

# Workplace drug testing in Italy – critical considerations

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Workplace drug testing (WDT) was established in Italy on 30 October 2007. Two tiers of survey are required: the first tier concerns drug testing on urine samples, the second involves both urine and hair analysis. Between July 2008 and December 2011, 10 598 workers' urine samples and 72 hair samples for opiates, cocaine, cannabinoids, amphetamines, methylenedioxyamphetamines, methadone, and buprenorphine were tested in our laboratory. Urine analyses were performed by immunological screening (EMIT); hair analysis and confirmation tests in urine were performed by gas chromatography–mass spectrometry (GC-MS). Employees tested positive in urine for drugs of abuse numbered 2.8% in 2008, 2.03% in 2009, 1.62% in 2010, and 1.43% in 2011. As regards the second level of analysis, we observed that only one-third of the workers who had been tested positive for drugs of abuse were referred to an Addiction Treatment Unit in order to verify drug addiction. Our experience shows that, four years after approval of the law on WDT, the percentage of workers positive for drugs of abuse in urine has reduced in comparison to the first year. Moreover, our data show that most of the times employees who tested positive are tardily referred or not referred at all to a Public Addiction Treatment Unit to verify drug addiction. This makes us believe that the legal provisions are widely disregarded not paying the right tribute to the fact that Italy is one of few European countries with legislation on WDT. Copyright © 2013 John Wiley & Sons, Ltd.

**Keywords:** workplace drug testing; drugs of abuse; Italy

## Introduction

Workplace drug testing (WDT) has been only recently introduced in some of the EU countries<sup>[1]</sup> but even those which have adopted it do not share common legislation; from country to country, toxicological analysis are carried out on different categories of workers; various matrices and different substances are checked. It has been attempted, however, through the European Workplace Drug Testing Society (EWDTs), to draw up some specific guidelines;<sup>[2,3]</sup> in short, they constitute a collection of laboratory good practices based on internationally widely accepted principles addressed to the operators performing this kind of analyses. The purpose is to ensure that the entire process is carried out in such a way that the most reliable data are provided over drugs consumption by the worker. In other words, it gives suggestions which, if correctly followed, may assure sustainability of the adopted procedures in front of a court of justice safeguarding the employee's rights at the same time.

It is known that many working activities may be influenced by the consumption of psychotropic drugs, which can reduce the performance or induce overconfidence and lead to underestimation of dangerous situations. In all cases, use of drugs leads to behavioural anomalies which may have serious consequences on the public safety. For the purpose of assuring the safety, health and security of others the law on WDT was introduced in Italy.<sup>[4,5]</sup>

In Italy, WDT is mandatory for some duties, but pre-employment tests are forbidden. The Italian law allows urine analysis to be carried out by authorized toxicological laboratories or alternatively directly by the occupational physician through on-site tests. Because these analyses are at employer's expense and the fees charged by specialized toxicological laboratories are normally high, many occupational physicians prefer making use of the cheaper

on-site testing, although lacking proper toxicological experience, and they request only sporadic confirmation analyses of positive samples. Furthermore, in order to cut costs, big companies with hundreds of workers to check, often submit only a fraction of their employees for analysis every year; analyses are performed at times also by unauthorized laboratories, which are cheaper but often inexperienced in drug testing.

## Italian legislation on WDT

The law on WDT was approved by the Italian Parliament on 30 October 2007. It describes the procedures governing the investigation of drugs abuse among workers performing safety sensitive functions. It details the procedures for the verification of occasional drugs use and for the diagnosis of drug addiction and identifies which groups of workers shall be submitted for analyses. The functions taken into account by the law are those which may pose a threat to the security, health, and safety of others. They can be divided into two major groups: functions for which a special qualification or licence is required (e.g. use of toxic gas, explosives and fireworks, nuclear plant operators) and functions concerning transport activities (e.g. bus, lorry, taxi or train driver, ship's officer, aircraft pilot, air traffic controller, fork-lift and excavator operator).

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Each worker performing one of the aforementioned tasks must undergo a yearly health screening. The procedure is divided into two stages: a toxicological test on urine sample (first-level survey), and only if there is a positive result, a stage which is the responsibility of an Addiction Treatment Unit (second-level survey).

### First-level survey

The first-level survey falls under the responsibility of an occupational physician: the collection of urine samples is made after verification of the identity of the worker and under the supervision of the collector to avoid sample substitution, dilution or adulteration; samples shall be transported to the laboratory under chain of custody. The employee must be forewarned of the urine test by not more than 24 h and three urine aliquots are collected (the first one for screening analysis, the second one for confirmation analysis, and the third one stored for 90 days, sealed, as a revision sample).

The first-level survey includes a drug test for amphetamines, buprenorphine, cannabis, cocaine, methadone, methylenedioxymphetamines, and opiates on urine samples. By law, at least creatinine determination must be performed to check sample dilution. In order to avoid any possible interferences or adulteration, workers must declare, before sample collection, all drugs and special dietary supplements they are taking. For example, creatine is a supplement often used by bodybuilders resulting in an increase in the excretion rate of creatine, which in such cases would affect its use as a marker of sample dilution (specific gravity is thus, a useful additional measurement). Screening analyses shall be performed by immunological methods in authorized laboratories or by on-site tests performed directly by the occupational physician, and positive results must be confirmed by GC-MS analysis. Cut-off levels for screening analyses are those recommended by EWDTS (only for buprenorphine the Italian cut-off is higher). With regard to cut-off levels for confirmation analyses, there are quite a few differences between Italy and the values recommended by EWDTS: in particular, cut-off for the heroin metabolite (6-acetylmorphine) is ten times higher in Italy. On the contrary, cut-off values for morphine, methadone, and benzoylecgonine are lower in Italy. Cut-off levels for screening and confirmation of drugs of abuse (DOA) in urine are described in Table 1.

### Second-level survey

Workers found positive to the first test are suspended from their duties, referred to an Addiction Treatment Unit and submitted to the second tier in order to verify drug addiction. This diagnosis is

under the responsibility of Public Addiction Treatment Units. During a month, four urine samples and one hair specimen (split in two) are collected and analyzed for the same substances tested in First Level verification. Cut-off levels for urine analysis are the same of the first-level survey, cut-off values for hair analysis are shown in Table 2: there is a difference between the Italian law and the cut-off level recommended by the Society of Hair Testing (SoHT) regarding cocaine; instead buprenorphine and methadone cut-off values are not indicated in SoHT guidelines.<sup>[6]</sup>

Once the positivity has been verified but addiction has been not proved (occasional drugs use), the occupational physician is responsible for carrying out subsequent repetitive urine tests in order to exclude further drugs assumption. Conversely, whenever addiction has been proven, the worker will remain suspended from his job; an appropriate therapy and rehabilitation shall be initiated while the job is preserved through unpaid leave up to three years maximum.

## Methods

The Laboratory of Forensic Toxicology of the Public Health Department of University of Pavia has been performing toxicological analyses (screening and confirmation) in urine and hair samples for the first and the second level of surveillance since July 2008. Most of the urine samples were collected by laboratory personnel, and analyzed within 24 h; the minority of urine specimens and all hair samples were collected from external staff and brought to the laboratory refrigerated and with chain-of-custody documentation. Urine samples were submitted to EMIT using Siemens ADVIA 1200 Chemistry System (Siemens, Milan, Italy) and Siemens EMIT II Plus Assays for amphetamines, buprenorphine, cannabis, cocaine metabolites, methadone, methylenedioxymphetamines, opiates, and creatinine. Urine specimens for confirmation analysis were submitted to solid-phase extraction using Varian Bond Elut Certify cartridges. Extracts evaporated to dryness were derivatized with MSTFA and injected into GC-MS. Hair samples, rinsed with methylene chloride and cut into small pieces were incubated overnight with HCl 0.1 N at 45°C and NaOH 2N for THC analysis. After solid phase extraction with Varian Bond Elut Certify cartridges, and liquid/liquid extraction with n-Hexane-Ethyl Acetate 9:1 for THC analysis, the extracts were evaporated to dryness, derivatized with MSTFA and injected.

GC-MS analysis were performed using a gas chromatograph Agilent Model 6890 equipped with a Agilent mass selective detector Model 5973, in SIM mode.<sup>[7]</sup>

**Table 1.** Cut-off values for screening and confirmation in urine (ng/ml)

URINE	SCREENING		CONFIRMATION	
	ITALY	EWDTS	ITALY	EWDTS
MOR/COD/DIHYDR	300	300	100	300
6-ACETYLMORPHINE			100	10
BENZOYLECGONINE	300	300	100	150
THCCOOH	50	50	15	15
AMPH/METAMPH	500	500	250	200
MDMA, MDA, MDEA	500	500	250	200
METHADONE	300	300	100	250
BUPRENORPHINE	10	5	5	5

**Table 2.** Cut-off values for hair analysis (ng/mg)

HAIR	ITALY	SOHT
MORPHINE		
6- AM	0.2 ng/mg	0.2 ng/mg
CODEINE		
COCAINE	0.2 ng/mg	0.05 ng/mg
BENZOYLECGONINE	0.5 ng/mg	0.05 ng/mg
THC	0.1 ng/mg	0.1 ng/mg
THCCOOH	-	0.0002 ng/mg
AMPH/METAMPH	0.2 ng/mg	0.2 ng/mg
MDMA MDA MDEA	0.2 ng/mg	0.2 ng/mg
METHADONE	0.2 ng/mg	
BUPRENORPHINE	0.05 ng/mg	

## Results

### First-level analysis

Between July 2008 and December 2011 our laboratory performed urine analyses on 10 598 workers (95% male): 1745 in 2008, 4283 in 2009, 2537 in 2010 and 2033 in 2011. The number of workers we tested increased between 2008 and 2009 but strongly decreased between 2009 and 2011. The percentage of positive urine samples constantly decreased throughout these four years: it was 2.8% in 2008 (49 subjects), 2.03% in 2009 (87 subjects), 1.62% in 2010 (41 subjects), and 1.43% in 2011 (25 subjects). Most of the positive urine samples were found when the laboratory started with WDT on July 2008 (5.5% of positive specimens); then we observed a steady decrease of positive samples. Only 3 out of the 202 employees tested positive for DOA were female.

Cannabis was the most frequently detected drug, followed by cocaine and methadone. Opiates, buprenorphine and amphetamine positive urine samples were rather uncommon and ecstasy was never detected. Between 2008 and 2010 we observed an increase in the number of workers tested positive for cannabis (from 62% in 2008 to 76% of positive samples in 2010). On the contrary, the percentage of workers tested positive for cocaine was 29% of all the positive samples in 2008, and it decreased during the following years (19% in 2009 and 20% in 2010). On the contrary, in 2011 the percentage of employees tested positive for cannabis in urine decreased (66.7% of positive samples), while the percentage of workers tested positive for cocaine increased (25.9% of positive samples). The percentage of methadone-positives decreased from 2008 (7% of the total number of positives) to 2011 (3.7%).

In these four years, 18 workers (8.9% of positive workers) tested positive for two substances (cocaine and cannabis 15 cases; opiates and methadone two cases; opiates and cocaine one case) and one (0.5%) tested positive for three substances (cocaine, cannabis and buprenorphine). The percentages of positive urine samples for each drug from 2008 to 2011 are described in Figure 1.

The age range of employees tested positive is between 21 and 40 years. Use of cannabis strongly decreases after the age of 40 (not in 2011, when we found many cannabis users among 40-year-old men) while cocaine is more common between age 31 and 40 years, with the exception of the year 2008 when we found the most cocaine users to be between 41 and 50 years old, and 2011 where cocaine users were particularly 20-year-old men. Methadone use was also found to be more common within

the group of senior workers. The number of positive samples and the age ranges are shown in Figure 2.

The duties involved in DOA use are substantially four (lift-truck drivers, excavators drivers, professional road drivers and chemical industry workers), and they are shown in Figure 3. Lift truck operators represent the largest group of workers submitted for analysis, and consequently they are the majority of workers tested positive (more than 60%). Other sectors of the chart represent professional road drivers (11.4% of positive workers) that are mainly truck drivers and only two bus drivers, excavator operators (12.4% of positive workers) and hazardous chemical industry workers (4.4% of positive workers).

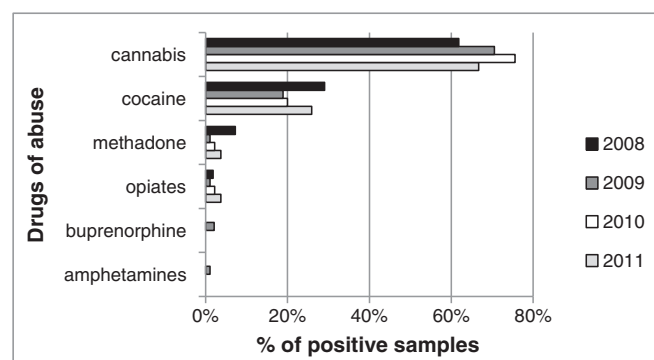


Figure 1. Percentages of drugs found in positive samples from 2008 to 2011.

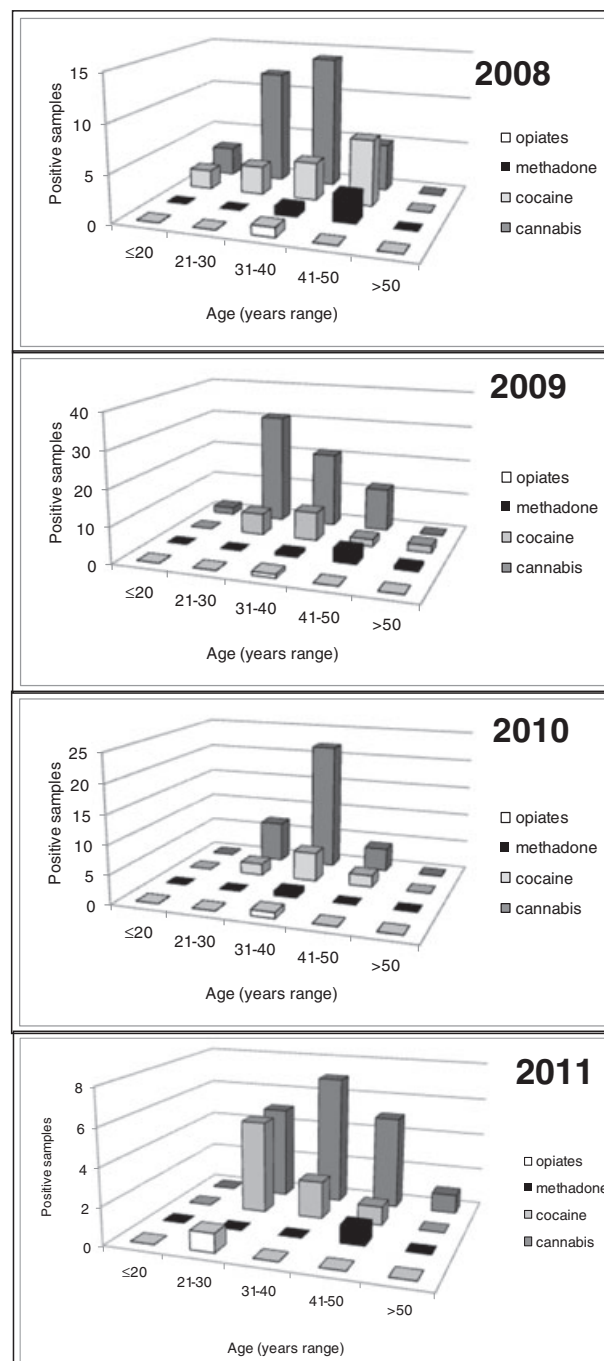
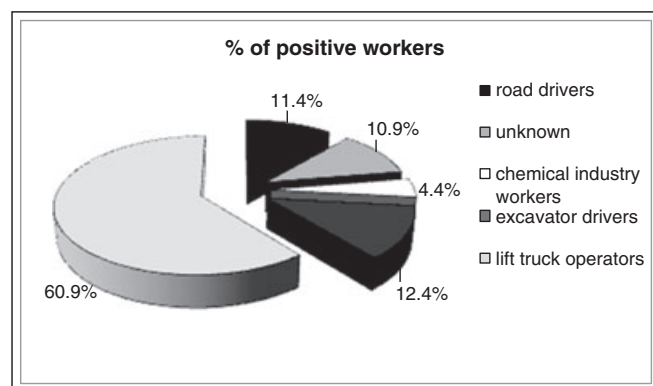


Figure 2. Number of positive samples compared with age ranges.



**Figure 3.** Positive workers rate in relation to their duties.

Regarding to the prevailing drugs in relation to duties, we observed that cocaine-positives among professional road drivers are more frequent than among fork-lift users: 30% of drugs-positive truck drivers and 21% of drugs-positive fork-lift users was found to be making use of cocaine. On the contrary, use of cannabis among fork-lift users (73% of the positives) is higher than among professional road drivers (53% of the positives).

### Second-level analysis

Urine and hair samples from workers who had been found positive to the first urine test, were also analysed in our laboratory for the second level of survey in order to verify if drug addiction existed. In this respect, we have observed that a number of physicians of the Addiction Treatment Unit do not perform hair collection, and choose to perform urine analysis only. In such cases, valuable information has been therefore wasted: hair analysis is in fact a very powerful tool to detect occasional drug use, since in some cases urine analysis may be negative due to the short elimination half-life of some drugs.<sup>[8]</sup>

The number of hair samples sent to our laboratory by Addiction Treatment Units was extremely limited: only 14 in 2009, 35 in 2010, and 23 in 2011 (out of 202 workers who tested positive in the first-level analysis between 2008 and 2011). Negative results in hair analysis were found in 8 cases in 2009, 16 cases in 2010, and 15 cases in 2011.

In the course of 2009, in two cases where urine samples had tested positive for cannabis only, the results of the hair testing showed heavy use of cocaine in one case (over 70 ng/mg of hair) and morphine + cocaine in the other. In 2010, cocaine was found in 9 out of 35 hair samples: 2 of them tested positive in the urine for cannabis only. Eventually in 2011 cocaine was found in 8 out of 23 hair samples.

### Discussion

In some European countries, WDT is not as developed as in the USA, since the relevant legislation has started to be introduced some 10 or 15 years later and because only in a few countries the matter has been approached with firmness and resolution.<sup>[9]</sup> Different EU member states have confronted the problem in different ways: Finland for instance, one of the first countries to legislate on this matter, has laid down a comprehensive set of regulations on consent, laboratory requirements and results of the analytical tests.<sup>[10]</sup> At present days, conversely, most

European countries have not got a legislation on this issue yet. In some of them, such as the UK or Norway, neither are there laws mandating the testing nor prohibiting it: laboratories performing WDT have therefore co-operated in producing a few guidelines for a legally defensible WDT in urine samples.<sup>[11,12]</sup> In some other countries, drug testing on a random basis is not acceptable but pre-employment testing is, hence some private companies are performing on-site testing for drugs-of-abuse (Germany). On the contrary, in other countries pre-employment drug testing is prohibited by law (the Netherlands).

From 2008 during four years of application of the law on WDT we have observed that the percentage of workers found positive for drugs of abuse in urine has been constantly reducing: this is probably due to the fact that employees are too often well informed about the date of urine collection, either by their employer or by the physician responsible for the medical surveillance; occasional drug users remain then often undiscovered.

As regards the results of urine analyses, cannabis was the most frequently detected drug (not only this is the most common drug but its metabolites have also a longer elimination time), followed by cocaine and methadone. This is in agreement with the data on the diffusion of cannabis and cocaine use in Italy: our country is one of the highest-prevalence countries in Europe for cannabis and cocaine use. In the 2011 Annual Report on the State of the Drugs Problem in Europe,<sup>[13]</sup> consumption levels of cannabis and cocaine in Italy are reported to be above European average. In the age range 15–64 years, use of cocaine in Italy has been reported to be: 7% lifetime, 2.1% in the last year, and 0.7% in the last month. In the same age range figures on the use of cannabis in Italy are: 32% lifetime, 14.3% in the last year, and 6.9% in the last month. The prevalence of cannabis use in the last year among adults (15–64 years) in Italy is 14.3% (EU average is 6.7%); instead the prevalence of cocaine use (the most commonly used illicit stimulant drug in Italy) in the last year among adults (15–64 years) in Italy is 2.1% (EU average is 1.2%).

As regards the second level of survey, we have highlighted another problem: occupational physicians in our region are often reluctant to refer workers positive to urine test to Addiction Treatment Units in order to verify whether there is drug addiction or occasional use. They prefer to increase the frequency of urine tests until they eventually obtain a negative result. This is primarily due to the fact that drug-positive employees must be suspended from their regular duties even though smaller companies cannot offer them any alternate duties. Additionally, whenever an addiction cannot be proven, medical and analytical costs for urine and hair analysis sustained by the addiction treatment unit are on the employer.

Our experience demonstrates that, four years after the approval of the law on WDT, the percentage of workers testing positive for drugs of abuse in urine has reduced in comparison to the first year. Eventually our data show that the necessary confirmation analyses after on-site drug testing are sporadic and often workers responding positive to testing are referred tardily, when at all, to Addiction Treatment Units to verify drug dependence. All of this makes us believe that the legal provisions are widely disregarded and don't pay the right tribute to the fact that Italy is one of the few European countries with a legislation on WDT. Italian law is rather articulate although still inadequate since, for instance, there are no alcohol abuse controls, and some groups of workers (such as van drivers) are not subject to drug controls. Really the benefits of checking on some groups of workers are undeniable: the preventive effect of a drug-free workplace



programme on reducing the risk of occupational injury has been widely proven. A statistically significant decrease in injury rates has been observed mainly for two industry groups: construction and services.<sup>[14]</sup>

## Conclusion

In conclusion, two years after the approval of the law on WDT in Italy, the percentage of workers found positive for drugs of abuse in urine tests by the Laboratory of Forensic Toxicology of the Public Health Department of University of Pavia has decreased from 2.8% in 2008 to 1.4% in 2011.

Unfortunately WDT in Italy is often perceived as persecutory and contrary to the right to privacy: on the contrary, it is mainly oriented to prevention, to reducing the risk of drug-related accidents and addressing drug addicts to rehabilitation programmes, in order to prevent those hazards to the working environment which are associated with drug consumption.

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