



Illicit Drugs in Wastewater

LNS – LIST collaboration



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Monitoring drug use

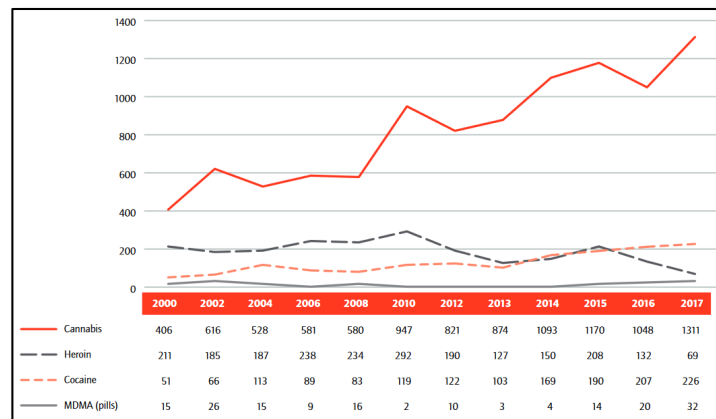


Monitoring drug use is crucial in order to better understand the drug problem and develop efficient countermeasures

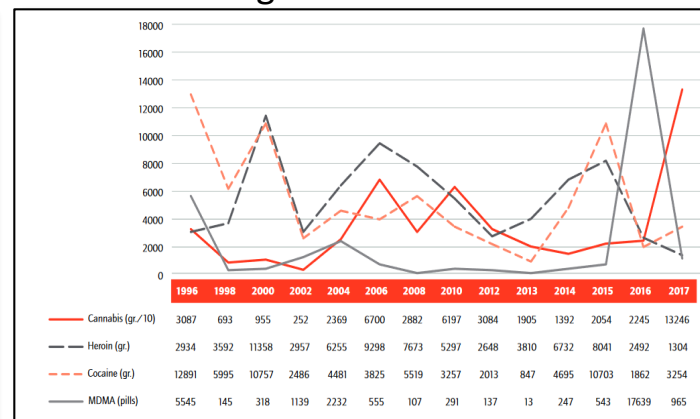
- Changing availability and quality of “classic drugs” (cocaine purity)
 - Emergence of new psychoactive substances (new psychoactive substances)
 - Negative effects of illicit drug use on crime rates and public health issues
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Number and amounts of drugs seized

Number of seizures



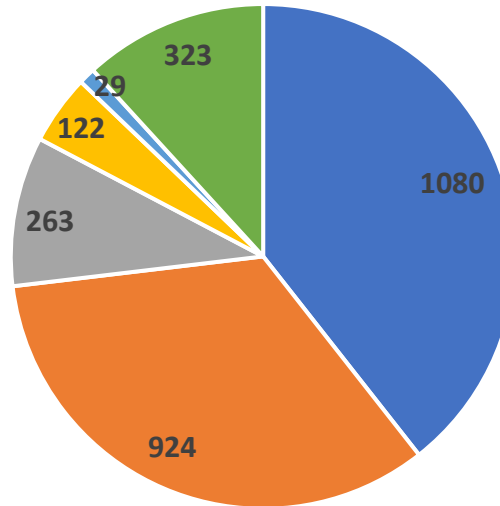
Amount of drugs seized



Drug analysis at the LNS



2741 samples analyzed in 2018




■ Cannabis ■ Cocaine ■ Héroïne ■ ATS ■ NPS ■ Autres

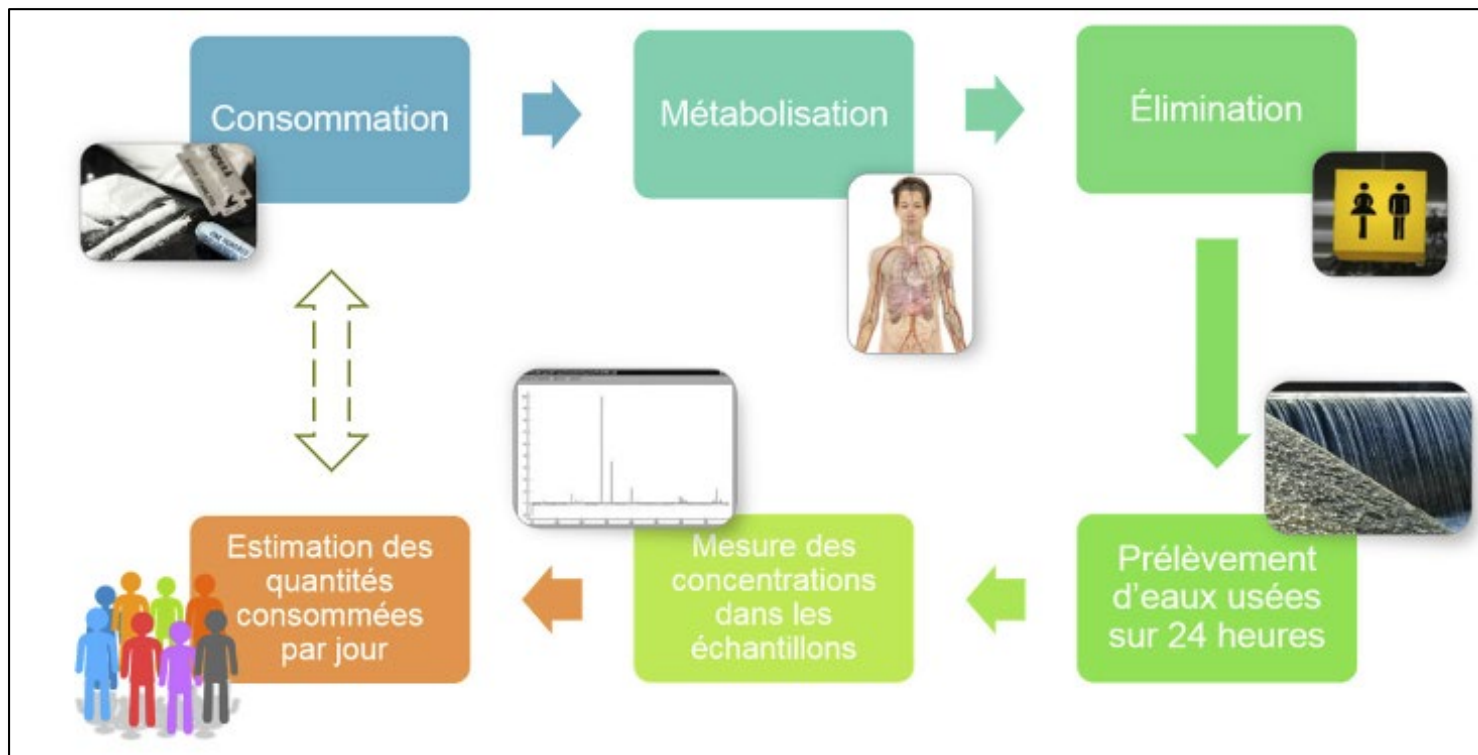
Wastewater analysis



Wastewater-based analysis is an efficient source to assess epidemiological data:

- Unbiased estimation of drug use in a specific geographical area
 - Monitor drug usage over a given time period and a geographical area
 - Complementary information to data from police and customs seizures, consumer interviews, hospitals and treatment centers
- 

Flow-chart



Wastewater analysis in Pétange

- Wastewater from Differdange, Käerjeng, Pétange and Sanem
- Nominal capacity: +/-70000 eq/inhabitants

<https://www.siach.lu/fr/site-dassainissement-installations/station-depuration>



Wastewater analysis in Pétange



Wastewater sampling:

- Monday 2018/06/25 - Friday 2018/06/29
- 40 samples (8/day → 1 sample represented 3h of the influent)
- Total: 1800 mL/sample (200 mL every 20 min)

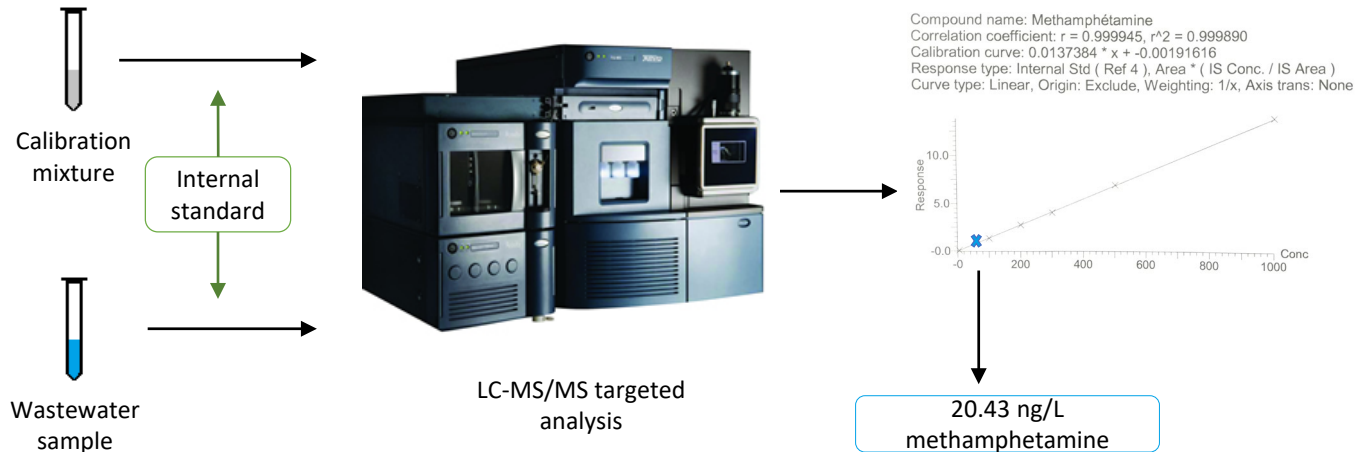


Drugs analysed



- Amphetamine (Speed)
- MDMA (Ecstasy)
- Methamphetamine (Crystal Meth)
- Cocaine (and its metabolite benzoylecgonine, BZE)
- 6-MAM (metabolite of Heroin)
- THC-COOH (metabolite of THC)

Sample analysis

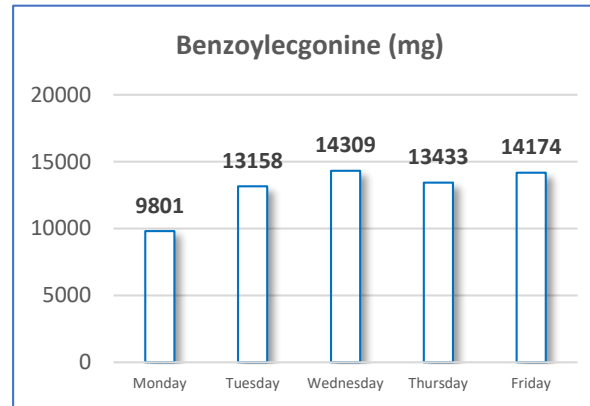
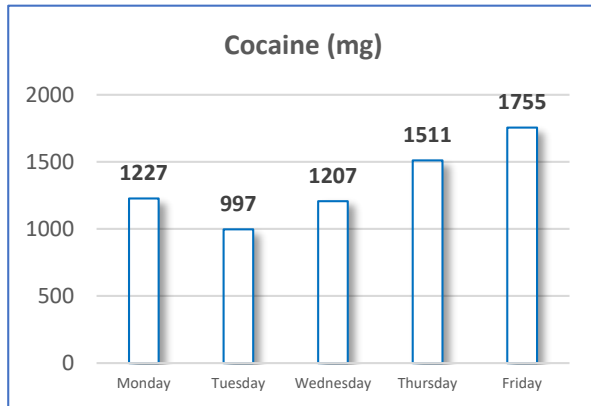


Sample analysis



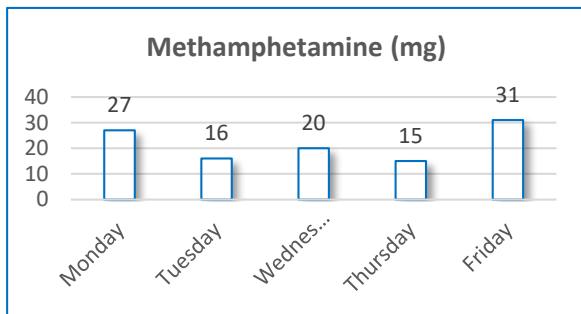
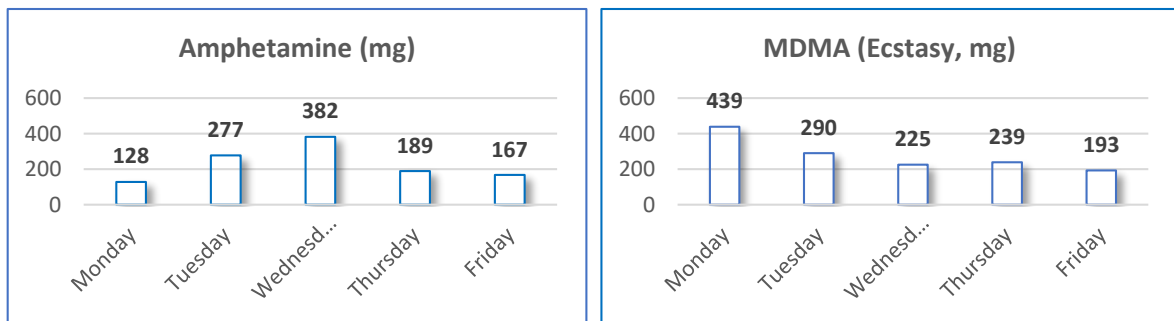
Diurnal loads

- High and constant levels of cocaine and benzoylecgonine (major cocaine metabolite)



Diurnal loads

- High levels of amphetamine and MDMA compared to methamphetamine

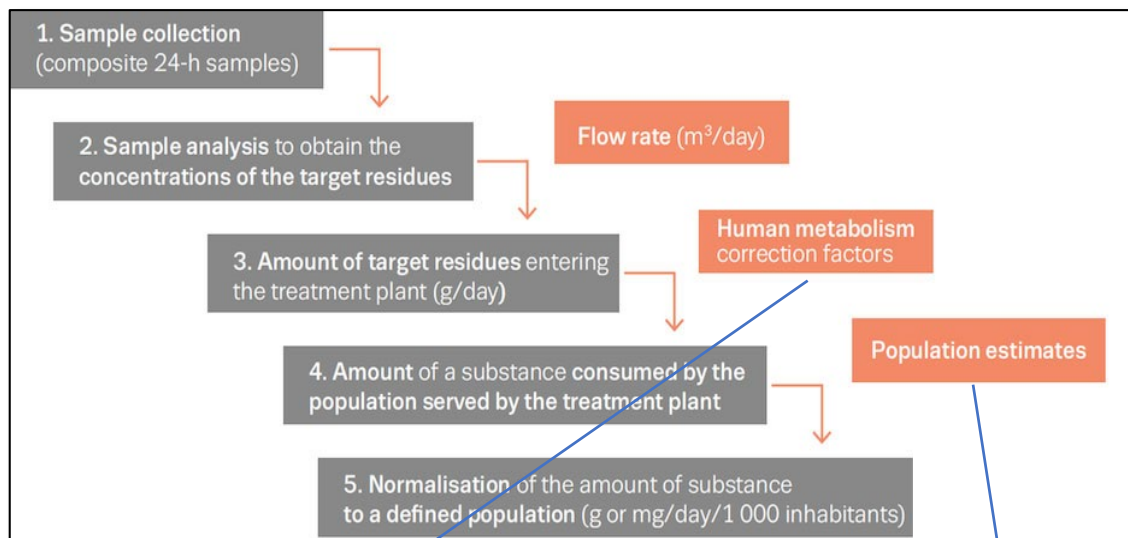


Diurnal loads



- The diurnal loads measured at Pétange are in agreement with results from other studies
- **The measured concentrations do not pose a health risk to humans**

Estimation of drugs consumption in Pétange area



	AMPH	MDMA	METHAMPH	BZE	COC
Average excretion (%)	36,3	22,5	22,7	29 - 45	7,5
Correction factor	2,77	4,4	4,4	3,0	13,0

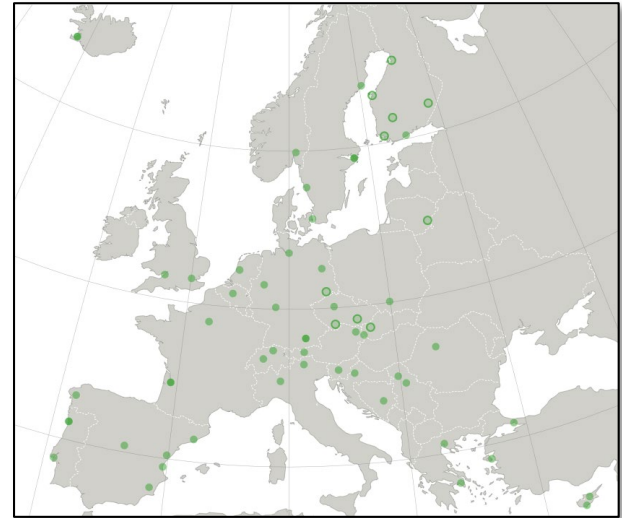
72000 inhabitants (2018)

Estimation of drugs consumption in Pétange area

	AMPHETAMINE (Speed)	MDMA (Ecstasy)	METHAMPH (Crystal meth)	COCAINE (as BZE)
mg/1000/day	8,8	17,0	1,3	541,0

Project SCORE

- Wastewater analyzed in **73 cities in 20 European countries** (2018) to explore drug-taking behaviors of their inhabitants
- 4 drugs monitored:
 - MDMA (“Ecstasy”)
 - Cocaine (as its major metabolite benzoylecgonine)
 - Amphetamine (“Speed”)
 - Methamphetamine (“Crystal Meth”)

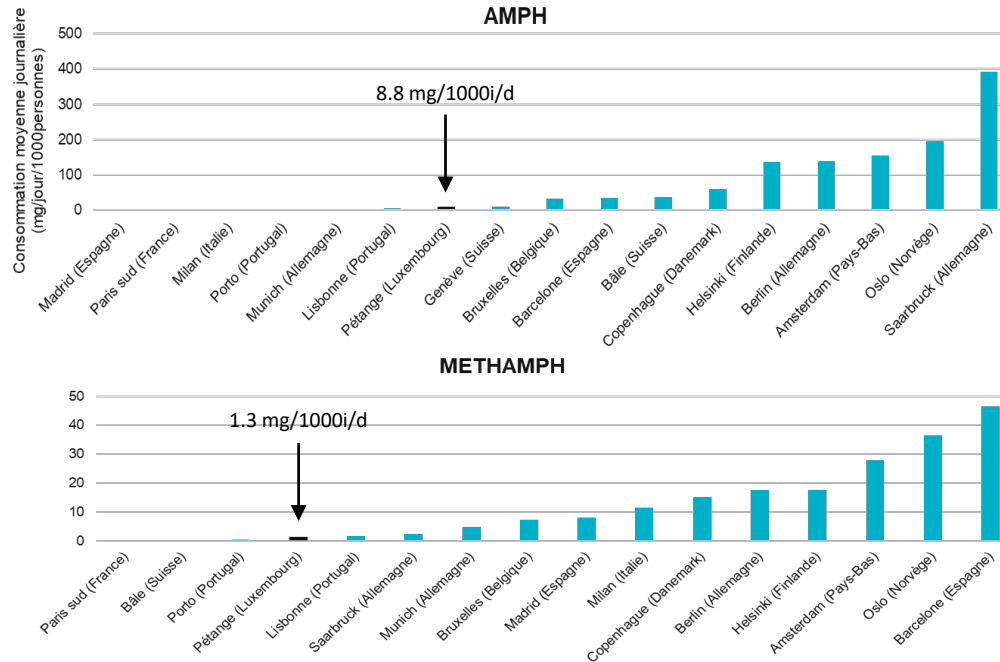


Comparison with Max and Median SCORE results

Drug	Pétange	Max in Europe	Median in Europe
	mg / 1000 / day		
Cocaine	541	892,4 (Bristol)	98,2 (Bratislava)
Amphetamine	8,8	391,0 (Saarbrücken)	35,0 (Berne)
Methamphetamine	1,3	205,4(Erfurt)	7,3 (Brussels)
MDMA	17	191,9 (Amsterdam)	12,5 (Copenhagen)

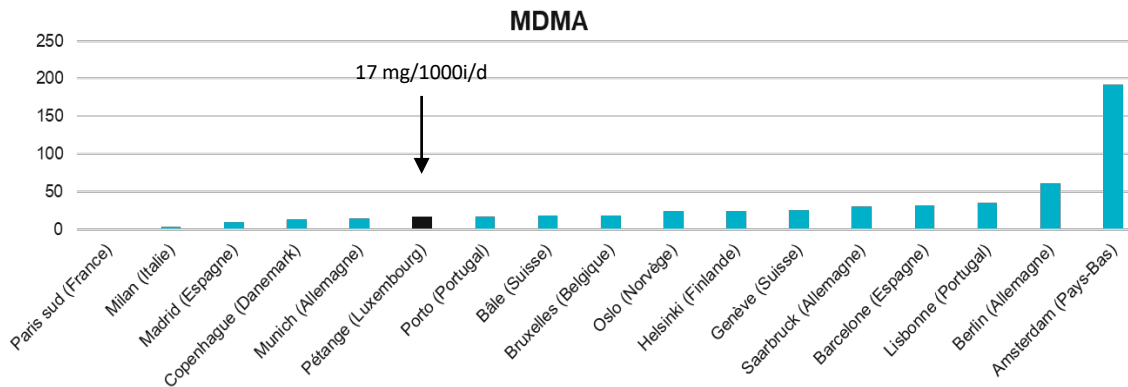
AMPH/METHAMPH in Pétange vs SCORE results

Low range of consumption in the entire study



MDMA in Pétange vs SCORE results

Median range of consumption in the entire study

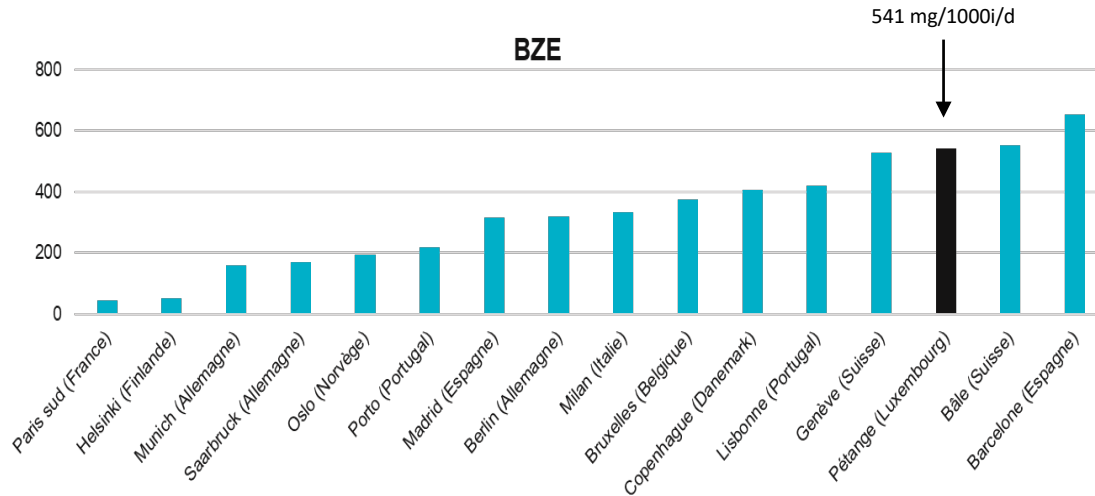


http://www.emcdda.europa.eu/topics/pods/waste-water-analysis_fr

COCAINE in Pétange vs SCORE results



High range of consumption in the entire study



http://www.emcdda.europa.eu/topics/pods/waste-water-analysis_fr


Limitations



No estimation can be given on:

- Number of drug consumers
- Quality (purity) of drugs

Parameters difficult to estimate:

- Drug stability in wastewater
 - Microbial degradation of drugs
- 

Perspectives



- **Analysis of WW from several treatment plants** : monitoring geographical differences
- **Several sampling campaigns per year**: evolution of drug consumption
- **Target sampling area/date**: specific districts, festivals...
- **Inclusion of other drugs**: new psychoactive substances (NPS), medicines

Conclusions



- No human health risk due to wastewater contamination with drugs
- Methamphetamine detected in all samples
- Drug consumption estimation:
 - Cocaine above European median
 - MDMA around European median
 - Amphetamine and methamphetamine below European median

Acknowledgement



Syndicat Intercommunal pour l'Assainissement du bassin de la Chiers
Fond de lutte contre certaines formes de criminalité for project funding

Dr sc. Adèle Bourmaud, LNS, Toxicologie analytique – chimie pharmaceutique

Karin Roschel, LNS, Toxicologie analytique – chimie pharmaceutique

Nicolas Gengler, LNS, Toxicologie analytique – chimie pharmaceutique

Michael Bayerle, LIST, Depart. of Environmental Research and Innovation

Tom Galle, LIST, Depart. of Environmental Research and Innovation

Service de surveillance alimentaire (LNS) for technical assistance



Questions?