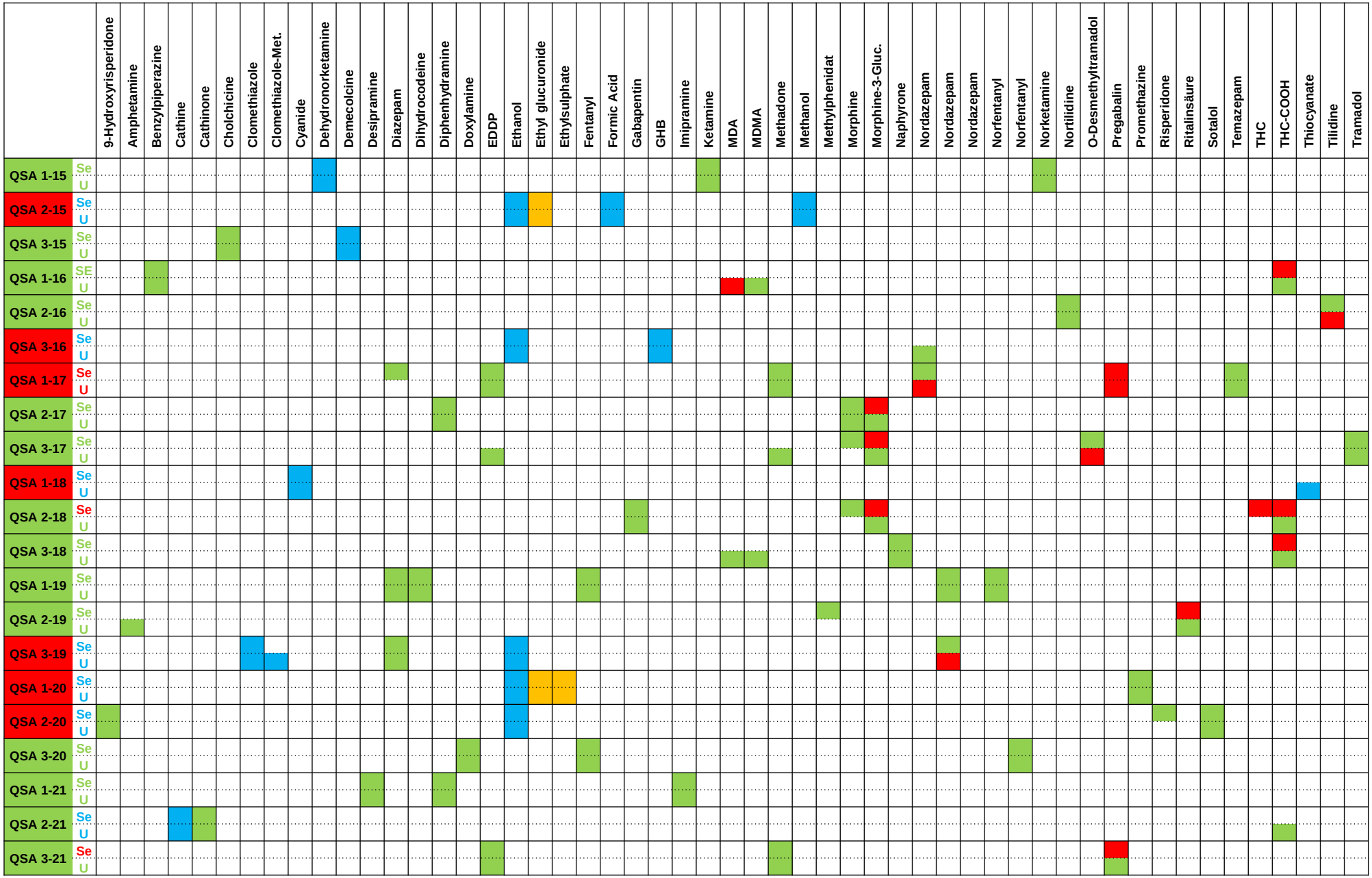
Overview of Spiked Compounds and Toxtyper® Results QSA 1-2015 to 3-2021

(Detailed information can be found on the following pages)



QSA 1-2015

Case History:

A young man is found unresponsive in a disco in the evening. The emergency physician called in finds signs of paralysis on the body, speech disorders, muscle spasms and muscle tremors. The man reports having experimented with a party drug. A blood and urine sample are sent in for analysis.

Questions:

- Are there any xenobiotics detectable?
- Which compound caused the described symptoms?
- Which preparation was ingested?

Spiked Compounds and Toxtyper® Findings

Ketamine	1000 µg/L	✓
Norketamine	800 µg/L	✓
Dehydronorketamine	200 µg/L	✗

Ketamine	50 µg/L	✓
Norketamine	5000 µg/L	✓
Dehydronorketamine	8000 µg/L	✗

=> Quantitative analysis of ketamine and norketamine

Issues ✗

Dehydronorketamine not included in the method

PASSED

QSA 2-2015

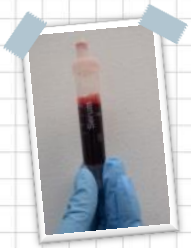
Case History:

A police patrol recognizes the impaired driving of a motorist and performs a control. The police officer observes gait, speech and visual disorder. The breath alcohol level is 0.8 ‰. The man states that he is a sober alcoholic and has released himself from hospital his family admitted him because he drank from a bottle containing a clear and spirituous liquid.
A blood and urine sample are sent in for analysis.

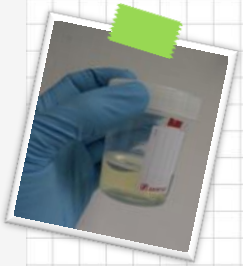
Questions:

- Are there any xenobiotics detectable?
- Which compound caused the described condition?
- Which therapy might have been applied in the hospital?

Spiked Compounds and Toxtyper® Findings



Methanol	2.5 g/L	✗
Ethanol	1.0 g/L	✗
Formic Acid	0.6 g/L	✗
Ethylglucuronide	0.5 mg/L	✗



Methanol	600 mg/L	✗
Ethanol	500 mg/L	✗
Formic Acid	100 mg/L	✗
Ethylglucuronide	1.0 mg/L	✗

Issues ✗

EtG is included in the screening but not great for LC-MSn detection

Issues ✗

Methanol, ethanol and formic acid are not detectable by LC-ESI-MS

FAILED

QSA 3-2015

Case History:

A young man presents himself to a doctor because of swallowing problems, vomiting, and diarrhea. He seasoned his dinner with plants and wild herbs collected in an nearby forest. A few hours after the meal first symptoms like a sore throat appeared.

A blood and urine sample are sent in for analysis.

Questions:

- Are there any xenobiotics detectable?
- Which compound caused the described condition?
- Which plant was probably collected?

Spiked Compounds and Toxtyper® Findings

Colchicine	5.0 µg/L	✓
Demecolcine	2.5 µg/L	✗

Colchicine	100 µg/L	✓
Demecolcine	50 µg/L	✗

=> *Quantitative analysis of colchicine*

Issues ✗

Demecolcine not included in the method

PASSED

QSA 1-2016

Case History:

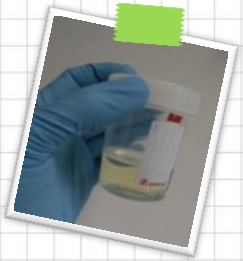
A young women is admitted to the ER. She complains about severe nausea and headache. Her blood pressure is very high, she shows states of anxiety and several seizures. An uptake of drugs of abuse is assumed.
A blood and urine sample are sent in for analysis.

Questions:

- Are there any xenobiotics detectable?
- Which compound primarily caused the described condition?

Spiked Compounds and Toxtyper® Findings

Benzylpiperazine	300 µg/L	✓
THC-COOH	25 µg/L	✗



MDMA	250 µg/L	✓
MDA	100 µg/L	✗
Benzylpiperazine	500 µg/L	✓
THC-COOH	25 µg/L	✓

=> Quantitative analysis of
- MDMA and metabolites
- benzylpiperazine
- THC and metabolites

PASSED

Issues ✗
- THC-COOH in serum not detectable due to sample prep
- MDA false negative

QSA 2-2016

Case History:

A young Turkish man is caught by a police patrol while breaking into a building. While getting arrested the man gets more and more aggressive. He can‘t be detained by routine procedures and seems to be uneffected by pain.

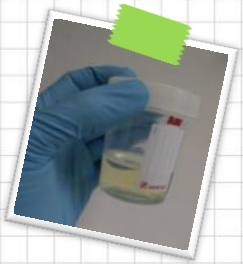
He tells the physician that he drank something but no alcohol. A blood and urine sample are sent in for analysis.

Questions:

- Are there any xenobiotics detectable?
- Which compound caused the described condition?
- Which preparation was ingested?

Spiked Compounds and Toxtyper® Findings

Tilidine	50 µg/L	✓
Nortilidine	200 µg/L	✓



Tilidine	5.0 µg/L	✗
Nortilidine	120 µg/L	✓

=> *Quantitative analysis of tilidine and metabolites*

PASSED

Issues ✗

Tilidine false negative in urine

QSA 3-2016

Case History:

A young woman is at a party with her friends in a well-known club. She consumes multiple glasses of champagne. Soon she gets dizzy. Her condition gets worse quickly and she is admitted to a hospital.

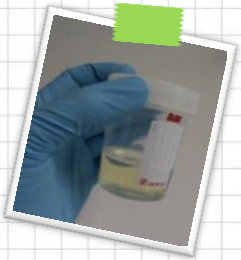
A blood and urine sample are sent in for analysis.

Questions:

- Are there any xenobiotics detectable?
- Which compound primarily caused the described condition?

Spiked Compounds and Toxtyper® Findings

GHB	140 mg/L	✗
Ethanol	0.6 g/L	✗



GHB	620 mg/L	✗
Nordiazepam	350 µg/L	✓
Ethanol	1000 mg/L	✗

=> *Quantitative analysis of benzodiazepines*

**GHB is analyzed with a specific LC-QqQ-MS method*

FAILED

Issues ✗

- Ethanol can't be detected by LC-MS
- GHB can't be detected with LC-ion trap-MS (mass range)

QSA 1-2017

Case History:

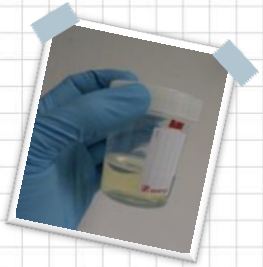
A young woman is caught shoplifting. When the police arrives, she acts very aggressive and provocative, making weird statements like „it was an order from the highest authorities“. She is known to the police as a drug addict.
A blood and urine sample are sent in for analysis.

Questions:

- Are there any xenobiotics detectable?
- Which compound primarily caused the described condition?

Spiked Compounds and Toxtyper® Findings

Pregabalin	15 mg/L	✘
Diazepam	200 µg/L	✓
Nordiazepam	150 µg/L	✓
Temazepam	20 µg/L	✓
Methadone	150 µg/L	✓
EDDP	20 µg/L	✓



Pregabalin	7.0 mg/L	✘
Nordiazepam	10 µg/L	✘
Temazepam	400 µg/L	✓
Methadone	400 µg/L	✓
EDDP	400 µg/L	✓

=> *Quantitative analysis of*
- *benzodiazepines*
- *methadone and metabolite*

FAILED

Issues ✘

Pregabalin not detectable in serum due to sample prep but false negative in urine!

QSA 2-2017

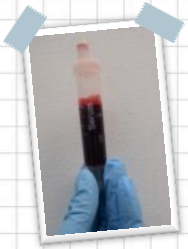
Case History:

A woman causes a minor accident while parking. However, she then continues to drive in serpentine lines and with frequent changes in driving speed. The police stops the woman, who claims to be taking medication for pain and to be under constant medical supervision. When her blood was taken, she appeared drowsy and her speech was slurred. A blood and urine sample are sent in for analysis.

Questions:

- Are there any xenobiotics detectable?
- Which compound primarily caused the described condition?

Spiked Compounds and Toxtyper® Findings



Diphenhydramine	500 µg/L	✓
Morphine	25 µg/L	✓
Morphine-3-gluc.	500 µg/L	✗

Diphenhydramine	1500 µg/L	✓
Morphine	10 µg/L	✓
Morphine-3-gluc.	1500 µg/L	✓

=> *Quantitative analysis of*
- diphenhydramine
- Morphine, 6-MAM and metabolites

✗ *Issues*
Morphine-gluc not detected due to sample prep.

PASSED

QSA 3-2017

Case History:

A young man is found huddled and apathetic in a toilet in the evening. There is vomit and a used disposable syringe nearby. He stammers to the emergency doctor that he had injected himself with something around noon.
A blood and urine sample are sent in for analysis.

Questions:

- Are there any xenobiotics detectable?
- How to asses the concentrations?
- Which compound primarily caused the described condition?

Spiked Compounds and Toxtyper® Findings

Tramdol	1500 µg/L	✓
O-Desmethyltramadol	500 µg/L	✓
Morphine	20 µg/L	✓
Morphine-3-gluc.	300 µg/L	✗

Tramadol	2000 µg/L	✓
O-Desmethyltramadol	600 µg/L	✗
Morphine-3-gluc.	500 µg/L	✓
Methadone	200 µg/L	✓
EDDP	200 µg/L	✓

=> *Quantitative analysis of:*
- *tramadol and metabolite*
- *Methadone and EDDP*
- *morphine, 6-MAM and metabolites*

PASSED

Issues ✗

Morphine-gluc not detected due to sample prep.
O-Desmethyltramadol false negative in urine

QSA 1-2018

Case History:

A 30 year old lab tech is found dead by a friend on the patio of his house. To the police, the friend states that the deceased had relationship problems recently. No evidence of drugs or medication was found at the scene, only a broken glass lying on the ground. A blood and urine sample are taken and sent in for analysis.

Questions:

- Which compounds can be detected?
- How to evaluate the concentrations?
- Which compound primarily caused the described condition?

Spiked Compounds and Toxtyper® Findings

Cyanide* 5.0 mg/L ✘

Cyanide* 10 mg/L ✘
Thiocyanate 10 mg/L ✘

*Quantitative analysis of cyanide is carried out by UV-spectroscopy

Issues ✘
Cyanide not detecable by LC-ESI-MS

FAILED

QSA 2-2018

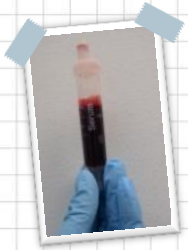
Case History:

A young man with a known drug addiction is stopped by the police. The he is is carrying contains suspected stolen goods. At first, the arrested man seems lethargic and reacts foolishly to questions. During blood collection he changes to provocative and aggressive behavior. He does not respond to questions and talks confused and muddled. A blood and urine sample are taken and sent in for analysis.

Questions:

- Which compounds can be detected?
- How to assess the concentrations?
- Which compound primarily caused the described condition?

Spiked Compounds and Toxtyper® Findings



Gabapentin	10,000 µg/L	✓
THC	5.0 µg/L	✗
THC-COOH	125 µg/L	✗
Morphine	125 µg/L	✓
Morphine-3-gluc	300 µg/L	✗

Gabapentin	10,000 µg/L	✓
THC-COOH	150 µg/L	✓
Morphine-3-gluc	500 µg/L	✓

=> *Quantitative analysis of:*
- THC and metabolites
- morphine, 6-MAM and metabolites

Issues ✗

THC and THC-COOH and Morphine-gluc not detected due to sample prep

PASSED

QSA 3-2018

Case History:

A police patrol stops a car early in the morning for speeding. A young man is sitting in the car. During questioning, the man makes a strikingly awake impression, although he says he is coming from a party. He shows a clearly agitated behavior and constantly tries to engage the officers into a conversation. His pupils are not dilated. Nevertheless, the officers suspect drug influence. A blood and urine sample are taken and sent in for analysis.

Questions:

- Which compounds can be detected?
- How to assess the concentration?
- Which compound caused the described condition?

Spiked Compounds and Toxtyper® Findings

THC-COOH	10 µg/L	✘
Naphyrone	250 µg/L	✓

MDMA	250 µg/L	✓
MDA	100 µg/L	✓
THC-COOH	25 µg/L	✓
Naphyrone	750 µg/L	✓

=> *Quantitative analysis of:*
- *THC and metabolites*
- *MDMA and MDA*
- *naphyrone*

PASSED

Issues ✘

THC-COOH not detected due to sample prep

QSA 1-2019

Case History:

A known drug addict is found dead in his appartment. His room mates states that the deceased had recently changed his consumption pattern and got his drugs from a hospital now.
A blood and urine sample are sent in for analysis.

Questions:

- Which compounds can be detected?
- How to evaluate the concentrations?
- Which compound caused the described condition?

Spiked Compounds and Toxtyper® Findings

Fentanyl	35 µg/L	✓
Norfentanyl	10 µg/L	✓
Diazepam	100 µg/L	✓
Nordiazepam	150 µg/L	✓
Dihydrocodeine	25 µg/L	✓

Fentanyl	75 µg/L	✓
Norfentanyl	60 µg/L	✓
Diazepam	150 µg/L	✓
Nordiazepam	200 µg/L	✓
Dihydrocodeine	60 µg/L	✓

=> *Quantitative analysis of:*
- *benzodiazepines*
- *fentanyl and metabolites*
- *dihydrocodine and opiods in general*

PASSED

QSA 2-2019

Case History:

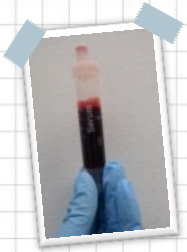
A young driver is taken for a blood sample after testing positive for amphetamine in a rapid urine test. During the control, the man stated that he has to take Ritalin. The police asks whether this statement is correct.

The blood and urine sample are sent in for analysis.

Questions:

- Was the medication taken as stated?
- Are there any signs for the uptake of additional compounds?
- Are the statements plausible?

Spiked Compounds and Toxtyper® Findings



Methylphenidate	10 µg/L	✓
Ritalinic acid	200 µg/L	✗

Ritalinic acid	200 µg/L	✓
Amphetamine	1200 µg/L	✓

=> *Quantitative analysis of:*
- *amphetamine*
- *methylphanidate*

PASSED

Issues ✗

Ritalinic acid not detectable due to sample prep

QSA 3-2019

Case History:

A 60-year-old man is found motionless in a building entrance in the morning. According to the wife, her husband had suffered from alcohol problems in the past. It had been very restless for a long time and had suffered from sleep disorders. A blood and urine sample are sent in for analysis.

Questions:

- Which compounds can be detected?
- How to assess the concentrations?
- Which compound primarily caused the described condition?

Spiked Compounds and Toxtyper® Findings

Clomethiazole	20 mg/L	✗
Diazepam	500 µg/L	✓
Nordiazepam	250 µg/L	✓
Ethanol	2.0 ‰	✗

Clomethiazole	1.0 mg/L	✗
Clomethiazole-Met.	50 mg/L	✗
Diazepam	0.5 mg/L	✓
Nordiazepam	0.4 mg/L	✓
Ethanol	1.5 ‰	✗

=> Quantitative analysis of:
- benzodiazepines

FAILED

Issues ✗

Ethanol not detecable by LC-ESI-MS

Clomethiazole and metabolite not included in the method

QSA 1-2020

Case History:

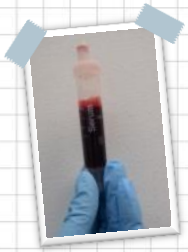
A 60 year old man is found lifeless in his bedroom in the morning. In the room are numerous older and new beer cans and bottles of vodka. The man's guardian states that there had been a quarrel the night before, which is why she had left the apartment.

A blood and urine sample are sent in for analysis.

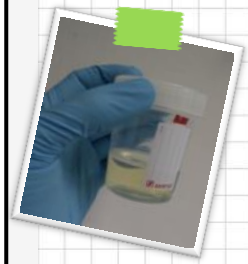
Questions:

- Which substances can be detected?
- How to asses the concetrations?
- Which compound primarily caused the described condition?

Spiked Compounds and Toxtyper® Findings



Promethazine	1.5 mg/L	✓
Ethanol	3.0 g/L	✗
Ethylglucuronide	2.0 mg/L	✗
Ethylsulfate	1.0 mg/L	✗



Promethazine	5.0 mg/L	✓
Ethanol	3.5 g/L	✗
Ethylglucuronide	1.0 mg/L	✗
Ethylsulfate	0.8 mg/L	✗

=> Quantitative analysis of promethazine

Issues ✗

EtG and ETS are included in the screening but not great for LC-MSn detection

FAILED

Issues ✗

Ethanol is not detectable by LC-ESI-MS

QSA 2-2020

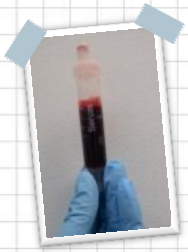
Case History:

Mr. D. has lined up to turn left. Although the traffic light has been red for 10 sec., he continues to cross the intersection. An accident occurs. After stopping, he resisted and was unable to provide any relevant information. He claims having lost his driver's license at an unknown place.
A blood and urine sample are sent in for analysis.

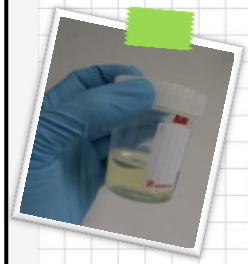
Questions:

- Which substances can be detected and are the findings suitable to explain the condition?
- Was Mr. D still fit to drive?
- What other recommendations would you make beyond assessing a possible driving unsafety?

Spiked Compounds and Toxtyper® Findings



Sotalol	3.0 mg/L	✓
Ethanol	0.65 g/L	✗
Risperidone	8.0 µg/L	✓
Hydroxy-Risperidon	12 µg/L	✓



Sotalol	4.0 mg/L	✓
Hydroxy-Risperidone	150 µg/L	✓
Ethanol	0.75 g/L	✗

=> *Quantitative analysis of:*
- *sotalol*
- *risperidone and metabolite*

FAILED

✗ *Issues*
Ethanol is not detectable by LC-ESI-MS

QSA 3-2020

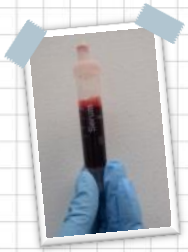
Case History:

Ms. S. strikes several cars in a narrow street late in the evening. She states to the police that she regularly takes painkillers due to chronic pain. The police officers assess her condition as drowsy, almost dazed, she seems to be physically and mentally impaired, her speech is unclear. A blood and urine sample are sent in for analysis.

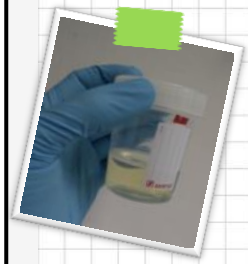
Questions:

- Which substances can be detected?
- How to assess the concentrations?
- Which compound primarily caused the described condition?

Spiked Compounds and Toxtyper® Findings



Fentanyl	4.0 µg/L ✓
Norfentanyl	4.0 µg/L ✓
Doxylamine	500 µg/L ✓



Fentanyl	50 µg/L ✓
Norfentanyl	150 µg/L ✓
Doxylamine	1000 µg/L ✓

=> *Quantitative analysis of:*
- *doxylamine*
- *fentanyl and metabolite*

PASSED

QSA 1-2021

Case History:

A woman is found unconscious on a train. A fellow passenger says that she told him she suffered from motion sickness. In the course of the journey, she had therefore taken several tablets. The woman is taken to hospital. A blood and urine sample are sent in for analysis.

Questions:

- Which substances can be detected?
- How to assess the concentrations?
- Which compound primarily caused the described condition?

Spiked Compounds and Toxtyper® Findings

Diphenhydramine	600 µg/L ✓
Imipramine	400 µg/L ✓
Desipramine	500 µg/L ✓

Diphenhydramine	1500 µg/L ✓
Imipramine	1000 µg/L ✓
Desipramine	700 µg/L ✓

=> *Quantitative analysis of:*

- *desipramine*
- *imipramine*
- *diphenhydramine*

PASSED

QSA 2-2021

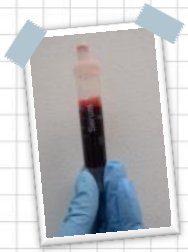
Case History:

During a police check at a motorway service area, a young man stands out due to his nervous behavior. He obviously has impairments in standing and walking and suffers from severe dry mouth. In the trunk of his vehicle is a large amount of plant material. The man denies having consumed any of the plant material. He claims just to be tired from the long drive.
A blood and urine sample are sent in for analysis.

Questions:

- Are there any xenobiotics detecable?
- Were drugs or medications ingested?
- Are exogenous substances responsible for the described condition?

Spiked Compounds and Toxtyper® Findings



Cathine	250 µg/L ✗
Cathinone	150 µg/L ✓

Cathine	1000 µg/L ✗
Cathinone	400 µg/L ✓
THC-COOH	200 µg/L ✓

=> *Quantitative analysis of:*
- THC and metabolite
- cathinone

PASSED

Issues ✗

Cathine not included in the method

QSA 3-2021

Case History:

Due to his aggressive driving, a young man is stopped by the police. He is known to the police as a drug addict and does not have a valid driver's license. During the check, the man violently resists the officers' instructions and behaves aggressively.
A blood and urine sample are sent in for analysis.

Questions:

- Are there any xenobiotics detecable?
- Which compound primarily caused the described condition?

Spiked Compounds and Toxtyper® Findings

Pregabalin	5000 µg/L ✗
Methadone	150 µg/L ✓
EDDP	20 µg/L ✓

Pregabalin	5000 µg/L ✓
Methadone	400 µg/L ✓
EDDP	400 µg/L ✓

=> *Quantitative analysis of:*
- methadone and EDDP
- pregabalin

PASSED

Issues ✗

Pregabalin not detectable in serum due to sample prep

Congratulations

You made it through 21 cases

I hope there was no cheating