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Methamphetamine as a street drug: effects, addiction, and associated risk factors

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ABSTRACT

Methamphetamine is the most prevalent amphetamine-type stimulant, which is often illicitly produced in clandestine or laboratory settings from prescription or over-the-counter drugs. Methamphetamine has more than 20 street names, with "crystal," "glass," and "hot ice" being among the most popular. Crystal methamphetamine resembles shards of colorless or light blue glass; however, the drug is often used as powders, tablets, pills, smoking mixtures, and/or solutions for injection. Methamphetamine may be administered by various routes, including oral, rectal, respiratory (via vapor/smoke inhalation), intravenous (via injections), and vaginal. It is generally absorbed through mucous membranes and crosses the blood-brain barrier. The physiological effects of methamphetamine are similar to those of amphetamine-type drugs. These are the result of stimulation of the central nervous system, the sympathetic part of the vegetative nervous system, and the cardiovascular system, with simultaneous suppression of the digestive tract function. Therefore, the effects of this group are similar to the physiological and psychological effects of epinephrine, known as the *fight-or-flight* response. These changes include stimulation of mental abilities, attention, reactivity, alertness, and anxiety (vigilance); improvement of mood (elimination of depression symptoms) and self-esteem; insomnia; increased muscle activity; and fatigue relief (the doping effect). They also provoke increased heart rate, blood pressure, body temperature, perspiration, respiratory rate, and blood sugar levels accompanied by suppression of appetite; constriction of peripheral arterial vessels; bronchial and pupillary dilation; decreased peristalsis of atonic intestines, stomach, gallbladder, biliary tract, and ureters; reduced secretory function of digestive glands; and dry mouth. High doses may induce paranoia, exacerbation of schizophrenia, seizures, cardiovascular collapse, stroke, or death. The effects of methamphetamine typically persist for 6–12 h, with maximum duration reaching up to 24 h at high doses. The biological half-life of methamphetamine in adults is 4–5 h. The substance is recognized as a highly addictive drug with a high potential for abuse. Consequently, it is classified as a narcotic drug worldwide.

Keywords: narcotic drugs; hallucinogens; doping; methamphetamine; ephedrine; crystal; hot ice; addiction.

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Метамфетамин как уличный наркотик. Эффекты, наркотическая зависимость и ассоциированные с ними факторы риска

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АННОТАЦИЯ

Метамфетамин является самым распространенным наркотиком амфетаминового ряда, который часто незаконно производится в кустарных условиях и лабораториях из рецептурных и безрецептурных лекарственных препаратов. Незаконно произведенный метамфетамин имеет более 20 уличных названий, среди которых чаще используется «кристалл», «хрустальное стекло» и «горячий лед». Кристаллический метамфетамин напоминает собой осколки бесцветного или светло-голубого стекла, но препарат часто используется в виде порошков, таблеток, пилюль, курительных смесей и растворов для инъекции. Препарат могут вводить внутрь (через рот или прямую кишку), в систему дыхания (в виде ингаляций, вдыхания паров или дыма), в кровь (с помощью инъекций), а также через влагалище. Как правило, он легко всасывается через слизистые оболочки и проникает через гематоэнцефалический барьер. Физиологические эффекты метамфетамина соответствуют эффектам препаратов класса амфетаминов и обусловлены стимуляцией центральной нервной системы, симпатической части вегетативной нервной системы и сердечно-сосудистой системы при одновременном угнетении функциональной активности органов пищеварения. Поэтому эффекты этой группы препаратов очень похожи на физиологические и психологические эффекты, вызываемые эпинефрином и известные как реакция «бей или беги». Этот комплекс изменений включает стимуляцию умственных способностей, внимания, реактивности, настороженности и тревожности (бдительности); улучшение настроения (устранение симптомов депрессии); повышение самооценки; бессонницу; повышение мышечной активности; устранение чувства усталости (эффект допинга); увеличение частоты сердечных сокращений, артериального давления, температуры тела, потливости; сужение периферических артериальных сосудов, расширение бронхов; учащенное дыхание; расширение зрачков; повышение уровня сахара в крови при одновременном подавлении аппетита; замедление перистальтики и тонуса кишечника, желудка, желчного пузыря, желчных путей и мочеточников; уменьшение секреторной деятельности пищеварительных желез и развитие сухости во рту. Высокие дозы могут вызывать паранойю, обострение шизофрении, судороги, сердечно-сосудистый коллапс, инсульт и смерть. Обычно эффекты сохраняются в течение 6–12 ч, но могут продолжаться до 24 ч после приема больших доз. При этом биологический период полувыведения метамфетамина у взрослых людей составляет 4–5 ч. Метамфетамин вызывает сильную зависимость, у него высокий потенциал злоупотребления, поэтому в большинстве стран мира он включен в списки наркотических препаратов.

Ключевые слова: наркотики; галлюциногены; допинги; метамфетамин; эфедрин; кристалл; горячий лед; зависимость.

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INTRODUCTION

Methamphetamine (synonyms: amferoxin, gerovit, sondrex, dezamine, deoxyn, methedrine, neodrine, etc.) is currently the world's most widely used "street drug", which is illicitly produced and distributed in the criminal environment to meet the needs of drug abusers. [1–5] At the same time, methamphetamine is not only available on the global pharmaceutical market as a street drug, but also as a high-quality pharmaceutical preparation. In the case of a quality pharmaceutical preparation, methamphetamine meets the pharmacopoeial requirements in terms of quality. Such methamphetamine is used in some countries for the treatment of obesity and attention deficit hyperactivity disorder (ADHD). [6–13]

Methamphetamine, as a legally manufactured drug, is a chemically pure substance that belongs to the group of amphetamine-type psychostimulants. [14–16] This is explained by the fact that the chemical formula of methamphetamine indicates its affinity with substituted phenylethylamines and amphetamines, i.e. substances that represent the basis of the specified pharmacological group. In particular, the symbol of the structural x formula of methamphetamine can be represented as C10H15N, which indicates the similarity of methamphetamine to other dimethylphenethylamines. A more detailed analysis of the chemical structure of methamphetamine indicates that it is a positional isomer of these compounds. [17]

This information indicates that the idea of methamphetamine as a drug relies on an idylized essence of a "pure" chemical substance. Moreover, it relies only on the symbol of the chemical formula of a single methamphetamine molecule and not on the actual pharmaceutical product. In turn, the mechanism of action of idialized methamphetamine described in manuals and handbooks is also illusory because it applies only to a virtual patient who is not addicted and has not taken methamphetamine before. [18] Nevertheless, the idealized mechanism of action of methamphetamine as a drug indicated in manuals, handbooks, and textbooks has been successfully used by physicians and specialists around the world as basic (baseline) information, which they adjust based on many factors. In doing so, specialists rely on personal experience as well as the experience of others, namely, those who have previously used the drug for various medical purposes, mainly under the name "pervitin." [19, 20]

Consequently, the information about methamphetamine as a drug and its mechanism of action currently contained in manuals, textbooks, drug reference books, and methamphetamine instructions for use is not directly relevant to methamphetamine as a specific street drug and its specific user. Nevertheless, this information can be used to characterize the biological activity of any street (or club) methamphetamine and the health status of any living person after interaction with any criminal drug. To do so, the specialist must make adjustments to the standard information using such factors as the composition of the selected drug product, its aggregate state, physicochemical properties, dose and concentration of each ingredient, as well as the user's age, body weight, health status, sensitivity to drugs in the group of psychostimulants, sympathomimetics, adrenomimetics and antidepressants, and the technology and frequency of methamphetamine administration into the body.

LOW QUALITY "STREET" METHAMPHETAMINE AS A RISK FACTOR FOR DRUG ADDICTION

Methamphetamine as a "street drug" has no quality standard, is not marketed as a standard pharmaceutical product and does not have a "standard" mechanism of action described in the relevant manuals. [14] The fact is that in the criminal environment methamphetamine is produced illegally in artisanal conditions and clandestine laboratories using different raw materials and different technologies. Therefore, each manufacturer's final product (drug) is different in terms of its quality and biological activity. In particular, it is reported that in the criminal world, methamphetamine can be produced from plant material containing ephedrine, as well as from ephedrine hydrochloride and/or its analogues (prescription and over-the-counter medicines for the treatment of runny noses and bronchial asthma). To do so, the specified feedstock is subjected to a chemical reduction reaction based on one of the classical methods (the Birch, Nagai, Leukart or Emde method), but with the substitution of pure chemical reagents for "dirty" reagents such as battery acid, household potassium permanganate, sewage cleaner and antifreeze. [14, 19] Therefore, illicit methamphetamine manufacture can lead to fires, explosions, injuries, and environmental contamination.

Therefore, the use of methamphetamine as a street drug by any user each time represents for each of them an experience of the influence of an "unfamiliar" product of chemical synthesis, produced in artisanal conditions without observing safe technologies of production, storage and transportation. Under such conditions, the street ("underground") drug may be "contaminated" with various impurities that alter its biological activity in different ways. In addition, methamphetamine may be distributed in the criminal environment not only under the name methamphetamine, but also under the slang names of pervitin, screw or "club drug". Methamphetamine as a street (or club) drug can have different aggregate states, different qualities and quantities, and can be administered in different ways to the user. Therefore, different quality, different quantity (different dose, concentration) of artisanally produced methamphetamine, as well as different technology of its use allows for a product with different biological activity and mechanism of action. [14, 20] In addition, methamphetamine may be distributed in the criminal environment not only in the form of a chemically

pure substance (e.g. crystals or powders), but also in the form of household "products" such as dietary supplements, smoking mixtures, bath salts and various solutions. [14, 20]

Consequently, homemade methamphetamine differs from factory-produced and legally produced methamphetamine in that it is produced under illegal conditions without complying with pharmacopoeial quality requirements, so such methamphetamine is not standard in its composition and quality. As a street (club) drug, it is not a completely pure chemical substance and is "contaminated" with various impurities. It has been shown that methamphetamine often contains pseudoephedrine. The purer methamphetamine is reported to be clear, colorless crystals or light blue crystals that are odorless. Typically, street methamphetamine crystals and/or powders and pills are white in color and have a bitter taste. Less commonly, street methamphetamine powders, crystals, and tablets may be pink, brown, and orange in color. [2, 21–25]

It is reported that the more "contaminated" methamphetamine is with other biologically active substances, the more its effect on humans differs from that of chemically "pure" methamphetamine. In particular, very "dirty" methamphetamine has the most pronounced neurotoxicity: in some people, such methamphetamine can cause drug dependence after the first use. [14] It also encourages users to stay awake for several days. At the same time, street methamphetamine users use it in different ways.Nowadays, people often use crystals and/or methamphetamine powders. At the same time, they sniff, smoke, dissolve under the tongue, or dissolve them and inject the solution directly into a vein. [17, 26–29] In addition, the drug can be introduced into the rectum (rectally) and into the vagina (intravaginally) in the form of special "balls". [17]

The described street (or club) drug was previously known in the criminal world by such slang names as screw and pervitin, while crystalline "pure" methamphetamine was known by such slang names as ice, crystal and meth. In recent years, methamphetamine as a street drug may be distributed under the names methamphetamine, methylamphetamine, desoxyephedrine, pervitin, screw, and slang names such as meth, crank, crystal, crystal meth, shatter, glass, ice, hot ice, speed, fast methamphetamine, poor man's cocaine, sneakers, yaba, shabu, batu, Biker Coffee, Black Beauties, pink panther, yellow barn, chalk, salt, chicken feed, weirdo, glass, Go-Fast, Hiropon, stove, Tina, trash, tweak, top, ventana, vidrio, gunpowder, carbide. [14, 17, 19, 20]

MECHANISM OF THE EFFECTS OF METHAMPHETAMINE ON HEALTHY INDIVIDUALS ON FIRST USE

When methamphetamine is first administered enterally and/or parenterally to a healthy adult at a moderate dose (5–30 mg), the drug is usually rapidly absorbed into the bloodstream and from the bloodstream it penetrates well into many organs and tissues, including the brain, where it causes a cascading release of norepinephrine, dopamine and serotonin. [20, 30, 31] As a result, the state of healthy individuals deprived of drug dependence changes towards a state characteristic of a stress response. This is due to the release of norepinephrine, dopamine and serotonin into the tissues from intracellular depots, which are located in the endings of nerve cells. At the same time, the drug inhibits their subsequent absorption by the tissue. To a lesser extent, methamphetamine acts as a dopaminergic and adrenergic reuptake inhibitor, and at higher doses it can act as a monamine oxidase inhibitor (MAOI). As a result, a single moderate dose of methamphetamine increases the concentration of these neurotransmitters in the synaptic clefts of the adrenergic part of the autonomic nervous system, which excites postsynaptic adrenoreceptors located in the sympathetic part of the autonomic nervous system. [31] This excites alpha- and beta-adrenoreceptors not only in the brain, but also in the muscular layer of bronchial walls, blood vessels, and myocardium. Simultaneously, there is a release of catecholamines into the blood from the adrenal glands. In this regard, the changes occurring in the body of healthy people after a single injection of methamphetamine in a moderate dose are caused mainly by an increase in the concentration of natural catecholamines in the blood. [14, 20]

Due to the mentioned activation of the sympathoadrenal system, a moderate dose of methamphetamine increases the reactivity of the organism of a person not addicted to it. This increases the intensity of basic metabolism, activity of the heart, central nervous system, respiratory system, skeletal muscles, musculoskeletal system with simultaneous suppression of functional activity of the digestive system organs. [31]

This change in the state of the organism of healthy people is characteristic of the effect of moderate doses of not only methamphetamine, but also almost all adrenomimetics, sympathomimetics, antidepressants, psychostimulants and hallucinogens. Under the influence of a moderate dose of methamphetamine, the central nervous system of a healthy person is aroused. Simultaneously, drowsiness is eliminated, there is a burst of energy, euphoria, false bravado, and an increased sense of sexual pleasure in sex. [32–36] There is even an entire subculture built around taking crystal methamphetamine and having sex. [33–38] It has been reported that methamphetamine's positive effects on sexual satisfaction have led to an increase in underground hangouts, gaming clubs (PnP), and chemsex parties in which participants use the club drug. [39–42] However, although methamphetamine as a club drug gives its users more self-confidence and they have more pleasure when having sex, these individuals have high risks of HIV infection because addicts have poor personal hygiene and weaker immune systems. [43–46]

Thus, the direct effect on healthy people of a single injection of methamphetamine in a moderate dose is

manifested in them by psychomotor excitation, elimination of drowsiness, the appearance of a sense of vigor, positive mood, improvement of cognitive functions such as attention and psychomotor coordination, as well as the elimination of hunger and loss of appetite. [14, 19–21, 31] It has been shown that stimulation of the sympathetic part of the autonomic nervous system stimulates not only the CNS, but also the cardiovascular system, respiratory system, and musculoskeletal system. Therefore, people who have taken a moderate dose of methamphetamine usually have increased systemic arterial pressure, increased rhythm of cardiac activity, increased strength of heart contractions, increased physical efficiency, developed inability to sit still, eliminated fatigue, drowsiness, increased body temperature, increased sweat secretion, deepened and increased lung ventilation, increased intensity of basic metabolism and oxygen consumption by the body, the organ of vision is reorganized for long-range vision, its pupil is dilating. In this case, the function of the digestive system organs is depressed: the tone and peristalsis of the stomach, intestines, gallbladder, biliary tract, ureters decreases, the secretory activity of the glands of the digestive tract decreases (saliva secretion, bile emission, pancreatic secretion decreases), dry mouth develops. At the same time eliminates runny nose, laryngospasm, bronchospasm, develops dryness in the nose, sore throat, bronchial dilatation, improves the sense of smell, vision. [20, 31]

The described mechanism of action of methamphetamine in the body of healthy adults develops when the drug is administered orally, into the lungs and/or into the blood. It is important that methamphetamine enters the bloodstream and spreads with the blood throughout the body. As a rule, these changes begin to develop a few minutes after using the drug. At the same time, the above effects develop in all people in various combinations and in different sequences one after another. The resulting effects begin to gradually intensify with an increase in the time interval from the moment of introduction into the body, reaching maximum values after 1–2.5 hours. Then these changes persist at the achieved level for 1–2 hours, after which they begin to gradually decrease until they are completely eliminated 6–12 hours after administration of the drug. However, when using very high doses, these effects can last up to 24 hours. Sometimes, regardless of the route of administration into the body, methamphetamine can have a pronounced local irritating effect on tissues. The severity of the local irritant effect increases in the case of administration of drugs with high acidic and hypertensive activity [47–50].

And finally, the described change in the condition of healthy people, which develops in them when methamphetamine is administered in a moderate dose, makes it possible to classify this drug as doping. The ability of moderate doses of methamphetamine to increase mental and physical endurance can attract athletes, which sometimes causes them to violate sports ethics. [14, 20]

REPEATED ADMINISTRATION OF METHAMPHETAMINE AS A RISK FACTOR FOR DRUG ADDICTION

The human body gets used to street methamphetamine very quickly. Therefore, when the drug is administered repeatedly in a moderate dose, it has a less and less pronounced effect on the person each time. Under these conditions, a person is forced to gradually increase the dose of the drug injected into his or her body to achieve the "desired" effects. This phenomenon is called habituation. [31] Very often, when using street methamphetamine, drug habituation develops in parallel with addiction. In this case, repeated and regular administration of the drug in increasing doses improves the mood more and more, causes a feeling of complete spiritual well-being and absence of sad problems for the addict. However, this cannot continue indefinitely. The fact is that prolonged and repeated use of methamphetamine gradually impairs brain function more and more severely, because street methamphetamine has a pronounced neurotoxicity. [51–56] Moreover, its toxicity to the brain tissue increases with the increase of the administered dose of the drug. Therefore, after several months and years of regular use of street methamphetamine, the addict develops mental disorders and mental confusion. This is often compounded by Parkinson's disease and uncontrollable jaw clenching syndrome. In cases where a drug addict uses street methamphetamine in high doses (exceeding 50 mg), the addict may develop psychosis, which is manifested by auditory, visual and tactile hallucinations, intense paranoia, irrational thoughts and beliefs, suicidal thoughts and delusions. [31]

It is important to remember that habituation, addiction and the addict's "chase" for a sense of well-being (euphoria), forces him to continuously increase the dose of the injected drug, which cannot be infinitely safe. Sooner or later the administered dose of methamphetamine reaches lethal values, and the addict dies of acute methamphetamine poisoning (methamphetamine overdose).

Manifestations of acute methamphetamine overdose include anxiety, tremor, hyperreflexia, rapid breathing, confusion, aggression, hallucinations, panic states, delirium, paranoia, hyperpyrexia, and rhabdomyolysis. Fatigue and depression usually follow central stimulation. Cardiovascular effects include palpitations and tachypnea arrhythmias, angina attack, myocardial infarction, hypertension, stroke or conversely circulatory collapse. Gastrointestinal symptoms include nausea, vomiting, diarrhea and abdominal cramps. Occasionally, acute transient ischemic colitis may develop. Regardless of the above complications it is possible to develop acute urinary retention, renal failure. In severe cases, poisoning ends in convulsions, coma and death. [31]

Sudden cessation of methamphetamine use causes the addict to develop a withdrawal syndrome manifested by depressed mood, anxiety and sleep disturbance. Acute

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withdrawal usually lasts for 7–10 days, and residual symptoms associated with neurotoxicity may persist for several months. [26]

SIGNS OF METHAMPHETAMINE ADDICTION

Drug addiction on methamphetamine is manifested by the inability of a person to live a normal existence without regular repeated intake of the drug. The drug addict's whole life is likened to running from the fear of impending death, i.e. withdrawal syndrome (withdrawal syndrome). The main goal of the addict's life becomes the search for drugs. At the same time, there is an exhaustion of the body, memory lapses, the ability to perceive abstract ideas is lost, body weight decreases, the rhythm of cardiac activity, the dynamics of systemic blood pressure is disturbed. [20, 31, 57, 58]

A person addicted to "street" methamphetamine usually has a pale complexion, poor hygiene, a labile psycho-emotional state and exhibits erratic behavior. Prolonged drug dependence is often characterized by the presence of skin infections and skin ulcers. In addition, long-term use of methamphetamine causes damage to the integrity of teeth in some users, as manifested by cracked teeth syndrome, also known as "meth mouth" or "crank tooth decay". The said syndrome is characterized by gum disease, tooth decay, cracked teeth, and scaling of the teeth. [24, 59–61] The unfortunate complications of chronic street methamphetamine use also include nervous tics, muscle spasms, seizures, bruxism (teeth grinding), hypertension, stroke, heart failure, myocardial infarction, hyperthermia syndrome, renal failure, gynecological complications (uterine muscle spasm, deterioration of placental blood flow, intrauterine hypoxia, fetal death, miscarriage, stillbirth). [62–67]

Another possibility for diagnosing drug abuse is to analyze the suspect's urine, since methamphetamine and its reduced metabolites are excreted in the urine. Therefore, methamphetamine and its reduced metabolites can be detected in the urine of the addict. [20, 31] It should be kept in mind that the average half-life of methamphetamine in adults is approximately 4–5 hours. However, in some addicts, this period can reach 10 hours. The point is that there can be a very significant variability in the pharmacokinetics of street methamphetamine, which depends on different doses and ways of introducing the drug into the bodies of different people, as well as on different health conditions of people and different degrees of habituation to methamphetamine and different degrees of addiction on it.

However, in practice, drug dependence is most easily suspected by analyzing the dynamics of a person's psychoemotional state. It should be assumed that a labile psycho-emotional state and unstable behavior is manifested in a drug addict by the fact that immediately after using a drug in the "active" dose, the person calms down and suddenly becomes cheerful to others. In the first minutes after the drug is administered, the addict develops a sense of maximizing pleasure. This inner feeling of gratuitous pleasure is characterized by addicts by the term "high". Then, after a few minutes or tens of minutes, the psycho-emotional state of the person may normalize, and the addict may look like a quite healthy person. In such a state he can stay up to 6–10 hours. But then, in case of absence of the next dose of the drug, the person with drug addiction's mood deteriorates more and more every hour. During this period, the addict is eager to get the next dose of the drug and inject it into his body. In the absence of the drug, addicts may experience insomnia, hallucinations and intense itching as if there are bed bugs crawling under the skin. Because of this, addicts in the absence of another dose of methamphetamine tend to become violent and unpredictable. Their eyes begin to run fast, their voice trembles, and their muscle twitches intensify. If the drug is not injected into the body, a methamphetamine user may suddenly fall asleep and sleep for several days while their body tries to recover from the effects of the drug. Subsequently, the user may begin to experience withdrawal symptoms such as fatigue, lack of pleasure, and deep depression. In this way, the person's body becomes completely dependent on the drug and the vicious cycle of addiction is closed. [68–72]

It has been shown that usually the cessation of regular doses of a drug to a person with drug dependence causes a progressive deterioration in mood and health over a period of 3 days. This change in state indicates the development of withdrawal syndrome or withdrawal syndrome.At the same time, the addict has a growing sense of fear of approaching death, memory lapses, inability to perceive abstract ideas, as well as the rhythm of cardiac activity, the dynamics of systemic blood pressure, and refuses to eat. However, the behavior and health status of the addict immediately normalizes if the drug is introduced into his body in a valid dose. [20, 21, 31]

In some cases, mood and health changes may have a different dynamic. This can occur when an increased dose of methamphetamine is administered. It has been reported that immediately after injecting another dose of the drug into the vein, the addict becomes agitated and may remain in an agitated state for about 30 minutes. Then a stage of drug intoxication develops, which can last from 4 to 16 hours. This stage is followed by a stage of uncontrolled use of the drug or alcohol. There is a desire to prolong the euphoria. To do this, the addict seeks to take an additional dose of the drug (smokes a cigarette or injects an additional dose into a vein). This state can last 3 to 15 days. During this period, the addict's mental, intellectual and physical activity increases. After that, a period develops when the introduction of additional doses of the drug no longer causes either euphoria or narcotic intoxication. The body of the addict is "drawn" to sleep. During this period, insomnia drives the addict to insanity (psychosis), he has hallucinations, irritability and aggressiveness. The addict becomes dangerous to others, may cause injury. After the addict falls asleep, he sleeps dead for 1–3 days. During this period he becomes almost a corpse

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and does not pose a threat to others. After deep sleep, the person wakes up, but feels sleep-deprived and hungry. The addict develops dehydration, physical, mental and emotional exhaustion, and depression. He or she loses the ability to experience pleasure without the drug. Suicidal thoughts may occur. This period lasts 2–14 days. During this period, the addict lives with only one thought — to take another dose of methamphetamine. [20, 21, 31].

Sometimes there may be cases when immediately after drug administration the condition of the addict may significantly worsen in other ways. The fact is that during withdrawal syndrome, drug addicts often tend to use the drug in excessively large doses to eliminate feelings of fear and get high. This can lead to an acute overdose of methamphetamine and the death of the addict from poisoning.

ACUTE METHAMPHETAMINE POISONING

When an excessively large dose of methamphetamine is administered, the addict gets high for the first few minutes and is therefore in a state of complete well-being and satisfaction of all desires. However, almost immediately after the brief high, the addict's behavior begins to change. This change occurs in direct correlation with the increase in the concentration of the drug in the blood of his body. [73, 74] At first, the addict becomes more and more talkative, begins picking at the skin of various parts of his body and performing various repetitive and meaningless tasks. After a few minutes, the addict's behavior begins to resemble that of a lunatic, or a person poisoned by belladonna, as he or she experiences auditory and visual hallucinations, photophobia, and inability to sit still in one place. The fact is that methamphetamine overdose resembles poisoning with adrenomimetics such as ephedrine and epinephrine. Confusion, hyperactivity, paranoia, hallucinations, illusion of omnipotence, aggressiveness, anxiety, desire to attack someone develop. Sometimes there are convulsions and severe convulsions that lead to death. The person begins to resemble a lunatic poisoned with belladonna, or a patient with an exacerbation of schizophrenia. Many people who are poisoned feel a sense of fear. Sometimes inadequate behavior may develop, which, combined with inattentiveness on the spot and irrepressible desire to run somewhere (from someone) leads to the fact that often a person in fear can run for a long time through a dark forest in an unknown direction, not feeling tired, pain from branches, lack of clothes lost from its tearing delayed by thick tree branches. Sometimes this behavior can end in death due to accidental injury or due to exhaustion, because following the period of excessive excitement often develops a period of complete weakness and sleep [20, 21, 31] Therefore, a person can fall asleep in the forest and freeze, because by this period he may be without clothes.

The treatment of methamphetamine addiction (chronic poisoning) is a very complex problem. [75–90]

The treatment of acute methamphetamine poisoning is a more manageable problem. It relies on gastric lavage, administration of activated charcoal, dilution of blood by infusion of plasma replacement fluids, and the use of adrenoblockers, sympatholytics, tranquilizers and neuroleptics, in particular chlorpropazine (aminazine), which should be used similarly to its use for the management of schizophrenia and/or psychosis. [31]

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