RUBRIC FOR RESEARCH PAPER EVALUATION

CRITERIA	0 credit	¼ credit	½ credit	¾ credit	Full credit	Score
Introduction: *Thesis statement and relevance to climate* **10 pts.**	The writer does not introduce the topic.	The writer introduces the topic but does not show relevance to course content. No question or hypothesis	The writer introduces the topic but does not show relevance to course content. Question or hypothesis is vague or unclear	The writer introduces the topic and its general relevance to course content. Poses a question or hypothesis	The writer introduces the topic and its specific relevance to course content. Clearly poses a question of hypothesis	
Body: *Structure/Flow* **20 pts**	There is no real flow of information and the order is not logical	There is a weak flow of information and the order is not very logical. Not written in correct paragraph form	There is a general flow of information and the order is somewhat logical. 3-4 paragraphs in incorrect form	Organization of the topic is mostly clear and logical. 1-2 paragraphs that are wrong length or poorly formed	Consistently demonstrates a logical and coherent, easy to follow plan of organization. Separate paragraphs for each of the points made in the body	
Content: *Coverage and relation to course work* **20 pts**	Content shows no relation to course content or is not based on relevant and current research.	Writer covers the content in general without being redundant. Relation to course work is not clearly demonstrated. Does not refer to the research	Writer covers the content in general without being redundant. Relation to course work is clearly demonstrated. Over uses quotations, does not draw connections or make comments or does not connect to research	Writer covers the content in depth without being redundant. Based largely on research Relation to course work is somewhat demonstrated.	Writer covers the content in depth without being redundant. Relation to course work is clearly demonstrated. Uses quotes from research that consistently add to the content and are integrated smoothly	
Clarity of Writing: *Easy to understand* **20 pts**	**Plagiarism or more than 25 spelling grammar errors = ZERO for the paper**	Writing is average. Written in student's own words. Used first person 3 or more times 13-25 spelling or grammar mistakes.	Writing is average. Written in student's own words. Used first person 1-2 times. 9-12 spelling or grammar mistakes.	Writing is mostly clear and concise. Written in student's own words. Mostly written in third person. 5-8 spelling or grammar mistakes.	Writing is clear and concise. Written in student's own words. Written in third person. Less than 5 spelling or grammar mistakes.	
Conclusion: *What was learned?* **10 pts**	No obvious conclusions made.		Writer makes weak conclusions and/or suggestions for further research. Not obvious that writer learned from the research.	Writer makes some conclusions and/or suggestions for further research. Obvious that writer learned from the research.	Writer makes precise conclusions and/or suggestions for further research. Obvious that writer learned from the research.	
Length or # of words 10 pts	< 5 ½ pages or less than 1500 words		5 1/2pages or 1500 – 1999words	6pages or/ 2000 – 2889 words	8+ pages or 2900+ words	
Reference Types 5 pts	No reference material from scholarly or professional or material not current	One reference material from a current professional/ scholarly source plus 2 others	1 Journal, 1Book and 2 others Journal and Book from current professional/ scholarly works	1 Journal, 1Book and 2 others All sources from current professional scholarly works	2 Journals, 1 book, and 2 others + All sources from current professional/ scholarly works	
Source Citations 5 pts	Incorrect in-text citations. Works cited has many mistakes or is missing.	Incorrect in-text citations. Works cited has no mistakes.	Mostly correct style within content. Works cited has a few mistakes.	Mostly correct style within content. Works cited has no mistakes.	Correct style within content. Works cited has no mistakes.	
TOTAL						

TOPIC: DRUG Abuse

/20

Alcohol- and Drug-Exposed Infants

Editors: Pamela Korsmeyer and Henry R. Kranzler
Date: 2009
From: Encyclopedia of Drugs, Alcohol & Addictive Behavior(Vol. 1. 3rd ed.)
Publisher: Macmillan Reference USA
Document Type: Disease/Disorder overview
Pages: 4
Content Level: (Level 5)

Full Text:

Alcohol- and Drug-Exposed Infants

Since the 1970s, increasing recognition of the use of alcohol and drugs by women during pregnancy has led to concern for possible deleterious effects to the developing fetus. With the greater societal acceptance of drug use that began in the 1970s and the development of smokable forms of drugs that were formerly only used by injection, women of childbearing age and pregnant women dramatically increased their use of alcohol and other substances.

SUBSTANCES USED BY PREGNANT WOMEN

Tobacco and alcohol are the most commonly used drugs during pregnancy. In the United States, tobacco exposure complicates 25 percent of all pregnancies, and alcohol, although widely recognized as causing harm to the fetus, is consumed by about 20 percent of pregnant women. Illicit drug use occurs in about 5.5 percent of all pregnancies, a figure that may be an underestimate as national surveys are based on self-report. Based on these data, about 450,000 pregnancies annually are complicated by drug exposure and approximately 820,000 by alcohol exposure in the United States. Among illicit drugs, marijuana is most frequently used, followed by cocaine. Crack use, cocaine in its smokable form, became an epidemic in the 1990s among poor, urban women. Heroin, methamphetamine, methylenedioxymethamphetamine (MDMA, Ecstasy) are also used during pregnancy, as well as phencyclidine (PCP), ketamine, and LSD, but to a lesser extent.

Additionally, legal drugs, such as methadone and buprenorphine, may be prescribed for treatment of heroin addiction during pregnancy, and the burgeoning use of antidepressants during

pregnancy has resulted in identification of SSRIs (selective serotonin reuptake inhibitors) as potentially harmful to fetal development. Anti-epileptic drugs are also medically prescribed during pregnancy when necessary. Nicotine-replacement therapy is often recommended during pregnancy, though concerns exist about the injurious fetal effects of the drug.

FETAL IMPACT OF MATERNAL USE

The majority of alcohol dependent and drug-addicted women use multiple substances. Since all drugs are carried across the placenta from mother to fetus, the newborn (neonate) is frequently exposed to a

multiple-drug cocktail. The clinical condition of the newborn and infant long-term development depend on the type of drugs used, the frequency, amount, duration, trimester of use, and the time since last use. Since embryonic and fetal development unfolds in an orderly fashion, first trimester exposure may affect physical and organ development, whereas third trimester exposure may affect brain processes while leaving physical development unaffected. Thus functional impairment may exist with normal anatomic development.

Newborns recently exposed to heavy alcohol, heroin, methadone, or other opioids during pregnancy may experience withdrawal, or neonatal abstinence syndrome. Alcohol withdrawal symptoms occur generally within twelve hours of birth; opiate withdrawal symptoms may be delayed up to a week but tend to occur within forty-eight hours. Methadone withdrawal symptoms may not occur for as long as two weeks.

The Finnegan Scale, created by Loretta Finnegan, was devised to measure symptoms of withdrawal, which include irritability, tremor, and increased muscle tone. Other symptoms include jitteriness, high-pitched cry, poor feeding, seizures, vomiting, diarrhea, apnea (suspension of breathing), sweating, frequent yawning, sneezing, symptoms of fever, and sleeping difficulties. Drug-exposed newborns frequently present with prematurity, low birth weight, or intrauterine growth retardation (IUGR), drug or alcohol related birth defects, or facial dysmorphism that signal the need to monitor for withdrawal symptoms. For heroin or opioid exposed infants, withdrawal occurs in 55 to 94 percent of infants. Heroin exposure withdrawal symptoms can persist for about ten days postnatally whereas those associated with methadone can last up to eight weeks.

MANAGEMENT

A thorough alcohol and drug use history should be obtained from the expectant mother and should be corroborated by testing the urine of both mother and newborn for alcohol and other drugs. Drug assessment of infant meconium can detect drug use during the last two trimesters of pregnancy, in contrast to the twelve-hour to two-week window apparent through urine screening. Newborns should be closely monitored for signs of withdrawal for a minimum of forty-eight to seventy-two hours and longer when the mother has been on methadone maintenance treatment. Since symptoms of withdrawal are nonspecific and may be confused with a variety of infections or metabolic disturbances, a search for concurrent illness to explain symptoms is also mandatory.

Most hospital nurseries use a standardized neonatal abstinence syndrome scoring system such as the Finnegan Scale. The hospital monitors the neonate's sleep habits, temperature, and weight. The earliest withdrawal symptoms are treated by intravenous fluids, swaddling, holding, rocking, a lowstimulation environment, and small feedings of hyper-caloric formula for weight gain. If symptoms continue or increase, medication may be initiated. Common medications include camphorated tincture of opium (Paregoric) or phenobarbital for opioid withdrawal, Phenobarbital or Diazepam for alcohol withdrawal. Diazepam is also used to help with cocaine hyperexcitability.

Interviewing the exposed mother is essential in evaluating the anticipated home environment and the extent of maternal addiction or dependence. Unfortunately, infants exposed to drugs and alcohol in utero are often at high risk for abuse and/or neglect. Normal maternal-infant bonding is difficult in the case of an irritable, poorly responsive neonate and a mother dealing with guilt, low selfesteem, poverty, inadequate housing, and an abusive or absent partner or parent, all of which often accompany her own drug addiction. A referral to child protection services may therefore be indicated.

Women who use drugs or alcohol during pregnancy are also highly likely (50%) to have significant mental health problems, especially depression and anxiety requiring referral, and a history of sexual abuse. Domestic violence is often present, especially with illicit drug use that involves criminal activity. The Drug Abuse Screening Test (DAST) or the Michigan Alcohol Screening Test (MAST) can be useful in establishing the extent of drug and/or alcohol dependence. The TWEAK alcohol screening test—an acronym for Tolerance, Worried, Eye-opener, Amnesia, and Kut down (as in "cut down consumption")—consists of five questions and was developed to screen pregnant women for harmful drinking habits. The involvement of social services for follow-up is paramount to ensure the health of both mother and infant. Breastfeeding is contraindicated as drugs and alcohol pass readily to the infant through breast milk. A significant percentage of drug-exposed or heavily alcohol-exposed infants need foster care placement. Infants whose parents are addicted to tobacco, crack-cocaine, marijuana, or methamphetamine are at risk for continued drug exposure in the home environment.

Alcohol and substance abuse during pregnancy are related to a higher risk for medical or obstetric complications, including high blood pressure, poor nutrition, sexually transmitted diseases, and preterm birth. Risk of human immunodeficiency virus (HIV)/AIDS is also high. Lack of, or inadequate, prenatal care and mental health problems are common. Obstetric management is complex, and substance abuse treatment, mental health, and social services coordinated with prenatal care are necessary.

OUTCOME

Research studies beginning in the 1970s with the identification of Fetal Alcohol Syndrome (FAS) and cresting in the 1990s with the crack-cocaine epidemic resulted in a growing body of literature on the negative effects of alcohol and drugs on child developmental outcomes.

Alcohol is the most widely used human teratogen, the leading cause of birth defects, and one of the leading causes of mental retardation. FAS, characterized by growth deficiency, mental retardation, and facial dysmorphology, affects two thousand to twelve thousand U.S. children a year. Many more prenatally alcohol-exposed children have varying degrees of learning disabilities and motor, behavioral, or physical problems, categorized broadly as Fetal Alcohol Spectrum Disorders (FASD).

There is no known safe dose of alcohol exposure during pregnancy. Low-to-moderate prenatal exposure has been associated with Attention-Deficit Hyperactivity Disorder (ADHD), visual-motor problems, learning and memory impairment, poorer information processing speed, and IQ decrements at school age. Adolescents and adults prenatally exposed continue to demonstrate these problems as well as social behavioral deficits. The amount and duration of prenatal exposure are related generally to the severity of problems seen. By 2008 imaging studies had begun to document reductions and alterations in specific brain areas associated with prenatal alcohol exposure and the impairments found in alcohol-exposed offspring.

Tobacco accounts for more cases of Sudden Infant Death Syndrome (SIDS) than all other abused substances, and is the major environmental cause of low birth weight. Maternal smoking during pregnancy does not appear to be related to infant malformations but has been related to long-lasting deficits in child cognitive function. Prenatal tobacco exposure has been related to infant visual and hearing impairments, childhood ADHD, and delinquent behaviors and poor educational attainment in adolescence and adulthood. Continued exposure to passive smoke in the household should be considered an additional risk factor affecting child behavior.

Marijuana is the most commonly used illegal drug during pregnancy. Two prospective cohort studies in Pittsburgh and Ottawa looked at the relationship between heavy marijuana exposure and outcome. As with alcohol and tobacco, marijuana exposure was related to attentional and behavioral problems, including delinquency. Short-term memory and visual reasoning problems were seen in the preschool years, and poor ability to organize and integrate cognitive information and poorer visual-perceptual

skills were evident by nine to twelve years. Attentional problems appeared to resolve by adolescence. Depressive symptoms were also found to increase at school age.

Page 114

The majority of cocaine-exposed infants are exposed to multiple substances, primarily alcohol, tobacco, and marijuana, so research has attempted to differentiate cocaine effects from those of other drugs through large prospective cohort studies. No cocaine syndrome with consistent dysmorphology had been identified as of 2008. Cocaine exposure has been related to behavioral problems, jitteriness, sleep dysregulation, excitability, poor feeding, and poor visual attention in the neonatal period. Greater risks of infectious diseases, SIDS and, for very low birth-weight preterm infants, a higher incidence of vascular hemorrhage have been found.

Long-term follow up studies to school age cocaine-exposed children reveal persistent language and attentional problems, identifiable as early as one year of age. Visual-motor and visual-reasoning deficits to school age have been linked to the extent of exposure. Studies of behavioral outcome have been inconsistent but have suggested increased aggressive and delinquent behavior. Although specific deficits have been noted related to the severity of prenatal cocaine exposure, the early alarmist and media reports in the 1990s of the hopelessly damaged crack baby have proved to be erroneous.

Heroin and methadone are the most commonly used opiates during pregnancy, affecting about ten thousand infants annually in the United States. Opiate exposure does not appear to be related to structural abnormalities among offspring, although neurobehavioral abnormalities may last up to six months postnatally. Follow-up of small samples of children prenatally exposed to heroin or methadone at school age indicate a higher rate of conduct disorder and lower school achievement than non-exposed children.

Methamphetamine is the most widely used stimulant drug in the world. A Swedish study that followed methamphetamine-exposed children to fourteen years found them to have delayed math and language development, peer behavioral problems, and poorer physical fitness compared to norms. Exposure to methamphetamine fumes in the home is also a concern for developmental toxicity.

There are no long-term studies, as of 2008, on PCP or MDMA, although studies were under way. The caretaking environment of the drug- or alcohol-exposed child is often not optimal, because of maternal addiction, also contributing to poorer child outcomes. Screening and treatment for substance use and mental health disorders among pregnant women are paramount in order to reduce the morbidity associated with prenatal drug and alcohol exposure.

See also **Fetal Alcohol Syndrome; Fetus, Effects of Drugs on the; Pregnancy and Drug Dependence.**

BIBLIOGRAPHY

Cernerud, L. (1996). Amphetamine addiction during pregnancy: 14-year follow-up of growth and school performance. *Acta Paediatrica, 85*, 204–208.

Huizink, A., et al. (2006). Maternal smoking, drinking or cannabis use during pregnancy and neurobehavioral and cognitive functioning in human offspring. *Neuroscience and Biobehavioral Reviews, 30*, 24–41.

Lewis, B. A., et al. (2007). Cocaine and tobacco effects on children's language trajectories. *Pediatrics, 120*, e78–e85.

Singer, L. T., et al. (2004). The home environment and cognitive outcomes of cocaine exposed, preschool children. *Journal of the American Medical Association, 291*, 2448–2456.

Slikker, W., et al. (1998). *Handbook of Developmental Neurotoxicology*. New York: Academic Press.

Smeriglio, V. L., et al. (1999). Prenatal drug exposure and child outcome. *Clinics in Perinatology, 26*, 1–16.

Substance Abuse and Mental Health Services Administration. (2004). Results from the 2004 National Survey on Drug Use and Health; National Findings.

U.S. Department of Health and Human Services. (1996). Behavioral studies of drug-exposed offspring: Methodological issues in human and animal research (NIDA Monograph 164). Washington, DC: Author.

JOYCE F. SCHNEIDERMAN
REVISED BY LYNN TWAROG SINGER (2009)

Source Citation (MLA 8th Edition)
"Alcohol- and Drug-Exposed Infants." *Encyclopedia of Drugs, Alcohol & Addictive Behavior*, edited by Pamela Korsmeyer and Henry R. Kranzler, 3rd ed., vol. 1, Macmillan Reference USA, 2009, pp. 111-114. *Gale eBooks*, https://link.gale.com/apps/doc/CX2699700037/GVRL?u=sav2&sid=GVRL&xid=65b18934. Accessed 11 Mar. 2020.

Gale Document Number: GALE|CX2699700037

in the reinforcing effect of drugs and in the powerful cycle of brain dysfunction they cause.

THE DOPAMINE SYSTEM

In the central nervous system, dopaminergic (dopamine-producing) neurons reside only in a few areas, such as the substantia nigra of the midbrain, but establish connections with numerous brain regions. Dopamine (DA) dysfunctions in Parkinson's disease and schizophrenia, for example, suggest that projections from midbrain to certain brain regions (such as the striatum and frontal cortex) are involved in behavioral reactions controlled by rewards. Extensive studies conducted since the mid-twentieth century revealed that DA is involved in the generation of movement, cognition, attention, mood, reward, reward expectation, addiction, and stress.

Pleasant behavioral events (natural reinforcers such as eating, drinking, exercising, and sexual activity) stimulate the brain's reward (limbic) circuitry, causing DA release from dopaminergic neuron terminals. The information is relayed to the frontal lobe of the brain and stored in memory. The stored memory leads to behaviors directed at procuring the reward.

DOPAMINE IN ADDICTION

Dopamine involvement in multiple stages of addiction is a complex phenomenon and the subject of intense research efforts. The need for DA and its pleasurable effect can be satisfied by substances that mimic the action of this molecule on its receptor.

These substances (addictive drugs) induce transitory, exaggerated increases in DA outside the cells in a deep brain area called nucleus accumbens, a key component of the reward system. This occurs through enhanced release or decreased recycling of the neurotransmitter. The DA surges mimic or exceed the physiological responses that follow natural rewards.

Human-brain imaging studies demonstrate that the subjective feeling of euphoria occurring during intoxication associated with DA increases in deep brain nuclei. The drug-induced surge of the neurotransmitter is especially rewarding for persons with abnormally low densities of certain DA receptors (such as D2DR). Low receptor availability is associated with an increased risk for abuse of cocaine, heroin, methamphetamine, alcohol, and methylphenidate.

The euphoria triggers a reinforcing pattern that "instructs" the person to repeat the rewarding behavior of abusing drugs. As the abuse continues, long-lasting and significant adaptive decreases in DA brain function occur. These decreased levels reduce the effect of the neurotransmitter on the reward system and force the addicted person to keep abusing drugs in an attempt to normalize DA function.

When larger amounts of the drug are required to achieve the same DA high, desensitization (tolerance) occurs. Chronic drug use ultimately produces cellular and molecular adaptations in higher-processing areas of the brain, leading to disruptions in learning, mood, inhibitory control, and many other functions.

Mihaela Avramut, MD, PhD

FURTHER READING

Kipper, David, and Steven Whitney. *The Addiction Solution.* New York: Rodale, 2010.

Koob, George F., and Nora D. Volkow. "Neurocircuitry of Addiction." *Neuropsychopharmacology* 35 (2010): 217–38. Print.

Renner, John A. Jr., and E. Nalan Ward. "Drug Addiction." *Massachusetts General Hospital Comprehensive Clinical Psychiatry.* Eds. Theodore A. Stern et al. St. Louis, MO: Mosby, 2008.

WEBSITES OF INTEREST

Addiction Science Research and Education Center
http://www.utexas.edu/research/asrec/dopamine.html

National Institute on Drug Abuse
http://www.nida.nih.gov/infofacts/understand.html

See also: Brain changes with addiction; Drug interactions; Science of addiction; Symptoms of substance abuse

Drug abuse and addiction: In depth

CATEGORY: Substance abuse

DEFINITION: Although drug abuse and drug addiction are related in many ways, these conditions are viewed independently by experts. While it is true that drug abuse may lead to drug addiction,

many circumstances can cause a person to only experiment with drugs and alcohol and not become addicted. Some people may have a biological predisposition for substance addiction, but there are a number of initiatives that aim to prevent the development of this disease.

CAUSES

The reasons people abuse drugs and alcohol are innumerable. Some people become hooked on a drug they once used recreationally or decided to try experimentally. Others find comfort in the escape that the effects of drugs and alcohol provide them: They become numb to any physical or emotional pain they feel and are distracted from any thoughts or emotions that may be causing them stress. Still others abuse medications that doctors prescribe for particular ailments or illnesses.

One of the most common reasons people abuse drugs is to escape reality. Research has shown that a high percentage of drug users did not have a stable childhood. Many have memories of being physically, verbally, or sexually abused as children or adolescents. Others recall violent households and quarreling parents. Women in physically or sexually abusive marriages are more likely to seek comfort in drugs and alcohol than are women in healthy relationships.

Men who are domestic violence offenders also are more likely to abuse drugs and alcohol—and act violently toward others while intoxicated—than men who are not violent. It is important to note, however, that drug and alcohol abuse is not a proven cause of domestic violence and that domestic violence is not a proven cause of drug and alcohol abuse. These situations are known as correlated rather than causal.

Gay, lesbian, bisexual, and transgendered men and women are more likely to use drugs—and continue to use them throughout their lifetime—than are heterosexual individuals. This drug use is often in response to the frequent discrimination and abuse that sexual minorities may face because of their sexual orientation or gender expression.

When a person abuses a drug too frequently, he or she can become addicted to that substance. Another cause of drug addiction is genetics. It is true that some people are predisposed to addiction because of family history and genetics. Abuse also may lead to addiction if the person has a mental illness, such as antisocial personality disorder, bipolar disorder, or schizophrenia. Drugs may ease the symptoms of these conditions or can make living with them more bearable. Thus, people may become addicted to drugs or alcohol as they attempt to self-medicate their disorders.

People also are more likely to abuse drugs if they enjoy the effects the substances have on their brains. Opioids, for example, block the nerve receptors in the brain that help the body to sense pain. Opioids also engage the receptors in the brain that detect pleasure. The drug causes users to enter a euphoric state, in which they experience stress relief and a carefree emotional state. People who enjoy this sensation may come to think they need the drug to be happy. Frequent and repetitive use leads to abuse of the drug. Users may then become addicted to it, which causes their brains to undergo physiological changes in response to the continued drug exposure, causing them to feel as though their bodies truly need the drug to survive.

RISK FACTORS

As discussed, risk factors to drug abuse and addiction, specifically addiction, include a genetic predisposition to addictive behavior. If a person with an addictive personality has a child, chances are high that the child also will form addictions in his or her adult life.

Considering the argument of nature versus nurture, both play a crucial role in the development of an addiction. Genetics are extremely important, but so is the environment in which a child is raised. If a child witnesses uncorrected addictive behavior, he or she is more likely to adopt that behavior at a later point in life. However, not all men and women who become drug abusers and addicts grew up in a household with a drug or alcohol addict. Witnessing a parent with a behavioral addiction, such as to gambling or sex, also may influence a child's later addiction to a substance, and not to a behavior.

Other factors that lead to drug and alcohol abuse and addiction include peer pressure and drug use at a young age. The earlier one starts smoking cigarettes and marijuana or drinking alcohol, the more likely that person will become addicted to those drugs in the future. Also, persons who start abusing drugs during adolescence are more likely to experiment with harder drugs.

The diagnosis of a mental disorder of various types—anything from anxiety to multiple personality disorder—also increases the chances that a person will begin abusing (and possibly become addicted to)

drugs or alcohol. Persons who are prescribed medications for mental illnesses or for pain relief may become addicted to their prescriptions. Persons who wish to ignore treatment of their mental conditions may fall into the habit of smoking, injecting, snorting, or drinking substances that offer relief from their present stresses.

Social risk factors for drug and alcohol abuse include being between the ages of eighteen and forty-four years, being of low socioeconomic status, and being single (not married). According to the US Department of Justice, men are more likely than women to abuse or become addicted to drugs and alcohol.

SYMPTOMS

The difference between drug abuse and drug addiction lies within the physical symptoms of each condition. Medical professionals use guidelines defined by the *Diagnostic and Statistical Manual of Mental Disorders* (DSM) to determine whether a person is addicted to a substance or is abusing a substance. According to the DSM, a person cannot be abusing and depending on a substance simultaneously. Once a person crosses into addictive behaviors, they are no longer just abusing the substance.

Because drug abuse leads to drug addiction, one can easily understand that addiction is the more serious condition when it comes to treatment. When persons are physically addicted to a substance, they may feel as though they cannot live without that substance in their system. People can become physically ill, and emotionally and mentally unstable, if their bodies crave a substance and do not receive it. This experience is called withdrawal. People who are abusing drugs do not experience withdrawal, as they are not yet physically dependent on the drug.

Another symptom that differs between drug abuse and drug addiction is related to tolerance levels. A person who is addicted to a substance becomes increasingly tolerant of that substance. To achieve a high from the drug, that person must increase the amount he or she takes. As time passes, the person becomes tolerant of this larger amount and again increases the amount consumed. People who abuse drugs may occasionally consume a larger amount in one sitting than they do normally, but they do so to achieve a more intense high; they do not consume more drugs because they can no longer get high with the amount they regularly use.

Symptoms of drug abuse include:

- failure to meet obligations, such as missing a meeting with a family member or friend, purposely skipping classes at school, or neglecting to arrive on time for a shift at work
- engaging in reckless activities, such as driving under the influence of drugs or alcohol
- developing legal or financial troubles, such as getting arrested, being accused of a serious crime, or failing to secure or keep track of personal funds
- continuing to use drugs even after encountering personal difficulties or issues, such as fighting with family members, friends, or coworkers

When a person becomes addicted to the substance, he or she will experience withdrawal without the drug and an increased tolerance for the drug in addition to some or all the following behavioral symptoms:

- inability to stop using
- failure to follow self-imposed limits
- decreased time spent on other activities that do not include drugs
- spending an excessive amount of time consuming drugs or alcohol

Drug Abuse Screening Test

Created in 1982 by Harvey Skinner, the drug abuse screening test (DAST) is a self-report questionnaire that assesses problems associated with the lifetime abuse of over-the-counter, prescription, and illicit drugs. The test does not directly assess the specific type, frequency or quantity of drug use, and it does not assess for problems related exclusively to alcohol use.

DAST is a self-administered questionnaire. Items on the test parallel questions on the Michigan alcoholism screening test. Questions require a yes or no response. Each response is assigned one point when answered in a manner consistent with drug use problems. A scoring system recommended by Skinner suggests that scores greater than five indicate problems with drug use.

DAST may be used either for research or for clinical purposes. Because DAST is a screening instrument only, the confirmation of DAST scores with more thorough diagnostic procedures is often necessary for clinical purposes.

- continuing to consume a substance despite the presence of other illnesses or poor health

These symptoms will be present along with the symptoms belonging to the individual substances the person is using. If someone is addicted to opioids, for example, that person may exhibit slurred speech, itching, paranoia, depression, confusion, low blood pressure, and excessive sleeping.

SCREENING AND DIAGNOSIS

The first step in treating drug abusers and addicts typically involves their loved ones—people who take notice of their behavioral changes, physical appearance, and drug use. These persons may convince the drug user to seek treatment.

The user may call his or her primary physician or family doctor. After an initial screening in which the doctor runs a series of tests and asks the patient questions about his or her drug use, the doctor may refer the patient to a specialist for an accurate diagnosis.

Before treatment can begin, the patient must be diagnosed as an abuser or an addict. This step is crucial, as treatments for drug abuse and drug addiction are different because of the physical withdrawal that accompanies drug addiction. Withdrawal requires its own special form of treatment, including medications and sometimes short stays in rehabilitation facilities.

To determine abuse or addiction, medical professionals adhere to the criteria defined by the DSM. They also use a series of surveys consisting of yes-or-no answers that help them to uncover how significant the substance is to the patient's life. Some of the most popular surveys used are the CAGE, T-ACE, AUDIT, and AA20. Before administering these surveys, medical professionals advise their patients to be honest about any drugs they have abused in the past twelve months. Then, using a point system associated with the given survey, the medical professional can see if the patient has become dependent on drugs or alcohol.

Another important part of the screening and diagnosis process is the discovery of other physical ailments, coexisting drug addictions, or comorbidity. This discovery occurs through both laboratory testing and psychotherapy. Specific medications and methods used in addiction treatment may counteract other drugs the patient is using or interfere with other conditions the patient may have; it is crucial to discover all illnesses, diseases, and dependencies before treatment begins.

Through laboratory screenings, medical professionals may discover that vital organs such as the lungs, liver, or heart have been damaged by repetitive drug abuse. They also may discover conditions such as tuberculosis or human immunodeficiency virus infection, which could have been obtained through the sharing of drugs and drug paraphernalia, such as needles.

Diagnosing comorbidity is a critical step in addictions treatment; treating a patient addicted to cocaine requires a different approach than the one taken to treat a patient addicted to prescription painkillers who is simultaneously struggling to overcome depression, anxiety, or a personality disorder. According to the National Institute on Drug Abuse, 60 percent of substance abusers also have a mental illness. A mental illness may be present before a person starts using drugs, or a person might start using drugs before becoming mentally ill. Both conditions also may be the result of similar risk factors, such as genetic predisposition and environmental triggers (such as high stress or trauma).

People living with mood disorders are more likely to develop a drug habit. In addition, patients with drug disorders are two times as likely to be diagnosed with a mood or anxiety disorder. Men seeking help for drug abuse are often diagnosed with antisocial personality disorders while women are likely to exhibit behavior indicative of depression, anxiety, or posttraumatic stress disorder.

TREATMENT AND THERAPY

Ideally, a person who is abusing or addicted to a substance and who is also dealing with an additional addiction, physical illness, or mental illness should be treated for these issues by the same health professionals at a single facility. This does not often occur in the United States, however. Patients' conditions are viewed as unrelated, and patients are sent to multiple facilities to speak to a variety of medical professionals, from physicians to psychotherapists to drug and alcohol counselors.

If a person is abusing and not yet addicted to drugs or alcohol, he or she will not go through the stages of withdrawal. Most drug abusers are assigned to group therapy sessions, in which they speak about their drug use in front of other persons who understand what they are going through. If they are uncomfortable with—or in are in need of supplementing—group

therapy, a drug and alcohol counselor or psychologist may counsel them independently. Therapy helps patients learn to deal with their cravings and to live a drug-free life. It enables them to set goals for the future and to repair strained or broken relationships with friends and family members. Although millions of people abuse drugs and alcohol each year, only 10 percent of abusers seek help for their conditions.

Persons dependent on substances experience withdrawal when they stop using the substance. Oftentimes, this is a painful process, as receptors in the brain "beg" for the drug of choice. Patients are often admitted to a medical facility for observation when they are about to enter withdrawal, as the symptoms can range from headaches to strokes, seizures, and heart attacks, depending on the drug of choice. Depending on the severity of the patient's situation, doctors may prescribe medications that help the patient during the withdrawal process. The most common withdrawal medications are methadone, clonidine, subutex, and suboxone.

After an addict's body is free of all drugs and alcohol, the patient may begin treatment for his or her condition. This treatment may be similar to therapies embraced by drug abusers—either group therapy or individual meetings with drug and alcohol counselors. Doctors also can choose to place some patients on medications to help calm cravings, fight depression, or reduce anxiety. Naltrexone, acamprosate, and disulfiram are common drugs administered to alcohol addicts. Naltrexone also can be distributed to opioid addicts. Even those addicted to nicotine can use bupropion or varenicline in addition to nicotine gum, patches, and nose sprays.

Each year about 40 percent of people who have become dependent on drugs or alcohol seek help for their problems. Research has found that the majority of those seeking help are men, as women are less likely to admit that they have substance abuse problems. They also, in general, have to ensure their children are cared for, which often keeps them from leaving home and joining treatment groups. Most rehabilitation facilities or drug and alcohol centers are not equipped to care for children and do not offer babysitting or daycare services.

To prevent relapse, people recovering from substance abuse and addiction are reminded to pay attention to their bodies and minds and to ask for help when they need it. The relapse process includes three stages: emotional, mental, and physical. If a patient feels anxious, defensive, or angry and misses group meetings or doctors' visits, he or she could be in the first stage of relapse. Combined with poor sleeping and eating habits and mood swings, this first stage may lead a patient to postacute withdrawal. Patients are instructed to reach out to medical professionals, friends, or family members if they feel they are in danger of relapse.

Nicole Frail

Further Reading

American Psychiatric Association. *Diagnostic and Statistical Manual of Mental Disorders.* 4th ed. Washington, DC: APA, 1994. The official guide all medical professionals use to diagnose mental illnesses and conditions.

Ghodse, Hamid. *Ghodse's Drugs and Addictive Behaviour: A Guide to Treatment.* New York: Cambridge UP, 2010. Examines in detail various types of drug addictions and behavioral addictions, presents treatment options, and suggests methods of preventing substance misuse.

Gwinnell, Esther, and Christine A. Adamec, eds. *The Encyclopedia of Addictions and Addictive Behaviors.* New York: Infobase, 2005. Provides information about more than three hundred types of addictions; discusses the historical and modern-day treatments of each addiction.

Hoffman, John, and Susan Froemke, eds. *Why Can't They Just Stop?* New York: Rodale, 2007. Written to supplement an HBO television documentary of the same name, this book offers insight into how a chemical dependency affects the lives of all involved; includes personal narratives and success stories.

Ries, Richard K., ed. *Principles of Addiction Medicine.* Philadelphia: Lippincott, 2009. Textbook that provides information on how to diagnose, manage, and treat patients experiencing various types of addictions.

Websites of Interest

AddictionsandRecovery.org
http://www.addictionsandrecovery.org

American Pharmacists Association
http://www.pharmacist.com

Centers for Disease Control and Prevention
http://www.cdc.gov

HelpGuide.org
http://www.helpguide.org

MedicineNet.com
http://www.medicinenet.com

National Institute on Drug Abuse
http://www.drugabuse.gov

National Institutes of Health: MedlinePlus
http://www.nlm.nih.gov/medlineplus

See also: Anxiety medication abuse; Gateway drugs; Hallucinogen abuse; Narcotics abuse; Opioid abuse; Painkiller abuse; Recreational drugs; Substance abuse

Drug abuse and addiction: Overview

CATEGORY: Substance abuse
ALSO KNOWN AS: Drug dependence
DEFINITION: Drug abuse is a disease characterized by continued misuse of drugs even when faced with drug-related occupational, legal, health, or family difficulties. Problems associated with drug abuse must be present for a minimum of twelve months to meet the diagnosis, according to the fourth edition of the American Psychiatric Association's *Diagnostic and Statistical Manual of Mental Disorders* (DSM-IV). Drug dependence refers to long-term, compulsive drug use, with attempts to stop that end in repeated returns to use. Drug dependence also indicates that the user's body has begun to develop a tolerance to the drug and may require the drug in higher doses to achieve the same effects and to avoid withdrawal symptoms. Drug abuse and drug dependence are not terms that should be used to describe people who are taking appropriate dosages of prescribed drugs (pain medication, for example) and who have become physically dependent on them. Diagnosis of both drug abuse and drug dependence requires the presence of specific behavioral symptoms.

CAUSES

The cause of drug abuse and dependence is unknown, although there are a variety of theories. One theory holds that there may be a genetic component that predisposes a person to developing a drug addiction. Another theory is that drug abuse is a learned behavior and that people begin to use drugs by copying the behavior of those around them. Medical professionals have not been able to target a specific cause. Long-term drug use alters the brain's structure and chemistry, which may reinforce the desire to keep using drugs regardless of the consequences.

RISK FACTORS AND SYMPTOMS

A risk factor is something that increases the chances of getting a disease or condition. For drug abuse and addiction, young males are at a greater risk, as are those who have family members with substance abuse problems. Other risk factors include social and peer pressure, early antisocial behavior, stress, and easy access to drugs. Anxiety, depression, and panic disorders are also risk factors associated with drug abuse and addiction.

Denial that a drug problem exists is common. Drug abuse can occur without physical dependence and often progresses to drug dependence. To diagnose drug abuse, the symptoms must have lasted for at least twelve months and may include repeated work, school, or home problems due to drug use; continued use of drugs even though it means risking physical safety; recurring trouble with the law related to drug use, including impaired driving; and continued use of drugs despite drug-related problems in personal relationships.

Symptoms of drug dependence include at least three of the following: craving for the substance; inability to stop or limit drug use; tolerance, or taking greater amounts to feel the same effect; withdrawal symptoms that occur when the drug is stopped; significant amounts of time trying to acquire drugs and recover from their effects; and giving up activities to use drugs or recover from their effects. Drug use continues even when it causes or worsens health and/or psychological problems.

DIAGNOSIS

To help with diagnosis, doctors ask a series of questions regarding drug-related problems, specifically:

- how often the patient uses drugs
- which drugs the patient uses

- what amount and if the patient has increased the amount to receive the same desired effect
- emotional problems that may have occurred while using drugs
- problems with a job, family, or the law

Tests may include blood and urine tests to check for the presence of drugs.

TREATMENT

There is no cure for drug abuse or drug dependence. Treatment consists of three main goals: to help patients stop using drugs, to decrease the toxic effects of the drugs being used and to aid in symptoms of drug withdrawal ("detoxification"), and to prevent relapse. Successful treatment depends on the drug user's recognition of the problem and desire to change. Recovery takes a long time and is not an easy process. Patients may need multiple courses of treatment.

Therapies include medications, counseling, and self-help organizations. Drugs may help to alleviate some of the symptoms of withdrawal. In some cases, medication may be ordered to prevent relapse. People addicted to heroin may be given methadone to help taper them off. Methadone may also be given on a long-term basis to improve the chance of staying in treatment. Methadone is a narcotic that blocks cravings as well as the pleasurable effects of heroin and other opiates. Other drugs that are used in treatment are naltrexone (e. g., ReVia, which blocks the effect of opiates) and buprenorphine (e. g., Subutex, which is similar to methadone).

Therapy raises awareness of the underlying issues and lifestyles that promote drug use. Therapy also works to improve coping and problem-solving skills and works to develop other ways of dealing with stress or pain. Through counseling, a person can learn how to handle situations associated with drug use and replace drug-using activities with other activities that are more meaningful. Family support is encouraged.

There are numerous organizations and support groups dedicated to helping people stop using drugs. Two examples are Narcotics Anonymous and Cocaine Anonymous. These are twelve-step programs. Members of these organizations meet regularly to talk about their drug-related troubles and provide a network of support for each other.

Debra Wood, RN

Drug-Seeking Behavior

Drug-seeking behavior (DSB) is a symptom of drug abuse and addiction. A person with DSB will continuously try to access narcotic pain medication or tranquilizers even though he or she may have no medical need for these drugs. In order to obtain the desired drug from a pharmacy or doctor, a person with DSB may exhibit the following behavior:

- complaints about severe pain
- repeated requests for "lost" prescriptions
- use of forged prescriptions and false identification
- assertiveness, including demands to see a doctor immediately
- evasiveness in answering questions about medical history and references
- giving exaggerated accounts of textbook symptoms
- becoming violent if requests are denied

FURTHER READING

Fisher, Gary, and Nancy Roget. *Encyclopedia of Substance Abuse Prevention, Treatment, and Recovery.* Thousand Oaks, CA: Sage, 2009. An encyclopedia of key concepts and approaches used in the field of substance abuse.

Shapiro, Harry. *Recreational drugs: A Directory.* London: Collins & Brown, 2004. A compendium of all major recreational drugs, including facts about use, effects, risks, and legal status.

Thombs, Dennis. *Introduction to Addictive Behaviors.* 3rd ed. New York: Guilford Press, 2006. Covers theories of addiction, prevention, comorbidity, motivation enhancement, and harm reduction. Also covers psychoanalytic, cognitive, family, and social/cultural issues.

WEBSITES OF INTEREST

Cocaine Anonymous
http://www.ca.org/

Narcotics Anonymous
http://www.na.org

Fetus, Effects of Drugs on the

Editors: Pamela Korsmeyer and Henry R. Kranzler
Date: 2009
From: Encyclopedia of Drugs, Alcohol & Addictive Behavior(Vol. 2. 3rd ed.)
Publisher: Macmillan Reference USA
Document Type: Topic overview
Pages: 8
Content Level: (Level 5)

Full Text:

Fetus, Effects of Drugs on the

The pregnant substance-abusing or drug-dependent woman subjects her developing infant to a host of problems. When assessing the effects of drugs, whether illicit or appropriately administered (not abused) prescription drugs, on newborn infants (neonates) and young children, two factors must be considered: (a) the duration and concentration of the drug exposure on the developing fetus, and (b) any preexisting medical complications in the mother. These factors are interactive and together will influence, in varying ways, the eventual health, learning challenges, and potential capabilities of the child. Therefore, the long-term outcome of children exposed to drugs during fetal development shouldbe assessed.

As cited by Dr. Nancy Young in her presentation on substance-exposed infants, the 2002 and 2003 Substance Abuse and Mental Health Administration (SAMHSA) Office of Applied Studies National Survey on Drug Use and Health (NSDUH) had a specific focus on substance use among pregnant women. It indicated that the reported incidence of pregnant women using any drug was highest in the first trimester, and decreased steadily thereafter: 7.7 percent of mothers affecting 315,161 infants in the first trimester, 3.2 percent of women affecting 130,976 infants in the second trimester, and 2.3 percent of women affecting 94,139 infants in the third trimester reported using any drugs whatsoever. Similar patterns were found for binge alcohol and alcohol use. For alcohol use the statistics were 19.6 percent of women affecting 802,228 infants in the first

trimester, 6.1 percent of women affecting 249,673 infants in the second, and 4.7 percent of women affecting 192,371 infants in the third trimester of pregnancy. For binge drinking of alcohol the statistics were 10.9 percent of women affecting 446,137 infants in the first trimester of pregnancy, 1.4 percent of women affecting 57,302 infants in the second, and 0.7 percent of women affecting 28,651 infants in the third trimester (Young, 2006, p. 11). Roughly 4 million live births are recorded annually in the United States (Young, 2006, p. 16).

The 2006 NSDUH Report, which combined data collected during 2005 and 2006, indicated that among pregnant women between 15 and 44 years old, only four percent reported use of illicit drugs during the previous 30-day period; the rate among the non-pregnant, age-matched cohort was 10 percent (p. 25). In the same age group, 11.8 percent of pregnant women reported current use of alcohol, 2.9 percent reported binge drinking, and 0.7 percent indicated that they drank heavily. Among the non-pregnant group, the results for those categories were 53.0 percent, 23.6 percent, and 5.4

percent. Binge drinking of alcohol decreased from 10.9 percent to 4.6 percent during the first trimester, as reported in 2002–2003 (p. 34). The rates of tobacco use/cigarette smoking were also lower among pregnant than non-pregnant women between the ages of 18 and 25: 25.6 percent and 35.6 percent, respectively. Among those between the ages of 26 and 44, the rates of tobacco use were 10.3 percent for pregnant women and 29.1 percent for those who were not pregnant. In contrast, the rate for girls between the ages of 15 to 17 was higher in the pregnant than in the non-pregnant group: 23.1 percent and 17.1 percent, respectively (p. 44).

A pregnant drug-dependent woman puts her developing fetus at risk for a number of diseases, including hepatitis, human immunodeficiency virus (HIV), tuberculosis, and sexually transmitted diseases (STDs). A number of these diseases may be acquired through needle sharing. Mothers who are infected with these diseases are likely to deliver prematurely.

HEROIN AND METHADONE

In pregnant women who use heroin, the placenta typically shows microscopic evidence of oxygen deprivation. Infants are small for their gestational age, and all their organ systems are affected. In heroin-dependent women, a significant portion of the medical complications seen in their newborns is due to prematurity and low birth weight. Such complications include immature lungs, difficulties in breathing at birth, brain hemorrhage, low sugar and calcium levels, infections, and jaundice.

Women on methadone maintenance (an oral narcotic used for the treatment of heroin addiction) are more likely to give birth to normal- or almost normal-sized babies. Because they are in treatment, the complications in their infants are not as severe and generally reflect: (a) the amount of prenatal care the mother has received; (b) whether the mother has suffered any complications, including hypertension or infection; and, most importantly, (c) any multiple drug use that may have produced an unstable intrauterine environment for the fetus, perhaps complicated by withdrawal and/or overdose.

Multiple drug use may cause a series of withdrawals when the pregnant woman cannot obtain the drug she needs. This series of extreme physical conditions in the pregnant woman can severely affect the oxygen and nutrients that feed the developing fetus, causing various birth defects depending on when in each trimester the withdrawals occur. If the mother overdoses, a decreased oxygen supply to the fetus can cause aspiration pneumonia—if the mother survives the overdose to give birth.

Laboratory and animal studies have shown that opioids may have an inhibitory effect on enzymes that influence oxygen metabolism. They also alter the passage of oxygen and nutrients to the fetus by constricting the umbilical vessels and decreasing the amount of oxygen delivered to the developing fetal brain. Such metabolic side effects may cause a derangement in the acid/base balance (acidosis). In contrast, increased maturation of organ systems and certain enzymes have been seen in heroin-exposed infants, including maturation of the lungs, tissue-oxygen unloading, sweat glands, and liver enzymes. The stressful life of the pregnant woman probably contributes to this enhanced maturation in heroin-exposed infants.

The genetic risks to the offspring of addicts on heroin *and* methadone include an increase in the frequency of chromosome abnormalities; infants

exposed predominantly to methadone *in utero* do not experience the same vulnerability to those abnormalities. The adverse environmental factors that may contribute to the abnormal findings in heroin-exposed infants may be less prominent in methadone mothers, as drug addiction is almost always compounded by poor maternal nutrition, extreme stress, infectious disease, and a lack of early and consistent prenatal care. However, in the absence of specific clinical abnormalities, it is impossible to isolate either methadone or heroin as agents linked to genetic damage. Given the

obstetrical and medical complications, the lack of prenatal care, and the prematurity of the infants at delivery, it is not surprising that the death rate for addicted babies is higher than for infants born to non-addicts.

NEONATAL ABSTINENCE SYNDROME

The term neonatal abstinence syndrome (NAS) refers to the continuum of signs and symptoms evidenced by infants born to substance dependent mothers. Prenatally, NAS primarily describes the physiological, psychological, and cognitive impacts of substance use/abuse on the developing fetus. These impacts may be apparent at, or shortly after, birth or may not be detected until the child is older and develops learning, medical, or behavioral difficulties.

Whether born to heroin-addicted or methadone-dependent women, most infants seem physically and behaviorally normal at birth. The onset of their withdrawal may begin shortly after birth to two weeks of age, but most develop symptoms within seventy-two hours of birth. If the mother has been on heroin alone, 80 percent of the infants will develop clinical signs of withdrawal between four and twenty-four hours of age. If the mother has been on methadone alone, the baby's symptoms usually appear within forty-eight to seventy-two hours. The time of onset of withdrawal in individual infants depends on the type and amount of drug used by the mother, the timing of her last dose before delivery, the character of her labor, the type and amount of anesthesia and pain medication given during labor, and the maturity, nutrition, and presence or absence of systemic diseases in the infant.

Postnatal NAS includes the constellation of sequelae (secondary consequences) of maternal substance use, both developmental and medical. When first studied, the presence of NAS applied to the after-birth syndrome seen in infants born to heroin- or methadone-using mothers; over time it was broadened to include the aftereffects of cessation of virtually any chronic substance use—whether prescription medications used to control physiological or behavioral health disorders (such as seizures, depression, mood disorders, or other chronic medical or mental health conditions), as well as alcohol, tobacco, or illicit drugs used either recreationally or as a result of dependence. NAS is the most pronounced in infants born of women using opioids or narcotics.

Multiple, or polydrug, use increases the likelihood and severity of NAS. Infants born to mothers using stimulants, such as cocaine, methamphet-amine, MDMA (Ecstasy), or medications used to treat ADHD (attention deficit hyperactivity disorder), often do not experience classic NAS, but show symptoms more closely associated with ongoing effects of the exposure to those substances. Drugs with a shorter half-life produce withdrawal effects more quickly after they are discontinued.

NAS typically involves multiple systems, with the greatest number of symptoms involving the central nervous and gastrointestinal systems. The type, number, and severity of symptoms will depend, to a large extent, on duration, amount, and frequency of drugs used as well as on the infant's own metabolism and physiological maturity. Opiates produce the most severe and obvious NAS effects and include premature birth, low birth weight for gestational age, and intrauterine growth retardation (IUGR). The effects of methadone use on the fetus are similar to those of heroin. It has a longer half-life, so acute NAS symptoms occur later, possibly even up to four weeks after birth.

Babies with NAS often exhibit signs and symptoms of central nervous system hyperirritability, gastrointestinal dysfunction, respiratory distress, and autonomic nervous system symptoms that include excessive yawning and sneezing, sweating, mottling, and fever. These infants frequently develop tremors that progress in severity. High-pitched crying, increased muscle tone, irritability, and exaggerated infant reflexes are common. Sucking of fists or thumbs is common, yet when fed, the infants have extreme difficulty in eating, and vomit

frequently because of an uncoordinated and ineffectual sucking reflex. The infants may develop diarrhea and are therefore susceptible to dehydration and electrolyte imbalance. At birth the level of drug(s) in the blood begins to fall, and the newborn continues to metabolize and excrete the drug(s); withdrawal signs occur when critically low levels have been reached.

Studies indicate that more full-term infants require treatment for withdrawal than do preterm infants. Because withdrawal severity appears to correlate with gestational age, less mature infants show fewer symptoms. Decreased symptoms in preterm infants may be due to either (a) developmental immaturity of the preterm nervous systems, or (b) reduced total drug exposure because of shorter gestations.

The most severe withdrawal occurs in infants whose mothers have taken large amounts of drugs over a long period of time. Usually, the closer to delivery a mother takes heroin, the greater the delay in the onset of withdrawal and the more severe the baby's symptoms. The duration of symptoms may be anywhere from six days to eight weeks. The maturity of the infant's own metabolic and excretory mechanisms plays an important role. Although the infants are discharged from the hospital after drug therapy is stopped, some symptoms such as irritability, poor feeding, inability to sleep regularly, and sweating may persist for several months.

Drug-exposed infants show an uncoordinated and ineffectual sucking reflex as a major manifestation of withdrawal. Regurgitation, projectile vomiting, and loose stools may complicate the illness further. Dehydration, due to poor intake coupled with excessive losses from the gastrointestinal tract, may cause malnutrition, weight loss, subsequent electrolyte imbalance, shock, coma, and death. Untreated neonatal withdrawal carries a risk of death. The infant's respiratory system is also affected during withdrawal: Excessive secretions, nasal stuffiness, and rapid respirations are sometimes accompanied by difficulty breathing, blue fingertips and lips, and cessation of breathing. Severe respiratory distress occurs most often when the infant regurgitates, aspirates, and develops aspiration pneumonia.

PRENATAL OPIOID EXPOSURE

In addition to the heroin and methadone effects listed above, newborns exposed to opiates *in utero* are at increased risk for fetal distress or death or sudden infant death syndrome (SIDS). Thrombocytosis, an excessive production of platelets in the blood that can lead to blood clots, often occurs within the first few weeks of life and may last for several months.

PRENATAL STIMULANT EXPOSURE

Stimulants such as cocaine, amphetamines, and methamphetamine cross not only the blood–brain barrier of the mother, but the placental barrier as well. Stimulants have potent effects on the brain and cause prevention of reuptake or physiological alteration of several important neurotransmitters (substances that transmit nerve impulses), such as dopamine, epinephrine, norepinephrine, and serotonin. Infants exposed to stimulants often have an exaggerated startle reflex, a larger than normal Moro reflex (when exposed to a sudden noise, babies flex their legs and extend their arms abruptly), an excessive need to suck, and general jitteriness and irritability. There is ongoing research on the relationship between prenatal stimulant exposure and head circumference as well as on the long-term impact on the development of the brain.

Exposure is causally linked to smaller head circumference and therefore delayed brain development. Although most children do catch up in terms of overall head/brain growth over the first few years of life, there is a significantly increased rate of learning disabilities among children prenatally exposed to drugs, particularly in the areas of reading and math, as well as attention deficit disorders.

PRENATAL CAFFEINE AND TOBACCO EXPOSURE

Mothers who have excessive intake of caffeine (in any form) transmit a substance called methylxanthine to fetuses and breastfed infants. Tobacco use intensifies the effects of the drug on the fetus, because the blood vessels of the placenta increase their concentration in the developing infants' blood systems by up to 15 percent above that experienced by the mother. Tobacco use during pregnancy increases the likelihood of low birth weight and tobacco withdrawal in the neonate.

Exposure to either substance impairs the newborn's ability to habituate, to orient by sight or sound, to develop appropriate physiological

mechanisms for autonomic regulation, and to be comforted. It can also cause a hyperreactive startle reflex, tachycardia, irritability, inefficient circulation, poor feeding, and tremors in the neonate—all indicators of nicotine toxicity in the body.

Behavioral studies have also been conducted with children exposed to prenatal smoking. Some research has shown that a child whose mother smoked during pregnancy is at increased risk of becoming a smoker. Because smoking activates neurotransmitters in the brain—including dopa-mine, which is involved in reinforcing the effects of addictive drugs—researchers have speculated that nicotine may have an effect on the developing dopamine system of the fetus and put the child at greater risk of addictive behavior in later life.

Prenatal exposure to cigarette smoking may affect a growing fetus in several ways. Carbon monoxide and high doses of nicotine obtained during inhalation of tobacco smoke can interfere with the oxygen supply to the fetus. Nicotine readily crosses the placenta, and it likely causes vasoconstriction of the umbilical arteries and impedes placental blood flow. Carbon monoxide can bind with hemoglobin to reduce the capacity of the blood to transport oxygen. These factors combined likely account for the developmental delays commonly seen in fetuses and infants of smoking mothers.

One of the most striking risks associated with prenatal smoking is that of Sudden Infant Death Syndrome (SIDS). A higher mortality rate exists for infants whose mothers have smoked compared to those who have not. Maternal smoking during pregnancy has also been cited as a major risk factor in almost every epidemiologic study of SIDS. The risk of sudden infant death syndrome is greater among infants exposed to both prenatal and postnatal smoking compared to those only exposed to postnatal smoking. The increase in SIDS risk also appears to be related to the *dose* of passive smoke to which the fetus or infant is exposed: The greater the exposure to smoke both before and after birth, the higher the risk of SIDS.

PRENATAL MARIJUANA EXPOSURE

To date, no research has shown the presence of a withdrawal syndrome in infants whose mothers used marijuana. However, prenatal exposure to marijuana may cause brain bleeds, jitteriness, sepsis (severe infection), excessively low calcium, hypoglycemia, hypoxic encephalopathy (lack of sufficient oxygen to the developing brain causing brain damage, possibly resulting in mental retardation, developmental delays, or other neurophysiological deficits), and IUGR—particularly involving weight, length, and head circumference. The greater the mother's drug use during pregnancy, the more pronounced and severe the symptoms in the neonate. Nicotine toxicity effects, as mentioned above, may also be present. Although cognitive effects may last for several years, catch-up physiological growth typically occurs during the first year.

planning and assuring optimal growth and development throughout infancy and childhood. Because there is no standard for the disposition of these infants, some may be released to their mothers, some to relatives, and others placed in the custody of a state agency. Other infants may be voluntarily released by their mothers to private agencies for temporary or permanent placement.

In the United States pressure to separate infants from their addicted mothers has been growing. This solution may not be practical in cities where social services and courts are already understaffed and overworked. There is a nationwide shortage of appropriately trained, licensed, and available foster parents qualified to care for high-risk infants. Pediatricians typically believe that the mother-infant association should not be dissolved except in extreme situations. In addition to intensive drug rehabilitation and medical treatment, these women need extensive educational and job training to become productive citizens and loving mothers who will positively socialize their children. Supportive therapies, such as outpatient care or residential treatment, may help eliminate some of the medical and social problems experienced by drug-dependent women and their children.

Most of the children evaluated for long-term development have been exposed to methadone. Evaluations have occurred at various intervals: at 6, 12, 18, and 24 months; then at 3, 4, and 5 years of age. Testing procedures utilized include the Gesell Developmental Schedule, the Bayley Scales of Infant Development, the McCarthy Scales of Infant Abilities, the Stanford-Binet, and the Wechsler Preschool and Primary Scale of Intelligence. Infants exposed to drugs prenatally have shown overall developmental scores in the normal range but a tendency to decrease in scores at about two years of age, which suggests that environment may confound long-term infant outcome. Low socioeconomic groups suffer from this factor particularly because of poor language stimulation and development.

The developmental scores in these early years, although useful in identifying areas of strength and weakness, are not valid predictors of subsequent intellectual achievement. Many studies have proposed multiple-factor models to assess infant outcome following intrauterine drug exposure. One such postnatal influence involves maternal-infant interaction. Drug-exposed infants are often irritable, have decreased rhythmic movements, and may display increased muscle tensing when handled. Mothers may interpret such behaviors as rejection, leading to inappropriate maternal caretaking and possible neglect of the infant. Studies of mother-infant interactions indicate that (a) infants born to narcotic-addicted women show deficient social responsiveness after birth; (b) this deficient mother-infant interaction persists until the infants' treatment for withdrawal is completed; and (c) maternal drug dosages may affect that interaction.

Available data suggest that at five years of age, children born to women maintained on methadone, in contrast to heroin-exposed babies, generally appear to function within the normal developmental range. In addition, no significant differences in language and perceptual skills were observed between them and a matched control group consisting of children of mothers not involved with drugs. Difficulty in following large cohorts (study groups) of drug-exposed infants has led to the study of very limited samples.

Positive and reinforcing environmental influences can significantly improve drug-exposed infant development. Women who show a caring concern for their infants are most likely to pursue follow-up pediatric care and cooperate in neurobehavioral follow-up studies. Lacking a large database, there is a significant need for comprehensive studies assessing the development of large populations of drug-exposed infants.

See also **Alcohol- and Drug-Exposed Infants; Attention Deficit Hyperactivity Disorder; Complications: Route of Administration; Fetal Alcohol Syndrome; Pregnancy and Drug Dependence.**