



EPS NPS PROJECT

RECOGNIZING AND IDENTIFYING **NPS** FOR ENFORCEMENT AND FORENSIC PURPOSES

CHALLENGES AND PRACTICES IN EUROPE

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EPS NPS PROJECT

The Project EPS/NPS - Enhancing Police Skills on Novel Psychoactive Substances is coordinated by RiSSC and developed in cooperation with University of Hertfordshire Higher Education Institution (UH) (UK), University of Szczecinski (US) (PL), Eotvos University (ELTE) (HU) and INTERPOL (associate partner), with the financial support of the EU Commission - Targeted call on cross border law enforcement cooperation in the field of drug trafficking - DG Justice/DG Migrations and Home Affairs (JUST/2013/ISEC/DRUGS/AG/6429).

The Advisory Board is composed of experts from Arma dei Carabinieri, EUROPOL, INTERPOL, Swiss Federal Police, UNODC and US Drug Enforcement Administration.

The overall objective of the Project is to contribute to enhancing a knowledge-based and joint EU approach to effectively addressing the rapid spread of NPS, by promoting in particular the generation of data/knowledge, information-sharing, and cooperation.

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RiSSC is an independent no-profit Italian research centre dealing with security and crime. The Centre promotes social and cultural development on crime prevention by means of research activities, education/training initiatives and technical assistance projects on the most relevant criminal phenomena and their trends, on the causes/factors that facilitate crime and anti-social behaviour, and on the countermeasures to prevent/reduce both crimes and their impact. RiSSC implements projects for prevention and risk reduction in favour of public and private bodies, involving a network of experts and researchers who contribute to a multi-disciplinary approach.

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CHALLENGES AND PRACTICES IN EUROPE

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INTRODUCTION

This Report presents the results of research activity carried out within the Project EPS/NPS - Enhancing Police Skills concerning Novel Psychoactive Substances (NPS), co-financed by the European Commission and coordinated by RiSSC – Research Centre on Security and Crime (IT), developed in cooperation with the University of Hertfordshire (UH) (UK), the University of Szczecin (US) (PL), the Eotvos University (ELTE) (HU) and INTERPOL.

In detail, starting from the analysis of the problems and challenges posed to forensic analysts and to LEAs activities by NPS, the Report focuses also on the practices and countermeasures adopted to handle them, with specific regards to both weak/negative factors and strong/positive elements. Finally, it develops inputs and suggests some recommendations on how to improve LEAs and forensic laboratories' capacity to handle NPS-related cases.

The NPS not homogeneous and somehow ambiguous legal status, the rapid and transient presence of NPS in the market, the fact that NPS are often disguised in mixed composition, and are traded/trafficked in small quantity in unsuspected packaging (sold over the Internet and sent by post), are among the main factors that are posing various problems to the agencies working at different levels of the process of drug detection, including investigation, recognition and analytical identification.

The most relevant challenges regard all the steps of the detection process and are about information-sharing and cooperation. In fact, the transient nature of NPS and their new fast appearance in the market require the continuous updating of information regarding the substances and across all the steps of the detection process. Accordingly, the rapid flow of information among all the agents who deal with NPS

is crucial. In particular, the continuous circulation of updated information is important for those who carry out investigations on NPS, for those who make postal inspections at the borders, and finally for those who work in the laboratories.

LEAS ACTIVITIES – MAIN PROBLEMS

The LEAs limited awareness and knowledge on NPS and the existing limitations in capital, technical and human resources represent serious obstacles in the face of the challenges posed by NPS.

The efficiency and efficacy of LEAs activities are also hindered by organizational factors. For example, in terms of investigation/control/recognition, the managing of NPS cases tend to be fragmented. Different and diverse LEAs, dealing in general with drugs or public health protection, or crimes committed on the Internet, usually handle NPS related cases. Customs, controlling the mail packs at the borders, are often those that face the problem of recognizing new drugs since NPS are mainly sent by post.

Generally speaking, there are not specialized units on NPS neither in the Police nor in the Customs. Moreover, there is a lack of tools and instruments (e.g. narcotests) able to identify new substances or facilitate their identification.

FORENSIC ANALYSIS – MAIN PROBLEMS

In terms of chemical analytical identification, laboratories have to face problems mostly related to

- + Getting reference standard materials that are not available and are expensive.
- + The difficulty of carrying out research by analysing new compounds offered in the market through Internet test purchasing, due to the lack of human and financial resources, and the bureaucratic obstacles related to the authorization.
- + Limited databases available (e.g. the spectrum libraries are not all updated rapidly enough, and the reliability/traceability of the spectra may be unknown).
- + The maintenance of analytical instrumentations, which is costly and requires specialist expertise.
- + The lack of continuity and sustainability of (good) practice which would stimulate and implement cooperation and the sharing of information (e.g. European projects, which are operative for a limited period of time).
- + The lack of cooperation and information sharing, in particular with hospitals and poison centres.
- + The great variety of managing systems of laboratories and analytical methods that produce a dispersion of information, do not facilitate communications between laboratories, and contribute at production/circulation inhomogeneous chemical analysis.

INITIATIVES, PRACTICES AND COUNTERMEASURES

The research has collected various practices for facing the new challenges posed by NPS and has shown that there is a direct correlation between the level of NPS penetration in the market and the effectiveness of the system, especially in terms of analytical methods and information sharing (e.g. Northern European countries, like Finland, Germany, the Netherlands, and Belgium).

More in detail, the research has been focused on:

Tools for recognizing NPS

A very good tool for recognizing NPS rapidly has been elaborated by the Forensic Science Institute Zurich in Switzerland, which has built a database of basic information about NPS (it contains around 600 items), allowing controllers to recognize NPS products at first sight. This database includes the product name; the substance description; the ingredients; the packaging

description; the packaging imprint; the sample origin; the category; the class; the K-Number and whether the substance is pure or a mixture. It also contains the picture of the product and gives information about the regulations concerning that substance according to the Switzerland legislation.

Analytical methods

In terms of analytical methods of identification, the practices most diffused in the forensic laboratories are GC/MS spectrometry, LC/MS spectrometry, and HR-LC-MS, GC –FID, FT-IR, RAMAN spectroscopy, ICP-OES, HPL. However, the techniques required for identifying new molecules, that do not have reference material, are advanced and more sophisticated: Nuclear Magnetic Resonance (NMR) and High Resolution Mass Spectrometry (HR-MS) (Reniero et al., 2014, p. 4). Not all the forensic and toxicology laboratories in Europe have these instruments. An innovative practice has been developed within a project called CLEN2SAND that was implemented by the DG TAXUD in collaboration with the EU Joint Research Centre. The Centre has provided, “scientific and technical support to the Customs Laboratories European Network (CLEN) for the characterization and chemical identification of new psychoactive substances.” (Reniero et al., 2014, p. 6) through NMR. This experience has brought significant results since the JRC have received many requests from the Customs laboratories of various MS thus helping them to identify and characterize new compounds.

Information sharing

The role played by the Early Warning System (EWS) developed through the network of the EMCDDA and EUROPOL and by the database EDND is crucial for information sharing. However, its efficiency depends mostly on the proficiency of each Member State’s system. Important practices of sharing information at European level has been developed by the European network of forensic institutes (ENFSI, <http://www.enfsi.eu/>). Also some projects funded by the European Commission have shown to be good practices of information sharing, like the project “Response Collect, Analyse, Organize, Evaluate, Share – A Response to Challenges in Forensic Drugs Analyses” (JUST/2013/ISEC/DRUGS/AG/6413).

The most important tools for sharing analytical data on NPS are databases and spectra libraries, although they are unlikely to be updated with the emerging compounds. There are some forensic national and international databases that are used for NPS identification.

As it will be illustrated in the report, some of the databases are open, while others have restricted access.

INPUTS AND RECOMMENDATIONS

Based on the research findings, the recommendations are directed towards both the national and the European level, thus addressing the main needs posed by a transnational criminal phenomenon, as NPS trafficking is. They are suggested in relation to all the steps of the detection process. In synthesis, the most important ones are as follows:

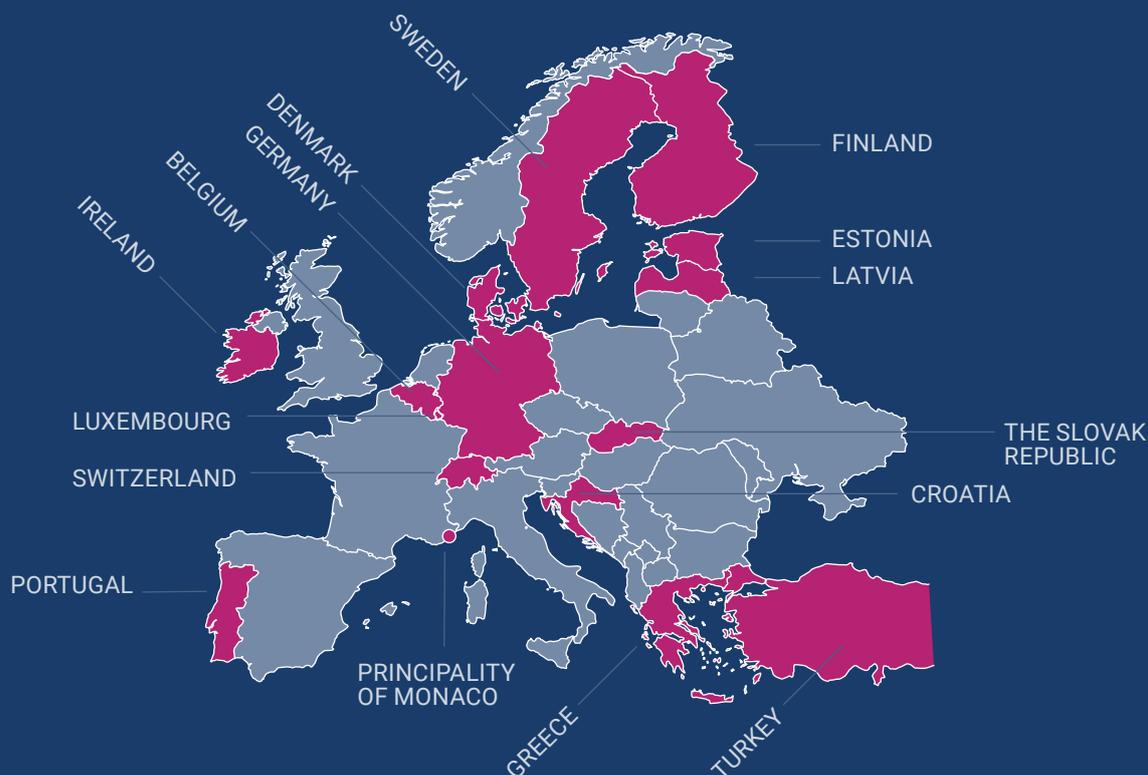
- + To develop LEAs specialized units on NPS at national level and to increase the synergy between drugs units and cyber-crime units in order to foster online investigations.
- + To improve, at national and European level, the capacity to establish permanent procedures of cooperation specifically focused on NPS, thus increasing the information sharing.
- + To allow a wider access to EMCDDA and national databases.
- + To create a European database of NPS factsheets.
- + To promote a continuous exchange of information between LEAs laboratories at European level, especially through long term projects.
- + To increase the collaboration between LEAs and forensic laboratories with those healthcare professionals and service that treat intoxicated people.
- + To create a European central cheminformatic database on NPS.
- + To promote the harmonization of the operating procedures at European level.
- + To facilitate the exchange of standards of NPS at international level.
- + To improve the procedures of validation of analytical data from national laboratories collected by national focal points and EMCDDA and recorded in the EDND.
- + To support the forensic community in the development of research on NPS based on test purchasing.
- + To implement continuous training programmes on NPS at national and international level.

METHODOLOGY

The research is grounded on the analysis of available literature and in particular on the information collected by means of a series of interviews with experts in the field of forensic analysis carried out from May to July 2016 (see table 1*) and with Italian Law Enforcement Agencies (LEAs) and Public Prosecutors carried out in 2015 (Mignone, Ingrassi, p.13), as well as on the results of a survey administered to national Law Enforcement Agencies (LEAs) in July 2016

The online questionnaire explored the LEAs handling of NPS related crime. The questions concerned LEAs organization; LEAs practices of NPS identification and investigation; practices of cooperation and information-sharing between LEAs and other international/national bodies dealing with NPS-related cases. Seventeen countries filled in the questionnaire, including Belgium, Croatia, Estonia, Denmark, Finland, Germany, Greece, Ireland, Latvia Luxembourg Portugal Principality of Monaco, Sweden, Switzerland, The Slovak Republic and Turkey.

INSTITUTION	TABLE 01	Date of interview
CARABINIERI, Italy		06-06-2016
UNODC		01-06-2016
NATIONAL INSTITUTE OF TOXICOLOGY AND FORENSIC SCIENCE, Spain		23-06-2016
NATIONAL BUREAU OF INVESTIGATION FORENSIC LABORATORY (NBIFL), Finland		29-06-2106
EMCDDA		30-06-2016
FORENSIC SCIENCE INSTITUTE ZURICH, Switzerland		01-07-2016
EUROPEAN JOINT RESEARCH CENTRE (JRC)		11-07-2016



*FOR THE SAKE OF PRIVACY, THE NAMES OF THE INTERVIEWEES ARE NOT REPORTED.

1 THE CHALLENGES OF NPS

In recent times, the drug market has changed at European and at an international level (UNODC, 2016). New synthetic psychoactive substances (NPS), in pure form or in preparation, have been introduced (UNODC, 2013). The Internet has facilitated their trade/trafficking (EMCDDA, 2015). Consumed as alternative to internationally controlled drugs, NPS mimic their effects posing a serious threat to public health (EMCDDA, 2011), as much as or even more than classical drugs.

As regards the response to this phenomenon, the enforcement and forensic activities envisage three main steps:

1) Investigation and control: this includes LEAs patrolling/control of people at street level or of mail packs at border level, as well as intelligence related activities.

2) Recognition: it takes place when Customs and/or LEAs find an illegal or suspected substance during control and/or investigative activities.

3) Identification: it occurs when forensic chemists analyse the psychochemical characteristics of the substance, that has been collected during control or has been found in biological samples taken from intoxicated people, and quantify it.

The characteristics of NPS (see table 2) and the limited knowledge base available, pose new challenges to both LEAs and Customs in all of the above mentioned steps (Interviews with experts; UNODC, 2016, p. 56) at street and at border level, and to forensic laboratories (Tetty, Crean, 2015).

TABLE 02

	NPS Characteristics	Challenges
A	Not homogeneous and ambiguous legal status	INVESTIGATION AND CONTROL
B	Rapid and transient presence in the market	IDENTIFICATION
C	Disguised in mixed composition	CONTROL AND RECOGNITION
D	Unsuspected packaging	RECOGNITION
E	Traded/trafficked in small quantity, on the Internet and by post	CONTROL AND IDENTIFICATION

A) The legal status of NPS is not homogeneous at European and international level. Indeed, they are called “legal highs”, because they are not controlled by international treaties, and therefore in some countries they might be legal. Moreover, their legal status is ambiguous as far as it changes rapidly, because even a small modification in the chemical structure might transform an illegal substance in a legal one (Ledberg, 2015). Indeed, they are called “smart drugs”, because they are able to circumvent the legislation as a result of the substitution strategy implemented by those who trade them: when a substance is banned, a similar and uncontrolled one is introduced in the market (Mignone, Ingrassi, 2016).

B) The NPS market changes fast: many new compounds are so new and unknown, that they “do not have CAS number or other chemical registration (...) and physical and chemical properties and spectroscopic data as well as pharmacological and toxicological are often not available” (Reniero et al., 2014 p. 5).

Some substances remain in the market, while others quickly disappear. Indeed, it is possible to identify two types of NPS according to the length of their presence in the drug market: stable substances and transient substances. “Ketamine” and “mephedrone” are example of the first category, while “N-benzyl-l-phenylethylamine” and the “2C series” belong to the second category (UNODC, 2016).

C) NPS are often sold in various compositions. They are made of different compounds, including controlled drugs, pharmaceutical products and adulterants. Some of the new products appearing in the market might be composed by different compounds both legal and illegal (Home Office, 2012).

D) The packaging of the products containing NPS often disguises the real psychoactive nature of the substances contained in the products, thus misleading LEAs and customs during investigation or control activities. Moreover, in many instances “the actual composition does not correspond to the description on the packaging” (Zuba, 2014, p. 361).

E) NPS are traded in small quantities (since they are quite powerful even in small dose) and sent by post, as they are usually sold on the Web. This makes them unlikely to be discovered during the Customs and police control. Moreover, the small quantities that are seized and become the samples for the laboratories’ analysis implies many difficulties in terms of analytical recognition of the compound, because chemists have so few of these substances available for the analysis.

In Europe not all the LEAs, Customs, forensic and toxicologist laboratories are equipped to face the above mentioned challenges due to a limited awareness and knowledge on NPS on the one hand, and limitations in capital, technical and human resources on the other.

In fact, the 2016 UNODC World Drug Report has outlined that “19 per cent of the countries and territories reporting NPS have identified more than 100 different substances since 2008. At the same time, more than a quarter of all countries and territories reporting the emergence of NPS have reported only one substance”. This lack of reporting “may be attributed to limited technical capacity for identifying NPS.” (UNODC, 2016, p. 57).

1.1 INVESTIGATION | CONTROL | RECOGNITION

The actual scenario related to investigation, control and recognition of the NPS trafficking presents diverse critical issues, determined by human related factors and organisational problems.

As emerged from the online questionnaire administered to national LEAs, not all national agencies have special units dealing with NPS (see answers to question 6), neither are they equipped with narcotest for NPS. The managing of NPS cases tends to be fragmented: different and diverse LEAs, mostly dealing with drugs or public health protection, or crimes committed over the Internet, handle NPS cases.

Customs - that are in charge of controlling packets at national borders - are likely to be the first to face the problem of recognizing new drugs (JRC, 2014). However, they usually don't have special investigative units on drugs, either.

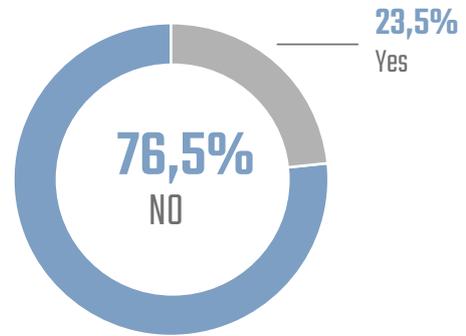
In general, LEAs typically work together through informal cooperation or mostly protocols, as emerge from question 19. Connections already exist with the national Reitox focal points, as well as with public health authorities, which are among the first who intercept emerging substances. Cooperation is also established with laboratories (e.g. forensic and toxicology laboratories).

However, the cases of cooperation with universities and also with judicial authorities/prosecutors are still limited.

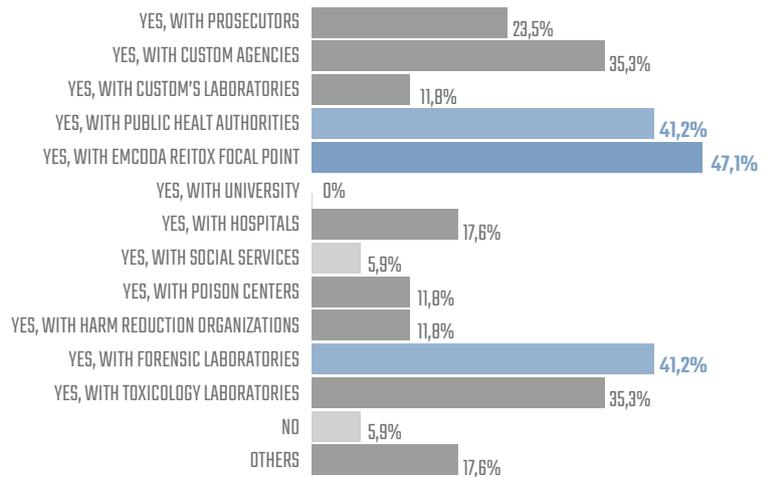
Carrying out investigations on NPS is difficult because it is as time-consuming as identifying the criminals/criminal rings behind the online selling of NPS. In particular, these activities require great efforts in terms of international cooperation, because they are usually perpetrated on a transnational base. These difficulties, along with the limited awareness and knowledge on the NPS phenomenon/market, are among the reasons why most investigation activities are addressed to traditional drugs, that are perceived as more dangerous for public health and for the economy (Interview with Italian Police, 2015), and have also a well-defined legal status.

In fact, according to the respondents to the questionnaire, investigations on NPS start only when LEAs detect and seize them in their routine activity or while they are doing investigations on traditional drugs trafficking (see answers to question 11).

06. IN YOUR COUNTRY, IS/ARE THERE ONE OR MORE LEA SPECIAL UNIT(S) IN CHARGE (ALSO) WITH THE HANDLING OF NPS -RELATED CASES?



19. DOES/DO THE LEA(S) OF YOUR COUNTRY HAVE PROTOCOLS OF COOPERATION COMMUNICATION FOR SHARING BEST PRACTICES AND INFORMATION ABOUT THE NATIONAL LEVEL? (multiple answers are possible)



1.2 IDENTIFICATION

The identification step is the most challenging one especially when it concerns NPS, and it is strictly influenced by the legal approach and the policies adopted to fight back against drug/NPS trafficking.

It is emerging that the demand for the forensic analysis of drugs increases in line with the growth of the implementation of those generic and wide legislations that tend to schedule an extensive number of substances (Tetty, Crean, 2015, p.3; Interview Forensic Science Institute Zurich). This has already been the case in Switzerland, where the 2010 generic legislation has generated an increasingly massive request for forensic drug analysis (Interview Forensic Science Institute Zurich).

However, at present, not all forensic laboratories are ready to deal with the new challenges posed by the NPS. In the survey carried out in 2014 by the UNODC on the impact of UNODC technical assistance to drug testing laboratories, the respondents (158 institutions in 48 countries)², have revealed that there are many difficulties in the sector of NPS identification: “20% of the respondents did not identify any NPS in 2014 and 18% of respondents erroneously categorised a number of internationally controlled substances as NPS” (UNODC, 2014, p. 2). This is because the laboratories encounter many problems, in particular in relation to reference material, as summarized in table 3 (see also Tetty, Crean, 2015 p. 3)

Other issues related to the challenges posed by NPS indicated by those respondents that left a comment (9% of the sample), concerned the work load, training and the need for greater access to databases.

The national institutes and laboratories contacted during the research presented here outline a series of problems in line with the UNODC survey's responses:

GETTING REFERENCE STANDARD MATERIALS.

Reference standard material may need to be synthesised or purchased or imported in minute amounts from other suppliers, which is a time-consuming and an expensive process. In addition, appropriate licences are often required to ensure legal cover of purchases, possession and/ or production of NPS or their precursors.

MANAGING BUDGET LIMITATIONS.

The cost of reference standards, consumables and

manpower is very high.

Skilled human resources and significant financial resources are needed to carry out research, which is crucial for the identification of new substances, as clearly underlined also by the experts interviewed.

The regular maintenance of analytical instrumentations is costly and requires specialist expertise, too.

MANAGING THE DIFFICULTIES OF CARRYING OUT RESEARCH BASED ON THE ANALYSIS OF NEW COMPOUNDS CIRCULATING IN THE MARKET, THROUGH INTERNET TEST PURCHASING.

Besides the problems determined by the lack of human and financial resources, there are also legal/administrative obstacles which often result in the lack of authorisation to develop research activities based on NPS samples purchased online (see question 13).

LIMITED DATABASES AVAILABLE AND PROBLEMS RELATED TO SPECTRUM LIBRARIES.

In many cases, the spectrum libraries are not updated rapidly enough to follow market evolution, and the reliability/traceability of the spectra may be uncertain. The great variety of managing system of laboratories and analytical methods, along with the different levels of capacity of reading the spectra, inevitably provoke dispersion of information, difficulties in communication and the production of not inhomogeneous chemical analysis.

LIMITED COOPERATION.

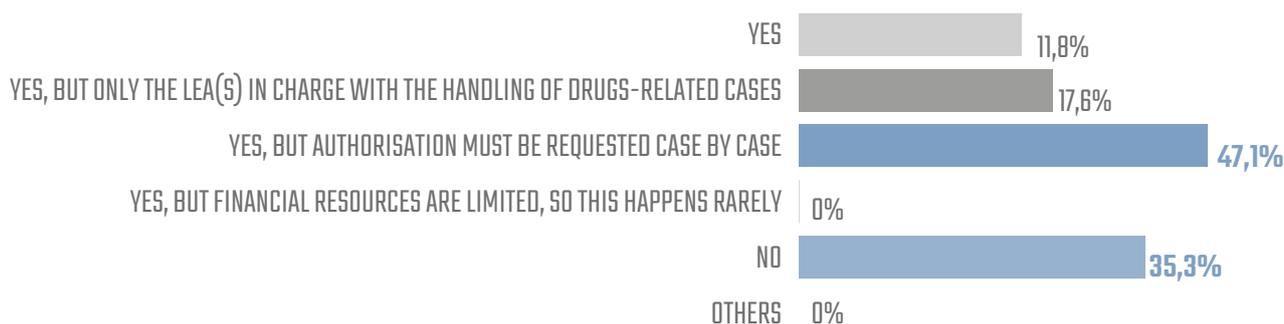
In particular, one of the major problems is the lack of continuity/sustainability of good practice that stimulates and implements cooperation and sharing of information, such as European projects that end in a given period of time. Also the very limited cooperation and information-sharing with hospitals and poison centres contribute to hindering LEAs and forensic laboratories' activities.

² The respondents were institutions participating in the UNODC International Collaborative Exercises programme that is part of the UNODC International Quality Assurance Programme, open to all national drug testing and forensic science laboratories. The aim of the programme is “to assist drug testing laboratories worldwide in assessing their own performance and taking corrective action, when appropriate. Participation in such collaborative exercises, inter-laboratory comparisons or proficiency tests is one of the essential elements for the implementation of a laboratory quality management system and ultimately accreditation” https://www.unodc.org/unodc/en/scientists/qa_new.html

TABLE 03

ISSUES	Percentage of respondents	Main problems
Reference material	80%	Cost Availability Access Choosing the reference material
Reporting	50%	Difficulties in reporting NPS, particularly due to gaps in national legislation and also how to report NPS without complete characterisation or due to challenges in reporting discrimination between positional isomers
Awareness	45%	Lack of knowledge of current trends in NPS Insufficient expertise/experience in the identification of NPS particularly, in the interpretation of mass spectral fragmentation patterns
Literature	41%	Difficulties with accessing relevant up to date scientific literature on NPS
Validated methods	39%	Not access to validated analytical methods for the analysis of a wide range of NPS
Analytical techniques	39%	Lack of techniques

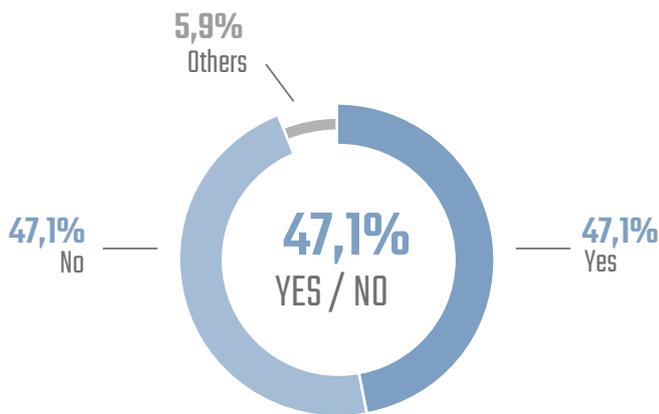
13. IN YOUR COUNTRY, ARE THE LEAs ALLOWED TO CARRY OUT INTERNET TEST PURCHASING ACTIVITIES? (Multiple answers are possible)



1.3 TRAINING

In order to achieve the capacities needed to investigate, recognise and identify NPS, training programmes are undoubtedly fundamental. From the questionnaire's results, it emerged that nearly half of the respondents participate in training programs on NPS.

13. IN YOUR COUNTRY, DOES THE LEA(S) PARTECIPATE IN TRAINING PROGRAMS ON NPS?



However, they specified that the topic of NPS is dealt with during training courses which are not specifically focused, but which are mostly related to other macro-issues, such as narcotics/traditional drugs trafficking or cybercrime. As written by the respondent from Belgium: "the basic training for police officers provides for a 'drugs' course in which NPS is explained as one of the current drug products." In some countries training programmes are just sporadic, in other countries there is a greater offer. Generally speaking, the method is based on meeting/briefing with experts from Police, Universities, The Ministry of Health and also from Europol and EMCDDA, or on online training; some LEAs participate in expert meetings organized by EMCDDA too.

The relevance of training is confirmed by the fact that the learning process should be considered as one element of the cooperation/information-sharing chain, which is essential when dealing with transnational phenomena such as NPS. In fact, training programmes should be considered as fundamental opportunities to allow information circulate among EU enforcement units. In particular, the more NPS are stable in the market, the more national LEAs, Customs and forensic laboratories improve their knowledge about them, acquire experience in controlling and identifying them, and can contribute at disseminating the information attained. The more LEAs recognize NPS (also emerging), the more the seizures increase and the dark number of NPS related crimes³ and consumption are likely to decrease. Nowadays, it is easier to recognize and identify those NPS that have "established presence" (UNODC, 2016, p. 57) like, for instance, ketamine, khat, the synthetic cannabinoide JWH-018, the synthetic cathinones mephedrone and methylone (the latter three are now under international control), since reference materials and in some cases also narcotest (e.g. ketamine and some types of synthetic cannabinoids), are available.

In conclusion, the challenges illustrated are mainly posed by the new generation of NPS, that appear continuously in the drug market, since they are unknown, and for this reason information and reference standards are not available. Cooperation, information-sharing and training are fundamental to allow LEAs and forensic laboratories to meet these challenges in the most effective and efficient way possible.

³ On the dark number of NPS phenomenon see Mignone, Ingrasci 2016

2 THE PRACTICES OF HANDLING AND ANALYSING NPS

At a European level, there is a heterogeneous approach to the NPS related phenomenon and this is confirmed by the variety of practices adopted by LEAs and forensic laboratories to handle and analyse NPS cases/substances.

2.1 INVESTIGATION | CONTROL | RECOGNITION

Given that NPS are largely traded over the Internet, online and international investigations are precious. Only very few countries of the sample involved in the survey have already started to organize online monitoring on drug trafficking, as illustrated by the answers to the questionnaires (see box 1). In Italy in 2013 the Central Counter Narcotics Directorate (D.C.S.A.) created the “Drug@Online” Section which focuses specifically on drug trafficking on the Internet.

The phase of recognition is important since if the substance is not recognized correctly as a suspected psychoactive substance, it is not detained and sent for forensic chemical analysis. Therefore, the law enforcement agencies’ capacity of recognition is crucial.

the regulations concerning that substance according to the Switzerland legislation. At the moment the database contains around 600 items (Interview Forensic Science Institute Zurich).

This database is used regularly by Customs and Police in Switzerland and it has been very useful, since it has facilitated LEAs in the decision of detaining or directly seizing products containing NPS (Interview Forensic Science Institute Zurich).

A very good practice registered during the research has been elaborated by the Forensic Science Institute Zurich in Switzerland, which has built a database of basic information about NPS, allowing controllers to recognize NPS products at first sight.

This database includes the product name, the substance description, the ingredients, the packaging description, the packaging imprint, the sample origin, the category, the class, the K-Number, and whether the substance is pure or mixture. It also contains the picture of the product and gives information about

BOX 1

BELGIUM

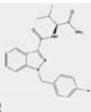


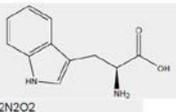
Recently, a special internet investigation unit was created within the central directorate of the Federal Police (DJSOC). It focuses on: supplying support to investigations concerning supply and trafficking of drugs (including NPS); supplying support to judicial investigations in case of infringement of the legislation; supplying specialised support to other investigating units or departments. Sometimes, specific and more targeted investigations into online supply and trafficking of drugs on the internet are conducted at regional level by the specialised drugs units of both the local and federal Police when the offences are committed or when the offenders are active on the territory for which these units are competent.

DENMARK



There are some police departments within the federal states with special units which deal with offers of drugs through the internet. Also in the BKA within the unit for synthetic drugs there is a team responsible for online drug trafficking (including the monitoring of online portals and the operational use of Internet data etc).

Fact-Sheet		Research Chemicals	
Product name	Space	Category	Plant material
Substance description	herbal material (1 g)	Class	Synthetic cannabinoids
Ingredients*	AB-FUBINACA	K-Number	K141027-012
Packaging description	Plastic bag	Regulations	Narcotics (e)
Packaging Imprint	new galactic	Analysis	GC/MS
Sample origin	Customs (Security check)	Reference	<input type="radio"/> Pure substance <input checked="" type="radio"/> Mixture
Remarks	none	Effect	cannabinoid receptor agonist
Chemical structure		Front side	
Molecular formula	C20H21FN4O2	Back side	
Molecular weight	368.16		
CAS Number	1185282-01-2	Issue date:	27.10.2014
		Last Change:	27.10.2014

Fact-Sheet		Research Chemicals	
Product name	After E, Recovery formula	Category	tablets, hard gelatine capsules
Substance description	white tablets, whitish hard gelatine capsules	Class	other
Ingredients*	Tablets: Ascorbic acid Capsules: Tryptophane, Vitamine B6	K-Number	K150105-046
Packaging description	Carton package	Regulations	not freely marketable but legal for personal consumption
Packaging Imprint	Dietary supplement. Recovery formula to be taken after ecstasy use.	Analysis	GC/MS MSTFA
Sample origin	Customs (Mail delivery)	Reference	<input type="radio"/> Pure substance <input checked="" type="radio"/> Mixture
Remarks	none	Effect	unknown
Chemical structure		Front side	
Molecular formula	C11H12N2O2	Back side	
Molecular weight	204.23		
CAS Number	73-22-3	Issue date:	06.01.2015
		Last Change:	06.01.2015

* Red = Narcotics
Bold = Chemical information below

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Bold = Chemical information below

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2.2 IDENTIFICATION

The second phase of the detection process, namely identifying the physicochemical characteristics of a substance and quantifying it, allows LEAs to understand whether the substance contains a drug that is controlled, and if a potential process of scheduling uncontrolled substances is also necessary.

The ability to identify new compounds with psychoactive effects depends on the analytical methods and the experience of the analyst, but also by the availability of information on new compounds that are shared within the forensic community.

There are different kinds of laboratories that carry out forensic and toxicology analysis of drugs, belonging to different institutions (i.e. Customs, law enforcement agencies, universities, hospitals). There are also private laboratories to which the forensic analysis of drugs might be outsourced by investigative authorities.

The field of forensics is fragmented (Tjin-A-Tsoi, 2013, p. 22) and as a result “it has developed into a sector comprising a large number of relatively small and local laboratories that necessarily act as pure production units” (Ibidem). The organization of the forensic system is not homogenous at European level. Even at national level the laboratories that carry out forensic analysis do not have the same managing system, nor the same analytical methods. They might have the ISO 1705 accreditation or they might participate to the UNODC ICE collaborative projects promoted by the UNODC mentioned in the note number 3. In some countries there is a national forensic institute, like in the Netherlands.

Generally speaking, the Customs laboratories usually deal with drugs seized at borders, the toxicologist laboratories with biological samples taken from intoxicated people, and the LEAs laboratories analyse materials seized in the street. For example, in Finland, law enforcement agencies’ laboratories analyse seized samples, while the National Institute for Health and Welfare (THL) carries out forensic toxicology analyses of biological samples.

The criteria according to which Law Enforcement Agencies and Prosecutors choose the laboratories

for the analysis of suspected substances are not the same neither at European level nor at national level and there are not mandatory rules related to this.

NPS requires great effort from LEAs, forensic analysts and toxicologists in detecting emerging substances and sharing information on NPS.

The European countries that have shown the most effective system both in terms of analytical methods and sharing information are those countries in which the NPS market has traditionally developed (e.g. Northern European countries, like Finland, Germany, the Netherlands, and Belgium) (Interview Forensic Science Institute Zurich).

According to the UNODC, the forensic laboratories have acquired in the last three years more competence in the analysis of NPS (Interview UNODC). However, there is still great difficulty due to the fact that the identification and quantification of NPS require sophisticated and advanced analytical methods, that not all the laboratories have (Reniero et al., 2014).

According to the EMCDDA, the alerts arriving through the Early Warning System are the results of analysis carried out with various methods, including the most used, GC/MS spectrometry, LC/MS spectrometry, and HR-LC-MS, GC-FID, FT-IR, RAMAN spectroscopy, ICP-OES, HPL (Interview EMCDDA).

BOX 2

“GC/MS analysis allows separation of compounds based on their retention time within a chromatography column and identification of each compound by the characteristic fragments into which a given chemical is broken following ionization of the compound (...). Over the years, technologic advances in electronics and detectors have allowed GC/MS to detect ever smaller concentrations of compounds, as has the addition of other analytical techniques, such as liquid chromatography” (Davis, 2014)

Although the most widespread analytical methods, including GC/MS spectrometry and LC/MS spectrometry are powerful techniques, they only permit the identification of substances already known. This is achieved by comparing “the analytical data of samples under investigation with available spectroscopic libraries” (Reniero et al., p. 5). Yet, the spectra available are not representative of all the substances emerging in the market, given the fact that, as already underlined, the NPS market changes rapidly.

The techniques required for identifying new molecules, that do not have reference material, are advanced and sophisticated: Nuclear Magnetic Resonance (NMR) and High Resolution Mass Spectrometry (HR-MS) (Reniero et al., 2014, p. 4). NMR is an analytical technique quite widespread in use in the field of pharmaceutical industries, unlike in the forensic laboratories. However, few Customs laboratories at national level are equipped with the NMR. Some of them use the machine also for the identification of NPS (like Czech Republic, Sweden, the Netherlands, and Spain), while other countries do not have developed capabilities of reading the data produced by NMR for the identification of NPS (Interview JRC).

As Tettey and Crean put it, “forensic science faces the prospect of having to find reliable options for unambiguous identification of substances, without comparison with authentic standards, examples of which include comparisons with reference spectra or interpretation of spectra from non-traditional methods such as nuclear magnetic resonance spectroscopy” (Tettey, Crean, 2015, p. 2)

TABLE 04

Analytical technique	Contribution
Infrared spectroscopy and gas chromatography-mass spectrometry	Identification of known compounds
Nuclear magnetic resonance	Identification of new compounds

Often, forensic laboratories send samples of unknown substances to university laboratories, that are equipped with NMR. This was the case of the Milan Customs forensic laboratory that in July 2016 had to analyse a substance found in a pack that arrived in Malpensa airport, which had never been detected in Italy before, the 2-Ethylaminohexophenone HCl, analogous to 2-amino-1-phenyl-1-propanone. They sent the sample to the university laboratory for the NMR analysis and thanks to the combination of GC-MS, FT-IR, LC-MS, X-RDNMR analysis they were able to identify the substance.

A very good practice for diffusing the use of NMR for the analytical identification of NPS has been developed within a project called CLEN2SAND that was implemented by the DG TAXUD in collaboration with the EU Joint Research Centre.

The Centre has provided “scientific and technical support to the Customs Laboratories European Network (CLEN) for the characterization and chemical identification of new psychoactive substances.” (Reniero et al., 2014 p. 6) This experience has brought significant results since the JRC received many requests from the Customs laboratories of various MS thus helping them to identify and characterize new compounds (Interview JRC).

Training programmes are crucial for improving forensic laboratories’ capacity of carrying out appropriate forensic identification of NPS. The research presented here has identified another example of good practice in terms of training that was implemented in Italy few years ago: in December 2012 the Department of Anti-drugs Policies and the Italian Arma dei Carabinieri signed a protocol for the project RIS-NEWS (2013-2015) that envisaged training courses for improving the capacity of Carabinieri to recognize and identifying NPS.

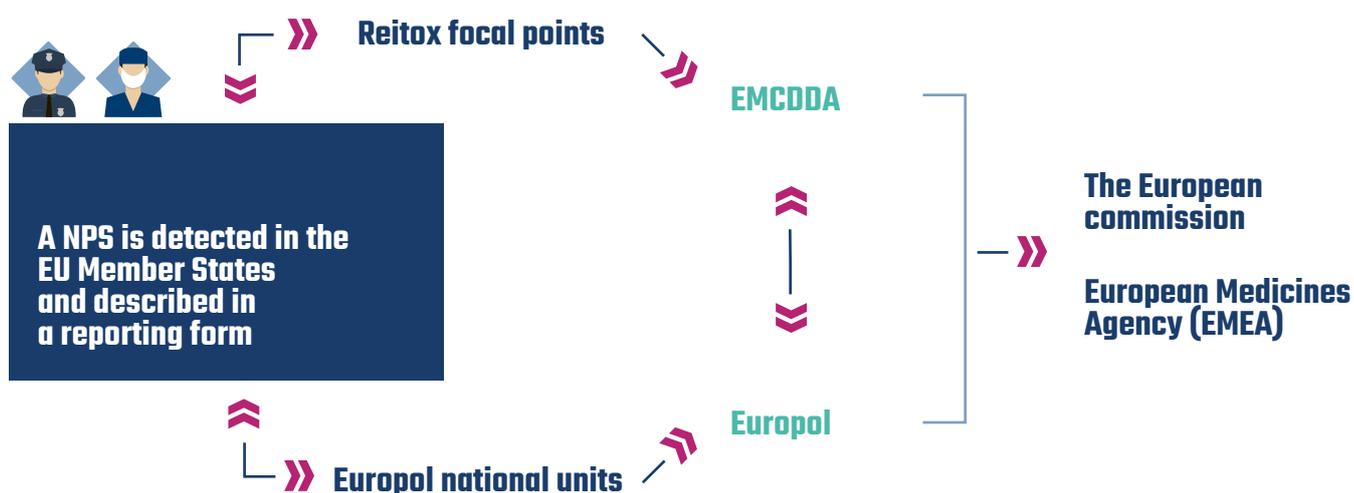
The programme consisted in semester courses of technical-scientific updates for Carabinieri personnel working in the local forensic laboratories (LASS). The project contributed to the promotion of the central and local Carabinieri laboratories participation in the National Early Warning System.

2.3 SHARING INFORMATION

The transient nature of NPS and their fast new appearance in the market require the continuous updating of information on substances in all the steps of the detection process. Therefore, fast communication of information between all the agents who deal with NPS is central. Indeed, it is important for those that carry out investigations on NPS and for those who control postal mail at borders and finally for those who work in laboratories.

European Monitoring Centre for Drugs and Drug addiction (EMCDDA) and Europol play a fundamental role in the exchange of information both on the general trend of NPS market and on specific chemical data on NPS. EMCDDA and Europol are the two organizations responsible for the Early Warning System (EMCDDA, EUROPOL, 2007, p. 5).

Information exchange/early-warning (source: Early-warning system on new psychoactive substances - Operating guidelines | EMCDDA - Europol)



The more the European warning system works efficiently, the more data and information are shared, increasing the chance to identify new compounds. Since the European EWS collects information at national level, its efficiency depends on the proficiency of each MS' system. ⁴

The respondents to the questionnaire underlined the crucial role that the EWS plays as a hub of information between different subjects dealing with NPS, where not only are law enforcement agencies given the facts, as already underlined, but that also that some NPS might be legal products. The Estonian

system seems to be particularly efficient, since it is based on the database managed by the Estonia Forensic Medical Examination department which notifies the drug department investigators as soon as it discovers NPS. Another efficient system is the UK Forensic early warning system that is used by the Home Office. ⁵

We also have to consider that the network of sharing information might even work beyond the early warning system through the LEA network, like in the case of Germany, as explained in the answer to the question 17 (see box 3)

BOX 3

THE CASE OF GERMANY

“There is no systematic formalized monitoring or early warning system. Monitoring, analysis and assessment are carried out by the police authorities, particularly the Federal Criminal Police Office, and the customs authorities, particularly the Zollkriminalamt (ZKA), in cooperation with forensic medicine institutes. Assessment is done, inter alia, by the Committee of Experts on Narcotic Substances (BetäubungsmittelSachverständigenausschuss) which must be consulted before a substance is added to the controlled substances schedules of the Narcotics Act. In Germany, we are engaged in an intensive exchange of information on drug related crime on both the national and international level. Drug related crime comprises of all offences related to the abuse of substances and preparations that are subject to the Narcotics Act (BtMG), other pharmaceutical substances or other substances drug users resort to as substitute or alternative drugs. The same goes for the illicit handling of precursors under the Precursor Control Act (Grundstoffüberwachungsgesetz GÜG). Identification of the active ingredients and the classification as a narcotic or unsafe medicinal product are usually done by the forensic science departments at the Area Criminal Police Office concerned. If the risk assessment of a new psychoactive substance so warrants, the political decision makers are informed to that effect.”

Unknown NPS emerge continuously in the market and for this reason there is a lack of spectroscopic data. This is a problem given the fact that, as previously explained, the analytical methods more diffused in the forensic laboratories at MS level are infrared spectroscopy and gas chromatography-mass spectrometry. Even companies selling reference material are not able to update their products as fast as the market evolves (Tetty, Crean, 2015). Moreover the existing reference materials are expensive.

EMCDDA does not have a laboratory which provides forensic analysis, but it does collect information on NPS from the national forensic laboratories through the European Early Warning System and store it in the European Database on New Drugs (EDND) (see table 5). The forensic laboratories are at the core of the Early warning system, since the indication of new molecules arrives from them after being identified. That is why it is very important to reduce as much as possible the risk of ambiguous data interpretation or mistakes, because the information circulates at international level.

The great inhomogenous variety of laboratory managing systems and analytical methods, plus the different levels of capacity of reading the spectra, provoke an inevitable dispersion of information, difficulties in communication and the production of inhomogeneous chemical analysis. In such a situation, developing strong and robust connections between different local institutions is pivotal, in order to harmonize the different systems and data interpretation.

Information sharing ‘good practise’ at European level has been developed by the European network of forensic institutes (ENFSI, <http://www.enfsi.eu/>). ENFSI envisages a varied working group according to different areas of interests, including drugs. It has been mentioned by the all interviewees as a very useful channel of communication both for exchanging practices of forensic analysis and above all for getting chemical data through its MS library (see table 5) .

⁴ For the national profile of the EWS see EMCDDA 2012.

⁵ For details see the annual reports of the FEWS released by the Home Office.

The ENFSI meetings are seen as critical opportunities to discuss the novelties of the drug market, including NPS and the use of advanced technologies.

Other good practices of sharing information on NPS indicated by the interviewees are projects co-financed by the European Commission. They are considered as very important occasions for improving the capacity of LEAs and forensic laboratories to exchange data on NPS, despite the fact that they have the drawback of ending within a fixed time.

As it emerged from the interviews, the RESPONSE PROJECT has been particularly useful for the information it collected and the database it created during its project activities (see box 4).

The most important tools for sharing analytical data on NPS are databases and spectra libraries, although they are unlikely to be updated with the emerging compounds.

There are some forensic national and international databases that are used for NPS identification. Some of the databases are open, while the access to other is limited (especially those at national level or the commercial one as the NIST database, Zuba 2014, p. 363) (see table 6).

BOX 4

RESPONSE PROJECT

Collect, Analyse, Organize, Evaluate, Share – A Response to Challenges in Forensic Drugs Analyses
JUST/2013/ISEC/DRUGS/AG/6413

The premise of this project is that “Systematic information on illicit drug markets and trafficking is still limited. Forensic drugs laboratories can provide such information via monitoring and profiling, identifying new psychoactive substances (NPS) and by evaluating other relevant data. Forensic information is the key factor for the strategic, operational, evidential and judicial purposes and influences the drugs supply reduction activities, planning, risk assessment and the coordination of actions at all EU levels.” Given the necessity of “adequate forensic science infrastructure which meets the state-of-the-art science and technology criteria and enhanced cooperation between forensic labs and networking with other stakeholders”, the project’s aims are: “collecting, analysing, evaluating, organizing and sharing information and knowledge, through expert exchange, creating and updating common databases, developing the competencies of EU forensic labs and know-how transfer.” (<http://www.policija.si/eng/index.php/generalpolicedirectorate/1669-nfl-page-response>)

TABLE 05 - RiSSC elaboration with the contribution of the Forensic Science Institute Zurich, Switzerland

Database	Institution	Data	Format	Access	Level
EWS (Early Warning Advisory)	UNODC	UNODC Early Warning Advisory on NPS, limited on name, structure and molecular weight of NPS	Html	Limited. Open to registered persons	Worldwide
European Database on New Drugs (EDND)	EMCDDA	Various information on NPS, including analytical data	PDF, not machine readable	Limited. Open to the national focal points and to experts and labs indicated by the national focal points.	European
MS-Database	SWGDRUG (Scientific Working Group for the analysis of Seized Drugs)	MS-Database of > 2'000 NPS compounds	MS-readable format and summary on Excel-File	Open	Worldwide
IR-Database	SWGDRUG	IR-Database of > 200 NPS compounds	IR-readable format and summary on Excel-File	Open	Worldwide
Monographs	SWGDRUG	A weakly updated series of monographs of NPS	PDF	Open	Worldwide
MS-Database	European Network of Forensic Science Institutes (ENFSI) Drugs Working Group (DWG)	MS-Database of > 2'000 NPS compounds	MS-readable format and summary on Excel-File	Limited. Open to ENFSI DWG members	European
IR-Database	ENFSI DWG	IR-Database of > 200 NPS compounds	IR-readable format and summary on Excel-File	Limited. Open to ENFSI DWG members	European

3 RECOMMENDATIONS

Given the many challenges posed by NPS, LEAs and forensic laboratories should improve their capacity to handle NPS in terms of investigation, control and identification both at national and European/international level. Generally speaking, it is necessary to implement the recommendations suggested in the operating guidelines of the Early Warning System, in accordance with the measures introduced by the Council Decision 2005/387/JHA: “the national focal points (NFP) should ensure that regular liaison is maintained with Europol national units (ENU), forensic science and toxicology laboratories, government departments responsible for enacting drugs legislation, national medicines agencies and other drugs agencies as appropriate.” (EMCDDA, EUROPOL, 2007, p. 7).

3.1 INVESTIGATION | CONTROL | RECOGNITION

Generally speaking, the new characteristics of the drug market request an update at national level from the LEAs by creating specific competence on NPS and also by improving the capacity to carry out drug investigations on the Internet. Narcotics units should introduce sub-units specialized in NPS, and online investigation units should focus their activities not only on cyber-crimes, but also on drug trafficking. Where it is not possible to create specific sub-units due to the lack of human and financial resources, it is recommended that cooperation between narcotics units and cyber-crime units developed, as suggested by most of the respondents to the questionnaire. This would facilitate the implementation of investigation activities focused on NPS.

To improve the capacity of NPS detection it is important to establish permanent procedures of cooperation specifically devoted to NPS and thus increasing the information sharing. The early warning system must be as efficient as possible, reducing the errors in drug identification, in order to give an

efficient contribution to the European Early Warning System. Therefore it would be necessary to improve the procedures of data validation as collected by the National Focal Points that are recorded in the EDND database.

To develop the good practice of sharing data it is important to have an efficient NPS database system. This could be achieved by improving those already existing and by creating new databases.

+ MAKE WIDER THE ACCESS TO EMCDDA DATABASE AND TO THE NATIONAL DATABASE

At present the access to EDND is reserved to the Reitox National Focal Points and to those indicated by the National Focal Points (EMCDDA, EUROPOL, 2007, p. 26). However, if the warning system does not work efficiently at national level, there might be the risk that agents dealing with NPS do not have access to this important database leading to a lack of communication and information sharing. Therefore it is suggested that the request of access to EDND can be submitted directly to the EMCDDA.

Selected and accredited LEAs and Custom officers should have the possibility of access to the various national databases of NPS.

+ CREATING A EUROPEAN DATABASE OF NPS FACTSHEETS

A European Database of NPS factsheets similar to the database developed by the Forensic science institute of Zurich, illustrated in this report, would be particularly useful for border controllers as a tool for the recognition of already known NPS. The EMCDDA, in collaboration with EUROPOL and CLEN, might be the appropriate institution to be charged with the implementation of this kind of database.

+ CREATING MORE OCCASIONS OF EXCHANGE OF INFORMATION BETWEEN LEA LABORATORIES AT A EUROPEAN LEVEL THROUGH LONG TERM PROJECTS.**+ INCREASING THE LEA AND FORENSIC LABORATORY COLLABORATIONS WITH PROFESSIONALS WHO TREAT INTOXICATED PEOPLE.**

3.2 IDENTIFICATION

As underlined in the report, the more drug legislation becomes generic and wide ranging and therefore scheduling an extensive number of substances, the more the demand for the forensic analysis of drugs will grow. For this reason it is very important to have tools that facilitate the work of forensic analysts and the exchange of information.

+ CREATING A EUROPEAN CENTRAL CHEMINFORMATIC DATABASE ON NPS

The EDND data are in a pdf format (see table 6), that is not machine readable. Therefore it would be necessary to create a database with information that is able to be used by computers.

A European Central Analytical Repository on NPS would facilitate the work of forensic laboratories. The repository should unify all the data of the existing libraries (see table 6) containing information on NPS, including chemi-informatic data.

The repository created by the European project "Response" (http://www.policija.si/apps/nfl_response_web/seznam.php) might be a good model for the construction of a European central database which could be managed by the EMCDDA with the technical support of the JRC. The creation of a European central analytical repository on NPS would envisage an investment only in human resources, since the JRC is already equipped with the necessary advanced analytical instrumentation. The JRC would control the quality of the information coming from the MS laboratories and keep update the repository.

Reniero *et al.* have already suggested the development at European level, "a repository of spectroscopic data and knowledge on NPS" using "electronic platforms such as European Customs Inventory of Chemical Substances (ECICS) or SINAPSE, a free web communication platform provided by the European Commission which offers tools to promote expertise in EU policy making, and is already used by the Customs Laboratories European Network (CLEN)" (Reniero *et al.*, 2014, p. 4).

+ PROMOTING THE HARMONIZATION OF THE OPERATING PROCEDURES AT EUROPEAN LEVEL

For facilitating the exchange of analytical information on NPS and data based on electronic format, it would be important to harmonize the procedures as suggested by Reniero *et al.* (Reniero *et al.*, 2014, p. 4). This harmonization would facilitate the creation of the databases above suggested.

+ FACILITATING THE EXCHANGE OF STANDARDS OF NPS AT INTERNATIONAL LEVEL

For sharing information on NPS it is also important to facilitate the exchange of reference materials, including seized materials. As Raniero *et al.* put it: "the use of certain seized materials as possible common analytical standards after their appropriate chemical characterisation would help the routine control work by customs laboratories" (Reniero *et al.*, 2014, p. 4).

+ IMPROVING THE PROCEDURES OF VALIDATION OF ANALYTICAL DATA FROM NATIONAL LABORATORIES COLLECTED BY NATIONAL FOCAL POINTS AND EMCDDA AND RECORDED IN THE EDND

+ FOSTERING FORENSIC COMMUNITY TO IMPLEMENT RESEARCH THROUGH TEST PURCHASING ON NPS

+ ENCOURAGING THE RESEARCH ACTIVITY

It is recommended that the promotion of incentives for increasing the research and investigation on the Internet be increased, especially when a substance is put under international control to monitor its impact, since the scheduling might stimulate the introduction of a new substance with similar effects to the substance put under control (Ledberg, 2015, p. 74), as recommended by the International Narcotics Control Board (INCB) (INCB, 2011, p. 44) in relation to mephedrone (INCB, Report of the International Narcotics Control Board for 2010, United Nations, New York, 2011) Nations, New York, 2011)

3.3 TRAINING

Training is at the core of the diffusion of expertise and capacity in recognizing and identifying NPS and sharing information. The knowledge and analytical know-how of NPS experts, police and customs, needs to be rapidly updated in line with the fast changes in the NPS market. The respondents of the questionnaire from countries that are going to adopt a generic legislation that will grow the LEAs work on NPS, underlined the necessity to improve the LEAs capacity of handling NPS by increasing specific training initiatives on NPS.

The training activities at national and European level should be implemented not once in a while, but regularly. The training programmes should be addressed to two different targets:

- **LEAs and Customs carrying out drug investigations and making controls.**
- **Forensic chemists working in laboratories.**

For the first target group the training should aim to enlarge the LEAs and Customs capacity to recognize at first sight whether the product might be controlled drugs or uncontrolled drugs or if they contain a chemical structure analogous to controlled drugs.

For the second target the training should aim to make the approach of chemists wider, to teach the most important analytical methods, and above all the techniques to read the results of the analysis. Training programmes should concern, for example, the reading of NMR results, which might be useful in the case the laboratories send the sample to another laboratory that is equipped with this technique and receive the results; or the capacity to create an

open format of the results produced by the different analytical methods for identifying NPS.⁶

The training programmes should envisage workshops that might be organized by the EMCDDA along with the JRC and should aim to bring together the network of ENFSI and CLEN that involve agencies, including police and Customs, which have the same needs in the field of NPS.

Finally, training initiatives should also address other targets that have to deal with NPS related cases, like poison centers and hospitals. This is because while knowledge of NPS has been increasing within LEAs, Customs and forensic laboratories, and there are established analytical methodologies to recognize and identify new substances, there is still a gap of knowledge in recognizing the health effects of NPS.

⁶ Some spectra are in universal format, other not. Therefore open format would increase the possibility of exchanging data.

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