CHAPTER 1 EXECUTIVE SUMMARY

The abuse of licit and illicit drugs represents a major public health problem in the United States. The costs to society of such abuse include thousands of premature deaths annually due to drug-related illnesses, accidents, and homicides; economic costs related to health care, criminal justice, and lost productivity; and the mental and physical pain suffered by millions of Americans. Many ills plaguing the nation today--including the AIDS epidemic, increased crime and violence, and homelessness--in some cases, may be linked to individuals' physical dependence on a variety of abusable substances. The consequences of substance abuse and addiction have been felt by people within every economic, social, racial, religious, and political boundary.

What are the root causes of substance abuse and addiction? Why and how does addiction occur? Who are the substance abusers? What factors lead to addiction? What are the implications for prevention and treatment?

ROOT CAUSES

The Office of Technology Assessment (OTA) was asked to identify the root causes of substance abuse and addiction. The term root causes has been used in political discussions and debate. To some, root causes of substance abuse and addiction are framed in a moral context, in which decisions related to use, abuse, and addiction are the responsibility primarily of individuals. To others, root causes include a multitude of social and economic problems, such as homelessness, poverty, and racism. Many people have strongly held opinions as to what constitutes the general root causes of substance abuse and addiction in populations, but no consensus exists about the specific root causes of substance abuse and addiction for particular individuals.

The OTA report has four parts: necessary preconditions, individual factors, community contexts, and policy options. The first part, Necessary Preconditions, focuses on several factors that are necessary for substance abuse and addiction to occur. The second part, Individual Factors, focuses on risk and protective factors in individuals that are thought to influence substance use, abuse, and addiction. The third part, Community Contexts, looks at how risk and protective factors play out in subcultures and in major activity settings (home, school, workplace, and recreation). The fourth part, Policy Options addresses a range of legislative issues and options for Congress.

NECESSARY PRECONDITIONS

No single or general set of variables explains the misuse of alcohol and other drugs for every individual; in other words there are no "root causes" for substance abuse that universally apply to everyone. Nevertheless, OTA has identified three major sets of necessary preconditions that must be present in order for substance abuse and addiction to occur:

- biology and pharmacology,
- availability, and
- use and transitions to abuse and dependency.

Biology and Pharmacology

The first major set of preconditions includes biological and pharmacological factors, without which drug abuse and dependency would be impossible. Underlying all alcohol and drug problems are the actions and effects that drugs of abuse exert on the brain. It is important to understand how drugs work in the brain, why certain drugs have the potential for being abused, and what, if any, biological differences exist among individuals in their susceptibility to abuse drugs.

A wide range of psychoactive substances have the potential for abuse (see box 1-1). The possession and use of several substances (e.g., marijuana, heroin, cocaine) are illegal in all 50 states. Other addictive substances (e.g., tobacco and alcohol) may be legally purchased, possessed, and consumed by many Americans. Some abusable substances (e.g., a wide range

of prescription drugs) are available on a restricted basis, usually by a physician's order, while others (e.g., inhalants) may be legally purchased, possessed, and consumed by anybody.

Biological factors that contribute to substance abuse and addiction fall into two groups: the effects drugs of abuse exert on the individual in general, and the biological status of specific individuals taking drugs. The effects the drugs exert can be either acute or chronic and will vary depending on the drug and its route of administration. Most drugs of abuse influence the brain's reward system. The pleasurable sensations that drug use can produce reinforce drug-seeking and drug-taking behaviors. These actions differ with different drugs; thus, some substances have greater potential for abuse and addiction than others. While growing evidence suggests that the brain reward system plays a role in the reinforcing properties of most drugs of abuse, the precise mechanisms involved are complex and have yet to be completely described (see figures 1-1 and 1-2).

Prolonged or chronic use of a substance or substances can produce both biological and behavioral changes (some long- lasting). Biological changes can include sensitization and/or tolerance to a substance and, if use is discontinued, withdrawal (see box 1-2). Behavioral changes also occur with continued drug use. An individual's drug-craving, drug- seeking, and drug-taking behaviors are reinforced through neuroadaptive changes in the brain's reward system.

Environmental cues also play a large role in drug-seeking and drug-taking behavior. On encountering certain environmental stimuli (i.e., specific locations, smells, tastes), drug-craving and drug withdrawal symptoms have been reported by former drug users who have been drug-free for months and even years.

Through family, twin, and adoption studies, most researchers agree that genetic factors play some part in the acquisition of alcohol problems and, although less clear, other drug problems. However, no conclusive evidence has been found to explain precisely what is inherited or the overall importance of this inherited material. It has been hypothesized that numerous genes (as opposed to one) interact in complex ways, and expression of those genes are affected by a myriad of environmental factors. Thus, the presence or absence of a genetic factor neither ensures nor protects against drug addiction.

Availability

The second set of preconditions for drug abuse and dependency includes availability. A person cannot become a drug abuser unless a drug is physically available. In addition, however, availability is affected by social norms (e.g., factors within the community conducive to drug use, including level of parental or guardian supervision, lack of consequences for alcohol and drug offenses, lack of alternative activities, and portrayals of alcohol and other drug use by friends and the media as a glamorous and healthy activity), prices (economic availability), and personal values (subjective availability) (see table 1-1).

The primary focus of U.S. antidrug policy has been to attack the physical availability of illicit drugs through law enforcement efforts aimed at disrupting the production, transport, and sale of drugs. While this focus has increased drug-related arrests--nearly half of newly sentenced federal inmates in 1991 were imprisoned on drug charges--illicit drugs are still widely available.

Marketing techniques for both licit and illicit drugs can alter social, economic, and subjective availability. Key components of marketing include the promotion and advertising of particular product lines to appeal to particular subpopulations of the consuming public, development of a product line that can be targeted to subpopulations within the larger community of consumers, pricing strategies to attract new buyers, and identification of retail outlets for sales.

Federal law regulates the merchandising of licit yet abusable substances such as tobacco, alcohol, and prescription drugs by placing a variety of restrictions on how such products may be marketed. Despite current restrictions, debate continues as to whether and how a variety of legal drugs should be marketed.

Use and Transitions to Abuse and Dependency

The third set of preconditions for drug abuse and addiction is drug use, including the progression to heavier and more harmful use. A person cannot become drug-dependent without first using a drug and then progressing to more harmful levels of use. Researchers have focused on stages in the progression of drug use in several ways. They have studied stages in the initiation of the use of different drugs, finding a sequence that moves from the use of cigarettes and wine or beer, to the use of marijuana, then hard liquor, and finally other illicit drugs. Because most individuals who use drugs do not go on to abuse drugs, and because the use of drugs at one level does not guarantee the use of drugs at a higher level, these stages

are descriptive but not predictive.

Initiation is the first step in the progression to more serious levels of drug use. Because drug use often begins during adolescence, most drug use research has focused on drug use initiation among adolescents. However, many individuals who initiate drug use do not progress to harmful drug use. Also, the factors associated with such progression may often differ from the factors associated with initiation. Thus, the focus on the initiation of drug use during adolescence is not sufficient for an understanding of the progression from use to abuse and dependency.

In addition to initiation, research has focused on other identifiable stages in the full cycle of drug use and abuse, including continuation of drug use, maintenance and progression of drug use within a class of drugs, progression in drug use across drug classes, and regression, cessation, and relapse cycles. Research has also been done on the co- occurrence and possible sequences in drug abuse and other problem behaviors, with some studies finding that problem behaviors often precede the onset of drug abuse.

INDIVIDUAL FACTORS

Much of the research on substance abuse and addiction has focused on identifying individual risk factors for alcohol and other drug use, specifically among adolescents and young adults (see table 1-2). Risk factors have been identified as those cognitive, psychological, attitudinal, social, pharmacological, physiological, and developmental characteristics that foster initiation of drug and alcohol use and/or abuse by an individual. Protective factors are those characteristics that reduce the risk of substance use and abuse and promote positive development, such as appropriate role models, involvement in positive peer groups, and a positive self-image and outlook for the future.

Because no individual risk or protective factor can be categorized as a root cause of substance abuse and addiction, a full analysis of each individual factor is beyond the scope of this report. However, an overview of selected factors highlights associations often present in substance abuse and addiction.

Demographic

Age

The preponderance of substance abuse research points to the fact that children who use alcohol and other drugs before the age of 15 have a greater likelihood of becoming problem alcohol and other drug users, versus those youth who begin use at a later age.

While most substance use and abuse occur during the adolescent and young-adult years, older persons are not immune to the addictive powers of these substances. For example, among women, alcohol problems tend to appear on average several years later than they do among men (although this trend may be reversing). For black males, problem drinking patterns typically occur after age 30, versus ages 18 to 25 for white males.

Although substance abuse problems are not exclusive to adolescence, most prevention programs currently target youth. The importance of these types of programs is obvious--to prevent or decrease the use of alcohol, tobacco, cigarettes, and other drugs by youth. Yet, adults can also be exposed to stressful life situations, such as unemployment, divorce, or death of a spouse or child, which could contribute to substance abuse problems. The adult population presents unique and often overlooked challenges for the planning and implementation of substance abuse prevention programs.

Gender

Historically, the vast majority of biological and behavioral studies were conducted on male participants; women substance abusers were not commonly included in research studies. A distorted picture emerged, in which women were assumed to misuse the same substances, and for the same reasons, as men. Within the past 10 to 20 years, however, some researchers have focused on the causes and consequences of substance abuse problems among women, and are beginning to report differences based on gender. Basic gaps in knowledge remain, however, regarding substance use and abuse among women. Until these gaps are addressed, the inaccurate and misleading practice of transferring data garnered from studies on men to women is likely to continue.

Race and Ethnicity

Historically, racial and ethnic minorities have been linked with, and often blamed for, many of the substance abuse problems within the United States (see box 1-3). Certainly, many urban areas have high concentrations of minorities, and within many of these areas the prevalence of substance abuse may be high. Often overlooked, however, is the prevalence of substance abuse problems in suburban and rural areas throughout the United States. In the minds of many, the link between minority populations and rampant substance abuse is inaccurate and derogatory.

Adolescent research has documented substantial racial and ethnic differences in substance use among high school seniors. On average, licit and illicit substance use is highest among Native American Indian youth, somewhat lower among white and Hispanic youth, substantially lower among black youth, and lowest among Asian youth. However, such findings do not include populations most likely to be excluded from self-reporting studies (e.g., high school dropouts).

Until recently, much of the analysis of substance use and/or abuse data has concentrated on the relationship between the use of a substance and one or two variables such as race and ethnicity and/or educational level. Often a positive association was found between minority populations and the use or abuse of certain substances. While statistically correct, these analyses can be simplistic and misleading. Clearly many risk and protective factors interact to produce substance use and abuse. If the majority of these variables are excluded from the analysis, a skewed picture may arise as to the importance of certain variables as risk factors for substance use and abuse. Additionally, to simplify the data collection, racial and ethnic categories are often broad. The most popular groupings are black, white non- Hispanic, Hispanic, and other. While each of these categories contains many distinct cultures, gross generalizations are commonly made.

Race and ethnicity have not been shown to be either biological or genetic risk factors for substance use or abuse. To date, the preponderance of investigative studies has focused on racial and ethnic differences in response specifically to alcohol. Few studies have been completed on differences in racial and ethnic biological responses to other licit or illicit drugs.

Economic

Are poor individuals at greater risk of developing problems related to substance abuse? While a relatively straight forward question, its resolution is hampered by the fact that poverty is difficult to define and drawing conclusions concerning an individual's potential for future substance abuse based on one or two variables such as family income or educational level is overly simplistic and deceptive.

In recent years, attention has been paid to the plight of the urban poor, many of whom are minorities. These inner- city communities are often riddled with high rates of crime, violence, unemployment, and inadequate social and medical services. For individuals living in these localities, the consequences of these problems are serious and far reaching.

To assess poverty and its relationship to substance abuse problems, some researchers have used the federal guidelines for poverty, while others employ measures of socioeconomic status (SES) such as educational level and household income. To date, the largest and most comprehensive analysis of SES variables and substance use has been accomplished by the National Institute on Drug Abuse (NIDA). While the analysis revealed associations between certain characteristics and patterns of substance use, it did not reveal causality. From this analysis, a straightforward "yes or no" response to the initial question linking poverty to increased individual risk for substance use or abuse is clearly impossible. The NIDA analysis demonstrated that the type and quantity of an individual's substance use is correlated with a variety of both individual as well as geographic characteristics. Furthermore, while the NIDA study was the largest and most comprehensive to date, some segments of the population (e.g., homeless, dropouts, institutionalized), many of whom were possible alcohol and drug abusers, were excluded from the survey.

Psychosocial and Behavioral

Many of the identified risk and protective factors relate to psychological, social, and behavioral characteristics. Conditions such as aggressiveness, delinquency, and mental disorders are often linked with substance abuse and addiction. Experiences such as physical and sexual abuse have also been identified as potential risk factors. While relatively little research has been accomplished on protective factors, several elements identified within the resiliency literature, as well as religiosity and spirituality, have been associated with decreased substance use.

However, the presence or absence of specific risk factors neither predicates nor guarantees protection from substance abuse. In addition, consensus is lacking within the substance abuse

field as to the importance, interaction, or order of the factors.

COMMUNITY CONTEXTS

A growing body of research is focusing on factors and interventions relevant to the onset and prevention of substance use, abuse, and dependency in the four principal community activity settings--homes and families, schools and peers, workplaces, and recreational settings.

In framing prevention programs with divergent populations, researchers are attempting to better understand qualitative as well as quantitative research methods, and the variety of settings in which substance abuse and addiction can take place and can be combated (see box 1-4).

Despite the promise of community-based research, several problems exist. First, much of the research does not address substance abuse and addiction per se, but rather risk and protective factors that can lead to a number of outcomes, including substance abuse and addiction. Second, research studies vary widely in methodology, making it difficult to draw scientifically valid conclusions. Third, rigorous evaluation of many prevention research programs is missing, leaving the effectiveness of such programs open to debate.

Homes and Families

Although American society expects families in their homes to take the lead in dealing with substance abuse and other problem behaviors, families in this country generally receive only limited support in protecting themselves against substance abuse. This situation may result in part from the belief that most nuclear families can raise their children largely independently and therefore do not need outside support, and in part from the belief that teens and young adults are more influenced by their peers. The first belief, however, is not supported by long-standing practices in most societies, where extended families and life-long neighbors have traditionally helped raise children (although in the United States many parents do not have access to these additional child-rearing resources because of urbanization, high technology, and family mobility). And the second belief is being questioned by growing evidence that certain parenting practices and family intervention programs can significantly reduce the risk of substance abuse among adolescents and young adults.

A growing body of research has identified risk and protective factors that may be particularly relevant in home and family situations (see table 1-3). Programs that enhance protective factors include those providing parent education, prenatal and infant care, preschool, and social support activities that help strengthen involved and responsive parenting. Programs that seek to decrease the presence of risk factors include those designed to reduce drug trafficking (e.g., community policing, clean sweeps of housing projects), physical and sexual abuse, the impact of negative life events (e.g., mental health counseling), and parental neglect. Substance abuse treatment programs that include an addict's family members also address risk factors.

Schools and Peers

Schools have been the target for prevention programs to curtail drug use at school sites (e.g., Drug Free School Zones) as well as curriculum-based programs that target drug use in the community as a whole. Because school-age youth are especially likely to initiate the use of alcohol and other drugs, much of the research has focused on use, rather than on abuse and dependency. Such research is nevertheless relevant to an understanding of abuse and dependency, since use is a precondition and contributor to abuse and dependency and because even experimental use can be harmful.

OTA conducted the most extensive compilation and examination of survey research on school-aged substance use to date-- 9,930 statistical analyses from 242 separate studies. The studies reported statistical relationships between substance use and its postulated causes. Statistical findings from the study reports were sorted into 11 major categories and 50 subcategories (see table 1-4), and then analyzed to identify strong, moderate, and weak statistical relationships, as well as those that had been insufficiently studied. The four variables that dominated as correlates of and possible contributors to substance abuse are: 1) prior and concurrent use of substances, 2) substance use by peers and friends, 3) perceived peer attitudes about substance use, and 4) offers to use substances. The prominence of prior and concurrent use is consistent with the reinforcing nature of substance use itself. The prominence of the other three variables emphasizes the importance of the social environment in contributing to and reinforcing substance use among school- age youth.

Schools primarily seek to prevent substance use and abuse through curriculum-based drug prevention programs. Such programs have dominated the field, largely because they are relatively simple to understand, implement, and replicate, and because methods to evaluate them have become standardized. Curriculum-based prevention programs have been hampered,

however, by a lack of good evaluation data needed to prove their effectiveness.

Workplaces

The prevalence of drug abuse among the employed remains inadequately documented, based on a small number of studies. Substance abuse contributes to workplace problems, such as accidents, injuries, absenteeism, turnover, lost productivity, compensation claims, and insurance costs. Substance abuse in workplaces can be affected by nonworkplace factors and workplace factors. The primary interventions are employee assistance programs that help employees with personal problems by providing services directly (through the work organization) or indirectly (through a provider in the community); health promotion programs that typically seek to prevent illness and promote wellness through behavior change; and alterations to workplace environments that seek to reduce stress and strengthen support for workers.

Recreational Settings

Recreational activities and settings may also contribute to the prevention of substance use and abuse or, by their absence, increase the risk. Examples of recreational activities and settings include Boys and Girls Clubs, Boy and Girl Scouts, organized sports, and local park and recreation department programs.

Research on the impact of organized youth activities on substance use and abuse is limited, and only a few studies have addressed the issue directly. However, existing research indicates that involvement in youth programs and activities is associated with fewer at-risk behaviors, including substance use among youth. The youth development field, including the resources of park and recreation departments, provides opportunities for broad-based prevention interventions.

Involvement in activities does not by itself protect against substance abuse. Some activities, such as those that are unstructured and unsupervised, may even increase the risks of substance use and abuse through association with a wider range of peers, some of whom are using substances. In addition, activities perceived as boring may not protect against substance use and abuse. More research is needed to clarify the aspects of recreational and other leisure activities that may protect against substance use and abuse. Research might focus on whether

activities that are supervised, structured, drug-free, empowering, skills- building, self-esteem-promoting, active, shared, and nonboring (or some combination of those) are associated with lower levels of substance use and abuse.

POLICY OPTIONS

Issues related to substance abuse and addiction have long occupied the attention of the American public (see table 1- 5). Congress has authorized a multitude of federal programs aimed at reducing or preventing the supply and demand of illicit drugs and regulating the availability of illicit substances, and has appropriated billions of dollars each year to federal agencies, provided oversight of federal programs, and passed broad-based legislation to coordinate programs as part of the war on drugs. In addressing what some policymakers term as the root causes of substance abuse and addiction, the list of relevant statutes expands significantly, as many domestic and social programs can influence the risk and protective factors that can lead an individual into or away from substance abuse and addiction.

A total of 12 executive branch departments, four independent agencies, one multiagency program (Weed and Seed), one White House office (the Office of National Drug Control Policy--ONDCP), and the Judiciary, all receive federal funding as part of national drug control strategy. These efforts include interdiction, treatment, and prevention programs.

The federal substance abuse control policy has as its primary focus the eradication of the supply of drugs. Congress currently appropriates more than $12 billion annually on antidrug efforts, with approximately two-thirds of this amount supporting drug interdiction and law enforcement activities, and the remainder supporting demand- side activities, such as drug treatment, research, and prevention programs.

Drug demand reduction efforts focus on providing treatment for abusers and addicts, prevention programs for various populations, and biomedical and behavioral research on the causes of substance use, abuse, and addiction. Of these, the federal government spends the most on treatment, followed by prevention and causality research. Drug treatment and prevention programs are funded at both the federal and state levels, while causation research is funded primarily by the federal government. A recent General Accounting Office (GAO) study revealed that for studying the causes of drug abuse, funding has remained comparatively tiny. In 1990,

for example, such research was funded at a level of $6 million, about one-tenth of one percent of the nation's drug control budget for that year.

OTA, in conjunction with GAO, surveyed federal agencies identified as having substance abuse prevention efforts. OTA finds that substance abuse prevention efforts are scattered over a number of federal agencies, and that federal prevention efforts are dictated by statutory mandates, rather than directed at identifying causes of substance abuse and addiction per se. The White House ONDCP, charged with coordinating federal antidrug efforts, lacks the statutory mandate to forcibly integrate or alter the multitude of programs that make up the federal government's war on drugs.

Congress faces several fundamental difficulties in addressing the causes of substance abuse and addiction:

- o No scientific consensus exists as to what is the driving cause of substance abuse and addiction. A range of risk and protective factors have been associated with drug use, abuse, and addiction.
- o Federal antidrug efforts, though coordinated by ONDCP, are spread among many federal agencies, whose authorization and appropriations fall under the jurisdiction of numerous congressional committees and subcommittees. ONDCP efforts in drug demand reduction efforts alone involved federal agencies across at least 11 Cabinet-level departments. This makes coordinated legislative action difficult to achieve.
- o The federal budget deficit is an obstacle to the creation of new domestic programs or the enhancement of existing programs that target known risk and protective factors in individuals and communities. The framework and literature reviews presented in this report make clear that substance abuse and addiction can arise and be influenced by multiple factors in individuals, groups, and communities. Thus, effective intervention requires prevention practitioners to select from a variety of options, so they can target the specific factors that are especially important for the particular populations and communities they are addressing. This does not mean that everything must be done at once nor that everything be known in advance of taking action. To the contrary, policymakers and practitioners can take small steps at a time, and then, as resources and new knowledge permit, take additional steps that address a fuller range of factors and contexts in greater depth.
- o Current drug prevention programs lack scientifically accepted standards for determining their success or failure. Whatever methods are developed, tested, and incorporated into prevention programs, a critical component of success is careful, rigorous evaluation. Answering "what works?" is essential in making advances in preventing substance abuse.

In choosing which policy issues to address, OTA focused on those areas directly addressed in this study. OTA identified a series of policy issues in four broad categories: federal focus and prevention program structure, research needs, community activity settings, and availability (see table 1- 6). A number of policy questions and options for congressional action emerge from these four categories (see table 1-7). A full discussion of the policy issues and options for congressional action can be found in chapter 9 of the full report. Given the broad nature of federal antidrug efforts, many important issues relating to federal antidrug efforts remain beyond the scope of this report. Such topics include drug treatment, interdiction and enforcement, and drug legalization.

BOX 1-1: Overview of Alcohol and Some Other Psychoactive Substances

Class of psychoactive substance(a) Description(b)

ALCOHOL (ethyl alcohol)

Alcohol, one of the most widely used of all drugs, is a central nervous system depressant with effects similar to those of sedative-hypnotic compounds (see below). At low doses, alcohol may be associated with behavioral excitation thought to be due to the depression of inhibitory neurons in the brain. Alcohol differs from sedative-hypnotic compounds in that it is used primarily for recreation or social rather than medical purposes.

Examples

1. Beer. 2. Wine. 3. "Hard" liquor (e.g., whiskey, gin).

Class of psychoactive substance(a) Description(b)

SEDATIVES, HYPNOTICS, OR ANXIOLYTICS

Sedative-hypnotics are drugs of diverse chemical structure that exert a nonselective general depressant on the central nervous system. In addition, they reduce metabolism in a variety of tissues in the body, depressing any system that uses energy. Depending on the dose, any sedative hypnotic compound may be classified as a sedative (an agent that allays excitement), a tranquilizer (an antianxiety agent), a hypnotic (a sleep-inducing agent), or an anesthetic (an agent that eliminates pain). Sedative-hypnotics are used medically as sedatives, anxiolytics (antianxiety agents), hypnotics, antiepileptics, muscle relaxants, and general anesthetics.

Examples

1. Barbiturates ("downers" or "barbs"): pentobarbital sodium[NembutalR], secobarbital sodium [SeconalR], amobarbital [AmytalR]--taken orally.

2. Nonbarbiturate hypnotics: methaqualone [QuaaludesR]-- taken orally.

3. Tranquilizers: diazepam [ValiumR], chlordiazepoxide hydrochloride [LibriumR]--taken orally.

Class of psychoactive substance(a) Description(b)

CANNABIS (THC)

THC (tetrahydrocannabinol) the active agent in marijuana, alters perceptions, concentration, emotions, and behavior, though the mechanisms of action are not entirely clear. Researchers have found, however, that THC changes the way in which sensory information is processed by the brain. It can be used medically to relieve nausea and side effects of chemotherapy in cancer patients; it is very rarely used to treat glaucoma.

Examples

1. Marijuana ("pot" or "grass")-- smoked or eaten. 2. Hashish ("hash")--smoked or eaten. 3. Hashish oil ("hash oil")--smoked (mixed with tobacco. 4. Tetrahydrocannabinol (THC)-- taken orally in capsules.

Class of psychoactive substance(a) Description(b)

NICOTINE

Nicotine, obtained naturally from tobacco, is a central nervous system stimulant.(c) It exerts its action secondary to stimulation of certain cholinergic (excitatory) synapses both within the brain and in the peripheral nervous system.

Examples

1. Cigarettes. 2. Smokeless tobacco (e.g., snuff or chewing tobacco).

Class of psychoactive substance(a) Description(b)

COCAINE

Cocaine, obtained naturally from coca leaves, is a potent central nervous system stimulant.(c) It stimulates the sympathetic nervous system, which regulates the activity of cardiac muscle, smooth muscle, and glands. It also produces bronchodilation in the lungs. It is used medically as a topical anesthetic for surgical procedures.

Examples

1. Cocaine hydrochloride powder ("coke" or "street cocaine")--usually snorted or injected intravenously.(d)

2. Cocaine alkaloid ("freebase" or "crack")--smoked.(e)

Class of psychoactive substance(a) Description(b)

AMPHETAMINES AND RELATED STIMULANTS(f)

1. Amphetamines

Amphetamines are a group of three closely related compounds, all of which are potent central nervous system and behavioral stimulants.(c) Some amphetamines are used medically to treat attention deficit disorder or minimal brain dysfunction in children, narcolepsy (recurrent, uncontrollable, brief episodes of sleep), or (rarely) depression.

Examples

1. Amphetamine ("speed" or "uppers" (BenzedrineR]--taken orally, injected, or snorted.(g)

2. Methamphetamine ("speed" or "crystal meth" or "ice") [MethadrineR]--taken orally, injected, or snorted.(g),(h)

3. Dextroamphetamine [DexedrineR]--taken orally, or injected.

Class of psychoactive substance(a) Description(b)

2. Nonamphetamine stimulants

Like amphetamines, nonamphetamine stimulates are central nervous and behavioral stimulants. Some non-amphetamine stimulants (e.g., PreludinR) are used for weight control, and some (e.g., RitalinR and CylertR) are used medically to treat hyperactivity, minimal brain dysfunction, narcolepsy, or (rarely) depression.

Examples

1. Pheumetrazine hydrochloride [PreludinR]--taken orally or injected.(d)

2. Methylphenidate hydrochloride injected.(d)

3. Pemoline [CylertR]--taken orally. [RitalinR]--taken orally, or injected.(d)

Class of psychoactive substance(a) Description(b)

HALLUCINOGENS

Hallucinogens, or psychedelics, are a heterogeneous group of compounds that affect a person's perceptions, sensations, thinking, self-awareness, and emotions.(i)

Examples

1. LSD (lysergic acid diethylamide) or "acid"--taken orally or put in the eyes.

2. Mescaline (3,4,5-trimethylox- phenylethyl amide) or "mesc" and peyote--disks chewed, swallowed, or smoked; tablets taken orally.

3. Psilocybin ("magic mushrooms")--chewed and swallowed. 4. MDMA (methylene dioxymethamphetamine)--taken orally.

Class of psychoactive substance(a) Description(b)

INHALANTS

Inhalants are chemicals that produce psychoactive vapors. Although different in makeup, nearly all of the abused inhalants produce effects similar to those of anesthetics, which act to slow down the body's functions or produce feelings of dizziness. At low doses, users may feel slightly stimulated. Amyl nitrite is used for heart patients because it dilates the blood vessels and increases blood supply to the heart. There are no medical indications for most of the inhalants.

Examples

1. Solvents (model airplane glue, nail polish remover, lighter and cleaning fluids, and gasoline)--vapors inhaled.

2. Aerosols (e.g., paints, hairsprays)--vapors inhaled.

3. Some anesthetics (e.g.,nitrous oxide)--vapors inhaled.

4. Amyl nitrite ("snappers" or "poppers") and butyl nitrite ("rush")--vapors inhaled.

Class of psychoactive substance(a) Description(b)

OPIATES (NARCOTICS) AND RELATED ANALGESICS

Opiates are natural or synthetic drugs that, like morphine, a substance derived from the opium poppy, have analgesic (pain-relieving) properties. Heroin is not approved for medical uses in the United States. The major medical use of other opiates is for the relief of pain (i.e., as analgesics); some narcotics are used to relieve coughing (i.e., as antitussives) or to treat diarrhea. Methadone is used in the treatment of narcotic abstinence syndromes and as an analgesic in terminal illness.

Examples

1. Heroin ("smack" or "horse")-- injected, smoked, or inhaled.(d)

2. Codeine (codeine sulfate)--taken orally or injected.(d) 3. Morphine (morphine hydrochloride)--injected, smoked, or inhaled.

4. Synthetic opiates (e.g., methadone [DolophineR]); hydromorphone hydrochloride [DilaudidR], meperidine hydrochloride [DemerolR], oxycodone and asprin [PercodanR]-- taken orally or injected.

Class of psychoactive substance(a) Description(b)

PCP (PHENCYCLIDINE) AND SIMILARLY ACTING SYMPHATHOMIMETICS

Phencycyclidine, commonly referred to as PCP, alters the functions of the neocortex and has been called a dissociative anesthetic. It was developed in the 1950s as an anesthetic but was subsequently taken off the market in 1967 when it was discovered that the drug caused hallucinations in some people.(j) PCP is now used legally only in veterinary medicine as an immobilizing agent.

Examples

PCP ("angel dust" or "lovely")--taken orally, or smoked (sprayed on joints or cigarettes).(d)

(a) According to Julien, one could conceivably classify psychoactive drugs by at least three methods: 1) mechanism of action, 2) chemical structure, and 3) behavioral effects. Probably the most useful approach would be to classify them by mechanism of action, but knowledge of the brain's physiology is too limited for this approach to be comprehensive. A limitation of the second approach is that many drugs of apparently similar structure exert quite different effects, and many drugs of dissimilar structure exert quite similar effects. The classification in this table largely reflects the behavioral effects approach. The classification used here is based on the categories in the American Psychiatric Association's Diagnostic and Statistical Manual of Mental Disorders, 3rd ed., revised. According to the American Psychiatric Association, all of the classes of psychoactive substances listed in this box except nicotine are associated with both abuse and dependence. Nicotine is associated with dependence but not abuse.

(b) The potential physiological, psychological, and behavioral effects of using the psychoactive substance shown are discussed in the sources listed below. The consequences depend in part on the specific drug used, the dosage level and mode of administration.

(c) Central nervous system stimulants are drugs that can elevate mood, increase alertness, reduce fatigue, provide a sense of increased energy, decrease appetite, and improve task performance. They can also produce anxiety, insomnia, and irritability. The drugs differ widely in their molecular structures and mechanisms of action.

(d) According to the American Psychiatric Association, the route of administration of a psychoactive substance is an important variable in determining whether use will lead to dependence or abuse. In general, routes of administration that produce more efficient absorption of the substance in the blood stream (e.g., intravenous injection) tend to increase the likelihood of an escalating pattern of substance uses that leads to dependence. Routes that quickly deliver psychoactive substances to the brain (e.g., smoking or intravenous injection) are associated with higher levels of consumption and with an increased likelihood of toxic effects. Use of contaminated needles for intravenous administration of amphetamines, cocaine, and opiates can cause hepatitis, HIV infection, and other illnesses.

(e) Freebase cocaine is a form of cocaine made by converting "street cocaine" (cocaine hydrochloride) to a purified base that is smoked. The effect of smoking freebase is similar to that of intravenous injection but smoking provides a shorter more intense high than sniffing or ingestion because of the rapid absorption of the drug through the lungs. "Crack cocaine" is the street name given to freebase cocaine that has been processed from cocaine hydrochloride to a chemical base by cooking it with baking soda and water. The term crack refers to the cracking sound that is heard when the mixture is smoked (heated), presumably due to the sodium bicarbonate.

(f) Describing a drug as a stimulant does not adequately describe its properties. Drug use surveys typically mean amphetamines when they use the word stimulants. Some surveys regard as stimulants both prescription (amphetamines) and nonprescription substances (e.g., caffeine-based compounds used in No-Doz, diet pills, and "fake pep pills"). Cocaine and nicotine (described above) are also central nervous system simulants.

(g) According to the National Institute on Drug Abuse, designer drugs are structural analogs of substances scheduled under the Controlled Substances Act that are prepared by underground chemists to mimic the psychoactive effects of controlled substances or produce other psychoactive effects. Because such analogs are not identical to their parent compound, their manufacture and distribution does not violate the law. As of June 1986, there were synthetic analogs of PCP, fentanyl and meperidine, and amphetamine and methamphetamine.

(h) In the past, abuse of methamphetamine had been in the form of tablets or intravenous injection. More recently, "ice" (one of the common street names for d-methamphetamine hydrochloride) has gained popularity in a form suitable for smoking.

(i) Most of the agents in this class of drugs can induce hallucinations if the dose is high enough. But the term hallucinogen does not adequately describe the range of pharmacological actions of the diverse group of substances usually included in the class. The term psychedelic was proposed by Osmond in 1957 to imply that these agents all have the ability to alter the sensory perception and thus may be considered "mind expanding." The effects of hallucinogens are unpredictable and depend on the amount taken, the user's personality, mood and expectations, and the surroundings in which the drug is used.

(j) PCP is considered a hallucinogen in some surveys of drug use.

SOURCES: Office of Technology Assessment, 1991, based on the following sources: American Psychiatric Association, Diagnostic and Statistical Manual of Mental Disorders, 3rd ed. revised (Washington, DC: 1987); R.M. Julien, A Primer of Drug Action, 5th ed. (New York, NY: W.H. Freeman and Co., 1988); J.F. Kauffman, H. Shaffer, and M. Burglass, "The Biological Basics: Drugs and Their Effects," Alcoholism and Substance Abuse: Clinical Interventions (New York, NY: 1985); U.S. Department of Health and Human Services, Public Health Service, Alcohol, Drug Abuse, and Mental Health Administration, National Institute on Drug Abuse, "Hallucinogens and PCP, Inhalants, Marijuana, Opiates, Sedative-Hypnotics, Stimulants, and Cocaine," Rockville, MD, 1983; U.S. Department of Health and Human Services, Public Health Service, Alcohol, Drug Abuse, and Mental Health Administration, National Institute on Drug Abuse, "Designer Drugs," NIDA Capsules, Rockville, MD, June 1986; U.S. Department of Health and Human Services, Public Health Service, Alcohol, Drug Abuse, and Mental Health Administration, National Institute on Drug Abuse, "Marijuana Update," NIDA Capsules, Rockville, MD, May 1989; U.S. Department of Health and Human Services, Public Health Service, Alcohol, Drug Abuse, and Mental Health Administration, National Institute on Drug Abuse, "Methamphetamine Abuse," NIDA Capsules, Rockville, MD, January 1989; and U.S. Department of Education, Growing Up Drug Free: A Parent's Guide to Prevention (Washington, DC: 1989).

BOX 1-2: Tolerance, Sensitization, Dependence, and Withdrawal

Tolerance to a drug develops when, following a prolonged period of use, more of the drug is required to produce a given effect. Sensitization, the opposite of tolerance, occurs when the effects of a given dose of a drug increase after repeated administration. Dependence is a type of neuroadaptation to drug exposure. With prolonged use of a drug, cells in the brain adapt to its presence such that the drug is required to maintain normal cell function. On abrupt withdrawal of the drug, the cell behaves abnormally and a withdrawal syndrome ensues. Generally, the withdrawal syndrome is characterized by a series of signs and symptoms that are opposite to

those of the drug's acute effects. For example, withdrawal of sedative drugs produce excitation and irritability. Conversely, withdrawal of stimulants produces profound depression.

SOURCE: Office of Technology Assessment, 1994.

BOX 1-3: Drugs and Discrimination

In America, tensions between the majority and various minorities often hinge on concerns raised by drug use. The groups change over time and place, but the dividing issues remain remarkably similar. Those in power decide which drugs are legal and how rules should be enforced. Minorities charge that unfair policies result from prejudice, ignorance, and hypocrisy.

When? 1850 Where? Boston Who? Irish Immigrants

Impoverished Irish immigrants brought the tradition of drinking whiskey with them. In American cities, people often blamed whiskey for neighborhood quarrels. In the mid-19th century, clashes with Irish immigrants occurred so often that police vans came to be known by the term "paddy wagons."

When? 1880s Where? San Francisco Who? Chinese Immigrants

Fear of immigrant Chinese often focused on their recreational use of opium. In 1875, San Francisco outlawed opium smoking, which most residents associated exclusively with the Chinese. This citywide ban became nationwide in 1909.

When? 1882 Where? Ohio Who? German Immigrants

Beer drinking often brought Germans into conflict with temperance advocates. Cincinnati's lively

German community gathered at beer gardens on Sundays to sing, dance, drink, and argue politics. In 1882, Ohio's governor denounced Germans as "sabbath breakers, criminals, and free thinkers."

When? 1930s Where? Colorado, New Mexico Who? Mexican Migrant Workers

The Southwest welcomed Mexican migrants during labor shortages. But during the Depression, anxiety over competition for jobs shifted to wildly exaggerated fears of the effects of marijuana use customary among Mexicans. To placate fears, Congress passed the Marijuana Tax Act of 1937, which prohibited recreational use of the drug.

When? 1991 Who? African Americans Police forces are largely white and inner-city residents are mostly black. Between 1980 and 1990, the drug-arrest rate in the city of Rochester, New York, was about five times that for suburban Monroe County.

SOURCE: "Altered States: Alcohol and Other Drugs in America," Strong Museum, Rochester, NY, 1993.

BOX 1-4: Ethnography

Ethnographic techniques allow researchers to study how environmental and cultural factors affect values, attitudes, and behaviors of individuals and groups. For three decades, researchers have documented societal and cultural influences on the patterns of substance use, abuse, and addiction; using a range of methodologies and working in diverse contexts, ethnographers have contributed to the understanding of substance abuse. Interacting with drug users under a wider set of circumstances than do strict quantitative researchers, ethnographers have expanded the framework of substance abuse research hypotheses. They have also assisted in the evaluation and interpretation of clinical and survey data to different subcultures and populations.

Ethnographies also provide information on constantlychanging substance use patterns. By collecting data from substance users in their natural environments, ethnographers have been

able to document who uses drugs and how drugs are used. This type of methodology is essential to the historical understanding of substance use and abuse.

Lastly, ethnographers have documented different styles of substance use within American society as well as abroad. Differences are cited in experience and use patterns based on social class, cultural background, gender, and geographic location.

SOURCE: Office of Technology Assessment, 1994.