs-of-Ketamine-use.php>). In our analysis, Xyz use was singly most closely associated with the presence of skin ulcer. Being homeless, which may compromise their hygiene, only slightly increased the risk of having skin ulcer. There are no reports detailing specific behaviors that might account for the increased incidence of skin ulcers among Xyz users.

Xyz abuse rates are highest in PR's west-central ranching communities. Syringes collected in these areas reflect that fact, containing greater quantities of Xyz than those from other regions. While access to Xyz at agricultural supply stores is legally controlled, apparently it is available on the illicit market. The present study explored neither how users obtain Xyz nor who prepares the Xyz-containing admixtures. Because Xyz content remained fairly consistent within a single collection site (though varying greatly from region to region), it seems likely that local dealers prepare and distribute the Xyz-containing drugs. More detailed analysis of Xyz distribution patterns may help curtail the spread of Xyz abuse.

Speedball was co-present in 90.6% of the syringes that contained Xyz, while 66.7% of the Xyz-free syringes contained speedball. In all, 280/370 (75.5%) syringes had speedball, a prevalence that is consistent with previous estimates in PR (Colon et al. 2001; Alegria et al. 2004; Finlinton et al. 2006). There are a number of acute toxicology reports (Poklis and Mackell 1985; Spoerke et al. 1986; Mittleman et al. 1998; Capraro et al. 2001; Hoffmann et al. 2002; Arican et al. 2004; Elejalde et al. 2003) and anecdotal case descriptions of Xyz abuse (Lewis et al. 1983; Haigh 1988); to our knowledge there are no reports regarding the health consequences of either chronic Xyz use or co-injecting Xyz and speedball. To determine the multiple impacts of these two factors, further studies are required, the results of which are likely to be quite different from those presented in existing literature. Still, one can definitively say that chronic Xyz use is associated with physical deterioration.

Though we found that Xyz users are more likely to be college educated (23.1% vs. 5.5%), and homeless (64.1% vs. 37.1%), the scope of this study precludes a more in-depth analysis of prevailing socio-demographic patterns in PR.

The results presented here must be interpreted with care as they may not precisely represent the overall pattern of Xyz abuse in PR: both waves of syringe collection were limited to sites where participating NEPs routinely conducted needle exchanges—sites selected for programmatic or public policy reasons, rather than for scientific sampling purposes. Consequently, large areas were not included. Nevertheless, both waves of syringe collection yielded almost identical rates of Xyz abuse (the short interview given to second-wave participants did not seem to hinder the collection process), leading to the conclusion that the drug-abuse pattern determined by this study is an accurate portrayal of Xyz abuse in PR. Despite the study's limitations, we find compelling the implications of its findings: that Xyz abuse is not confined to a small area in PR. Unfortunately; there is a dearth of information regarding the pharmacological, epidemiological, and clinical aspects of Xyz injection on the island. Though not officially acknowledged, there have been—to date—three drug-related deaths in PR possibly linked to Xyz overdose; these, coupled with our findings, argue the need for a more thorough investigation of Xyz abuse in PR. It is unclear at present if the observed abuse of Xyz with speedball represents a new trend of drug abuse pattern or how wide spread Xyz abuse is beyond this Caribbean island of PR.

5. LITERATURE CITED

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Table 1

Demographic profiles of and the presence of skin ulcer among Xyz users and non-Xyz users.

	Xyz Users*	Non-Xyz Users*	p-value**
TOTAL NUMBER	39	73	
GENDER RATIO (Female/Male)	10/29	9/64	0.111 (n.s.)
CURRENT AGE*	21–50 (33)	18–61 (34)	ns
AGE WHEN ONE STARTED INJECTION*	12–44 (19)	11–38 (18)	ns
DAILY FREQUENCY OF INJECTIONS*	2–15 (6)	1–15 (7)	ns
EDUCATION LEVEL COMPLETED			
0. None	0 (0%)	2 (2.7%)	ns
1. Elementary School	3 (7.7%)	5 (6.8%)	ns
2. Middle School	6 (15.4%)	25 (34.3%)	0.03
3. High School	21 (53.8%)	37 (50.7%)	ns
4. College	9 (23.1%)	4 (5.5%)	0.05
CURRENT LIVING ARRANGEMENT			
0. On street	25 (64.1%)	27 (37.0%)	0.009
1. In a shelter	0	1 (1.4%)	ns
2. With unrelated person(s)	0 (0%)	5 (6.9%)	ns
3. In a rented room/apartment	1 (2.6%)	0 (0%)	ns
4. With relative(s)	5 (12.8%)	9 (12.3%)	ns
5. With parent(s)	7 (17.9%)	19 (26.0%)	ns
6. In own house	1 (2.6%)	12 (16.4%)	0.029
PREVALENCE OF SKIN ULCERS	15 (38.5%)	5 (6.8%)	<0.001

Information was obtained from 112 addicts who responded to the study questionnaire and who returned at least one syringe that contained detectable amounts of one or more drugs.

* The figures represent the respective ranges and the (median value), respectively.

** Statistical significance was calculated for each category between the two groups by using Z-test (ns: not significant).