Stadt Zürich
Soziale Einrichtungen
und Betriebe

MDMA Evaluation

Drug Checking at the Drug Information Center Zurich 2022

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1 Introduction

MDMA (3,4-methylenedioxymethamphetamine) is a synthetic amphetamine derivative and belongs to the group of entactogenic[1] and emphatogenic[2] stimulants. MDMA is trafficked and consumed either in pill form or crystalline or powder form. A total of 556 samples declared as MDMA were analyzed by the Drug Information Center (DIZ) Zurich in 2022.

The MDMA evaluation 2022 is in two parts. The first part deals with MDMA pills and the second part with crystalline/powder MDMA.

The results published here are not representative of the substance market in the city of Zurich.

[1] Touching the inside, intensifying the emotional perception
[2] Triggering feelings of closeness and connection to other people

2 MDMA pills

In 2022, 298 pills declared as MDMA were handed in for analysis at the DIZ and during mobile operations. 202 pills were tested as part of the drug testing at the DIZ, and 96 as part of the eleven mobile drug checkings conducted in the city of Zurich in 2022.

2.1 Risk assessment

In addition to the risks typical of MDMA, there is a risk of ingesting unexpected active ingredients, pharmacologically active extenders, synthetic byproducts, and/or high-dose pills when consuming MDMA pills. Even MDMA pills with the same logo or appearance can differ greatly in terms of their composition. Since 2015, the number of analyzed high-dose (>120 mg MDMA*HCl[3]) and extremely high-dose (>200 mg MDMA) pills is increasing. Over 1.5 mg MDMA per kg body weight for men and 1.3 mg per kg body weight for women are considered too much from a pharmacological point of view and are recommended as a maximum dose[4] . At higher doses, side effects such as jaw grinding, hallucinations, eye and nerve twitching, and seizures can occur, and MDMA has an increased negative effect on nerve cells. High doses of MDMA also mean a greater risk of overheating, lead to dehydration of the body, put a high strain on the cardiovascular system and lead to stronger and longer undesirable after-effects (hangover). Taking very high doses of MDMA leads to a strong concentration of serotonin in the brain. This increases the risk of life-threatening complications such as serotonin syndrome. With more than 200 mg of MDMA in one pill, even taking half can lead to an overdose.

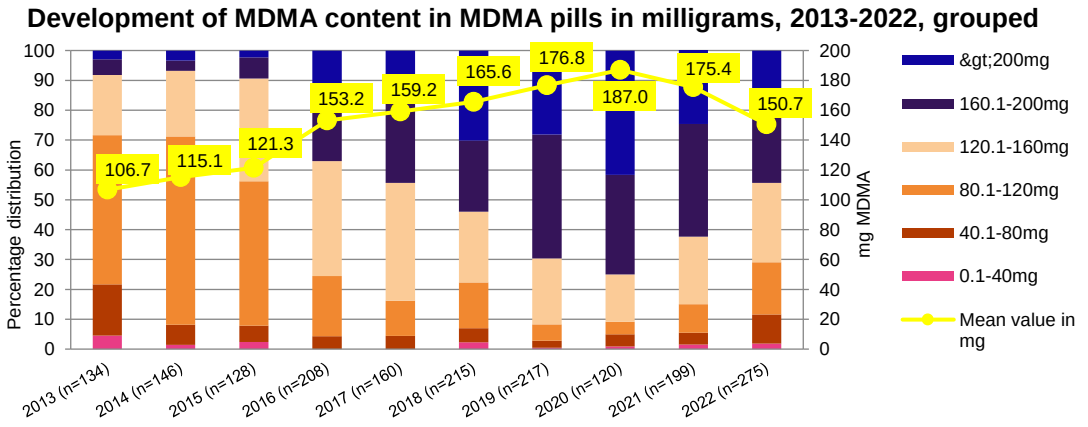
Information and recommendations for low-risk use can be found on saferparty.ch under MDMA / Safer Use.

2.2 MDMA content

On average, MDMA pills analyzed by the DIZ 2022 contained 150.7 mg of MDMA (n=275)[5] . This is an average of 24.7 mg of MDMA less than the previous year, which represents a significant decrease[6] . The range in 2022 was from 0.5 mg to 288.4 mg of MDMA per pill. The proportion of MDMA pills with more than 120 mg MDMA per pill was 70.6% (-15.8%) and also decreased significantly compared to 2021. 17.8 % (-8.3 %) of the pills were samples with extremely high dosages (more than 200 mg).

[3] MDMA exists exclusively in salt form (classically as hydrochloride). HCl is the chemical abbreviation for hydrochloride. For simplicity, MDMA is used synonymously with MDMA HCl in this document.
[4] Example calculation for an 80 kg man: 1.5 x 80 kg = max. 120 mg MDMA. Example calculation for a 60 kg woman: 1.3 x 60 kg = max. 80 mg MDMA.
[5] The average MDMA content in MDMA pills only included whole MDMA pills that actually contained the active ingredient MDMA. These were 275 samples. In 12 samples, only parts of the pill were submitted for analysis, and 11 samples declared as MDMA pills contained other or no active ingredients instead of MDMA.
[6] The percentage deviation compared with the previous year is given below in brackets in each case.

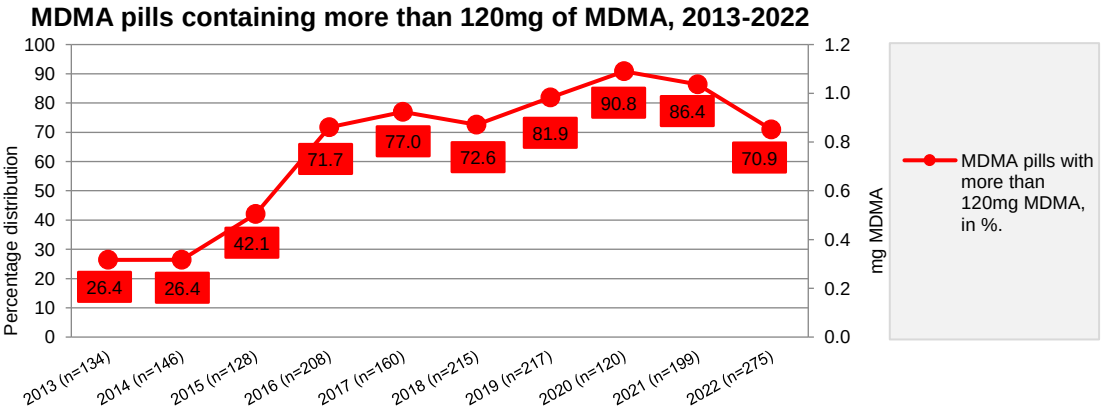
The graph shows the development of MDMA content in MDMA pills over the last ten years.



Graph 1: Development of MDMA content in MDMA pills in milligrams, 2013-2022, grouped

In 2022, 226 MDMA pills (75.8% of all MDMA pills) published as an alert on saferparty.ch due to high MDMA content or unexpected ingredients.

For 195 (70.9 %)[7] of the analyzed MDMA pills, an alert was published due to a high MDMA content (>120 mg MDMA). The proportion of high-dose MDMA pills has decreased significantly compared to previous years and is back at the level of 2016.



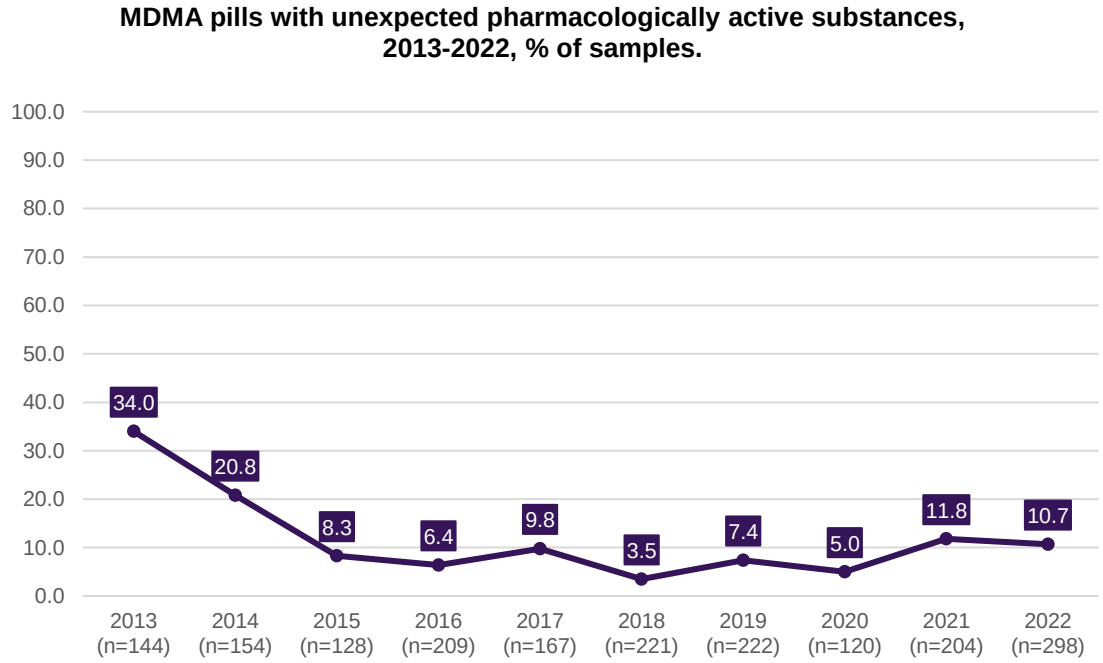
Graph 2: MDMA pills containing more than 120mg of MDMA, 2013-2022.

[7] Only whole pills that actually contained MDMA were included.

2.3 Unexpected pharmacologically active substances

In 2022, 31 samples (10.5%) of the analyzed MDMA pills contained at least one unexpected pharmacologically active substance in addition to or instead of MDMA. These were misdeclarations, pharmacologically active extenders and/or synthesis by-products. This corresponds to a decrease of 0.9 % compared to the previous year. In addition to pharmacologically active substances, MDMA pills always contain pharmacologically non-active additives (e.g., lactose, sorbitol, etc.) and tableting agents (e.g., starch) that have no additional psychological and/or physical effects on consumption. [8]

Graph 3 shows the evolution of unexpected substances detected in MDMA pills over the last decade.



Graph 3: MDMA pills with unexpected pharmacologically active substances, 2013-2022, % of samples.[9]

Graph 4 shows all substances detected in 2022 in samples declared as MDMA pills instead of or together with MDMA.

[8] Some of these pharmacologically non-active additives may cause allergic reactions in individuals (redness, stomach problems, e.g. due to lactose intolerance).

[9] The difference in the number of samples between graphs 2 and 3 is due to the fact that in graph 2, MDMA pills declared as MDMA that did not contain MDMA (e.g., false declarations) were not included in the analysis. In chart 3, all pills declared as MDMA were included in the analysis.

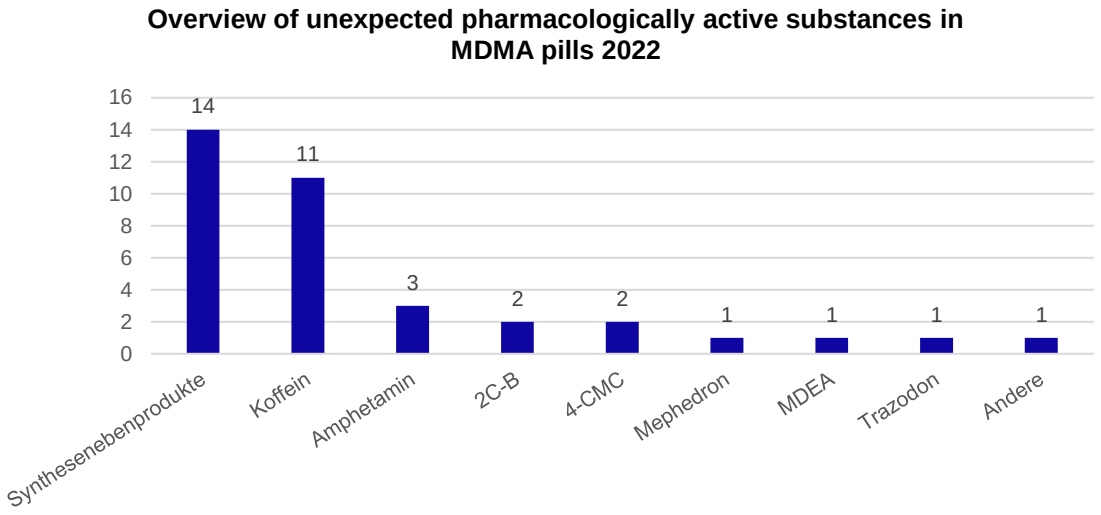


Figure 4: Overview of unexpected pharmacologically active substances in MDMA pills 2022

The pharmacologically active substances that were analyzed in addition to or instead of MDMA in MDMA pills are described below.

2.3.1 Synthesis by-products

Synthesis by-products indicate improper production, which is mainly related to the fact that the substance is produced in illicit laboratories with very different quality standards and expertise. No reliable information is available on the risks, side effects and long-term consequences of these synthesis by-products; the interaction potential of synthesis impurities with MDMA is completely unknown. Information regarding psychoactivity, toxicity, side effects and long-term consequences is scarce. The use of pills or substances contaminated by synthetic by-products is not recommended.

2022, synthesis by-products were analyzed in 14 MDMA pills (4.7 %). (-3.2 %).

2.3.2 Caffeine

Caffeine makes you awake, accelerates the heartbeat and temporarily increases mental performance. In higher doses (from 300 mg / approx. 8 cups of coffee) it also produces euphoria. At high doses, side effects such as sweating, heart flutter, urinary urgency, cardiac arrhythmia, perceptual disturbances, tremors, nervousness and sleep disturbances are possible. In addition, caffeine has a circulatory stimulating and appetite suppressing effect.

Caffeine is added to MDMA pills presumably for its stimulant effects.

In 2022, caffeine was analyzed in eleven MDMA pills declared as MDMA (3.7%) (+2.2%); on average, 23.5 mg of caffeine was present in these pills (-0.6 mg).

2.3.3 Amphetamine

Amphetamine is a synthetically produced stimulant that belongs to the phenethylamine group of substances. The release of the endogenous neurotransmitters norepinephrine and dopamine produced by the use of amphetamine can cause a feeling of increased performance, an increase in self-esteem, and an increase in body temperature. Furthermore, it can lead to the suppression of fatigue, hunger and thirst, an increased willingness to take risks, a suppressed sense of pain, euphoria and an increased urge to talk.

Amphetamine is probably added to MDMA pills for its stimulant effect.

2022, amphetamine was analyzed in three pills declared as MDMA (1.0 %) (+/-0.0 %). In two cases, small amounts of amphetamine were detected in addition to MDMA. One pill did not contain any MDMA at all.

2.3.4 2C-B

2C-B (4-bromo-2,5-dimethoxyphenethylamine) is a synthetic, psychedelic phenethylamine derivative that is psychoactive even in small amounts. The effects of MDMA and 2C-B are completely different. Therefore, there is a risk of going through an unwanted psychedelic experience. Since 2C-B is difficult to dose (2 mg more or less already make a big difference), there is a risk of a bad trip and unpleasant physical effects (nausea, sweating, dizziness).

In 2022, 2C-B was additionally analyzed in two (0.7%) pills declared as MDMA (+0.2%).

2.3.5 4-MMC (mephedrone)

Mephedrone (4-MMC, 4-methylmethcathinone) is a synthetic cathinone derivative, belongs to the group of stimulants and is a New Psychoactive Substance (NPS). Mephedrone is described as having strong performance-enhancing and euphoric effects and exhibits empathogenic properties. It leads to an increased urge to talk, increased performance, and altered sensory perception. The need for food and sleep is suppressed. In addition, it is reported that the substance can trigger a strong urge to re-dose, which increases the risk of overdosing and the potential for addiction. The substance is hardly researched and the available knowledge is mainly based on user reports.

In 2022, 4-MMC was analyzed instead of MDMA in one (0.3%) pill declared as MDMA (+0.3%).

2.3.6 4-CMC

Clephedrone (4-CMC, 4-chloromethcathinone) is a synthetic cathinone derivative structurally related to mephedrone (4-MMC) and is a New Psychoactive Substance (NPS). 4-CMC is described as having strong performance-enhancing and euphoric effects and exhibits empathogenic properties. There is little established information on the risks, toxicity, side effects, and long-term consequences of 4-CMC. Chemically, 4-CMC is similar

to the potent neurotoxin 4-chloromethamphetamine, and there are initial indications of cytotoxicity (cell damage) for 4-CMC. Accordingly, consumption is discouraged. Some users report severe headaches, as well as kidney and liver pain on the days after use. In addition, it is reported that the substance can trigger a strong urge to re-dose, which increases the potential for overdosing and addiction.

4-CMC is believed to be added to MDMA pills due to its similar spectrum of effects, legal status in certain countries, and cheap manufacturing and acquisition costs.

In 2022, 4-CMC was analyzed instead of MDMA for the first time in one pill (0.3%) declared as MDMA.

2.3.7 MDEA

MDEA (3,4-methylenedioxyethylamphetamine) is a synthetic amphetamine derivative that rarely occurs together with MDMA in pills. Some aspects of its effects are comparable to those of MDMA, but the empathogenic and euphoric effects, the communication perceived as simplified, and the positive self-regard are significantly less pronounced. It is assumed that the intake of repeated and/or high doses has neurotoxic and cardiotoxic effects.

MDEA is added to MDMA pills presumably because of the similar spectrum of effects.

In 2022, MDEA was analyzed in one pill (0.3%) declared as MDMA (-0.7%).

2.3.8 Other pharmacologically active substances analyzed

Furthermore, the antidepressant trazodone was detected in one sample. It can be assumed that this was a misdeclaration or a mix-up.

3 Crystalline / powder MDMA

MDMA is always trafficked in salt form (mostly as hydrochloride) and is thus basically present in crystalline form as a solid, regardless of whether it is compressed into pills or trafficked as crystals or powder. This section discusses crystalline or powder MDMA. The term "crystalline" is used in the context of MDMA to refer to coarse-grained material (crystals that are still visible to the eye to a size of several millimeters or even centimeters). Powder refers to crystalline MDMA that is finely ground. In 2022, 199 crystalline MDMA samples[10] were handed in for analysis at the Drug Information Center (DIZ) in Zurich. During the eleven mobile drug-checkings, 60 crystalline MDMA samples were analyzed. The results published here are not representative of the entire substance market in the city of Zurich.

3.1 Risk assessment

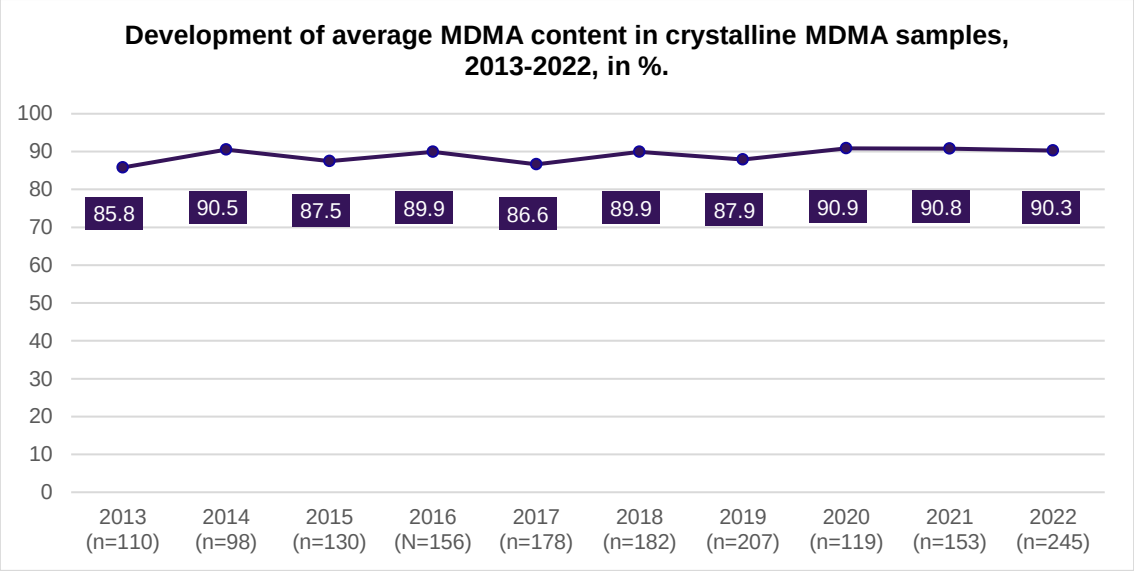
The risk assessment is the same as for MDMA pills in chapter 2.1

3.2 MDMA content

In 2022, crystalline MDMA samples analyzed by the DIZ contained an average of 90.3% (-0.5%)[11] MDMA*HCl. The MDMA content varied between 7.6 % and 100 % MDMA (n=245)[12] . The average MDMA content for crystalline MDMA has been fairly constant over the years.

Graph 5 shows the evolution of MDMA content in crystalline MDMA over the last 10 years.

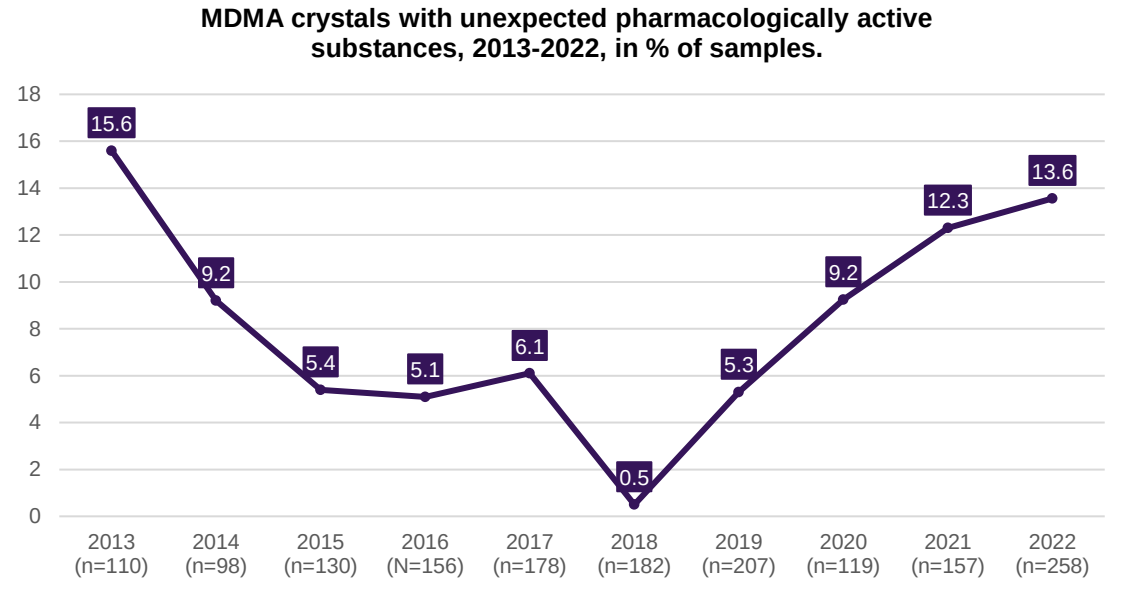
[10] In the following text, only the term "crystalline MDMA" is used due to readability. This always also refers to powdered MDMA.
[11] The differences compared with the previous year are shown in brackets below.
[12] The average MDMA content in crystalline MDMA samples only included crystalline MDMA samples that actually contained the active substance MDMA. These were 245 samples. 13 samples contained other active substances (false declarations) or were only analyzed qualitatively (i.e. without indication of quantity) by the laboratory due to the small sample quantity on delivery.



Graph 5: Evolution of average MDMA content in crystalline MDMA samples, 2013-2022, in %.

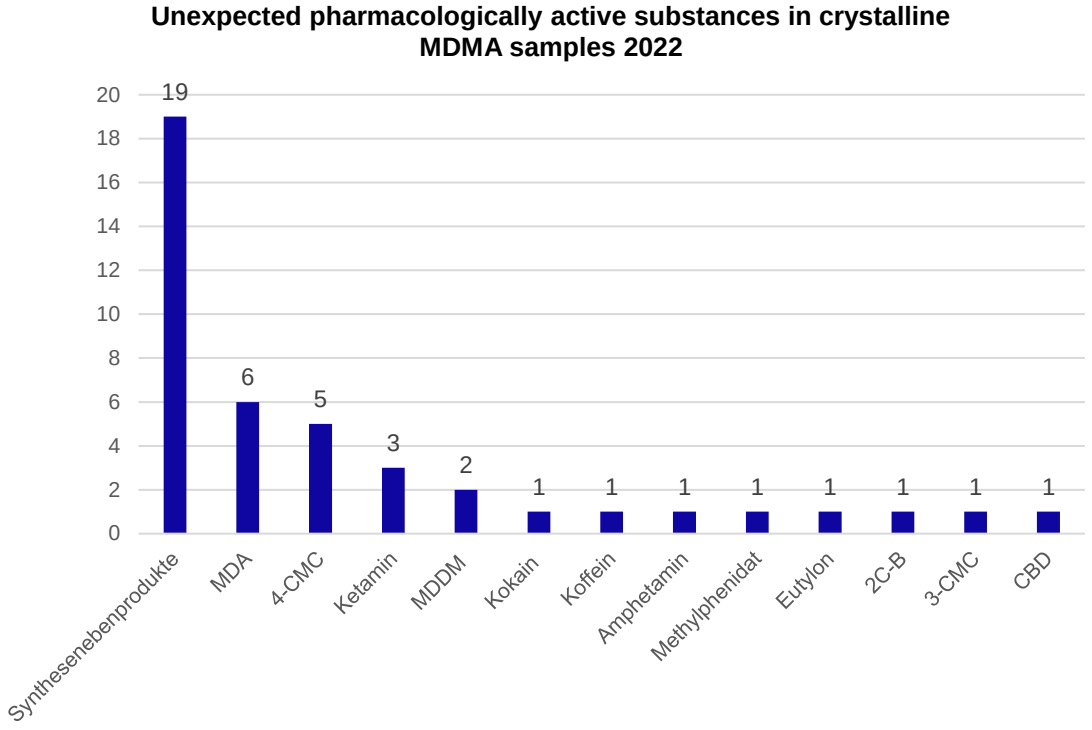
3.3 Unexpected pharmacologically active substances

In 2022, 13.6% (+1.3%) of the crystalline MDMA samples declared as MDMA contained unexpected pharmacologically active substances instead of or in addition to MDMA. This represents a slight increase compared to the previous year and an approach to values last reached in 2013.



Graph 6: MDMA crystals with unexpected pharmacologically active substances, 2013-2022, in % of samples.

The following pharmacologically active substances were detected in crystalline MDMA samples in 2022:



Graph 7: Unexpected pharmacologically active substances in crystalline MDMA samples 2022

All pharmacologically active substances that were analyzed in 2022 in addition to or instead of MDMA in crystalline MDMA samples are described below.

3.3.1 Synthesis by-products

Synthesis by-products indicate improper production, which is mainly related to the fact that the substance is produced in illicit laboratories with very different quality standards and expertise. No reliable information is available on the risks, side effects and long-term consequences of these synthesis by-products; the interaction potential of synthesis impurities with MDMA is completely unknown. Information regarding psychoactivity, toxicity, side effects and long-term consequences is scarce. The use of substances contaminated by synthetic by-products is not recommended.

In 2022, synthesis by-products were analyzed in 19 crystalline samples declared as MDMA (7.8%) (-0.8%).

3.3.2 MDA

MDA (3,4-methylenedioxyamphetamine) is a synthetic amphetamine derivative. The effect is similar to that of MDMA in certain features, but it is described as harder, stronger and "colder" than MDMA. The entactogenic effect is much weaker and a dose-dependent psychedelic effect is possible. The neurotoxic effects of MDA have not been fully elucidated according to current knowledge. However, it is assumed that the damage to nerve cells is more pronounced than with MDMA. MDA is also suspected of being liver-damaging (hepatotoxic). Regular use can also lead to schizophrenia-like symptoms. Consumption is not recommended.

MDA is probably added to crystalline MDMA samples or sold as a misdeclaration due to the similar spectrum of effects. In addition, depending on the MDMA synthesis route, it may also be a synthesis by-product.

2022, MDA was analyzed in six crystalline samples declared as MDMA (2.5 %). (+2.5 %).

3.3.3 4-CMC

Clephedrone (4-CMC, 4-chloromethcathinone) is a synthetic cathinone derivative structurally related to mephedrone (4-MMC) and is a New Psychoactive Substance (NPS). 4-CMC is described as having strong performance-enhancing and euphoric effects and exhibits empathogenic properties. There is little established information on the risks, toxicity, side effects, and long-term consequences of 4-CMC. Chemically, 4-CMC is similar to the potent neurotoxin 4-chloromethamphetamine, and there is initial evidence of cell damage (cytotoxicity) for 4-CMC, so use is not advised. Some users report severe headaches and kidney or liver pain in the days following use. In addition, it is reported that the substance can trigger a strong urge to re-dose, which increases the potential for addiction and overdose.

4-CMC is believed to be added to MDMA pills due to its similar spectrum of effects, legal status in certain countries, and cheap manufacturing and acquisition costs.

In 2022, 4-CMC was analyzed for the first time in four crystalline samples declared as MDMA (1.6%).

3.3.4 MDDM

MDDM (3,4-methylenedioxy-N,N-dimethylamphetamine) is a synthesis by-product of MDMA. It is known that the substance does not cause any psychoactive effect up to a dose of 150 mg. When high doses (>200mg) are taken, a rather unpleasant effect sets in that is not comparable with other substance effects. There is hardly any reliable information about MDDM regarding its risks, toxicity and side effects. The use of this substance is therefore not recommended.

MDDM is found in MDMA samples, because probably the synthesis was not done cleanly.

2022 MDDM was analyzed in two crystalline MDMA samples (0.8%) (-1.7%).

3.3.5 Ketamine

Ketamine belongs to the group of dissociatives and is used in medicine as an anesthetic (narcotic). In lower doses, ketamine has a disinhibiting and relaxing effect similar to alcohol, while higher doses can induce trance-like states up to out-of-body or near-death experiences (K-Hole). In addition, ketamine stresses the cardiovascular system.

Ketamine is presumably added to MDMA crystals, as there are reports from experience that indicate a combination of effects that is perceived as positive.

In 2022, ketamine was analyzed in two (0.8%) crystalline MDMA samples (+0.8%) .

3.3.6 2C-B

2C-B (4-bromo-2,5-dimethoxyphenethylamine) is a synthetic, psychedelic phenethylamine derivative that is psychoactive even in small amounts. The effects of MDMA and 2C-B are completely different - so there is a risk of going through an unwanted psychedelic experience. Since 2C-B is difficult to dose (2 mg more or less already make a big difference), there is a risk of a bad trip and unpleasant physical effects.

2C-B is presumably added to MDMA crystals, as there are reports from experience that indicate a combination of effects that is perceived as positive.

2022, a crystalline MDMA sample (0.4 %) was analyzed for 2C-B (+0.4 %).

3.3.7 3-CMC

Clophedrone (3-CMC, 3-chloromethcathinone) belongs to the group of synthetic cathinones, is structurally related to mephedrone (4-MMC) and 4-CMC (4-chloromethcathinone) and belongs to the group of new psychoactive substances (NPS). The effects of 3-CMC are described as strongly performance-enhancing, but less euphoric and empathogenic compared to mephedrone. There is little established information on the risks, side effects, and long-term consequences of 3-CMC. Chemically, 3-CMC is similar to the potent neurotoxin 4-chloromethamphetamine, and there is initial evidence of cell damage (cytotoxicity) for 3-CMC, so consumption is discouraged. In addition, it is reported that the substance can trigger a strong urge to re-dose, which increases the potential for overdose and addiction. Consumption is discouraged.

3-CMC is probably added to crystalline MDMA samples due to its similar spectrum of activity, low acquisition cost, and its (still) legal status in some countries last year.

2022 3-CMC was analyzed for the first time in a crystalline MDMA sample (0.4%).

3.3.8 Other pharmacologically active substances analyzed

Furthermore, cocaine (1 sample), eutylon (1 sample), amphetamine (1 sample), CBD (1 sample), methylphenidate (1 sample) and caffeine (1 sample) were analyzed in MDMA crystal samples. These substances were most likely misdeclarations or mix-ups.

4 Conclusion

General

- At the DIZ Zurich, as in previous years, some samples with synthesis by-products were analyzed in 2022. A possible reason for this could be that the producers in the laboratories are under time pressure, have to switch to new synthesis routes due to increasingly stronger regulation of precursor substances and/or work improperly in the synthesis of MDMA. Lack of know-how in dealing with different manufacturing processes of MDMA, relocation of production sites to other countries and/or changing work ethics may also offer further explanations.
- MDMA pills and crystalline MDMA samples containing various new psychoactive substances (NPS) such as the cathinones 4-CMC or 3-CMC instead of or in addition to MDMA have proliferated this year. This is probably because these substances were still legally available in some producing countries in 2022 at very low prices and were used as cheap MDMA substitutes, even though they have a slightly different spectrum of effects.

MDMA pills

- From 2013 to 2020, the average MDMA content in MDMA pills rose steadily. In the last two years, this value has now dropped significantly again. Currently, the average content is 150.7 mg MDMA, which is about the same level as in 2016. Nevertheless, 70% of MDMA pills still contain more than 120 mg, which is why the risk of overdose remains high. Presumably, this decrease is related to a slight shortage of MDMA, which can be attributed to the difficulty in obtaining MDMA precursors and some law enforcement successes. In addition, some large laboratories in Holland appear to have specialized in the production of more lucrative substances.
- As it was the case for the first time in 2021, an exceptionally large number of pills were analyzed at the DIZ in 2022 that looked identical in appearance (logo, shape and color) but had a different MDMA content or contained unexpected ingredients. It is therefore also recommended to have "known" pills (e.g. Punisher pills) tested.
- Furthermore, around one in ten pills is a misdeclaration or contains unexpected pharmacological substances in addition to MDMA. This increases the health risk when consuming untested pills.

MDMA Crystals

- Among the analyzed crystalline samples, the number of samples with unexpected substances has increased again this year. For this reason, it is important to have MDMA crystals analyzed.
- The crystalline samples analyzed at the DIZ usually have a very high MDMA content. It is therefore all the more important to pay attention to the dosage. No more than 1.5 mg MDMA per kg body weight for men and 1.3 mg per kg body weight for women should be consumed. Higher doses increase the risk of adverse health effects.

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