



# MDMA Evaluation

## Drug Checking at the Drug Information Center Zurich 2021

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# 1 Introduction

MDMA (3,4-methylenedioxyamphetamine) is a synthetic amphetamine derivative and belongs to the group of entactogens. MDMA is traded either in tablet form as "ecstasy" or as crystals or powder. A total of 364 samples declared as MDMA were analyzed by the Drug Information Center (DIZ) in Zurich in 2021.

The MDMA evaluation 2021 is in two parts. The first part deals with ecstasy tablets and the second part with crystalline/powder MDMA.

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

## 2 Ecstasy tablets

2021, 202 ecstasy tablets declared as MDMA were handed in for analysis. 171 were tested in the course of stationary drug testing. During three mobile drug checkings<sup>1</sup>, which were carried out in the city of Zurich in 2021, 31 ecstasy tablets were handed in and analyzed.

### 2.1 Risk assessment

In addition to the [side effects](#) typical of MDMA, there is a risk of ingesting unexpected active ingredients, pharmacologically active extenders, synthetic by-products and high-dose tablets when using ecstasy tablets. Even ecstasy tablets with the same logo or appearance can differ greatly in terms of their composition. Since 2015, high-dose tablets (>120 mg MDMA\*HCl<sup>2</sup>) have been increasingly analyzed. More than 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 since side effects such as jaw grinding, eye and nerve twitching up to seizures can occur more frequently and MDMA has an increased negative effect on the nerve cells above these doses. High doses of MDMA also mean a greater risk of overheating, lead to dehydration of the body, place a high strain on the cardiovascular system and lead to a stronger and longer hangover.<sup>3</sup> Information and recommendations for a low-risk consumption can be found on [saferparty.ch](http://saferparty.ch) under [MDMA / Safer Use](#).

### 2.2 MDMA content

On average, ecstasy tablets analyzed by DIZ 2021 contained 175.4 mg MDMA\*HCl (n=199)<sup>4</sup>. This is an average of 11.6 mg MDMA\*HCl less than in the previous year<sup>5</sup>. The range was from 53.9 mg to 300.2 mg MDMA\*HCl per tablet. The proportion of ecstasy tablets with more than 120 mg MDMA\*HCl per tablet was 86.4% and decreased slightly in 2021 (-4.4%). 26.1 % of the tablets dispensed were even classified as extremely high-dosed (>200mg) (-15.6 %).

A substance warning was issued for 86.4 % (-4.4 %) of the analyzed ecstasy tablets due to a high MDMA content (>120 mg MDMA).

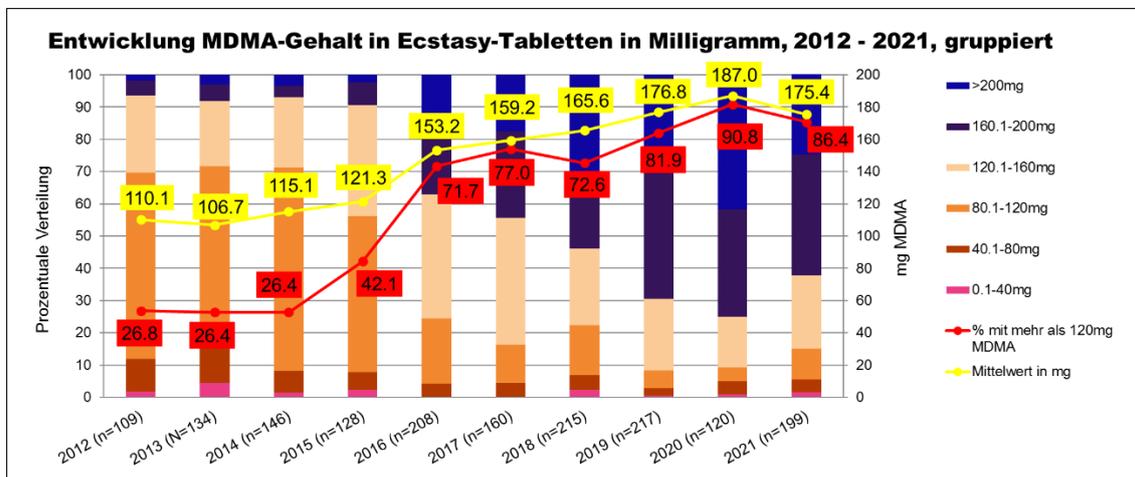
<sup>1</sup> Due to the Corona pandemic, only three mobile drug checks could be conducted in 2021.

<sup>2</sup> MDMA exists exclusively in salt form (classically as hydrochloride).

<sup>3</sup> Dosing guidelines are: maximum 1.5 mg MDMA\*HCl per kilogram body weight for males (e.g., 1.5 x 80 kg = max. 120 mg MDMA) and maximum 1.3 mg MDMA\*HCl per kilogram body weight for females (e.g., 1.3 x 60 kg = max. 80 mg MDMA).

<sup>4</sup> The average MDMA content in ecstasy tablets only included ecstasy tablets that actually contained the active ingredient MDMA. These were 199 samples. Three samples contained other active ingredients, but were handed over to the DIZ or mobile drug checking declared as ecstasy tablets.

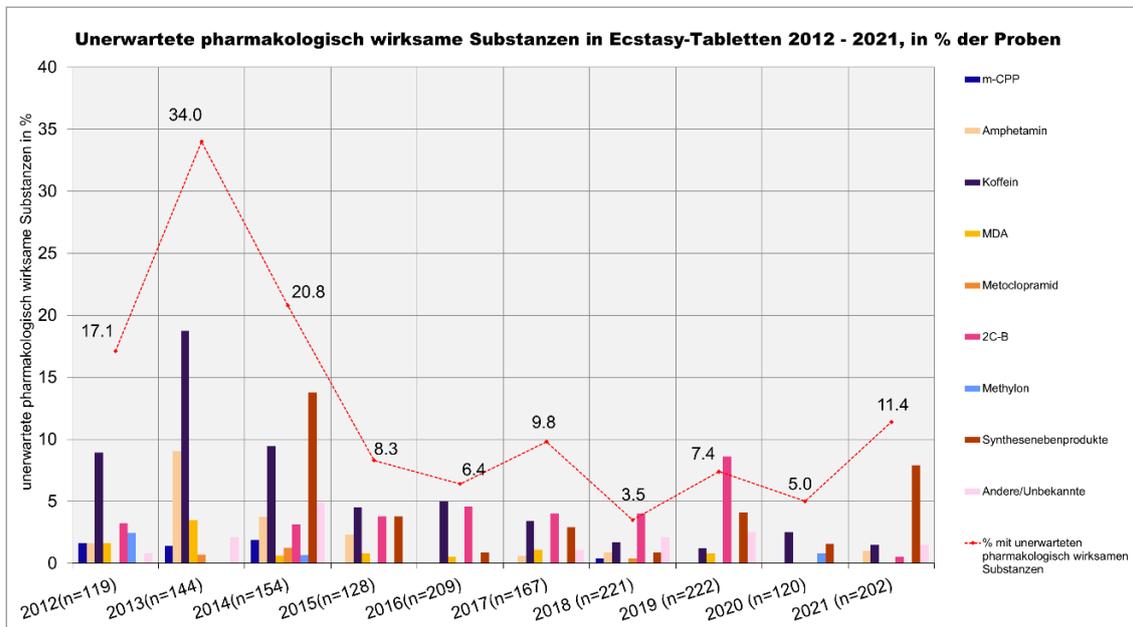
<sup>5</sup> The differences compared with the previous year are shown in brackets below.



Graph 1: Evolution of MDMA content in ecstasy tablets in milligrams, 2012 -2021, grouped (n=1,636).

### 2.3 Pharmacologically active extender

In 2021, 11.4% (+6.4%) of the ecstasy tablets analyzed contained at least one other unexpected pharmacologically active substance in addition to or instead of MDMA. These were false declarations, pharmacologically active extenders and/or synthetic impurities. In addition to the pharmacologically active substances, ecstasy tablets 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 during consumption.



Graph 2 Unexpected pharmacologically active substances in ecstasy tablets 2012-2021, in % of samples (n=1,686).<sup>6</sup>

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

### 2.3.1 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 arrhythmias, perceptual disturbances, tremors, nervousness and sleep disturbances are possible. In addition, caffeine has a circulatory stimulating and appetite suppressing effect. Caffeine is added to ecstasy tablets presumably because of its stimulating effect.

**In 2021, caffeine was analyzed in three tablets (1.5%) of Ecstasy tablets (-1.0%); on average, 24.1 mg of caffeine was present in the tablets (+15.2 mg).**

### 2.3.2 Synthesis by-products

Synthesis by-products indicate improper production and/or purification, which is mainly related to the fact that the substance is produced in underground laboratories with very different standards and expertise due to its illegality. No reliable information is available on the risks, side effects and long-term consequences of these synthesis by-products;

<sup>6</sup> The difference in the number of samples between graphs 1 and 2 (n=1,636 and n=1,686) is due to the fact that in graph 1, those ecstasy tablets declared as MDMA that did not contain MDMA (e.g. false declarations) were not included in the analysis. In chart 2, all tablets declared as ecstasy were included in the analysis.

the interaction potential of synthesis impurities with MDMA is completely unknown. Information regarding psychoactivity, toxicity, side effects and long-term consequences is scarce. Consumption of tablets/substances contaminated by synthetic by-products is not recommended.

**In 2021, synthesis by-products were analyzed in 16 (7.9 %) ecstasy tablets (+6.3 %).**

### **2.3.3 MDEA**

MDEA (3,4-methylenedioxyethylamphetamine) is a synthetic amphetamine derivative that rarely occurs together with MDMA in ecstasy. The effect is comparable to that of ecstasy, but without the empathic effect and less euphoric, but more intoxicating. Administration of repeated or high doses is thought to have neurotoxic and cardiotoxic effects in a yet unknown form.

**2021 MDEA was analyzed in two (1.0%) ecstasy tablets (0%).**

### **2.3.4 2C-B**

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

**In 2021, 2C-B was analyzed in one (0.5%) tablet declared as ecstasy (+0.5%).**

### **2.3.5 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, an increase in body temperature, the suppression of fatigue, hunger and thirst, an increased willingness to take risks and a suppressed sense of pain, and can lead to euphoria as well as an increased urge to talk (babble flash).

**In 2021, amphetamine was analyzed in two (1.0 %) ecstasy tablets (+1.0 %).**

## 3 Crystalline / powder MDMA

MDMA, as a solid, is basically always present in crystalline form, regardless of whether it is compressed into tablets or traded as crystals or powder. In this section, tablets are excluded. The term "crystalline" is used in the context of MDMA to refer to coarse-grained material (crystal sizes that are still visible to the eye, up to several mm or even cm in size). Powder refers to MDMA that is finely ground. In 2021, 148 crystalline MDMA samples<sup>7</sup> were handed in for analysis at the Drug Information Center (DIZ) in Zurich. During the three mobile drug-checking missions, 14 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

Cf. chapter 2.1

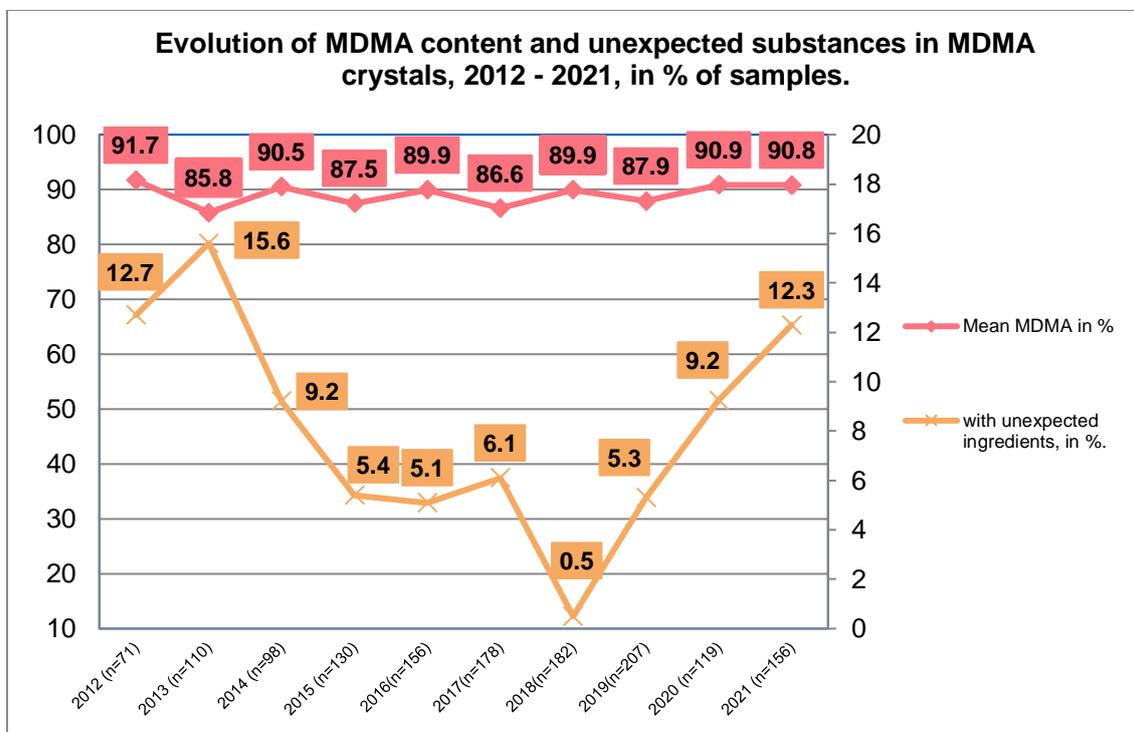
### 3.2 MDMA content

On average, the crystalline MDMA samples we analyzed contained 90.8 % (-0.1 %) <sup>8</sup> MDMA\*HCl. MDMA content varied from 56.9% to 100% MDMA\*HCl. (n=156)<sup>9</sup>. The average MDMA content for crystalline MDMA is fairly constant over the years.

<sup>7</sup> In the following text, only the term crystalline MDMA is used due to readability. This always includes powdered MDMA as well.

<sup>8</sup> The differences compared with the previous year are shown in brackets below.

<sup>9</sup> For the average MDMA content in crystalline MDMA samples, only crystalline MDMA samples that actually contained the active substance MDMA were included. These were 156 samples. Six samples contained other active substances (false declarations) or were only analyzed qualitatively by the laboratory due to the small sample quantity on delivery. These were not included in the calculation of the MDMA content.



Graph 3: Evolution of average MDMA content and unexpected substances in crystalline MDMA samples, 2012 - 2021, in % (n=1'407).

### 3.3 Unexpected pharmacologically active substances in MDMA

In 2021, 12.3 % (+3.1 %) of the analyzed crystalline MDMA samples contained unexpected substances. The pharmacologically active substances that were analyzed in addition to or instead of MDMA 2021 in crystalline MDMA samples are described below.

#### 3.3.1 Synthesis by-products

Synthesis by-products indicate improper manufacture and/or purification. Information regarding psychoactivity, toxicity, side effects and long-term consequences is scarce. Consumption of substances contaminated with synthetic by-products is not recommended.

**2021 additional synthesis by-products were analyzed in 14 crystalline MDMA samples (8.6%) (+5.2%).**

#### 3.3.2 MDDMA

Very little information exists about MDDMA (3,4-methylenedioxy-N,N-dimethylamphetamine). What is known is that the substance does not seem to cause any psychoactive effect up to 150 mg. When high doses (200mg) are taken, an indefinable and rather unpleasant effect sets in. MDDMA is a synthesis by-product about whose risks, toxicity

and side effects there is little reliable information. The consumption of this substance is therefore not recommended.

**2021 MDDMA was analyzed in four crystalline MDMA samples (2.5%) (-0.9%).**

### **3.3.3 MDA**

MDA (3,4-methylenedioxyamphetamine) is a synthetic amphetamine derivative. The effect is similar to that of MDMA, but it is perceived as harder, stronger and "colder" than MDMA, and a dose-dependent psychedelic effect is possible. The neurotoxic effects of MDA are not fully understood based on current knowledge, but damage to neurons is thought to be more pronounced than with MDMA. MDA is 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 due to its similar spectrum of activity. In addition, depending on the MDMA synthesis, it may be a synthesis by-product.

**In 2020, two crystalline MDMA samples (1.2 %) were analyzed for MDA (-0.5 %).**

### **3.3.4 2C-B**

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

**In 2021, 2C-B was analyzed (+0.6%) in a crystalline MDMA sample (0.6%).**

### **3.3.5 Butylone**

Butylone ( $\beta$ -keto-N-methylbenzodioxylpropylamine) belongs to the group of substances known as entactogens, to which MDMA is also classified. There is little scientific knowledge about butylone, which is classified as a new psychoactive substance (NPS, research chemicals). Butylone has a stimulating and entactogenic effect and is therefore similar to MDMA. According to experience reports, the effect is less stable and occurs in waves, which is perceived by many users as unpleasant.

**2021 butylone was analyzed (+0.6%) in a crystalline MDMA sample (0.6%).**

### **3.3.6 Cocaine**

Cocaine (benzoylecgonine methyl ester) is obtained from the leaves of the South American coca bush (*Erythroxylum coca*) and belongs to the group of stimulants. The increased release and additional reuptake inhibition of the body's own neurotransmitters dopamine and norepinephrine lead to the suppression of fatigue as well as hunger and thirst, euphoria, feelings of increased performance, greatly increased self-confidence, urge to move, restlessness, talkativeness, elimination of inhibitions and fears, suppressed sense of pain and increased willingness to take risks.

**In 2021, cocaine was analyzed (+0.6%) in a crystalline MDMA sample (0.6%).**

### **3.3.7 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 ecstasy tablets presumably because of its stimulating effect.

**In 2021, caffeine was analyzed (+0.6%) in a crystalline MDMA sample (0.6%).**

### **3.3.8 MDEA**

MDEA (3,4-methylenedioxyethylamphetamine) is a synthetic amphetamine derivative that rarely occurs together with MDMA in ecstasy. The effect is comparable to that of ecstasy, but without the empathic effect and less euphoric, but more intoxicating. Administration of repeated or high doses is thought to have neurotoxic and cardiotoxic effects in a yet unknown form.

**2021 MDEA was analyzed (+0.6%) in a crystalline MDMA sample (0.6%).**

## 4 Conclusion

- At DIZ Zurich, an increase in samples with synthesis by-products was observed in 2021 for ecstasy tablets as well as for crystalline MDMA samples. One possible reason for this could be that the manufacturers in the laboratories are under time pressure and work improperly when synthesizing MDMA. Another possible reason could be the lack of know-how in dealing with different manufacturing processes of MDMA.
- The crystalline samples analyzed in the DIZ mostly 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. More increases the risk of adverse health effects.
- The percentage of MDMA samples provided at the DIZ remained constant despite club closures during the pandemic. The cliché that MDMA is an exclusive "club/party drug" does not seem to be true.
- Since 2013, the average MDMA content in ecstasy tablets has risen steadily. In 2021, this value decreased slightly again for the first time. Currently, the content in 2021 is 174.5 mg MDMA. However, at such a level, there is still a high risk of overdose.
- In 2021, DIZ increasingly analyzed tablets that looked identical in appearance (logo, shape and color) but had different contents and contained some unexpected ingredients. This was particularly noticeable in blue tablets with the name "The Punisher". There, there were content differences of up to 219 mg MDMA. One assumption could be that the demand for "[The Punisher](#)" tablets was high and the production sites (drug labs) had to produce many ecstasy tablets under time pressure and therefore the "quality" suffered. We suspect that the crystalline MDMA was irregularly distributed (stirred) into the tableting mass.

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