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Police custody following driving under the influence of cannabis: A prospective study



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ABSTRACT

Traffic offences are a common cause of detention in police custody. We hypothesized that drug intoxication while driving could correspond to specific medical conditions of the detainees. Our objective was to evaluate medical features and addictive behaviours of suspected drug drivers and to collect data regarding assaults or injuries in these individuals. We conducted a prospective study (April 2010-December 2011) of suspected drug driving arrestees, who were compared to drink drivers or persons aged over 18 detained for other reasons. Data collected concerned persons' characteristics, reported assaults, and observed injuries. A total of 205 drivers were tested positive for drugs in blood, 116 were either positive for drugs in urine or saliva and negative in blood, or negative in urine. Cannabisonly users accounted for 201 of 205 drug drivers (98%). Suspected drug driving arrestees had good overall health rating. Drug drivers were younger than controls and requested more rarely medical examination (12% vs. 44%, P < 0.0001). They were rarely involved in addiction treatment (3%) and reported assaults or presented traumatic injuries less often than drink drivers and controls (8% vs. 38% and 25%, P < 0.0001). Drug drivers were less often alcohol abusers than controls. Their opinion on custody was better than that of controls and they were considered unconditionally fit for detention more frequently (99% vs. 77%, P < 0.0001). We conclude that arrested drug drivers were young, healthy, and infrequently reported assaults or presented traumatic injuries, which does not put them in a high risk medical condition. Medical care could include brief interventions on addictive behaviours.

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1. Introduction

Increased attention has focussed on driving under the influence of psychoactive substances in recent years (see, for example, [1,2]). Acute cannabis consumption is associated with an increased risk of a motor vehicle crash, especially for fatal collisions [3]. In France in 2001–2003, 7% of drivers involved in fatal road crashes were positive for cannabis [4] and 6% of drivers involved in road crashes in a series from Italy were positive for drugs, mostly opiates, cannabis, and cocaine [5]. In a survey evaluating the prevalence of drug driving in British Columbia, 10% of randomly selected drivers were tested positive for cannabis in oral fluid [6]. Driving under the influence of cannabis is associated with the perpetration of serious road-rage behaviour, as well as experiencing road-rage victimization and perpetration [7].

Police custody is a detention in response to a suspicion of crime or if the police have 'reasonable grounds' to suspect that someone has committed an offence. Drug driving is a crime. Legal assessment of drug intoxication is based on blood testing. First, police officers expect the driver to perform oral fluid or urine testing. If the screening test is positive, a physician is required for blood testing. The presence of illegal drugs in blood indicates recent use and blood testing is the only available test currently considered by law to prove drug driving. Urine and blood testing are performed during police custody. Few medical data relate to drug issues in police custody [8-11]. Custody following driving under the influence of drugs has never been studied. A recent study showed that detained drink drivers required special medical attention, as about 30% of them had recent traumatic injuries [12]. We hypothesized that drug intoxication while driving could correspond to specific medical conditions of the detainee. Our objective was to evaluate medical features and addictive behaviours of detainees held in police custody for drug driving and to collect data regarding reported assaults or observed injuries in these individuals.

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2. Methods

2.1. Study population

We conducted a prospective monocentric study (April 23, 2010-December 31, 2011) in the forensic medicine unit of a university teaching hospital in France. Physicians from this unit examine arrestees and collect their biological samples from a department with a population of 1.5 million people. We included all patients aged 18 or more held in police custody for proven or suspected driving under the influence of drugs, examined by a physician for assessment of fitness for detention or for urine testing or blood sampling, and for whom our laboratory of forensic toxicology was requested for blood drug testing. According to French law, any persons placed in police custody may, at their request, be examined by a doctor. A medical examination can be also performed at the request of a police officer or of the person's family [13]. We excluded all patients who refused or could not give urine sample and those tested positive for drugs in urine who refused blood test.

2.2. Drug detection process

Detection and quantification of cannabinoids in blood were performed as previously described with minor modifications [14,15]. Deuterated tetrahydrocannabinol (THC-d3), deuterated 11-hydroxy-THC (11-OH-THC-d3) and deuterated 11-nor-9carboxy-THC (THCCOOH-d3) were used as internal standards. The derivatization procedure for the gas chromatography-mass spectrometry (GC-MS) analysis used trimethylsilyl (TMS) derivatives. Analysis was accomplished by selected ion monitoring (SIM) of ions at m/z 386 and 271 for THC, m/z 389 and 374 for THC-d3, *m*/*z* 371 and 474 for 11-OH-THC, *m*/*z* 374 and 477 for 11-OH-THC-d3, m/z 371 and 473 for THCCOOH, and m/z 374 and 476 for THCCOOH-d3. The intra-day and inter-day precision studies showed coefficients of variation (CVs) <3% and <5%, respectively. Coefficients of determination (r^2) were >0.99. The limits of detection (LOD) were 0.25 ng/mL for THC and 11-OH-THC, and 1.0 ng/mL for THCCOOH. The limits of quantitation (LOQ) were 0.5 ng/mL for THC and 11-OH-THC, and 2.0 ng/mL for ТНССООН.

Cocaine and related metabolites were detected and quantified in blood as previously described, with minor modifications [16]. Deuterated cocaïne (cocaïne-d3), deuterated benzoylecgonine (benzoylecgonine-d3) and deuterated cocaethylene (cocaethylene-d3) were used as internal standards. The derivatization procedure for the GC–MS analysis used TMS derivatives. Analysis was accomplished by SIM of ions at *m*/*z* 182, 303, and 198 for cocaine, *m*/*z* 185 and 306 for cocaine-d3, *m*/*z* 240, 361, and 256 for benzoylecgonine, *m*/*z* 243 for benzoylecgonine-d3, *m*/*z* 196, 317, and 272 for cocaethylene, and *m*/*z* 199 for cocaethylene-d3. The intra-day and inter-day precision studies showed CVs <6% and <7%, respectively. Coefficients of determination (r^2) were >0.99. The LOD were 5.0 ng/mL for cocaine, benzoylecgonine, and cocaethylene. The LOQ were 10.0 ng/mL for cocaine, benzoylecgonine, and cocaethylene.

Opiates were detected and quantified in blood as previously described, with minor modifications [17]. Deuterated heroin (heroin-d9), deuterated 6-monoacetylmorphine-d3, deuterated codeine (codeine-d3), and deuterated morphine (morphine-d3) were used as internal standards. The derivatization procedure for the GC–MS analysis used TMS derivatives. Analysis was accomplished by SIM of ions at m/z 371, 234, and 78 for codeine, m/z 374 and 237 for codeine-d3, m/z 429, 236, and 414 for morphine, m/z 432 and 239 for morphine-d3, m/z 399, 340, and 287 for 6-monoacetylmorphine, m/z 402 and 343 for 6-monoacetylmorphine-d3, m/z 369 and 327 for

heroin, and m/z 378 and 334 for heroin-d9. The intra-day and interday precision studies showed CVs <3% and <4%, respectively. Coefficients of determination (r^2) were >0.99. The LOD were 5.0 ng/ mL for heroin, 6-monoacetylmorphine, morphine, and codeine. The LOQ were 10.0 ng/mL for heroin, 6-monoacetylmorphine, morphine, and codeine.

Amphetamines were detected and quantified in blood as previously described, with minor modifications [18]. Deuterated amphetamine (amphetamine-d5), deuterated methamphetamine (methamphetamine), and deuterated 3,4-methylenedioxy-methamphetamine (MDMA-d5) were used as internal standards. The derivatization procedure used heptafluorobutyric acid derivatives. Analysis was accomplished by SIM of ions at m/z 123 and 240 for amphetamine-d5, m/z 118, 91, and 240 for amphetamine, m/z 258 for metamphetamine-d5, m/z 254, 210, and 91 for metamphetamine, m/z 258 for MDMA-d5, and m/z 254, 389, and 162 for MDMA. The intra-day and inter-day precision studies showed CVs <2% and <5%, respectively. Coefficients of determination (r^2) were >0.99. The LOD were 10.0 ng/mL for amphetamine, methamphetamine, and MDMA. The LOQ were 20.0 ng/mL for amphetamine, methamphetamine, and MDMA.

All the drivers involved were taken as soon as possible to the hospital. We considered urinary screening for drugs as positive above a concentration of 1000 ng/mL for amphetamines, 300 ng/mL for cocaine and opiates, and 50 ng/mL of tetrahydrocannabinol for cannabis. We considered blood tests, using gas chromatogra-phy-mass spectrometry, positive above 50 ng/mL for amphetamines and cocaine, 20 ng/mL for opiates, and 0.5 ng/mL of delta-9 tetrahydrocannabinol for cannabis.

2.3. Measures

During medical examination, we collected data concerning persons' characteristics, their DSM IV-based evaluation of addictive disorders, their own experience of police custody, and reported assaults or observed injuries, as recommended since a national consensus conference [19] and applied in our department [20] (Table 1). We recorded detainees' self-reports of received physical violence, either before being arrested, at the time of the arrest, or during custody. No specific examinations were performed or questions asked for research purposes only.

Perceived health was evaluated by the three global health indicators of the Minimum European Health Module [21]. The question "Do you have a chronic health condition?" could be answered by yes, no, or no opinion expressed. The question "Do you have a severe limitation of at least six months' duration in performing activities people usually engage in?" could be answered by severely limited, limited, or not limited at all, do not know or refusal. The question "How would you rate your overall health?" could be answered by very good, good, fair, bad, very bad, do not know or refusal. Detainee's opinion on custody was requested and rated as very good, good, fair, bad, very bad, do not know or refusal.

2.4. Evaluation

We compared three groups of detainees suspected by police officers to drive under the influence of drugs or alcohol. Drivers tested positive for drugs in both urine and blood, i.e. legally considered as drug drivers, were referred to as group 1. Drivers tested either positive for drugs in urine and negative in blood or tested negative in urine, i.e. who at the time of arrest were suspected to drive under the influence of drugs, but who later revealed not to be under the influence, were referred to as group 2. Drink drivers, evaluated by alcohol blood testing, were referred to as group 3.

Table 1Characteristics for all drivers.

	Drug drivers, n (%)	Wrongly suspected drug drivers, <i>n</i> (%)	Drink drivers, n (%)	Control group, n (%)	P value ^a (Chi2)
Total population	205	116	231	2427	
M/F	197/8	115/1	223/8	2261/166	0.006 (12.3)
	(96)	(99)	(97)	(93)	
Median/mean age	25/26	29/31	36/34	28/31	<0.0001, <i>F</i> =20.2
Exam requested by the detainee	23 (12)	13 (12)	26 (12)	944 (44)	<0.0001 (177.9)
First custody	38 (20)	38 (37)	83 (41)	617 (30)	<0.0001 (21.2)
Detainee's opinion on custody ^b	92 (58)	58 (60)	95 (54)	1028 (45)	<0.0001 (21.6)
Medical history and perceived health status					
Chronic somatic illness	15 (7)	22 (19)	45 (20)	353 (15)	0.001 (15.7)
Chronic psychiatric illness	3 (1)	4 (3)	17 (8)	138 (7)	0.01 (10.8)
Chronic health condition ^c	15 (7)	21 (18)	43 (19)	458 (21)	<0.0001 (23.4)
Functional limitation ^d	4 (2)	3 (3)	7 (4)	188 (10)	< 0.0001 (21.2)
Overall health rating ^b	165 (91)	93 (91)	168 (80)	1647 (82)	0.001 (15.7)
Addictive behaviours					
Daily alcohol consumption	10 (5)	11 (10)	51 (24)	228 (20)	<0.0001 (35.3)
Alcohol abuse	19 (13)	28 (29)	71 (33)	392 (37)	<0.0001 (37.1)
Alcohol dependence	3 (2)	2 (2)	18 (9)	91 (9)	0.005 (13.0)
Nicotine dependence	124 (62)	41 (37)	153 (69)	941 (61)	<0.0001 (33.2)
Cannabis consumption	188 (94)	31 (28)	49 (23)	590 (24)	<0.0001 (439.5)
Cocaine consumption	8 (4)	4 (4)	2 (1)	68 (3)	0.19
Heroin consumption	1(1)	0 (0)	1 (0)	23 (1)	0.87
Addiction treatment	6 (3)	5 (5)	6 (3)	97 (5)	0.43
Assaults and injuries					
Reported assaults	12 (6)	16 (14)	64 (29)	458 (21)	<0.0001 (39.2)
Before being arrested	1(1)	1 (1)	10 (9)	193 (9)	< 0.0001
While being arrested	7 (4)	8 (7)	39 (36)	260 (13)	<0.0001 (72.8)
During custody	3 (2)	5 (4)	16 (15)	56 (3)	< 0.0001
Observed injuries	12 (6)	13 (11)	60 (28)	495 (23)	< 0.0001 (42.2)
Reported assaults or observed injuries	16 (8)	19 (17)	85 (38)	583 (25)	<0.0001 (54.6)
Outcome of medical examination					
Treatment administered	42 (21)	30 (26)	65 (29)	1323 (58)	<0.0001 (1969)
Unconditionally fit to be detained	175 (99)	101 (91)	200 (90)	1862 (77)	<0.0001 (72.6)
Unfit to be detained	0 (0)	0 (0)	4 (2)	71 (3)	0.01
indicated percentages were obtained from captured data only and do not include missing data					

ndicated percentages were obtained from captured data only and do not include missing data.

^a Fisher's exact test, Chi-2 or ANOVA, as appropriate.

^b Very good or good opinion.

^c Yes-answer to the following question: "Do you have a chronic health condition?".

^d Severe limitation or limitation.

Controls were persons over 18, consecutively referred to us, held in police custody (June 22, 2010–August 31, 2010) and who were detained for other reasons than suspicion to be driving under the influence of drugs or alcohol (group 4).

2.5. Analysis

We searched differences between all 4 groups. Tests of significance included ANOVA, Fisher's and chi-square tests, as appropriate (GraphPad InStat 3.1 software, San Diego, CA). When overall comparisons showed significant differences, we made subsequent pairwise comparisons. Results were considered significant for *P* values below 0.05.

3. Results

3.1. Patients included

A total of 552 drivers were included, as follows: 205 in group 1, 116 in group 2, and 231 in group 3. Nine drivers of 205 from group 1 (4%) and 2 of 116 from group 2 (2%) were tested positive in oral fluid. The 321 drivers suspected to be under the influence of drugs accounted for 1.2% of all 27,896 detainees over 18 examined in police custody by a physician from our unit during the time of the study (Fig. 1). Control group included 2427 persons. Table 1 presents the characteristics of all

4 groups and overall intergroup comparisons showing significant differences.

3.2. Patients' characteristics

Male predominance was observed in all 4 groups. Mean age ranged from 26 to 34 in the four groups. Lifetime history of police custody, as declared by the arrestees, showed that a majority of detainees from all 4 groups (59–80%) had already been detained in custody.

3.3. Results of drug testing

The median times from the arrest to fluid sampling were 4.0 h in group 1 (range, 0.7–23.0 h; data available in 205 of 205 cases, 100%) and 4.7 h in group 2 (range, 0.7–22.8 h; data available in 77 of 116 cases, 66%).

A total of 204 of 205 drug drivers tested positive for drugs in both urine or oral fluid and blood were positive for cannabis in blood, 2 for cocaine, and 2 for opiates. Cannabis-only positive drivers accounted for 201 of 205 drivers (98%). Median tetrahy-drocannabinol concentrations in blood were 1.9 ng/mL (range: 0.5–20.1, mean: 3.0). In group 2, all 35 drivers tested positive for drugs in urine or oral fluid and negative in blood were positive for cannabis, 2 were positive for cocaine, 1 for opiates, and 1 was positive for amphetamines.



Fig. 1. Flow of included detainees.

3.4. Suspected drug driving arrestees (groups 1 and 2)

Groups 1 and 2 had common characteristics, as follows: marked male predominance (group 1, 197 of 205, 96%; group 2, 115 of 116, 99%) and very good or good overall health rating (group 1, 165 of 182, 91%; group 2, 93 of 102, 91%). Arrested drivers from the two groups requested medical examination more rarely than controls and as infrequently as drink drivers (12, 12, and 12% vs. 44%, P < 0.0001). They had rarer alcohol dependence than drink drivers and controls (3 of 152 [2%] and 2 of 95 [2%] vs. 18 of 204 [9%] and 91 of 1055 [9%], all P < 0.05), received medication less frequently than controls during custody (all P < 0.0001), and were all fit for detention.

3.5. Drug drivers (group 1)

Mean age of drug drivers was lower than all other groups (26 vs. 31, 34, and 31 years, ANOVA: *F* = 20.2, *P* < 0.0001; Tukey–Kramer tests of age differences: 1 vs. 2, mean difference -4.0 years, 0 = 4.3, *P* < 0.05, 95% CI -7.5 to 0.6; 1 vs. 3, mean difference -8.5 years, Q = 10.9, P < 0.001, 95% CI -11.3 to -5.7; 1 vs. controls, mean difference –4.9 years, Q = 8.3, P < 0.001, 95% CI –7.0 to –2.7; 2 vs. 3, mean difference -4.4 years, Q = 4.8, P < 0.01, 95% CI -7.8 to -1.1; 2 vs. controls, mean difference -0.8 years, Q = 1.1, P > 0.05[NS], 95% CI -3.6 to 2.0; 3 vs. controls, mean difference 3.6 years, Q = 6.5, P < 0.001, 95% CI 1.6–5.7). We found marked predominant use of cannabis (group 1, 188 of 200, 94%). A small minority reported addiction treatment (6 of 183, 3%), which did not differ from other groups. Drug drivers were less often alcohol abusers than all other groups (19 of 152 [13%] vs. 28 of 95 [29%], 71 of 215 [33%], and 392 of 1055 [37%], *P* = 0.002, *P* < 0.0001, and P < 0.0001). They also daily consumed alcohol less frequently and were less frequently alcohol-dependent than drink drivers and controls (10 of 196 [5%] vs. 51 of 216 [24%] and 228 of 1130 [20%], *P* < 0.0001 and <0.0001; 3 of 152 [2%] vs. 18 of 204 [9%] and 91 of 1055 [9%], *P* = 0.006 and 0.002). Drug drivers had a chronic health condition less often than all other groups (15 of 205 [7%] vs. 21 of 116 [18%], 43 of 231 [19%], and 458 of 2153 [21%], P=0.006, 0.0009, and <0.0001) and less functional limitation than controls (4 of 163 [2%] vs. 188 of 1870 [10%], *P* = 0.002). They rated their overall health better than drink drivers and controls (very good or good, 165 of 182 [91%] vs. 168 of 209 [80%] and 1647 of 2020 [82%], P = 0.007 and 0.003). However, they were also younger (mean age, 26 vs. 34 and 31, P < 0.001). They reported a chronic somatic illness less often than all other groups (15 of 205 [7%] vs. 22 of 116 [19%], 45 of 225 [20%], and 353 of 2427 [15%], *P* = 0.003, 0.0003, and 0.006) and had a chronic psychiatric illness less often than controls (3 of 205 [1%] vs. 138 of 2093 [7%], P = 0.006).

They reported assaults and presented traumatic injuries or were in either situation less often than drink drivers and controls (12 of 201 [6%] vs. 64 of 222 [29%] and 458 of 2173 [21%], P < 0.0001 and < 0.0001; 12 of 201 [6%] vs. 60 of 218 [28%] and 495 of 2192 [23%], P < 0.0001 and < 0.0001; 16 of 198 [8%] vs. 85 of 225 [38%] and 583 of 2297 [25%], P < 0.0001 and < 0.0001).

Drug drivers had more frequently prior life experience of custody than all other groups (first custody: 38 of 185 [20%] vs. 38 of 104 [37%], 83 of 204 [41%], and 617 of 2086 [30%], P = 0.005, <0.0001, and 0.01).

Drug drivers' opinion on custody was better than controls' (very good or good opinion, 92 of 158 [58%] vs. 1028 of 2291 [45%], P = 0.001). They were considered unconditionally fit for detention more frequently than drink drivers and controls (175 of 177 [99%] vs. 200 of 223 [90%] and 1862 of 2412 [77%], P < 0.0001 and <0.0001).

4. Discussion

In this study, we found that suspected drug driving arrestees had good overall health rating and rarely requested medical examination. Drug drivers were younger than controls. They predominantly used cannabis and were rarely involved in addiction treatment. They also reported assaults or presented traumatic injuries less often than controls. Drug drivers were less often alcohol-dependent or alcohol abusers than controls. Their opinion on custody was better than that of controls and they were considered unconditionally fit for detention more frequently.

The study focused on drug drivers. We comparatively analyzed two subsets of detainees suspected to be driving under the influence of drugs, in order to differentiate patterns of drug using arrestees, whether or not they had recent substance use at the time of driving. Suspected drug users shared the same context of arrest, whatever their actual substance use, and it happens that the crime suspected can play a determining role in the interaction and the relationships between police officers and arrestees [22]. We collected detainees' reports of assaults, most of which were said to occur at the time of arrest or during custody, and recent traumatic lesions.

We found 98% of cannabis-only users, which is higher than the rate of 80% of cannabis-only users identified in a French series on less than 30-year-old drivers killed in a road crash in 2003 [23] and markedly different from other countries. In Sweden, cannabis was found in only 18–30% of blood samples from drug driving suspects, with 15% of these samples showing cannabis alone [24]. In Switzerland, cocaine was found in only 1% of drug drivers in our study.

Drug-driving custody mainly concerned young male adults, as expected and observed in other causes of detention [8,12]. A single woman was wrongly suspected to be drug driving, which could be related to a common representation in police officers that illegal substance users are men, although 30–40% of cannabis consumers are women [26,27]. The low percentage of drug drivers and controls considered unfit for detention after medical examination (0–3% in all groups) was similar to that reported in drink drivers in France and in all detainees in the UK or in the Netherlands [11,12,28].

Most examined drug drivers had experience of police custody, which can be related to their good opinion on custody, since the first custody is commonly associated with significant manifestations of anxiety [29]. Medical examination was rarely performed at the request of suspected drug-driving arrestees and 91% rated their overall health as good or very good. The lower rates of alcohol abuse or chronic health conditions reported by drug drivers, as compared with other groups, can be related to their younger age. Only a small minority of drug drivers (3%) reported to be involved in addiction treatment, which did not differ from controls. Involvement in addiction treatment can be triggered by the perception of substance-related complications by users themselves. Few reports are available on the perception of quality of life by cannabis users. Mental, but not physical quality of life was perceived poorer by cannabis users than non-users in a population-based US epidemiological survey [26]. The low rates of reported assaults and observed injuries in drivers under the influence of cannabis could be related to the decline in aggressive behaviour by cannabis users reported by a number of researchers [30].

This study has some limitations. First, as in any monocentric study, it is unclear how generalizable our findings are to other areas in France or in other countries. Second, we found considerable heterogeneity across THC rates in blood from drug drivers. Moreover, the delay between medical examination or blood sampling and the time of arrest varied from one arrestee to another and was usually unknown to us. Third, a quarter of the patients who were tested positive for cannabis in urine and negative in blood denied use of drugs. In the study by Stark et al. evaluating the validity of self-reported substance misuse amongst detainees in police custody, nearly one half of detainees tested positive for cannabis in urine denied use of drugs [31]. However, these authors conclude that reasonable information can be usually obtained via self-reporting in detainees [31].

The present study originated from findings in drink drivers. Drink-driving detainees, who commonly present traumatic injuries and are reluctant to request medical examination, need special attention from attending physicians in police custody [12]. In the present study, arrested drug drivers were young, healthy, and infrequently reported assaults or presented traumatic injuries, which does not put them in a high risk medical condition. Detention for cannabis-involved driving or for possession of cannabis is misinterpreted by arrestees, who commonly do not consider it as a complication of substance use. Cannabis users do not perceive cannabis use as being associated with increased driving risk [32,33]. Medical care in custody of detainees arrested in relation to substance misuse could include brief interventions on addictive behaviours [34]. Preliminary evaluation of such interventions in our department shows high feasibility.

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Conflict of interest

None declared.

References

- J.M. Walsh, J.J. De Gier, A.S. Christopherson, A.G. Verstraete, Drugs and driving, Traffic Inj. Prev. 5 (2004) 241–253.
- [2] K. Wiese Simonsen, A. Steentoft, T. Hels, I.M. Bernhoft, B.S. Rasmussen, K. Linnet, Presence of psychoactive substances in oral fluid from randomly selected drivers in Denmark, Forensic Sci. Int. 221 (2012) 33–38.
- [3] M. Asbridge, J.A. Hayden, J.L. Cartwright, Acute cannabis consumption and motor vehicle collision risk: systematic review of observational studies and metaanalysis, BMJ 344 (2012) e536.
- [4] B. Laumon, B. Gadegbeku, J.L. Martin, M.B. Biecheler, SAM Group, Cannabis intoxication and fatal road crashes in France: population based case-control study, BMJ 331 (2005) 1371–1374.
- [5] F. Mari, F. Voller, G. Bardazzi, M. Di Padua, L. Politi, M.G. Di Milla, V. Santarlasci, C. Orsini, E. Bertol, Alcohol and illicit drugs among subjects involved in road crashes in Florence, Italy, Indian J. Forensic Med. Toxicol. 3 (2009) 30–32.
- [6] D.M. Beirness, E.E. Beasley, A roadside survey of alcohol and drug use among drivers in British Columbia, Traffic Inj. Prev. 11 (2010) 215–221.
- [7] I. Fierro, C. Morales, F.J. Alvarez, Alcohol use, illicit drug use, and road rage, J. Stud. Alcohol Drugs 72 (2011) 185–193.
- [8] I. McKinnon, D. Grubin, Health screening in police custody, J. Forensic Legal Med. 17 (2010) 209–212.
- [9] J.J. Payne-James, P.G. Green, N. Green, G.M. McLaghlan, M.H. Munro, T.C. Moore, Healthcare issues of detainees in police custody in London, UK, J. Forensic Legal Med. 17 (2010) 11–17.
- [10] S. Heide, D. Stilller, R. Lessig, C. Lautenschläger, M. Birkholz, W. Früchtnicht, Medical examination of fitness for police custody in two large German towns, Int. J. Legal Med. 126 (2012) 27–35.
- [11] M. Ceelen, T. Dorn, M. Buster, I. Stirbu, G. Donker, K. Das, Health-care issues and health-care use among detainees in police custody, J. Forensic Legal Med. 19 (2012) 324–331.
- [12] A. Lepresle, T.S. Mahindhoratep, F. Chiadmi, J. Schlatter, C. Boraud, P. Chariot, Police custody following drink-driving: a prospective study, Drug Alcohol Depend. 126 (2012) 51–54.
- [13] French code of criminal procedure, Article 63-3. http://www.legifrance. gouv.fr/affichCode.do?idSectionTA=LEGISCTA000006151876&cidTexte= LEGITEXT000006071154&dateTexte=20120526 (accessed 23.02.2013).
- [14] C.R. Goodall, B.J. Basteyns, A reliable method for the detection, confirmation, and quantitation of cannabinoïds in blood, J. Anal. Toxicol. 19 (1995) 419– 426.
- [15] W. Huang, D.E. Moody, D.M. Andrenyak, E.K. Smith, R.L. Foltz, M.A. Huestis, J.F. Newton, Simultaneous determination of d9-tetrahydrocannabinol and 11-nor-9carboxy-d9-tetrahydrocannabinol in human plasma by solid-phase extraction and gas chromatography-negative ion chemical ionization-mass spectrometry, J. Anal. Toxicol. 25 (2001) 531–537.
- [16] D. Smirnow, B.K. Logan, Analysis of ecgonine and other cocaine biotransformation products in postmortem whole blood by protein precipitation-extractive alkylation and GC-MS, J. Anal. Toxicol. 20 (1996) 463-467.
- [17] F. Musshoff, T. Daldrup, Evaluation of a method for simultaneous quantification of codeine, dihydrocodeine, morphine, and 6-monoacetylmorphine in serum, blood, and postmortem blood, Int. J. Legal Med. 106 (1993) 107–109.
- [18] K. Hara, S. Kashimura, Y. Hieda, M. Kageura, Simple extractive derivatization of methamphetamine and its metabolites in biological materials with Extrelut columns for their GC-MS determination, J. Anal. Toxicol. 21 (1997) 54-58.
- [19] P. Chariot, P. Martel, M. Penneau, M. Debout, Guidelines for doctors attending detainees in police custody, Int. J. Legal Med. 122 (2008) 73–76.
- [20] H. Briffa, T. Lefevre, C. Boraud, P. Chariot, Physicians attending detainees in police custody: An improved format of the doctor's opinion. Intervention du médecin en garde à vue: proposition d'un certificat médical amélioré, Press. Med. 42 (2013) e9–e15.
- [21] B. Cox, H. van Oyen, E. Cambois, C. Jagger, S. Le Roy, J.M. Robine, I. Romieu, The reliability of the Minimum European Health Module, Int. J. Public Health 54 (2009) 55–60.
- [22] H. Cooper, L. Moore, S. Gruskin, N. Krieger, Characterizing perceived police violence: implications for public health, Am. J. Public Health 94 (2004) 1109– 1118.
- [23] P. Mura, C. Chatelain, V. Dumestre, J.M. Gaulier, M.H. Ghysel, C. Lacroix, M.F. Kergueris, M. Lhermitte, M. Moulsma, G. Pépin, F. Vincent, P. Kintz, Use of drugs of abuse in less than 30-year-old drivers killed in a road crash in France: a spectacular increase for cannabis, cocaine and amphetamines, Forensic Sci. Int. 160 (2006) 168–172.
- [24] A.W. Jones, A. Holmgren, F.C. Kugelberg, Driving under the influence of cannabis: a 10-year study of age and gender differences in the concentrations of tetrahydrocannabinol in blood, Addiction 103 (2008) 452–461.
- [25] M.C. Senna, M. Augsburger, B. Aebi, T.A. Briellmann, N. Donzé, J.L. Dubugnon, P.X. Iten, C. Staub, W. Sturm, K. Sutter, First nationwide study on driving under the influence of drugs in Switzerland, Forensic Sci. Int. 198 (2010) 11– 16.
- [26] S. Lev-Ran, S. Imtiaz, B.J. Taylor, K.D. Shield, J. Rehm, B. Le Foll, Gender differences in health-related quality of life among cannabis users: results from the national

epidemiologic survey on alcohol and related conditions, Drug Alcohol Depend. 123 (2012) 190–200.

- [27] B. Redonnet, A. Chollet, E. Fombonne, L. Bowes, M. Melchior, Tobacco, alcohol, cannabis and other illegal drug use among young adults: the socioeconomic context, Drug Alcohol Depend. 121 (2012) 231–239.
- [28] J.J. Payne-James, I.J. Wall, C. Bailey, Patterns of illicit drug use in police custody in London, UK, J. Clin. Forensic Med. 12 (2005) 196–198.
- [29] N. Bourokba, Le mineur en garde à vue, in: P. Chariot (Ed.), L'intervention du médecin en garde à vue, Conférence de consensus, Dalloz, Paris, 2006, pp. 423-427.
- [30] P.N.S. Hoaken, S.H. Stewart, Drugs of abuse and the elicitation of human aggressive behaviour, Addict. Behav. 28 (2003) 1533–1554.
- [31] M.M. Stark, G. Norfolk, D.J. Rogers, J.J. Payne-James, The validity of self-reported substance misuse amongst detained persons in police custody, J. Clin. Forensic Med. 9 (2002) 25–26.
- [32] P. Terry, K.A. Wright, Self-reported driving behaviour and attitudes towards driving under the influence of cannabis among three different groups of users in England, Addict. Behav. 30 (2005) 619–626.
- [33] M.B. Johnson, T. Kelley-Baker, R.B. Voas, J.H. Lacey, The prevalence of cannabisinvolved driving in California, Drug Alcohol Depend. 123 (2012) 105–109.
- [34] D. Best, A. Noble, M. Stark, E.J. Marshall, The role of forensic medical examiners and their attitudes on delivering brief alcohol interventions in police custody, Crim. Behav. Ment. Health 12 (2002) 230–235.