EU Drug Market: Amphetamine — Production in Europe

At the global level, Europe is a key producer of amphetamine, with most of it manufactured in the Netherlands and neighbouring countries in illicit laboratories where other synthetic drugs may also be produced. Synthetic drug producers in the Netherlands are believed to control much of the production taking place in Belgium, with laboratories often found close to the border with the Netherlands, and more recently near the Belgian-French border. Production facilities for synthetic drugs – including amphetamine – are often set up in remote regions on farms or in warehouses, where the risks of detection are relatively low. In addition, there are indications that Dutch criminal networks have expanded production activities to Germany and potentially to other EU countries.

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Information collected during the dismantling of illicit laboratories by law enforcement and precursor seizure data show that the Leuckart method, which requires BMK and formamide, is the most commonly used means to produce amphetamine in Europe. The term 'alternative chemicals' is used in this report when referring to chemicals that can be used to produce BMK, including pre-precursors and designer precursors. BMK may itself be imported, but the BMK used is typically produced in Europe from alternative chemicals that are trafficked from abroad, typically China. These substances appear on the market, only to be replaced by alternatives when authorities put controls in place to restrict their use. This has been the case with APAAN, APAA, MAPA, EAPA and glycidic derivatives of BMK. More information about the emergence of these substances can be found in the report Drug precursor developments in the European Union (EMCDDA, 2019a). The Leuckart method is relatively straightforward, yet somewhat low yielding and reliant on a number of controlled chemicals. Displaying remarkable flexibility, European producers have optimised some of the low-yielding steps, while also showing signs of expanding their synthesis expertise towards routes less frequently encountered, such as the 'nitrostyrene method'.

Overview of amphetamine production

The amphetamine consumed in the EU is believed to be exclusively produced in the EU, with production concentrated in the Netherlands and Belgium. In some cases, the manufacturing of the consumer product is not completed in these countries and the amphetamine base oil is exported to another country, where it is converted into amphetamine sulfate (salt). A much smaller proportion of the amphetamine produced in the EU is used to make captagon tablets, which are then exported to the main consumer markets in the Arabian Peninsula (see Box Amphetamine as captagon tablets).

Amphetamine as captagon tablets

Amphetamine may be processed into tablets, including captagon tablets. These typically contain amphetamine, caffeine and occasionally theophylline, and display a characteristic logo (EMCDDA, 2018). The production of captagon tablets has recently been uncovered in the Netherlands, while there have also been older reports from Greece and Bulgaria. According to the Dutch police, since 2018 large captagon production sites (tableting facilities) have been found in the Netherlands at a rate of one or two per year (EMCDDA and BKA, 2023). In three instances, in 2018, 2019 and 2020, these sites were used for the production of both amphetamine powder and captagon tablets.

Seizures of theophylline were reported by the Netherlands in 2016 and 2021. The 2016 case was described as a 150 kilograms seizure in an illicit laboratory, possibly associated with the production of captagon tablets, given the discovery of tablet punches with the characteristic logo. In 2021, a further 295 kilograms of theophylline was seized in three separate cases, with the largest amount (220 kilograms) found in a warehouse where a number of other chemicals associated with drug production were stored. In one customs seizure, theophylline was found in a package mislabelled as ‘hydroxypropyl methyl cellulose’. These relatively large quantities of theophylline, some of which had been mislabelled, may indicate that the production of captagon tablets continues to be an issue in the Netherlands.

Despite these illicit laboratories and chemical seizures, there are no indications that the captagon tablets produced in the EU are intended for EU drug markets. It appears that captagon tablet production is not a typical activity of synthetic drug producers in the Netherlands, but rather an opportunistic way to make a profit when there is a specific request or demand for such a product (see Section Europe’s role in the global captagon trade).

Like most synthetic drugs, amphetamine can be produced by multiple methods, depending on the available chemicals and equipment, reaction conditions and, to some extent, the skills of the producer. Importantly, many of these methods are versatile enough to yield a variety of drugs, with only small changes needed to the chemicals and equipment used.

This is the case for the Leuckart method, a standard organic chemistry method that can be used in the synthesis of amphetamine, methamphetamine and MDMA, as well as a number of other chemical products. For amphetamine and methamphetamine, BMK (benzyl methyl ketone, or P-2-P) is used as the starting material, whereas for MDMA and MDA, PMK (piperonyl methyl ketone,

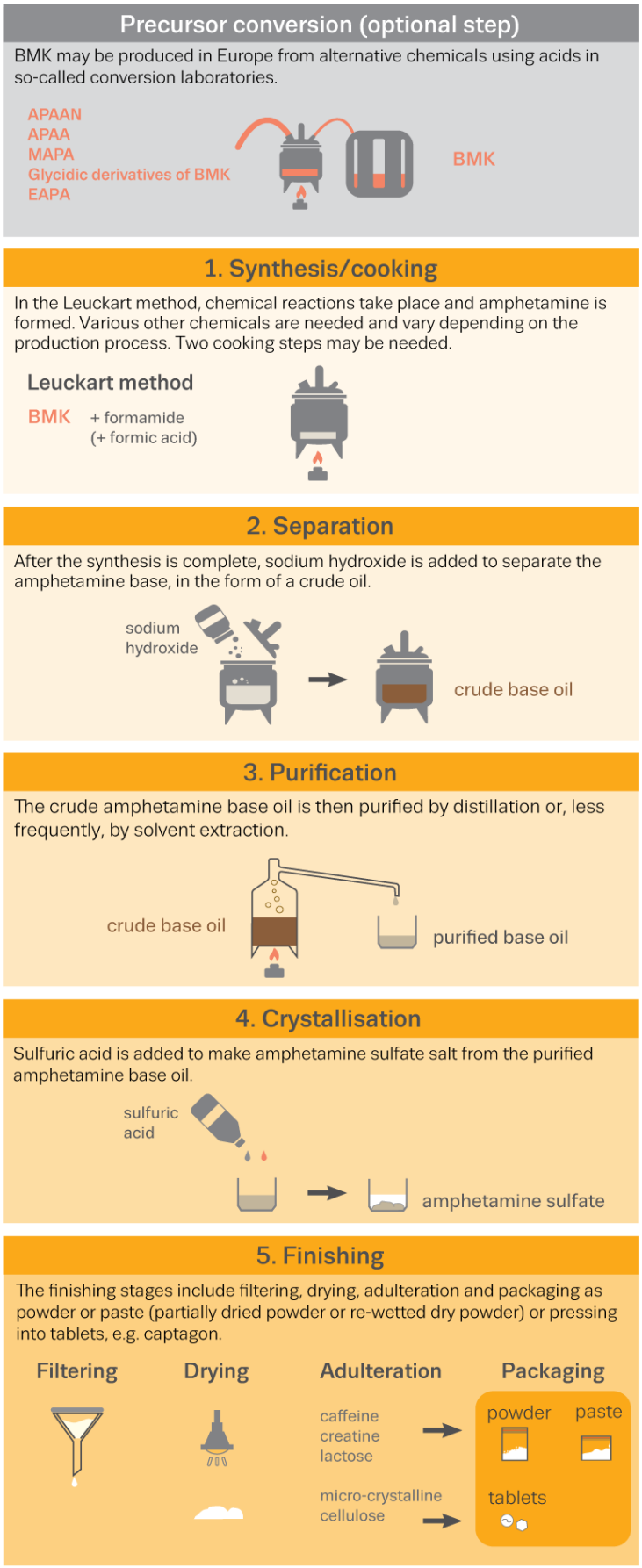
MDP-2-P) is the necessary precursor. To avoid the legal controls placed on BMK, the production of amphetamine often starts with the conversion of commercially available chemicals into BMK. A number of illicit laboratories specialise in this process.

The process comprises five main steps, with an additional, optional, first step being the production of BMK from alternative chemicals (see Figure Simplified general schema of amphetamine production):

1. The synthesis or 'cooking' step, where the precursor is combined with other chemicals and the chemical reaction takes place;
2. The separation of the crude amphetamine oil from other chemicals;
3. The purification of the crude oil into clean, pure amphetamine base oil (typically involving several cycles of steam distillation or, less commonly, solvent extraction);
4. The crystallisation of amphetamine base oil into solid amphetamine sulfate with sulfuric acid;
5. The adulteration of amphetamine sulfate with other substances and its packaging for sale, or pressing into tablets, for example captagon.

Although there is no systematic collection of data in this area, the available information suggests that BMK and alternative chemicals for amphetamine production are mostly sourced in China, whereas solvents and other essential chemicals (acids, bases, solvents) may be obtained directly in EU countries. The sourced chemicals are often transported to the main production countries of the Netherlands and Belgium by road via transit countries.

Simplified general schema of amphetamine production

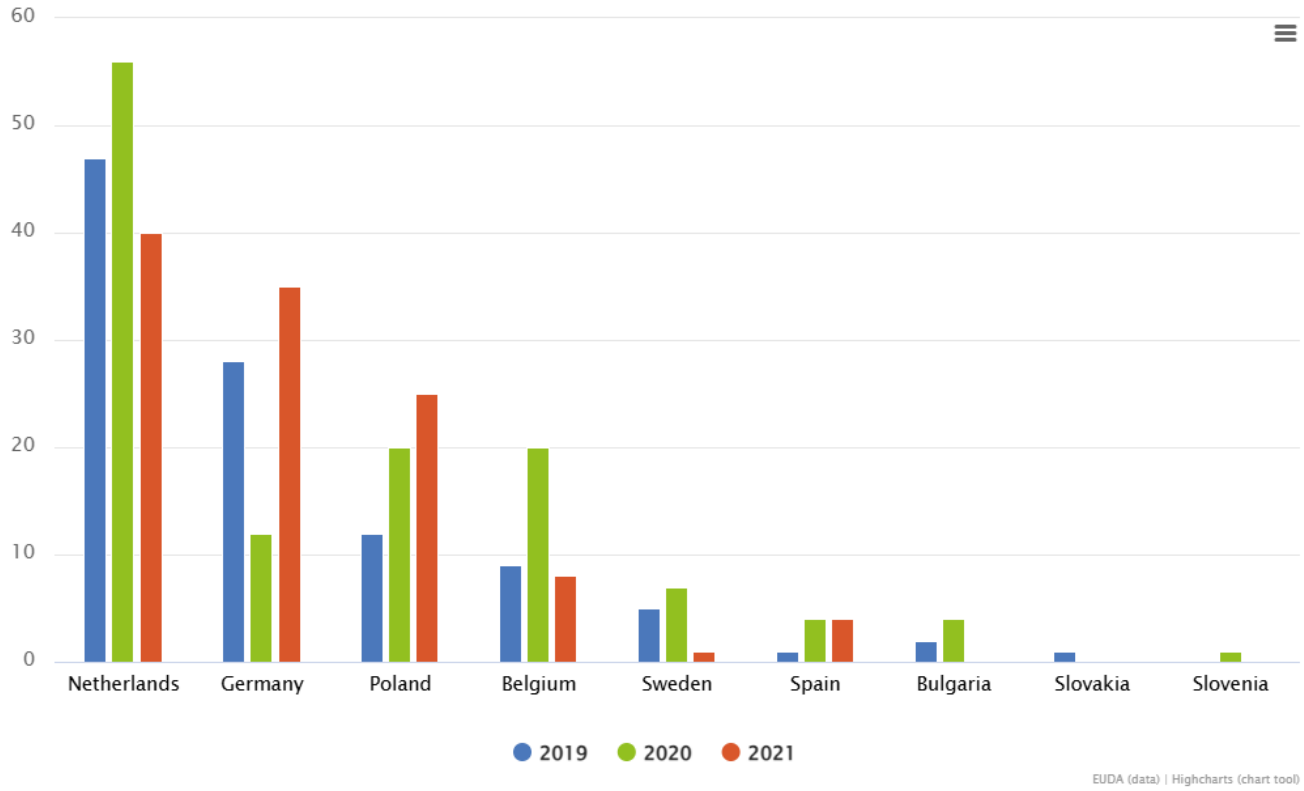


Source: EMCDDA

Illicit amphetamine sites identified in the EU

Between 2019 and 2021, 337 sites related to illicit amphetamine production were dismantled in the EU. Among these were production sites, chemical or equipment storage facilities and waste dump sites. Of these sites, 114 were dismantled in 2021 in Belgium (6), Bulgaria (4), Germany (35), Estonia (1), the Netherlands (38), Poland (25), Spain (4) and Sweden (1). The totals for Germany and Poland include a number of laboratories where amphetamine oil was processed into amphetamine sulfate (28 and 15 sites respectively). Out of the 114 sites dismantled in 2021, 44 were operational (compared to 72 in 2020), and were detected in Germany (4), the Netherlands (32), Poland (3), Spain (4) and Sweden (1) (see Figures Number of amphetamine production sites dismantled in the EU, 2019-2021 and Location of sites related to amphetamine production in the EU, 2019-2021).

Number of amphetamine production sites dismantled in the EU, 2019-2021



Source: EMCDDA. The source data for this graphic is available in the source table on this page.

Location of sites related to amphetamine production in the EU, 2019-2021

Source: EMCDDA

According to the available data, the Netherlands is a notable hub for synthetic drug production in the EU, with Dutch law enforcement data revealing that a total of 362 synthetic drug production sites were detected between 2017 and 2020. Evidence of amphetamine manufacturing was found

in 135 (37 %) of those locations. Combination laboratories, where at least two different types of synthetic drugs are manufactured, were less frequently found, but 25 such sites were discovered that involved amphetamine. Combined production of amphetamine or MDMA with methamphetamine was found to have increased over this period, while combined production of amphetamine and MDMA decreased (National Police of the Netherlands, 2022).

Amphetamine laboratories are often situated in rural or residential areas, on farms, in private houses, in industrial parks or in remote industrial premises. Criminal networks engaging in this business are adaptable and take measures to reduce the risks of, and any losses resulting from, detection. Such measures include setting up laboratories that can be quickly dismantled when they are no longer needed or become unsafe, as well as using separate locations for different stages of the production process. Equipment that can be reused may be removed when a laboratory is dismantled by the criminal networks, and waste is often left behind.

Europe has historically been the source of amphetamine (and other synthetic drugs) for the United Kingdom (UK) drug market, however, evidence of large-scale amphetamine production in the UK has emerged since 2020. This may be partly explained by the withdrawal of the UK from the EU. For example, in December 2022, four members of a criminal network were convicted of running an industrial-scale amphetamine lab in Scotland. In that case, the police seized more than 560 kilograms of APAA that was destined for the illicit production site (UK NCA, 2022). In a separate case, two men were convicted of conspiring to build and operate a rural illicit laboratory to manufacture amphetamine on an industrial scale, according to the Attorney General's office. The site, which was operational between June 2020 and April 2021, was capable of producing 136 kilograms of amphetamine per week (UK Attorney General's Office and Tomlinson, 2022).

The main production methods used in Europe

Information from law enforcement in Europe suggests that most of the amphetamine produced in Europe is synthesised using the Leuckart method. Other techniques have been encountered, albeit infrequently, including what is commonly called the nitrostyrene method and the pressure reaction method. There have been some recent signals, however, that the nitrostyrene method may become more prominent in the future. This reflects the adaptability and resilience of synthetic drug producers, who can shift and adjust production methods in response to (or in anticipation of) changes in the availability of chemicals.

Leuckart method

The Leuckart method is the most commonly used means of manufacturing amphetamine in illicit laboratories in the Netherlands and Belgium. Between 2019 and 2021, this method of synthesis was reported in 110 cases in the Netherlands and 23 in Belgium. By contrast, the nitrostyrene method was only identified in one case in the Netherlands in 2019. The Leuckart method is a

relatively simple, versatile and well-established organic chemistry process that converts carbonyl compounds (aldehydes or ketones) into amines, under heating. This method may also be used in the synthesis of methamphetamine, MDMA, MDA and a number of other compounds, depending on what carbonyl and amine combination is used (see Figure Main precursors and essential chemicals needed for the synthesis of amphetamine, methamphetamine, MDMA and MDA via the Leuckart method). Despite being a procedure that does not require a high level of skill or a complicated set-up, it is labour intensive, requires the use of high temperatures (around 190 ^{0}C in some cases) and, compared to the methods used for the production of other synthetic drugs, is associated with relatively low production yields.

Main precursors and essential chemicals needed for the synthesis of amphetamine, methamphetamine, MDMA and MDA via the Leuckart method

Source: EMCDDA

Typically, the Leuckart synthesis of amphetamine starts with heating BMK with formamide, often in the presence of formic acid, to form an intermediate (*N*-formylamphetamine or N-FA). This intermediate is converted to amphetamine base oil and the base oil is subsequently processed into the desired amphetamine salt (typically amphetamine sulfate). Although uncomplicated, the method suffers from product losses, mostly due to impurities generated from side reactions, but also because of the extensive (and often incomplete) purification steps. This means that, in most cases, the theoretical reaction yield of 60-70 % (whereby 1 litre of BMK could theoretically produce 700-800 grams of amphetamine sulfate) is rarely reached (Europol, 2019).

Risks associated with the Leuckart method are mostly related to fire, if open flames are used, and possible overheating during the initial synthesis steps, which can result in hot chemicals being spilled or projected. The overheating of formamide and/or formic acid has been associated with poisonings at European production sites through the inhalation of toxic vapours, and, in some cases, explosions (Landelijke Faciliteit Ontmanteleng (LFO), personal communication 2022).

Amphetamine production: evolution of the Leuckart method

To minimise product loss in the synthesis of amphetamine, European producers have introduced modifications to the Leuckart method. One of these modifications involves the use of excess base (sodium hydroxide) at the end of the first step, where the *N*-formylamphetamine intermediate is formed. The use of excess base shortens the cooking time, but it also avoids the need to perform the hydrochloric acid cooking step. This eliminates the requirement for extensive purification of the resulting amphetamine oil and turns the synthesis of amphetamine into a ‘one-pot’ procedure. This change therefore improves the practicality of the method, and reduces some of the product losses that occur with extensive purification at high temperatures. The first report of a dismantled laboratory using this type of modification was in Germany in 2019, although there were indications

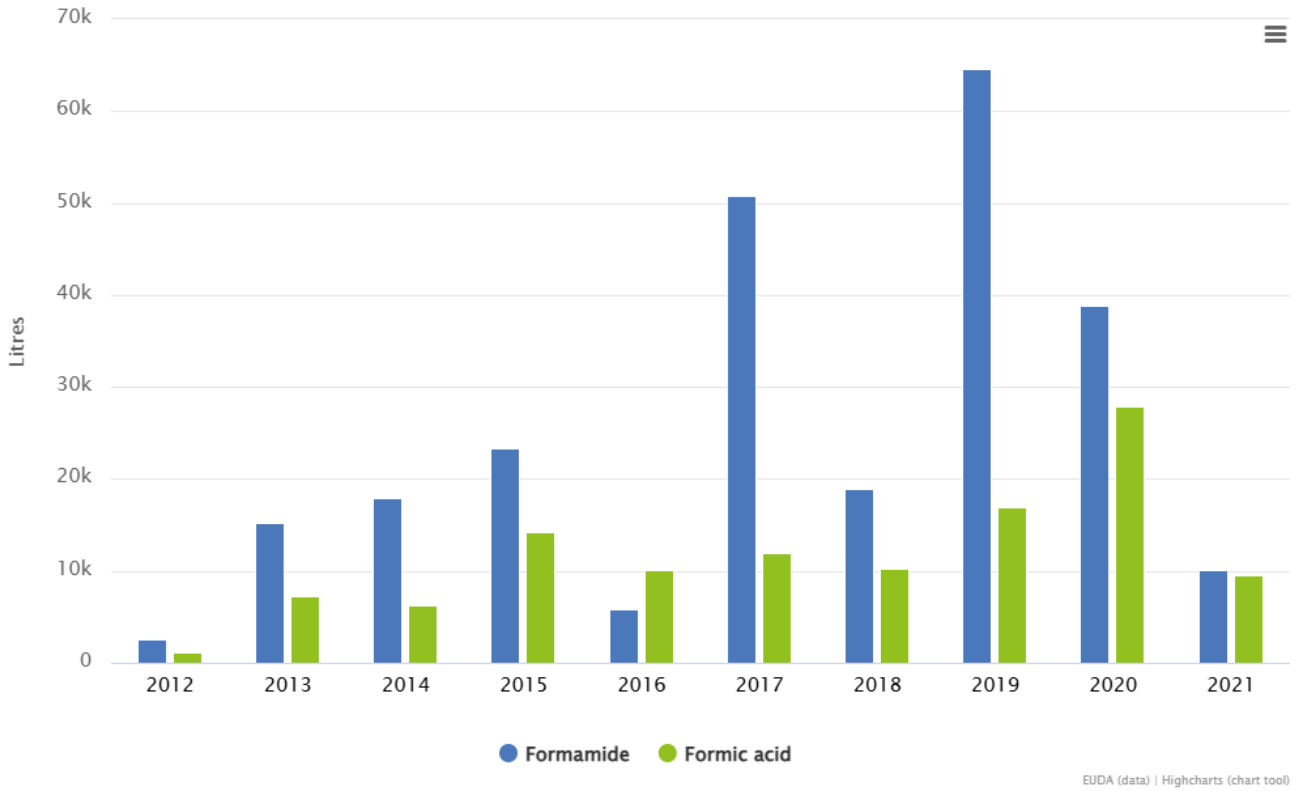
that Dutch criminals were involved. Since then, it has become the predominant method in Europe, indicating the extent of knowledge-sharing between networks producing illicit amphetamine.

BMK is a crucial starting material for the synthesis of amphetamine and methamphetamine. Despite legal controls on its trade, significant amounts of BMK oil are still trafficked (predominantly) from China and Hong Kong into Europe every year, with the Netherlands reporting the most seizures. To avoid these controls, synthetic drug producers can use a number of non-scheduled alternative chemicals that can be converted into BMK. The last few years have seen a number of alternative chemicals being successively and rapidly introduced into Europe in response to (or even in anticipation of) the introduction of legal controls; this is indicative of a resilient and adaptable market, run by well-informed synthetic drug producers. Large quantities of these substances are seized in the EU each year (see 'Quantity of designer precursors for the synthesis of BMK seized in Europe').

When BMK is used to produce amphetamine, formamide is the chemical used to synthesise the drug. This can occur in the presence or absence of formic acid, which can reduce the temperatures reached in the Leuckart reaction. Formamide (and formic acid) can also be used in the production of MDA (see Figure 'Main precursors and essential chemicals needed for the synthesis of amphetamine, methamphetamine, MDMA and MDA via the Leuckart method'), but the production of MDA in Europe is very limited, implying that most of the formamide seized will be associated with amphetamine production.

Reflecting its role as a global amphetamine producer, Europe remains the region where the largest seizures of formamide and formic acid are reported (INCB, 2021). In 2020, almost 39 000 litres of formamide were seized by four EU countries (Belgium, Germany, Poland and the Netherlands), alongside almost 28 000 litres of formic acid (reported by Belgium, Germany and the Netherlands) (see Figure Quantities of seized chemicals associated with the Leuckart method in the EU, 2012-2021). In 2021, the scale of seizures was slightly more modest (10 200 litres of formamide, close to 10 000 litres of formic acid), yet still significant at the global level. The Netherlands accounted for 74 % of all formamide seizures reported in 2020 and 99 % of those reported in 2021 (INCB, 2022a). Where contextual information was available, the seizures were carried out in illicit laboratories and warehouses associated with amphetamine production, either exclusively or in conjunction with other drugs or precursors (INCB, 2021, 2022a).

Quantities of seized chemicals associated with the Leuckart method in the EU, 2012-2021



Source: European Union's drug precursors database (EUDPD). The source data for this graphic is available in the source table on this page.

Dutch law enforcement intelligence indicates that formamide, BMK and its alternative chemicals are mostly obtained from China. Formamide is often found in large (200-litre) barrels (National Police of the Netherlands, 2022). These shipments are frequently imported into various European countries and eventually transported to the Netherlands by road, rather than being shipped there directly. Formamide is also diverted from legitimate chemical suppliers in the EU, a practice that has been noted in Germany. These chemicals, regardless of their origin, are typically mislabelled, for example as cleaning products.

Other chemicals, including solvents, gas cylinders, acids and bases may be sourced from several European countries, including Poland and Germany, where a number of legitimate chemical companies are based (see Box Illegal dumping of chemical waste leads to precursor supplier). Russia is also thought to be an important source of sodium hydroxide for Dutch synthetic drug laboratories, including those producing amphetamine (National Police of the Netherlands, 2022), but presumably this supply has been interrupted by the war in Ukraine. In the EU, France, Poland and Romania are also known to be targeted as sources of sodium hydroxide.

Illegal dumping of chemical waste leads to precursor supplier

In April 2018, a chemical waste dump site was discovered in Germany, close to the Dutch border. The chemicals were found to be associated with drug production and were traced back to a

legitimate chemical company that operated in Nettetal, Germany. An extensive investigation was initiated, which culminated in July 2020 in the seizure of several thousands of litres of the chemicals necessary for producing and processing synthetic drugs, including 1 640 litres of formamide and close to 1 000 litres of formic acid. The investigation also led to the arrest of three individuals, on charges of supplying large amounts of chemicals intended for illicit drug production. The chemicals were obtained in bulk amounts and then repackaged in smaller containers at the premises in Germany before being delivered to illicit laboratories in Belgium and the Netherlands.

Sources: INCB Precursors Report, 2020 and https://www.presseportal.de/blaulicht/pm/65857/4651613

In one case, reported by Germany in 2021, the seizure of precursors associated with amphetamine production occurred in a large illicit laboratory operated with the support of Dutch criminals. The laboratory was classified as 'industrial', that is, capable of producing amphetamine in tonne amounts. In another case, reported by the Netherlands in 2021, 4 575 litres of formamide were seized in a former construction factory where 'industrial' quantities of amphetamine were being produced.

Nitrostyrene method

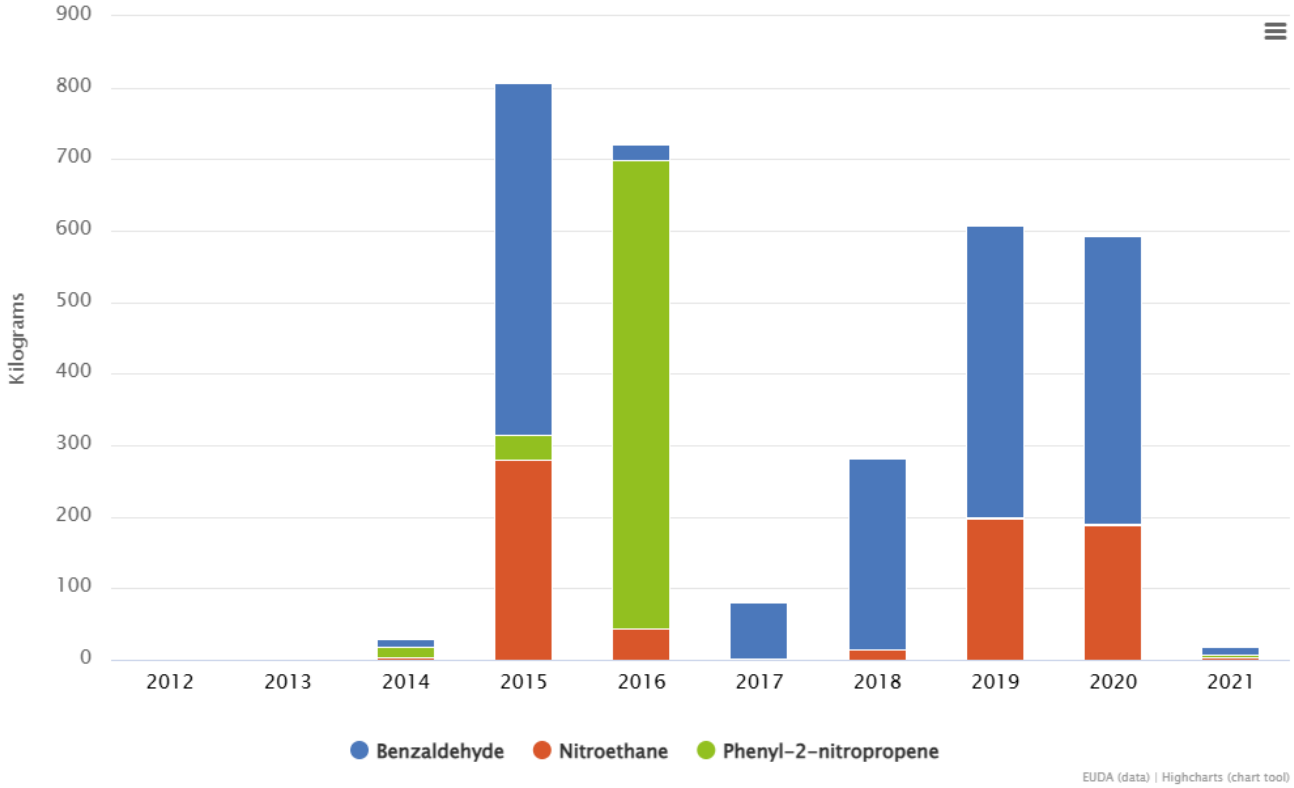
The use of BMK and its alternative chemicals in the synthesis of amphetamine can be circumvented by use of the nitrostyrene method (also known as the nitropropene method). Production of amphetamine using the nitrostyrene method has rarely been reported in Europe, with the exception of Poland. In Europe, seizures of precursors and essential chemicals associated with the nitrostyrene method are typically small in scale compared to those associated with the Leuckart method. A possible reason for this may be that the chemicals needed for the nitrostyrene method are widely used in various industries. Where data are available, the seizures typically occur in small to mid-size illicit laboratories.

Between 2019 and 2021, the method of amphetamine synthesis used in illicit laboratories in Poland was reported in 22 cases, with 10 using the nitrostyrene method and 12 using the Leuckart method. The nitrostyrene method proceeds through the formation of a bright yellow intermediate (1-phenyl-2-nitropropene or P2NP) from benzaldehyde and nitroethane in the presence of catalytic amounts of an amine (via a standard Knoevenagel reaction). This intermediate can be converted into amphetamine oil by a number of reduction techniques and is finally purified and converted into amphetamine sulfate. These processes are relatively simple, high yielding and avoid the use of controlled chemicals. The second step is particularly hazardous as it generates heat and needs to be carefully controlled to avoid explosions and fires breaking out at the production sites – particularly if the synthesis is being conducted on a large scale. BMK itself can also be produced from P2NP in a one-pot method.

In 2020, close to 600 kilograms of precursors associated with the nitrostyrene method (nitroethane, benzaldehyde and P2NP) were seized in Europe, 96 % of which was found in Estonia. In 2021, seizures amounted to only 19 kilograms (all in Austria) (see Figure Quantities of seized

chemicals that may be associated with the nitrostyrene method in the EU, 2012-2021). While this suggests that the method is mainly restricted to small production sites and has not been gaining ground in recent years, it should be noted that in 2022 at least one seizure of just over 480 litres of benzaldehyde was reported by the Netherlands. Together with recent seizures of these chemicals elsewhere, this may indicate that this production method may become more prominent in Europe. These developments need to be carefully monitored in the future.

Quantities of seized chemicals that may be associated with the nitrostyrene method in the EU, 2012-2021



Source: European Union's drug precursors database (EUDPD). The source data for this graphic is available in the source table on this page.

Other methods

A number of other methods can be used to synthesise amphetamine, including the 'pressure reaction' method. Information from law enforcement agencies suggests that this synthetic route is mostly associated with the production of MDMA, but that on a limited number of occasions it has been used in amphetamine production, simply by changing the precursor from PMK to BMK. In these cases, the method is initiated by reacting BMK and ammonia in a solvent in the presence of a catalyst (e.g. Raney nickel). The air generated by the reaction is removed by vacuum and hydrogen gas is added at a defined pressure. As the reaction proceeds, the temperature rises while the pressure lowers until both are stable. The resulting amphetamine oil can then be separated from

the catalyst and purified by distillation. This method is more demanding and requires more sophisticated equipment than the other two methods described here.

Equipment used in amphetamine production

The piece of equipment that is central to amphetamine production is the reaction vessel, however other equipment is also needed, for example separators, drying apparatus, presses, vacuum heat sealers and tablet presses, some of which are commercially available.

Large-scale amphetamine producers use increasingly customised – or fully custom-made – high-quality reaction vessels in order to eliminate possible tracing and to increase the amount of amphetamine produced, and hence their profits. In addition to custom-made equipment, which is on occasion outsourced to specialists, equipment may also be purchased from online and offline vendors. Reaction vessel capacities vary depending on the need, from small-scale, litre capacity, to industrial-scale vessels that can hold 4 000 litres or more of reactants.

Criminal networks are adaptable and can readily find equipment suppliers, either via brokers or by engaging directly with the producers. Companies and individuals in the metal industry may be approached by criminal networks for the purpose of sourcing, building or customising equipment. As production equipment becomes more sophisticated, the task of identifying and dismantling the equipment becomes more challenging, and, in some cases, more dangerous for law enforcement.

Synthetic drug production poses a number of other possible hazards. In the last few years, several fatalities have been recorded in synthetic drug production laboratories in the Netherlands and Belgium as a result of fires or explosions (van den Berg, 2021) or due to suffocation from carbon monoxide or other toxic fumes caused by the production process (Steenberghe, 2020). A scientific review of cases of exposure to chemicals in illicit drug laboratories linked this contact not only to mild or moderate respiratory, ocular and dermal effects, but also to severe symptoms and fatalities (Koppen et al., 2022).

International action and cooperation on equipment used for illicit drug production

Article 13 of the Convention against Illicit Traffic in Narcotic Drugs and Psychotropic Substances of 1988 provides a basis for international action and cooperation to prevent equipment from reaching illicit laboratories and to investigate cases involving the diversion of such equipment. In addition to article 13, article 3 of the 1988 Convention provides a framework for national efforts to counter the manufacture, transport or distribution of equipment to be used for illicit purposes, by making such activities criminal offences under each country's domestic law. Since the provisions have not been used to the full extent possible, the International Narcotics Control Board (INCB) has published guidelines to prevent the trade in and diversion of essential equipment for illicit drug manufacture (INCB, 2022b). With the assistance of international partners, including Germany, the Netherlands and Europol, the INCB has also established an International Monitoring List of

Equipment. These initiatives are intended to help Governments make better operational use of article 13 by taking appropriate measures to prevent the trade in and diversion of essential equipment for illicit drug production (INCB, 2022b).

Environmental impact of amphetamine production

The manufacture of amphetamine not only poses hazards to those involved in its production; it also entails the generation of chemical waste products, which are typically dumped away from the production site, sometimes even in neighbouring countries. Such waste has been found dumped in Belgium, Germany, the Netherlands and Poland. Such practices can frustrate efforts to identify production sites and present collateral risks for the environment and the people involved, as well as the local community.

The waste generated by the production of synthetic drugs can be estimated on the basis of instructions found in dismantled illicit laboratories. For the conversion of BMK to amphetamine and the synthesis of BMK from alternative chemicals, it has been estimated that the manufacture of one kilogram of amphetamine generates between 19 and 39 kilograms of chemical waste (Ter Laak and Mehlbaum, 2022). This results in health risks, environmental damage and high clean-up costs. A variety of methods are used to dispose of these large quantities of chemical waste. For example, the waste may be simply poured down the sink or toilet, although this is unlikely to be a common practice, as the waste can be corrosive or so viscous that it would damage the pipes or block the drains. However, if chemical waste is disposed of in this way, it may affect the quality of drinking water or adversely affect municipal wastewater treatment plants (Emke et al., 2018; Schoenmakers et al., 2016).

A more common occurrence is that members of the public report containers of waste dumped in the countryside. There have also been instances where waste has been found buried underground or discharged directly into the soil. Waste can also be left in abandoned properties or loaded into stolen vans or lorry trailers, which may then be set on fire to conceal forensic evidence. More elaborate methods have been found, including the use of modified vans that pump waste onto road surfaces. The dumping of synthetic drug production waste directly into surface waters, or indirectly via the sewers and wastewater treatment plants, can affect surface water quality (Emke et al., 2018). Scenario studies making use of hydrological modelling illustrate that a large emission of drug production waste from an illicit laboratory into a sewer (or directly into surface water) can temporarily affect surface water quality over wide distances (Pronk, 2020). Waste discharged into surface water can be cleaned up when the water is stagnant, such as in lakes or ditches, and the response time is short. However, this is not possible in large rivers and fast-flowing streams (Ter Laak and Mehlbaum, 2022).

Four dumping sites specifically related to amphetamine production were reported in the EU in 2021: two in Belgium and another two in the Netherlands. This represents only a fraction of the

total 224 dumping sites reported in the EU that year. It is therefore likely that many more of these sites were related to amphetamine production but this cannot be confirmed, as samples are not always taken for analysis to ascertain the particular synthetic drug or chemical processes to which the waste related.

Knowledge of the mechanisms and extent of environmental damage related to synthetic drug production is fragmented and the topic is under-researched. A study on the impact of synthetic drug production on the environment through the analysis of contaminants in groundwater samples was commissioned to shed some light on this issue (see Box Groundwater contamination related to synthetic drug production waste disposal). While stand-alone studies on specific impacts have been conducted, a more comprehensive and complete assessment of the environmental impact of synthetic drug production has not yet been carried out.

Groundwater contamination related to synthetic drug production waste disposal

In 2022 the EMCDDA commissioned a study into groundwater contamination related to synthetic drug production waste in the Netherlands (EMCDDA, 2023). The study site was contaminated with drug production waste twice in a few days in 2021. The ditch was isolated shortly after the first disposal was discovered. While isolated, a second discharge most likely occurred during the night. The location was subsequently cleaned up. The results showed that the waste dumped at the location came from amphetamine, MDMA and methamphetamine production. Furthermore, the presence of various precursor intermediates and synthesis by-products were observed. Despite the clean-up that was performed shortly after the discovery of the contamination events, residues of the drugs and production-related compounds remained in the water and sediment, indicating that such chemicals can be difficult to eradicate, and may have a lasting impact on the environment that is still to be assessed (EMCDDA, 2023).

Number of amphetamine production sites dismantled in the EU, 2019-2021

Search:
Showing 1 to 9 of 9 entries
First1Last

Quantities of seized chemicals associated with the Leuckart method in the EU, 2012-2021

Search:
Showing 1 to 10 of 10 entries
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Quantities of seized chemicals associated with the Leuckart method in the EU, 2012-2021

Quantities of seized chemicals associated with the Leuckart method in the EU, 2012-2021

Quantities of seized chemicals that may be associated with the nitrostyrene method in the EU, 2012-2021

Search:
Showing 1 to 10 of 10 entries
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Quantities of seized chemicals that may be associated with the nitrostyrene method in the EU, 2012-2021

Quantities of seized chemicals that may be associated with the nitrostyrene method in the EU, 2012-2021

Table. Approximate locations (+/- 10 km) of amphetamine production sites dismantled between 2019 and 2021

References

Consult the list of references used in this resource.

Number of amphetamine production sites dismantled in the EU, 2019-2021

Number of amphetamine production sites dismantled in the EU, 2019-2021