DRUG CHECKING ON THE DANCE FLOOR WITH A MOBILE HIGH-TECH LAB

Club Health 2017 Dublin

Health & Social Welfare Department State of Berne

Office of the Cantonal Pharmacist

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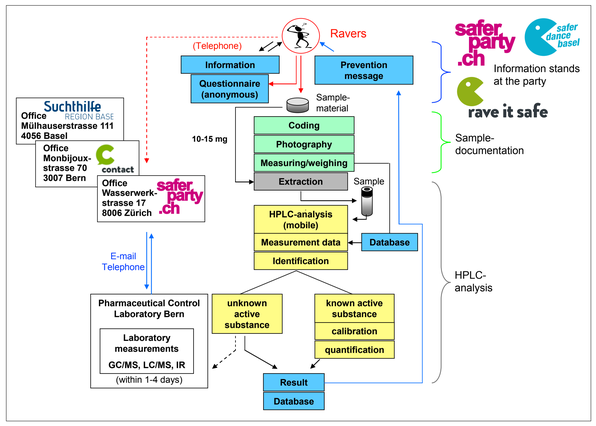
Introduction

Since 1998 the mobile lab unit of the Office of the Cantonal Pharmacist (Health & Social Welfare Department, State of Berne, Switzerland) is testing so called „Party Drugs“ on the dance floor. At more than 160 events the team has tested over 3400 samples in cooperation with „Streetwork Zurich“, „Contact Bern“ and „Suchthilfe Region Basel“.

The mobile lab consists of four custom made subunits mounted in steel framed racks on wheels, one for weighing and documentation, one for sample preparation and two with the equipment for chemical analysis (HPLC-DAD).
The lab is operated by two experienced technicians. Before analysis the interested customer is asked by the lab crew to fill out a questionnaire concerning information about the sample; thereafter every sample is digitally documented and characterized by physical appearance (form, weight, dimensions etc.).

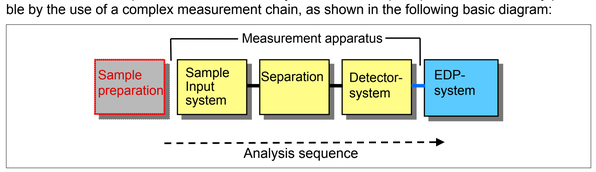
Flow diagram

Collaboration between the prevention-teams and the laboratory



Chemical analysis requirements

Chemical analysis of “Party Drugs“ gives one of three possible results. The findings may be a single active agent, several active agents, or indeed no active agent. Reliable analysis of the substances in a sample cannot be achieved by means of a simple “quick test“ and is only possible by the use of a complex measurement chain, as shown in the following basic diagram:



This arrangement applies to most modern chemical-analysis measurement systems.

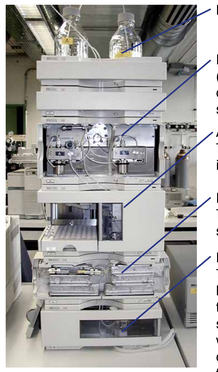
Sample preparation:

Due to the very sensitive analytical methods, only a representative part of the sample is used for further analysis. Sample preparation is quick and effective. The material is pulverised in a mortar and dissolved in methanol with the aid of an ultrasonic extractor.

An internal standard is added as control. In most cases this extract still contains insoluble components, which must be filtered off before analysis. The clear sample solution obtained is transferred into a sample vial.

HPLC (measurement apparatus)

For chemical analysis of party drugs separation and detection of different constituents of mixtures (active ingredients and fillers) is necessary. With the mobile lab we are using High Performance Liquid Chromatography (HPLC) for the separation process. Our computer controlled HPLC-systems are equipped with DAD/UV-Vis Spectrometers (Diode Array Detector).



Bottles with mobile phase (solvent mix)

HPLC- Pump
(Part of the separation-system). This high-pressure pump delivers the solvent (with the dissolved sample) through the separating column to the detector.

Autosampler
The autosampler transfers the prepared sample from the vial into the measurement apparatus.

HPLC-column
The “central unit“ of the HPLC-system serves to separate dissolved mixtures of substances into their constituents.

Detector
The chemical detector is positioned at the end of the column. It is the highly sensitive “eye“ of the measurement chain and records substances which absorb ultra-violet light when they pass trough the detector cell dissolved in the mobile phase. The detector provides two kinds of information about the molecules measured: their identity and their quantity. The whole process is continuously monitored with a computer system. Measurement signals are converted into graphical displays appearing on the computer screen. The two most important displays are the chromatogram and the UV-spectrum. The chromatogram is a representation of the separation process. The UV-spectrum is a characteristic constant for a particular substance.

Analytical method

HPLC-System	
Autosampler:	HP-1100, Typ G1389A
Pump:	HP-1100, Binary Pump, Typ G1376A
Detector:	HP-1100, UV-Vis DAD-Detector, Typ G1315B
Intrument control & integration	ChemStation for LC 3D software
HPLC- Conditions	
Stationary phase:	Spherisorb 80-3 ODS-1 (Waters)
Column dimension:	125 x 4.0 mm
Hold-up volume:	1.002 ml
Elutiontype:	Gradient
Eluent A	8,50 g ortho-phosphoric acid 85% + 280 µl hexylamine + purified water ad 1000 ml
Eluent B	4,25 g ortho-phosphoric acid 85% + 140 µl hexylamine + 45,75 g purified water + 351 g acetonitrile

Gradient program

Time in min	% A	%B
0 – 2.5	95	5
2.5 – 9	95 - 60	5 - 40
9 – 13.5	60	40
13.5 – 14	60 - 95	40 - 5
14 – 16.5	90	5

Measuring parameters:

Flowrate:	1 ml/min
Pressure:	150 bar
Injection volume:	2.5 µl
Column temperature:	40 °C
Detection:	UV 198 nm
Signal-Range:	190-400 nm

Report

Analytical results are available within about 20 minutes. The computer prints the results of the analysis as a report. The report consists of 3 parts: The header, the chromatogram, and the results (including identification and quantification)

Header:

The header contains details like: File-name, sample-number, date of analysis, name of method etc.

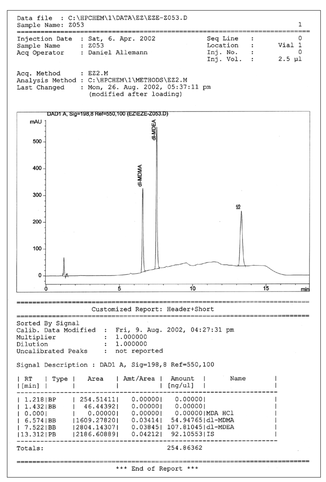
Chromatogram:

The chromatogram is a graphic visualisation of the separation process.
Detected substances appear as “Peaks”.

Results (identification and quantification):

The system compares the area-value of an integrated Peak with the corresponding calibration of the active substance in the specified methods.
This automatic process gives us a precise quantification.

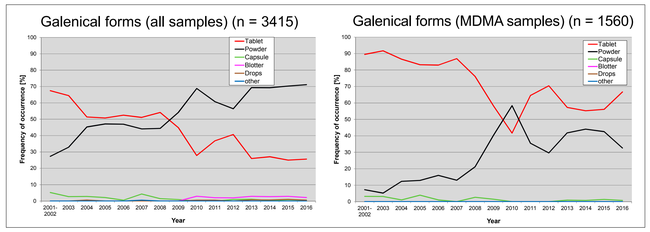
Additionally it is possible to get the UV-spectra of the “Peak” and compare it with our specific UV- Spectra-library.

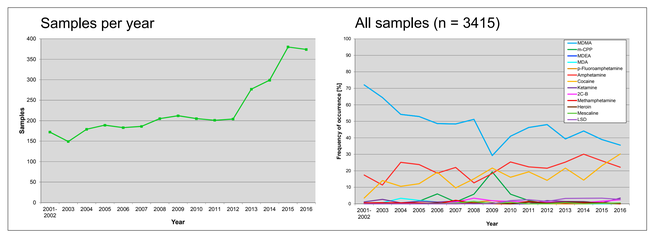


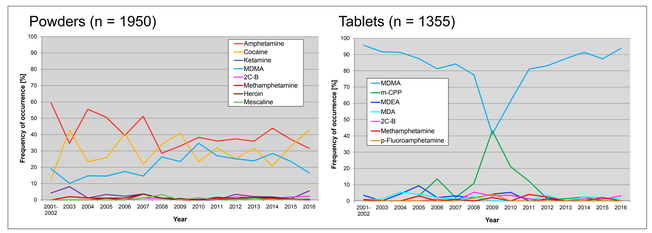
```
Data file  : C:\EPCHEM\1\DATA\EZ1\EZE-Z053.D                              1
Sample Name: Z053
================================================================================
Injection Date  : Sat, 6. Apr. 2002          Seq Line   :    0
Sample Name     : Z053                       Location   :  Vial 1
Acq Operator    : Daniel Allemann            Inj. No.   :    0
                                             Inj. Vol.  :  2.5 µl

Acq. Method     : EZ2.M
Analysis Method : C:\EPCHEM\1\METHODS\EZ2.M
Last Changed    : Mon, 26. Aug. 2002, 05:37:11 pm
                  (modified after loading)

DAD1 A, Sig=198,8 Ref=550,100 (EZ\EZE-Z053.D)
mAU
500
400
300
200
100
0
 MDA
 MDMA
 MEA
0
5
10
15
min

================================================================================
                    Customised Report: Header+Short
================================================================================
Sorted By Signal
Calib. Data Modified   :  Fri, 9. Aug. 2002, 04:27:31 pm
Multiplier             :  1.000000
Dilution               :  1.000000
Uncalibrated Peaks     :  not reported

Signal Description : DAD1 A, Sig=198,8 Ref=550,100

| RT    | Type | Area    | Amt/Area | Amount   | Name          |
|[min]  |      |         |          | [mg/ul]  |               |
|-------|------|---------|----------|----------|---------------|
| 1.218 | BP   | 254.51411 | 0.00000 | 0.00000 |               |
| 1.432 | BB   | 46.44392 | 0.00000 | 0.00000 |               |
| 0.000 |      | 0.00000 | 0.00000 | 0.00000 | MDA HCl       |
| 6.574 | BB   | 1609.27820 | 0.03414 | 54.94765 | d1-MDMA       |
| 7.522 | BB   | 2804.14307 | 0.03845 | 107.81045 | d1-MDEA      |
| 13.312 | PB   | 2186.40889 | 0.04212 | 92.10553 |               |
Totals:                                          254.86362
================================================================================
                        *** End of Report ***
```

Results

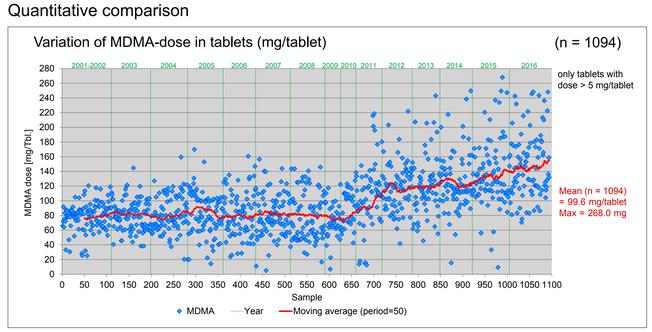
Frequency of occurrence

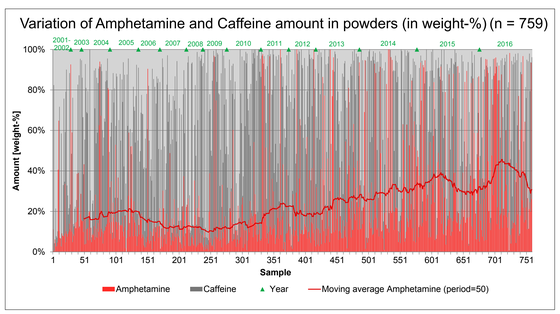


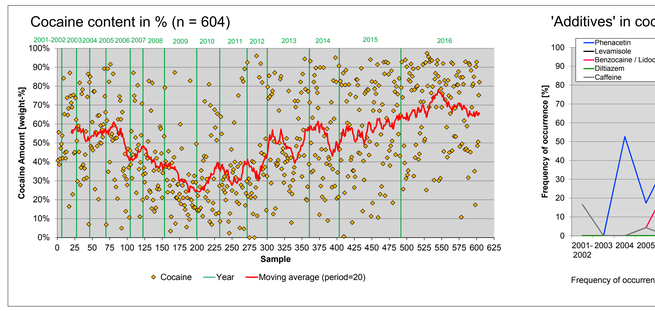


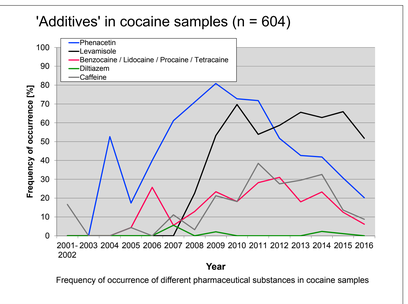


Quantitative comparison



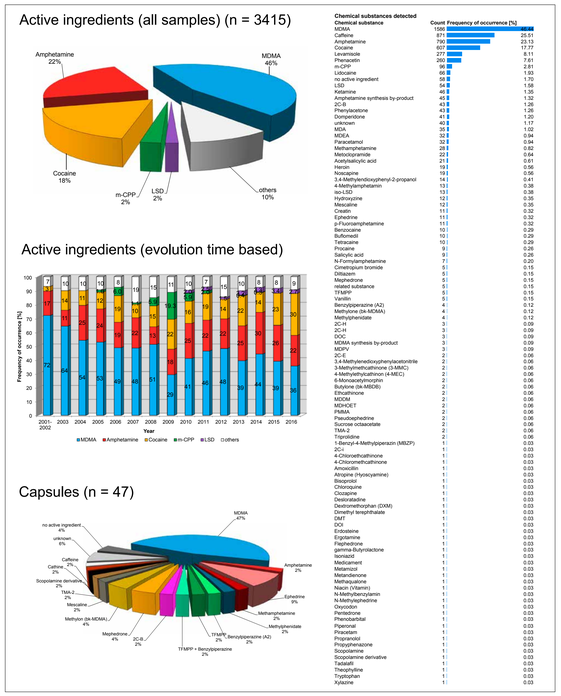






Frequency of occurrence of different pharmaceutical substances in cocaine samples

Qualitative results



Chemical substances detected		
Chemical substance	Count	Frequency of occurrence [%]
MDMA	1560	46.00
Caffeine	871	25.51
Amphetamine	790	23.13
Cocaine	607	17.77
Levamisole	277	8.11
Phenacetin	260	7.61
m-CPP	96	2.81
Lidocaine	66	1.93
no active ingredient	58	1.70
MDEA	54	1.58
Ketamine	46	1.35
Amphetamine synthesis by-product	45	1.32
2C-B	43	1.26
Phenylacetone	43	1.26
Dumpenidone	41	1.20
unknown	40	1.17
MDA	35	1.02
MDEA	32	0.94
Paracetamol	32	0.94
Benzocaine	28	0.82
Metoclopramide	23	0.67
Acetylsalicylic acid	21	0.61
Heroin	19	0.56
Noscapine	19	0.56
3,4-Methylendioxyphenyl-2-propanol	14	0.41
4-Methylamphetamin	13	0.38
iso-LSD	13	0.38
Hydroxyzine	12	0.35
Mescaline	12	0.35
Coffeine	11	0.32
Ephedrine	11	0.32
p-Fluoroamphetamine	11	0.32
Benzocaine	10	0.29
Buflomedil	10	0.29
Tetracaine	10	0.29
Procaine	9	0.26
Salicylic acid	9	0.26
N-Formylamphetamine	7	0.20
Cetrimonium bromide	5	0.15
Lidocaine	5	0.15
Mephedrone	5	0.15
related substance	5	0.15
TFMPP	5	0.15
Vanillin	5	0.15
Benzylpiperazine (A2)	4	0.12
Methylone (bk-MDMA)	4	0.12
Methylphenidate	4	0.12
2C-H	3	0.09
2C-I	3	0.09
DOM	3	0.09
MDMA synthesis by-product	3	0.09
MDPV	3	0.09
2C-E	2	0.06
3,4-Methylenedioxyphenylacetonitrile	2	0.06
3-Methylmethcathinone (3-MMC)	2	0.06
4-Methylethcathinon (4-MEC)	2	0.06
6-Monoacetylmorphin	2	0.06
Butylone (bk-MBDB)	2	0.06
Ethylamphetamine	2	0.06
MDDM	2	0.06
MDHOET	2	0.06
PMMA	2	0.06
Pseudoephedrine	2	0.06
Sucrose octaacetate	2	0.06
TMA-2	2	0.06
Triprolidine	2	0.06
1-Benzyl-4-Methylpiperazin (MBZP)	1	0.03
2C-T-7	1	0.03
4-Chloroethcathinone	1	0.03
4-Chloromethcathinone	1	0.03
Amiocidin	1	0.03
Atropine (Hyoscyamine)	1	0.03
Bisoprolol	1	0.03
Chloroquine	1	0.03
Clozapine	1	0.03
Desloratadine	1	0.03
Dextromethorphan (DXM)	1	0.03
Dimethyl terephtalate	1	0.03
DMA	1	0.03
DOI	1	0.03
Endostene	1	0.03
Ergotamine	1	0.03
Flephedrone	1	0.03
gamma-Butyrolactone	1	0.03
Isoniazid	1	0.03
Medicament	1	0.03
Metamizol	1	0.03
Methadone	1	0.03
Methaqualone	1	0.03
Niacin (Vitamin)	1	0.03
N-Methylbenzylamin	1	0.03
N-Methylephedrine	1	0.03
Oxycodon	1	0.03
Pentedrone	1	0.03
Phenobarbital	1	0.03
Piperonal	1	0.03
Piracetam	1	0.03
Propranolol	1	0.03
Propyphenazone	1	0.03
Scopolamine	1	0.03
Scopolamine derivative	1	0.03
Tadalafil	1	0.03
Theophylline	1	0.03
Tryptophan	1	0.03
Xylazine	1	0.03

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