

## CHAPTER 3

*The Effects of Drugs**Part I*

As noted in Chapter 1, the use of substances for their consciousness-altering effects is ubiquitous in human history. There is evidence that psychoactive plants such as ephedra were used by Neanderthal man as far back as 50,000 years ago (Merlin, 2003), and all civilizations that have had access to these substances have significant numbers of individuals who choose to use them. The tendency to alter consciousness is not even unique to humans: Animals, both domesticated and wild, have been shown to seek out intoxicating substances such as fermenting fruit or psychoactive plants (R. Siegel, 1989). Drugs are often viewed as possessing an almost mystical quality in terms of their ability to generate psychoactive effects, but it is important to recognize that these substances do not “create” these effects; they simply stimulate a natural function of the brain. Or, as Gahlinger (2001) comments, “All drug sensations, feelings, awareness, or hallucinations can also be achieved without drugs” and “all effects of psychoactive drugs can be produced naturally and spontaneously” (p. 159).

In Chapters 3 and 4, we discuss several drugs categorized by their subjective psychoactive effects as well as their effects on

the body. This chapter will focus on the stimulants, depressants, inhalants, and opiates, and Chapter 4 will address the hallucinogens, PCP and ketamine, marijuana, antidepressants and aphrodisiacs, and steroids and other performance-enhancing drugs. There are significant differences between these drug types and—compared to the other drugs we address—the antidepressants, aphrodisiacs, and steroids and other performance-enhancing drugs stand apart. However, it is important to recognize that the antidepressants, aphrodisiacs, and performance-enhancing drugs share many characteristics in common with more “traditional” psychoactive drugs: All of these substances have potential benefits and drawbacks, all may be abused, and each represents a means by which people may alter their consciousness or reality.

Although it is true that antidepressants will not get users “high” in the fashion of other psychoactive drugs, they do have the ability to alter perception and mood; indeed, this is why they are useful in a medical context. We do not question that these drugs have been very helpful for countless individuals suffering from mental illnesses such as depression. But the fact remains that these substances alter consciousness,

and this illustrates our point that consciousness alteration should not be seen as negative per se; it is only when this tendency is manifested in ways that are harmful to others that it becomes problematic.

Similarly, aphrodisiacs are clearly a unique form of drug in that their sole purpose is to allow for sexual pleasure (Shenk, 1999). As discussed below, these drugs may allow for—or assist in—the attainment of sexual pleasure by those who have lost the ability to achieve erection/orgasm, but they are also widely used recreationally by those who seek to enhance their sex life, despite the absence of any “problems” with it. Although we do not see the use of these substances as directly analogous to the use of more traditional psychoactive drugs, aphrodisiacs are similar to the others discussed in the sense that they are designed to assist in the achievement of a state of overpowering emotion and feeling—in this case, sexual ecstasy.

Finally, we recognize that steroids and (certain) other performance-enhancing drugs are, in many respects, different from the other substances discussed. These substances are used primarily to enhance

athletic performance and/or to improve physique. Thus, while the primary motivation for using performance-enhancing drugs is, to some degree, unique, the use of these substances also represents “an expression of a basic human drive to stimulate the human organism beyond its normal metabolic state” (Hoberman, 1992, p. 105). In this sense, then, these drugs are similar to others that will be discussed. It is also important to recognize that steroids and similar substances have also been shown to possess mood-altering effects. Of these, aggression is the most well-known, but more “desirable” effects associated with steroid use include euphoria, increased sexual desire, friendliness, and stimulant-like properties including alertness, decreased fatigue, increased energy and vitality, and improved memory and concentration (Bahrke, Yesalis, & Wright, 1996; Pope, Kouri, & Hudson, 2000; Rubinow & Schmidt, 1996; Yates, 2000). Although we are not making the claim that steroids and similar substances are initially taken in pursuit of these effects, the effects may come to be important reasons that people continue to use these drugs.

**The only known societies that had no access to psychoactive substances were the Inuit, who traditionally lived near the Arctic Circle, and some people of the Pacific Islands. These groups shared the trait of being extremely isolated from other civilizations, and when these people were eventually exposed to psychoactive substances, especially alcohol, they exhibited catastrophic rates of addiction and abuse (Gahlinger, 2001).**

It is also interesting to note that the effects of drugs are often seen as either “good” or “bad” depending on the context of their use. However, it is important to recognize that drugs are just substances, and regardless of their reputation and legal status, they affect the functioning of the brain and corresponding mood states in very similar ways. This is because psychoactive drugs either act on or resemble various

neurotransmitters, which are “messenger chemicals” that carry messages within the brain and from the brain to the rest of the body. Commonly known neurotransmitters include serotonin, dopamine, and adrenaline, and as Gahlinger (2001) notes, “the effects of a drug depend on which neurotransmitters it resembles, and its potency is partly determined by how close this resemblance is” (p. 138).

Because of their psychoactive effects, all drugs have the potential to cause harm in society, as drug users may harm people, either intentionally or accidentally, while under the influence. Some have referred to this as a drug's **behavioral toxicity** (Ray & Ksir, 2004). Although this is difficult to assess (is it the drug or the person using the drug that creates the problem?) and varies with the potency and amount of the drug that is taken, we discuss the subjective mental effects of various drugs and consider their potential behavioral toxicity.

Aside from their subjective psychoactive effects, drugs are also assessed in terms of the physical and psychological risks they pose to users. The risks presented by various drugs are commonly assessed in terms of their **toxicity**, or ability to generate negative health consequences in users, and their potential to result in *dependency* (often used interchangeably with *addiction*). Toxicity can be both acute and chronic. **Acute toxicity** refers to problems that come on immediately or very quickly, as in the case of a drug overdose, while **chronic toxicity** refers to effects that result from the long-term exposure to the drug, such as emphysema associated with smoking or cirrhosis caused by alcohol consumption (Ray & Ksir, 2004).

Although issues of acute toxicity are often provided as justification for policies against certain illegal drugs, it is important to recognize that many legal drugs have among the highest levels of acute toxicity. For example, as noted in Chapter 5, prescription **psychotherapeutic drugs** and alcohol in combination with other substances were the first and second leading causes of drug-related visits to hospital emergency rooms in 2003, followed by cocaine (Substance Abuse and Mental Health Services Administration [SAMHSA], 2003b). Similarly, despite the attention paid to acute toxicity, it is a drug's chronic

toxicity that is, by far, most harmful in terms of illness and loss of life. For example, alcohol and tobacco are estimated to be involved in the deaths of over 600,000 Americans every year, mostly as a result of the chronic toxicity of these drugs. Although the measurement of alcohol and tobacco mortality figures are confounded by other factors, estimates indicate that tobacco and alcohol kill between 75 and 100 times the number of people annually as all illegal drugs combined (Gahlinger, 2001).

Drugs can also be evaluated in terms of their ability to generate dependence, sometimes called "addiction." In layman's terms, these conditions collectively refer to a person's inability to stop using a drug when it is causing him or her problems (Weil & Rosen, 1998). The terms "dependence" and "addiction" are very loosely used in society, and many health professionals now avoid using the term "addiction." In part, this is because "addiction" is commonly used to refer to many behaviors that have nothing to do with drugs or anything able to generate physical dependence (e.g., sex, gambling, exercise, TV, shopping), suggesting that addiction or dependence "has more to do with human beings than with drugs" (p. 171).

Referring to substance use, there are two distinct forms of dependence. The first is **physical** (or **physiological**) **dependence**, which refers to the potential of a drug to generate a withdrawal syndrome, or a predictable set of symptoms that affect the user when the use of a drug is discontinued after some period of use (Weil & Rosen, 1998). Thus, drugs that are not accompanied by a withdrawal syndrome when long-term or heavy use is stopped are not regarded as physically addicting. Physical dependence arises in part because users develop **tolerance** to some forms of drugs, meaning that the body adapts to repeated drug use so that the same dose of a drug produces less of the desired effect. In order to overcome

increased tolerance, users often increase their dose of the drug to the point that they may be taking an amount that would kill a novice user (Ray & Ksir, 2004). For some drugs, such as alcohol and heroin, the body comes to depend on the presence of some amount of the drug in the system, and when drug use is rapidly discontinued, users experience physical withdrawal.

In addition to physical dependence, drugs may also result in **psychological** (or **behavioral**) **dependence**. Behavioral psychologists have pointed out that repetitive

and positively reinforced behaviors such as drug use are often accompanied by a desire (i.e., “craving”) and tendency to be repeated (Ray & Ksir, 2004). Accordingly, a drug that cannot cause a user to become physically dependent may still be able to produce psychological dependence. Although this is more difficult to assess, psychological dependence is typically determined according to the criteria set forth in the American Psychiatric Association (2000) *Diagnostic and Statistical Manual of Mental Disorders* (see Box).

The *DSM-IV-TR* distinguishes between substance abuse and substance dependence. According to these criteria, an individual is an *abuser* of a substance if he or she meets one of the following criteria:

1. Recurrent use of the substance resulting in a failure to fulfill major role obligations
2. Recurrent use of the substance in physically hazardous situations
3. Recurring drug-use-related legal problems
4. Continued use of the substance despite having persistent or recurrent problems caused by or exacerbated by use of the substance

Also under the *DSM-IV-TR*, an individual is *dependent* on a substance if he or she meets at least three criteria from the following list:

1. Tolerance, as defined by a need for increased amounts of the drug to achieve the desired effect or a markedly diminished effect with continued use of the same amount of the substance
2. Withdrawal, as manifested by the characteristic withdrawal syndrome for the substance or that the same substance is taken to relieve or avoid withdrawal symptoms
3. Using the substance in larger amounts over a longer period of time than intended
4. A persistent desire or unsuccessful efforts to cut down or reduce use of the drug
5. A considerable amount of time spent obtaining, using, or recovering from the effects of the drug
6. Giving up or reducing important social, occupational, or recreational activities in favor of consuming the substance
7. Continued use of the drug despite persistent or recurrent physical or psychological problems caused or exacerbated by use of the drug

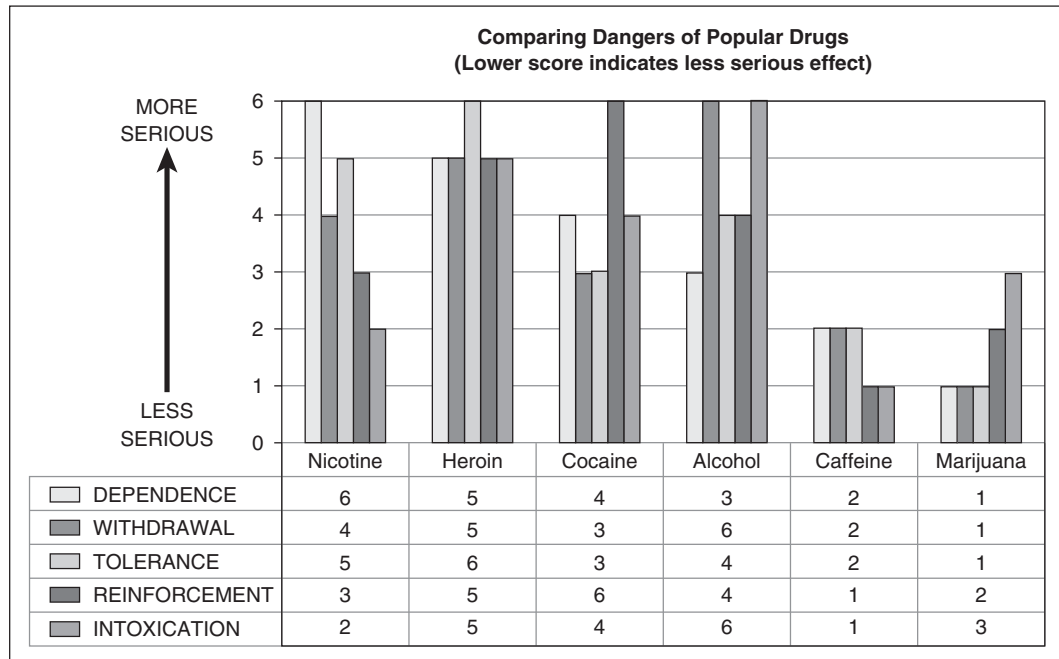
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Above we have discussed several different forms of risks that drugs pose. Specifically, we discussed the potential “behavioral toxicity” of drugs due to their psychoactive effects; we addressed the potential for a drug to generate physical and psychological dependence; and we have noted that the use of *all* drugs, both legal and illegal, poses some level of physical and/or psychological risk, which can be both acute and chronic. Thus, it is essential to keep in mind that the risks legal and illegal drugs pose are multifaceted, and all these risks must be

considered in order to accurately interpret how harmful or beneficial a particular drug is (see Figure 3.1).

In Chapters 3 and 4, we discuss several categories of substances based on their primary effects on the mind and the body, considering their legal classification and the indicators of harm discussed above. The most significant legislation regarding the legal status of psychoactive drugs in the United States is the Comprehensive Drug Abuse Prevention and Control Act passed in 1970. Title II of this Act is known as the



**Figure 3.1** Do Our Drug Laws Focus on the Truly Dangerous Drugs?

SOURCE: Hilts (1994).

NOTES: This advertisement appeared in *New Republic*, the *National Review*, *NewsMax*, the *American Prospect*, *Reason*, the *Progressive* and *The Nation* in Winter, 2005. Dependence: How difficult it is for the user to quit, the relapse rate, the percentage of people who eventually become dependent, the rating users give their own need for the substance, and the degree to which the substance will be used in the face of evidence that it causes harm. Withdrawal: Presence and severity of characteristic withdrawal symptoms. Tolerance: How much of the substance is needed to satisfy increasing cravings for it, and the level of stable need that is eventually reached. Reinforcement: A measure of the substance’s ability, in human and animal tests, to get users to take it again and again, and in preference to other substances. Intoxication: Though not usually counted as a measure of addiction in itself, the level of intoxication is associated with addiction and increases the personal and social damage a substance may do.

**Controlled Substances Act**, which classifies drugs into five legal “schedules.” The legal classification of a drug is allegedly based on (1) the potential for abuse of the drug, (2) whether the drug has medical applications, and (3) the potential of the drug to generate psychological and physical dependence (see Figure 3.2). As will be demonstrated, when substances are compared in terms of their psychoactive effects and potential to generate harm, distinctions between legal and illegal drugs are very difficult to make.

## STIMULANTS

Stimulants are drugs that often make users feel more alert and energetic. They exert these effects by causing nerve fibers in the brain to release adrenaline and other neurotransmitters (Weil & Rosen, 1998). Like many types of drugs, some stimulants are found in nature, present in various plant species, while others are chemicals made in laboratories (because it is often cheaper and easier to make drugs synthetically than to harvest them from plants). Although stimulants can make users feel more alert and energetic for a time, as is true with most things, you don’t get “something for nothing” (Weil & Rosen, 1998). That is, stimulants don’t “create” energy out of nothing; they simply force the body to use up some of its reserves of chemical energy, energy that must be replenished later (Weil & Rosen, 1998). Because of this, stimulants can be useful when energy or alertness are needed to complete an important task or obligation, and such use is apt to have few consequences, provided the body is given time to recharge itself. As noted by Weil and Rosen, problems arising from the use of stimulants generally occur because users don’t want to allow for this “down time”; they want to feel good again right away, and they keep taking stimulants in order to obtain this effect.

## Caffeine

Caffeine occurs naturally in plants used to produce coffee, tea, and chocolate and has long been the most widely used drug in the world. Coffee beans have been chewed for their stimulating effects at least as far back as 600 A.D., and grinding the beans to make a hot water drink then known as “the wine of Islam” (Gahlinger, 2001) dates back over 1,000 years, when groups of Muslims would meet once a week to have all-night prayer and chanting sessions with the help of large amounts of coffee (Weil & Rosen, 1998). By 1674, coffee was being widely used in Europe and an English women’s group protested the use of coffee in their pamphlet “The Women’s Petition Against Coffee,” which noted the

grand inconveniences accruing to their sex from the excessive use of the drying and enfeebling liquor. . . . Our countrymen’s pallates are becoming as Fanatical as their brain . . . to run a Whoreing after such variety of destructive Foreign Liquors, to trifle away their time, scald their Chops, and spend their Money, all for a little base, black, thick nasty bitter stinking, nauseous Puddle water. (cited in Ray & Ksir, 2004, p. 330)

Charles II of England briefly outlawed coffeehouses at the end of the 17th century, and in the 18th century, coffeehouses became “penny universities” where for a penny a cup, patrons could sit and listen to literary, political, and scholarly figures (Ray & Ksir, 2004). Until the end of the 18th century, users bought the green coffee beans and then roasted them just before use, but in 1790 commercial roasting began in New York City, and by 1900, vacuum-packed ground coffee was being marketed (Ray & Ksir, 2004). In 1902, Crothers claimed that coffee drinkers often became less satisfied with the psychoactive effects of coffee and moved to

The Controlled Substances Act, passed as part of the Comprehensive Drug Abuse Prevention and Control Act of 1970, places all regulated psychoactive drugs into one of five schedules. These are the schedules and well-known drugs included in the schedules.

*Schedule I:* Substance has a high potential for abuse, has no medical use in the U.S., and has a lack of accepted safety for use under medical supervision.

Heroin	Psilocybin	MDMA (Ecstasy)
LSD	Peyote	Methadone
Marijuana	Rohypnol	Gamma-Hydroxybutyrate (GHB)
Methaqualone	Bufotenine	
Mescaline	Hashish & Oil	

*Schedule II:* Substance has a high potential for abuse, has a currently accepted medical use in the U.S. with severe restrictions, and abuse may lead to severe psychological or physical dependence.

Cocaine	Amobarbital	Demerol
Codeine	Secobarbital	Percocet
Hydrocodone	Pentobarbital	Opium
Morphine	Marinol	Oxycodone
Methamphetamine	Ritalin	THC
Phencyclidine (PCP)	Percodan	Dexedrine

*Schedule III:* Substance has a potential for abuse (less than Schedule I or II), has currently accepted medical use in the U.S., and may lead to moderate or low physical dependence or high psychological dependence.

Codeine with Aspirin	Vicodin	Nandrolone
Hydrocodone with Aspirin	Anabolic Steroids	Testosterone

*Schedule IV:* Substance has a low potential for abuse as compared to Schedule III, has currently accepted medical use in the U.S., and abuse may lead to limited physical and psychological dependence.

Valium/Diazepam	Darvon/Propoxyphene	Chloral Hydrate
Phenobarbital	Triazolam/Halcion	Restoril/Temazepam
Diazepam	Fenfluramine	Chlordiazepoxide/Librium
Xanax/Alprazolam	Phentermine	

*Schedule V:* Substance has a low potential for abuse as compared to Schedule IV, has currently accepted medical use in the U.S., and abuse has a narrow scope for physical and psychological dependence.

Cough medicines with Codeine

### Figure 3.2 U.S. Legal Drug Schedules

SOURCE: U.S. Department of Justice (2005).

the consumption of other drugs, making coffee one of the first substances purported to be a gateway drug (Brecher, 1972; Faupel et al., 2004).

The other main source of caffeine, tea, was first reported being used medically in China around 350 A.D., and reports dating to 780 A.D. suggest that tea was being widely cultivated and used nonmedically by this time (Ray & Ksir, 2004). By the early 17th century, tea had made its way to Europe, being imported by the East India Company along with spices and other riches from Asia and Africa. Being partial to the

substance and loyal to the Crown, early American colonists bought large amounts of tea from England, but heavy taxes on tea led to the Boston Tea Party in 1773, speeding the outbreak of the American Revolutionary War. Despite its wide use in these years, tea came to be condemned by many, with one critic claiming in the early 20th century that tea produced “a strange and extreme degree of physical depression . . . a grievous shrinking may seize upon a sufferer . . . the speech may become vague and weak” and that “by miseries such as these, the best years of life may be spoilt” (Brecher, 1972, p. 198).

**Howard Schultz, the inventor of Starbucks, deemphasizes the importance of caffeine to his company's success, commenting, “I don't think it is the caffeine. I think the ritual, the romance of the thing, is really more important” (as quoted in Reid, 2005, p. 31).**

Caffeine is associated with a number of negative side effects. The drug is irritating to the stomach, and caffeine can produce physical dependence, sometimes from consumption levels as low as 100 milligrams a day (1–2 cups of coffee) (Weil & Rosen, 1998). Withdrawal symptoms are likely to occur if regular users suddenly stop consuming caffeinated coffee, and these symptoms include lethargy, irritability, a severe headache, and potentially nausea and vomiting for 36 to 72 hours (Weil & Rosen, 1998). Heavy caffeine use will produce restlessness, insomnia, rapid heartbeat, muscle twitching, and although it is not widely known, caffeine can be a potent poison if taken in large enough doses. Like many drugs, caffeine can cause death by overdose.

Ten grams of caffeine (roughly 100 cups of coffee) is sufficient to cause convulsions, respiratory failure, and death (Gahlinger, 2001), and in 2002, a university student in Wales committed suicide by purposely ingesting caffeine pills equivalent to 100 cups of coffee (T. Reid, 2005, pp. 24–25). It is also believed that health problems can occur in individuals who consume more than 300 milligrams of caffeine per day, including an increased risk of heart disease and an increased risk of stillbirth among pregnant women (Ray & Ksir, 2004; Wisborg, Hedegaard, & Henriksen, 2003).

Caffeine has many positive uses as well. In addition to its well-known and valued stimulating effects, caffeine is a vasoconstrictor (i.e., it constricts blood vessels), making it

**As noted by Charles Czeisler, a neuroscientist and sleep expert at Harvard Medical School, “the principal reason that caffeine is used around the world is to promote wakefulness. But the principal reason that people need that crutch is inadequate sleep. Think about that: We use caffeine to make up for a sleep deficit that is largely the result of using caffeine” (as quoted in T. Reid, 2005, p. 36).**



useful for treating headaches, particularly migraines (e.g., caffeine is a key ingredient in Excedrin, which markets itself as “the headache medicine”). Coffee use may also lower the risk of diabetes. For example, a longitudinal study published in the *Annals of Internal Medicine* of more than 120,000 healthy men and women found that, as compared to those who did not drink coffee, men who drank more than six cups of caffeinated coffee per day reduced their risk of diabetes by more than 50%, while women’s risk of diabetes declined by 30% (Salazar-Martinez et al., 2004).

As compared to coffee, tea (especially green tea) contains less caffeine. As a consequence, tea drinkers are less likely than coffee drinkers to develop a dependence on the substance (Weil & Rosen, 1998). Tea (again, particularly green tea) is also thought to have a number of health benefits. The health benefits of green tea are associated with the polyphenols it contains. Polyphenols are powerful antioxidants that can eliminate cell-damaging free radicals and reduce abnormal cell growth and inflammation and are related to what makes eating certain fruits and vegetables so good for the body (Roan, 2003). Recent studies have found that the use of green tea is associated with a reduced risk for conditions such as cancer—including stomach, colon, lung, pancreas, breast, and skin cancer—as well as a reduced risk for heart disease and high cholesterol (Briffa, 2004). For example, in one study it was found that

women drinking approximately half a cup of green tea per day had a 47% reduced risk of breast cancer, and research has also found that men consuming three cups of green tea per day had approximately one-quarter the risk of contracting prostate cancer (Briffa, 2004).

### “Energy” Drinks

A more recent development with respect to substances containing caffeine is the boom in the marketing and sales of high-caffeine “energy drinks.” Although Red Bull is the best known of these products, countless copycat products are now widely sold, such as RockStar, Red Devil, Full Throttle, V, Roaring Lion, SoBE Adrenaline Rush, Whoop Ass, Rhino, No Fear, Monster, and Cheetah, a product whose advertisements juxtapose images of Canadian sprinter Ben Johnson (who was stripped of a gold medal in the 1998 Olympics for steroid use) with the tag line “Go Ahead and Cheetah” (M. Campbell, 2006). The target audience for these products is largely adolescents and young adults looking for a “boost” (T. Reid, 2005).

Although these products are marketed partly on the basis of the supplements they contain (e.g., taurine, ginseng), the stimulating effects of energy drinks result primarily from their high caffeine content (e.g., 80 mg in a 8.3 ounce can of Red Bull, roughly equivalent to 2 1/2 cans of Coke or two one-ounce shots of espresso (T. Reid, 2005; Rowley, 2001).

The prevalence of caffeine use in the form of energy drinks is particularly high among adolescents and young adults. For example, the manager of the London dance club “Egg” comments, “Actually, we see a revival at about half four or so in the morning. That’s when we get the real rush at the bar for Red Bull. And the kids say ‘I’ve had eight Red Bulls. I’m flying!’” Says nurse and clubgoer Lee Murphy, “By four or five in the morning you’re totally blotto. That’s when the Red Bull comes in. I drink these two tins, it’s like drinking a pint of speed” (as quoted in T. Reid, 2005, pp. 5–6).

Red Bull and similar beverages are commonly labeled as “clubbers’ drinks” due to the extensive use of these products by this population. As well as being consumed on their own, energy drinks are frequently combined with alcohol. As T. Reid (2005) comments, many young “clubbers” combine Red Bull with alcohol to make various “energy cocktails,” including the Vodka Bull (Red Bull and vodka), Chambull (Red Bull and champagne), Bullgarita (Red Bull and tequila), and the Bull Meister (Red Bull and Jagermeister). With respect to this practice, Red Bull has provided partygoers with the assurance that “adding alcohol does not change Red Bull’s properties” (as quoted in T. Reid, 2005, pp. 20–21).

### **Tobacco**

Tobacco, or *Nicotiana tabacum*, has been cultivated in South America since the early Neolithic period, up to 8,000 years ago (Meyer, 2003). Christopher Columbus reported in his journals that the native inhabitants of San Salvador presented him with a gift of tobacco leaves on his birthday in 1492, and a member of Columbus’s party, Rodrigo de Jerez, was possibly the first European to smoke tobacco (Ray & Ksir, 2004). De Jerez was introduced to smoking by the aboriginal Americans, and when he continued the practice upon his return to Portugal, his friends were “convinced the Devil had possessed him as they saw the smoke coming out of his mouth and nose” (Ray & Ksir, 1993, p. 231). Holy inquisitors agreed with this assessment, and de Jerez was jailed for seven years, only to discover upon his release that people everywhere were now smoking tobacco!

Despite claims that tobacco was useful as a medicine, some early commentaries on the substance were quite negative. For example, in 1604, King James I of England produced a

pamphlet titled “A Counterblast to Tobacco” in which he wrote,

[Tobacco use,] a custome (custom) lathsome (loathsome) to the eye, hateful to the nose, harmeful (harmful) to the brain, dangerous to the lungs, and the blacke (black) stinking fume thereof, resembling the horrible stigan some of the pit that is bottomless. (cited in Walton, 2002, p. 133)

In 1617, Dr. William Vaugh claimed tobacco would, among other things, make women barren: “Tobacco that outlandish weede, It spends the braine and spoiles the seede, It dulls the spirite, it dims the site, It robs a woman of her right” (cited in Ray & Ksir, 2004, p. 302). Similarly, in 1650, Johann Michael Moscherosch wrote of tobacco,

They who smoke can be compared only to men possessed, who are in need of exorcising. While their throats belch forth with the stinking, poisonous fumes, they remain nonetheless thralls to the tobacco fiend to whom they cling with an idolatrous devotion, exalting him as their God above all others, and striving to entice all they meet to imitate their folly. (cited in Sullum, 1998, p. 15)

In the late 1800s and early 1900s, tobacco became increasingly seen as potentially harmful rather than medically useful. Though still commonly recommended for the treatment of bronchitis and asthma, the excessive use of tobacco was said to cause sterility and birth defects and to lead to insanity (Troyer & Markle, 1983). The famous inventor Thomas Edison even claimed that tobacco had “a violent action on the nerve centers, producing degeneration of the cells of the brain, which is . . . permanent and uncontrollable” (as quoted in Shenk, 2003).

Although Edison may have exaggerated the damage of tobacco on the brain, tobacco smoke does contain about 4,000 distinct chemicals, 400 of which are toxic and 43

are known carcinogens (Gahlinger, 2001). Modern commercially marketed cigarettes have about 700 *additional* ingredients, including 13 that are considered too toxic to be allowed in food and five that are classified as “hazardous,” such as freon, ethyl 2-furoate, ammonia, and various pesticides (Gahlinger, 2001). In raw plant form, tobacco is one of the most powerful stimulants known, and its primary active ingredient, nicotine, is one of the most toxic of all known drugs (Weil & Rosen, 1998). Although most of the nicotine in tobacco is destroyed when it is burnt, an average cigar, if soaked in water and consumed, contains a sufficient amount of nicotine to kill several people (Weil & Rosen, 1998), and a child who eats a cigarette is in serious danger (Goldberg, 2003).

Nicotine was isolated from tobacco in 1828 and comprises about 5% of raw tobacco by weight. Because nicotine is so toxic, the body rapidly develops tolerance to it to protect itself. Tolerance to nicotine may develop in a matter of hours, as compared to days or weeks for heroin and months for alcohol (Weil & Rosen, 1998). Ironically, because of this rapid tolerance, it is only the occasional users who experience a “high” from nicotine, with most addicted smokers feeling no alteration of consciousness at all when they ingest the drug (Weil & Rosen, 1998).

Nicotine exerts its effects on the body by mimicking the neurotransmitter acetylcholine, a chemical that, among other things, assists the brain in communicating with the muscles and in processing information (Goldberg, 2003). Although the primary effects of nicotine are stimulatory, including increasing the heart rate and blood pressure, it is important to note that nicotine first stimulates and then depresses the nervous system (Schilit & Lisansky-Gomberg, 1991) so it can also act as a tranquilizer (Brecher, 1972).

Tobacco can be consumed in a variety of forms, and in addition to cigarettes, cigars, pipe tobacco, snuff, and “chew,” several other variations exist. Among these is a product known as the “bidi” cigarette, which originated in India but has become increasingly popular among youth in the United States. This product, which comes in a variety of flavors including grape, chocolate, and root beer, is hand-rolled, wrapped in a leaf, and looks similar to a marijuana cigarette. According to the federal government’s Center for Disease Control, between 2% and 5% of teenagers in the United States, and close to 40% of adolescents in some urban areas such as Boston, have consumed bidis at least once (Horowitz, 2002).

In 1798, Dr. Benjamin Rush wrote an essay in which he purported that tobacco was a gateway drug to alcohol:

One of the usual effects of smoking and chewing is thirst. This thirst cannot be allayed by water, for no sedative or even insipid liquor will be relished after the mouth and throat have been exposed to the stimulus of the smoke, or juice of tobacco. A desire of course is excited for strong drinks, and these when taken between meals soon lead to intemperance and drunkenness. One of the greatest sots I ever knew, acquired a love for ardent spirit by swallowing ends of tobacco, which he hid, to escape the detection of the use of it.

(cited in Robert, 1949, p. 106)

Another recent trend related to tobacco consumption is the emergence of “hookah houses”; approximately 300 of these establishments opened in the United States between 1998 and 2003 (Black, 2003). Hookahs, which are basically water pipes, use charcoal to heat the tobacco, which is soaked in honey or molasses and mixed with fruit pulp for flavor. Another tobacco product known as the “nicotini” emerged in 2003. This product has been referred to as a liquid cigarette due to the fact that it is a drink that comes complete with a nicotine rush and the tobacco aftertaste that is found in cigarettes. Nicotini is created by soaking tobacco leaves in vodka and adding other liquors (Wyman, 2003).

In its most commonly used form of cigarettes, tobacco is probably the most addictive drug known—more addictive than alcohol, heroin, crack, or other illegal drugs (Gahlinger, 2001; Weil & Rosen, 1998). There is also no question that tobacco consumption is associated with many negative health outcomes and high mortality rates. Globally, it is estimated that more than four million people die from smoking-related diseases annually, and the World Health Organization estimates that the number of annual tobacco-related deaths will reach 10 million by the year 2030. However, as Sullum (1998) notes, smoking mortality rates should be examined critically. These rates are based on epidemiological research using samples that are typically not representative of the general population, and they often do not take into account other variables that may be related to the high mortality rates of smokers. For example, smokers tend to have higher levels of alcohol consumption, have poorer diets, are less likely to engage in physical exercise, have lower incomes, and are employed in more hazardous occupations than non-smokers. Accordingly, a 1992 British study

concluded that between 10% and 20% of the deaths attributed to smoking were, in fact, due to confounding variables such as those listed above (cited in Sullum, 1998).

While the effects of tobacco are mostly negative and it has become a pariah substance, like any other drug, it has its benefits. For example, it has been demonstrated that the substance has a facilitating effect on learning and memory in animals and humans (Schilit & Lisansky-Gomberg, 1991; Sullum, 1998), and studies suggest that it may help people with brain disorders such as Alzheimer’s disease and schizophrenia (Goldberg, 2003). Research also suggests that current smokers have a 60% reduction in the risk of contracting Parkinson’s disease compared to those who have never smoked (Martin & Gale, 2003). Similarly, in a study conducted on teenagers diagnosed with attention deficit disorder, it was found that nicotine (administered through a skin patch) was effective in helping them with some mental functions (Goldberg, 2003).

### *Cocaine*

Coca is a shrub native to the Andes in South America that has been cultivated by native peoples in that region for thousands of years. Archaeological evidence from Ecuador and Chile indicates that the practice of chewing coca leaves for their psychoactive effects has occurred for at least 2,000 years and perhaps much longer (Davenport-Hines, 2001). Today, millions of Indians still chew coca leaves every day as a medicine and stimulant, which has an effect similar in intensity to coffee, although it soothes rather than irritates the stomach and doesn’t produce the “jitteriness” of coffee (Weil & Rosen, 1998).

According to Incan legend, the first Incan Emperor, Manco Capac, son of the Sun God, brought coca from heaven

(Gahlinger, 2001). Coca was said to be “a gift from the gods to satisfy the hungry, fortify the weary, and make the unfortunate forget their sorrows” (Bugliosi, 1991, cited in Gahlinger, 2001, p. 38). It is easy to see why the natives viewed these leaves as a gift from God. In addition to being a stimulant, coca leaves are rich in B vitamins, stabilize body blood sugar levels, and contain more iron and calcium than any of the food crops grown in the Andes and, as noted by Gahlinger, “it is likely that without coca the Indians would not have even been able to survive on their potato diet” (p. 38). When the Spanish Conquistadors invaded the Americas in the 16th century, they initially attempted to ban coca chewing but quickly relented when they discovered that the natives could not bear the labor involved in extracting silver (to be sent to Spain) from the high-altitude mines without the use of the drug (Gahlinger, 2001).

Coca leaves were exported to Europe once their value was discovered by the Conquistadors, but Europeans remained largely uninterested in the substance until the mid-19th century because the leaves lost much of their potency on the long sea voyage (Gahlinger, 2001). The change came when French chemist Angelo Mariani developed an extract of the leaves for use in lozenges, tea, and, most popularly, wine (Ray & Ksir, 2004). Mariani wine was a Bordeaux that was combined with the coca leaf extract, and it came to be used by many, including inventor Thomas Edison, Civil War general and U.S. President Ulysses S. Grant, and Pope Leo XIII, who had a special Vatican medal issued in praise of coca wine (Gahlinger, 2001). In fact, Pope Leo carried Vin Mariani in a “personal hipflask to fortify himself in those moments when prayer was insufficient,” and Robert Louis Stephenson wrote the book *The Strange Case of Dr. Jekyll and Mr. Hyde* during a “six-day cocaine binge” (Valley, 2006).

Although coca contains 14 different drugs, cocaine is the most important in terms of its psychoactive effects (Weil & Rosen, 1998). What is called “cocaine” is actually cocaine hydrochloride, which is roughly 90% cocaine and 10% hydrochloric acid. The exact year that cocaine was isolated from coca is debated, but this had certainly occurred by 1860. In the 1880s, physicians—including Dr. W. S. Halstead, who later became known as “the father of modern surgery”—began experimenting with cocaine as an anesthetic. Cocaine was found to be especially useful for eye operations, which had previously been very difficult and excruciatingly painful (cocaine is still used today in ear, eye, nose, and throat operations) (Ray & Ksir, 2004; Weil & Rosen, 1998). In 1884, purified cocaine became commercially available in the United States, and in 1885, Parke-Davis marketed a coca cigarette (Gahlinger, 2001). Cocaine was used for many different recreational and medicinal purposes at this time, including as a topical ointment to numb the vagina and prevent masturbation in women (Alexander, 1990). At the end of the 19th century, pharmaceutical companies even sold “cocaine kits,” which contained everything needed to take the drug, including syringes (Gahlinger, 2001). In 1887, cocaine was declared the official remedy of the Hay Fever Association, with products such as Ryno’s Hay Fever and Catarrh Remedy (which was 99.9% cocaine) recommended for use “whenever the nose is stuffed up, red, and sore” (Davenport-Hines, 2001).

Coca-Cola was invented by a pharmacist in 1886 and contained significant amounts of cocaine until 1902. The exhibit here depicts a 1905 advertisement for Coca-Cola emphasizing that the drink “revived and sustained” those who consumed it. As an early ad for Coca-Cola proclaimed,



*R* Take one glass of Coca Cola  
 when weary with shopping  
 It imparts energy and vigor

The “INTELLECTUAL BEVERAGE” and “TEMPERANCE DRINK” contains the valuable TONIC and NERVE STIMULANT properties of the Coca plant and Cola (or Kola) nuts, and makes not only a delicious, exhilarating,

refreshing and invigorating Beverage but a valuable Brain Tonic, and a cure for all nervous afflictions—SICK HEADACHE, NEURALGIA, HYSTERIA, MELANCHOLY, &c. (cited in Ray & Ksir, 2004, p. 338)



Early 20th-century legislation resulted in the Coca-Cola Company removing coca from the Coca-Cola recipe, but the soft drink still contains a decocanized extract of coca leaves.

Among the prominent early users of cocaine were Queen Victoria of England, U.S. President William McKinley, and the psychologist Sigmund Freud, who injected the drug periodically over a three-year period in the 1880s to alleviate his depression and chronic fatigue (Brecher, 1972; Kunitz, 2001). Freud published an article titled "On Coca" in 1884, which promoted cocaine as a cure for morphine addiction and argued that while excessive consumption of the substance could lead to physical problems and "moral depravity," its benefits outweighed the risks associated with it (Walton, 2002). At least partially as a result of Freud's promotion of the substance, the Merck pharmaceutical company's production of cocaine increased from less than one kilogram in 1883 to over 80,000 kilograms in 1885 (Davenport-Hines,

2001). Freud later retracted his statements regarding the substance's utility as a medical treatment, but he continued to use small quantities of cocaine without developing an addiction to it (Alexander, 1990).

The effects of cocaine are both euphoric and stimulating. Users typically report feelings of excitement, alertness, well-being, and increased confidence; pulse rate and blood pressure increase; appetite is suppressed; and users often experience insomnia (Gahlinger, 2001). The intensity and duration of the effects depend somewhat on the method of ingestion. Snorted cocaine reaches the brain in one to three minutes, providing a high that lasts roughly half an hour. Conversely, the intravenous injection of cocaine produces an effect in 15 to 30 seconds, with the high peaking in three to five minutes and lasting 15 to 20 minutes. Smoking cocaine produces an effect in 10 seconds, with the high peaking in three to five minutes and lasting for approximately

The fact that cocaine became widely illegal in the late 19th and early 20th century may seem surprising given the vast number of commercial products that contained the drug (Ray & Ksir, 1993). However, the circumstances that had come to surround cocaine by the turn of the century included everything necessary to demonize the drug.

All the elements needed to insure cocaine's outlaw status were present by the first years of the twentieth century: it had become widely used as a pleasure drug, and doctors warned of the dangers attendant on indiscriminate sale and use; it had become identified with despised or poorly regarded groups—blacks, lower-class whites, and criminals; it had not been long enough established in the culture to insure its survival; and it had not, though used by them, become identified with the elite, thus losing what little chance it had of weathering the storm of criticism.

—Ashley (1972, cited in Ray & Ksir, 2004, p. 171)

15 minutes (Gahlinger, 2001). Powder cocaine cannot be smoked because the combustion destroys the drug, so in order to be smoked, cocaine hydrochloride must be modified, which was first done by making freebase cocaine and later crack cocaine. Crack is made by dissolving cocaine hydrochloride in water and adding baking soda to make a solution that is then boiled or put in a microwave and finally cooled, often in ice or a freezer. The result is a yellowish-white substance that looks like soap, and small chunks (often called “rocks”) are broken off and smoked, making “cracking” sounds when burned—hence the name “crack” (Gahlinger, 2001). Regardless of the method of ingestion, the high associated with cocaine is typically followed by a “dysphoric crash—a disagreeable feeling of fatigue, depression, and anxiety” and another dose of cocaine is often taken to remedy this (p. 253).

It is important to recognize that despite rhetoric and policy to the contrary, there is no evidence that the occasional use of small amounts of cocaine is a threat to the health of users (Ray & Ksir, 2004; Weil & Rosen,

1998). Conversely, both the extended and short-term heavy use of cocaine can produce effects such as hallucinations, paranoia, repetitive behaviors, and depression after use. In addition, because cocaine is a vasoconstrictor, meaning it shrinks blood vessels and slows bleeding, excessive use of the substance can cause physical damage to tissues by starving them of blood (Gahlinger, 2001). For example, heavy snorting of cocaine often gives people a “cocaine nose” in which there are ulcers and perhaps a perforated septum, and those who put it inside of the penis (done in the belief that it will enhance sexual performance) may have their penis tissue damaged, possibly necessitating amputation (Gahlinger, 2001).

The use of both powder and crack cocaine will increase the heartbeat and may cause irregular heart activity, but deaths due to cocaine use alone are relatively rare (Weil & Rosen, 1998). Unfortunately, the physical dangers associated with cocaine are increased many times over when it is used in combination with alcohol. A study published in the *Journal of the American*



*Medical Association* reported that in studies of both animals and humans, when cocaine was combined with alcohol a new drug, cocaethylene, was produced in the body. Cocaethylene produces a different, more euphoric high than cocaine, is likely more addictive than either cocaine or alcohol, and is many times more likely to cause sudden death than is the use of cocaine alone (Randall, 1992).

One of the common problems associated with cocaine use is addiction; however, it is important to note that physical dependence does not occur with cocaine. For example, a cocaine user who is deprived of the substance will not suffer physical withdrawal symptoms similar to those experienced by opiate or alcohol users (Schilit & Lisansky-Gomberg, 1991). Several studies have also shown that individuals can maintain patterns of moderate use of cocaine for several years without becoming psychologically dependent on the substance (Sullum, 2003a). On the other hand, there is clear evidence that, like other stimulants, the potential for psychological dependence on cocaine is high if the drug is used more than occasionally (Weil & Rosen, 1998). With the emergence of the crack “epidemic” in the United States in the mid-1980s, it was widely reported that crack cocaine was much more addictive than powder cocaine, and this served as one of the justifications for treating crack cocaine more severely than powder cocaine in drug legislation. But as Alexander (1990) and others have pointed out, there is no pharmacological difference in the addictive liability of crack and cocaine hydrochloride. The only distinction between crack and powder cocaine in terms of addiction arises due to its method of ingestion. Because smoking crack cocaine and injecting powder cocaine results in a more immediate high, and because the high is shorter in duration, encouraging more frequent use, both of

these methods of ingestion may be more psychologically addicting than snorting cocaine (Ray & Ksir, 2004). Thus, like most drugs, the repetitive use of cocaine may be quite harmful, but as noted by the World Health Organization’s Program on Substance Abuse, “most participating countries agree that occasional cocaine use does not typically lead to severe or even minor physical or social problems” (cited in Jelsma, 2003).

### *Amphetamines*

Very similar to cocaine are the amphetamines, a group of powerful stimulants that are synthesized from adrenaline and **ephedrine** (discussed below). As compared to cocaine, amphetamines are more toxic, more difficult to metabolize, and their effects last longer—but as a consequence of their longer duration of effect, users are less likely to dose repeatedly in a short period of time in order to maintain their high, as many do with cocaine (Weil & Rosen, 1998). The first amphetamine, Benzedrine (levoamphetamine), was synthesized in Germany in 1887. Other forms of amphetamines include Dexedrine (dexamphetamine), which is twice as strong as Benzedrine, and methamphetamine, developed by a Japanese chemist in 1919, which is twice as strong as Dexedrine (Davenport-Hines, 2001). The effects of the various amphetamines are very similar but may vary in intensity and duration. The variation is due to the differences in the potency of the amphetamine and also the typical method of ingestion (i.e., oral, smoking, injecting).

Following its discovery in 1887, Benzedrine remained relatively obscure until the 1930s when it was marketed in an over-the-counter nasal spray to treat asthma and low blood pressure. Soon after, amphetamines were used to treat narcolepsy—a condition which causes victims to suddenly fall asleep—and

also a behavioral syndrome called minimal brain dysfunction (MBD), what we would now call attention deficit hyperactivity disorder (ADHD) (Gahlinger, 2001).

Because the effects of amphetamines include the relief of mental fatigue, increased attention and endurance, appetite suppression, and potentially an increase in feelings of aggression, these drugs have been widely used in various war efforts (Gahlinger, 2001). During World War II, German, Japanese, and Allied troops were widely using amphetamines. American soldiers actually received amphetamines in their ration kits, and by the end of the war, the number of amphetamine tablets dispensed equated to one pill per soldier per day (B. Eisner, 1993; Gahlinger, 2001).

The use of amphetamines to treat various medical conditions soon led to the realization that they were strong appetite suppressants. Their application as a weight-control aid resulted in unprecedented levels of amphetamine use, to the point that in the United States during the 1950s, 50 doses of amphetamine were produced for every American man, woman, and child, with amphetamines accounting for 20% of all written prescriptions (Gahlinger, 2001). The 1960s and 1970s saw amphetamines further marketed for dieting and for the treatment of depression, and in 1971, 12 billion amphetamine tablets were legally produced in the United States (Gahlinger, 2001). Today, pharmaceutical companies continue to cater to the dieting and weight-control market, often with serious or disastrous consequences when the side effects of these substances are not clearly understood. For example, one of the most popular diet drugs ever, fen-phen (a combination of fenfluramine and phentermine), was used by millions of people in the 1990s. Although the drug was clearly effective at reducing weight, users typically gained the weight back very quickly once they stopped using

fen-phen. This prompted many to use the drug long term, potentially putting them at a greater risk for heart disease. A study conducted by researchers at the Mayo Clinic found the use of fen-phen to increase users' risk for pulmonary hypertension and valvular heart disease (Connolly, Cracy, McGoon, Hensrud, Edwards, & Schaff, 1997). Although subsequent studies debated whether fen-phen was medically harmful, American Home Products Corporation, the makers of fen-phen, later agreed to pay \$3.75 billion in compensation to the thousands of people who used the diet drugs before they were removed from the market in 1997 ("Fen-Phen Maker Agrees," 1999).

Similar concerns have been raised with other drug combinations marketed for weight control. One of these, Xen-phen, is seen by many as the replacement for fen-phen, and it involves taking both Xenical (the trade name for orlistat) and phentermine (the half of fen-phen still available). Within weeks of becoming available in 1999, 49,000 prescriptions were written for Xenical, which, along with phentermine, is extremely easy to obtain over the Internet (following an "e-consultation" with a physician). For example, as an article on this issue in *The New York Times* recently noted,

A company based in the British Channel Islands called Direct Response Marketing is selling Xenical over the Internet to just about anybody who electronically fills out a medical questionnaire that is reviewed by a company doctor who then "prescribes" the drug. (Canedy, 1999)

Further, and consistent with the "magic bullet" marketing strategy typical of these products, the Direct Response Marketing Web site proclaims about Xenical, "Most overweight people harbor a sneaking suspicion that somewhere there is a product that

will solve all their weight-loss problems. Well, now that product has arrived” (cited in Canedy, 1999).

Recently another prescription stimulant, modafinil (trade name Provigil), has become widely used for its amphetamine-like properties. Described on Provigil’s Web site as “the *first and only* wake-promoting agent,” the drug is also called a “memory-improving and mood-brightening psychostimulant” by *The Good Drug Guide*. As with certain amphetamines, modafinil is intended for the treatment of narcolepsy, but numerous reports indicate that it is primarily being used to abstain from sleep. For example, a 2004 article in *The New York Times* titled “Wakefulness Finds a Powerful Ally” claimed that modafinil “has quietly altered the lives of millions of people” as it “revs up” the central nervous system, supposedly without the jitteriness of caffeine or the addiction of amphetamines (O’Connor, 2004). But as with other stimulants, modafinil can have serious side effects, which according to the National Library of Medicine’s (2003) *Medline Plus* include nervousness; difficulty falling or staying asleep; dizziness; depression; chest pain; shortness of breath; and a fast, pounding, or irregular heart beat. Doctors justify their prescription of modafinil by claiming the side effects are uncommon, but they recognize that these could emerge with time and as the drug becomes increasingly widely used (O’Connor, 2004).

The sales of modafinil have increased substantially since the drug was placed on the market in 1998, increasing from \$207 million in 2002 to a projected \$409 million in 2004, with 90% of sales occurring in the United States (O’Connor, 2004). In part due to its expanding use, many have raised concerns about the use of modafinil to get ahead or accomplish tasks, particularly among young people. For example, as Dr. Farah at the Center for

Cognitive Neuroscience notes with respect to modafinil,

It would be a shame for a generation of young adults to come of age believing that the only way they can take on a challenging project is with some kind of pharmacological help. It is quite possible that modafinil will be the next Ritalin on campus, something that kids go off to college with. If it is used widely for ADHD, then it will probably end up being readily available to the undergraduate masses. (as quoted in O’Connor, 2004)

As noted in Chapter 1, the type of amphetamine currently generating the greatest concern in the United States is methamphetamine. Methamphetamine is the most potent and fast acting of the amphetamines, and because it is available in a powder form it is rarely taken orally (as Benzedrine and Dexedrine typically are), but rather snorted, smoked, or injected, which intensifies its effects (Faupel et al., 2004). Methamphetamine, in its various forms, is often called meth, crank, speed, ice, glass, crystal, and crystal meth, and the drug is commonly diluted or “cut” with substances such as baking soda, lactose, ether, insecticides, photo developer, and strychnine (Gahlinger, 2001). As with other amphetamines, both the rush and the high associated with methamphetamine results from the release of dopamine into the areas of the brain that regulate pleasure, and as compared to cocaine, it is metabolized quite slowly, resulting in a larger amount of the drug remaining unchanged in the user’s body (Pennell et al., 1999).

The use of methamphetamine results in increased energy, alertness, and stamina, as well as decreased appetite and sleeplessness (ONDCP, 2003a). Although these effects are similar to all amphetamines, the effects of methamphetamine are typically more intense due to the greater

potency of methamphetamine and because methamphetamine is typically snorted, smoked, or injected rather than taken orally in pill form. The side effects are often worse as well because methamphetamine causes the user to expend a great deal of energy over an extended period of time. Frequent and high-dose users of the substance display increased nervousness, paranoia, irritability, confusion, insomnia, schizophrenia-like symptoms, and possibly hallucinations or delusional symptoms including scratching

at the “crank bugs” methamphetamine abusers sometimes believe are crawling under their skin (this tactile hallucination is referred to as “formication”) (Liska, 2000; ONDCP, 2003a). Some of the most erratic and violent behaviors resulting from methamphetamine use may result when users binge or “run” on methamphetamine, using it heavily and repeatedly over a period of days, typically foregoing sleep during this time, which further compounds the problem (Swetlow, 2003).

**In 2005, an open letter to the media regarding methamphetamine was drafted by medical doctor David C. Lewis and signed by nearly 100 other medical doctors and health professionals. The letter requested that the media coverage of methamphetamine avoid making sensationalistic and scientifically baseless claims and instead base their reports about methamphetamine “on science, not presumption or prejudice.” The letter criticized the use of the scientifically baseless term “meth-addicted baby,” noting that, “By definition, babies cannot be ‘addicted to methamphetamines’” and criticized the common media portrayal of methamphetamine as being especially difficult to treat when scientific data have not found this (Lewis, 2005).**

Although the amphetamines, and especially methamphetamine, have attracted a great deal of negative attention recently, it is important to recognize that several legal herbal products and cold remedies, sold widely in health food and grocery stores, act in a similar fashion to the amphetamines. For example, many herbal products contain ephedrine, which along with adrenaline was used to create the amphetamines. Accordingly, if herbal products containing ephedrine are taken in sufficient quantities, they will generate effects similar to amphetamines (Gahlinger, 2001).

Ephedrine is naturally found in several species of the ephedra plant, which is a leafless bush somewhat similar to a pine tree that grows in arid regions throughout the world (Weil & Rosen, 1998). As noted at the beginning of this chapter, ephedra

was one of the first psychoactive substances used by humans. The Chinese have used the ephedra plant in traditional medicines (e.g., Ma Huang) for the treatment of asthma and other respiratory problems for thousands of years (Gahlinger, 2001). Ephedra was similarly used for its stimulant properties by American Indians of the southwest, and it is also sometimes called “Mormon tea” because the Mormons began using it as a substitute for coffee and tea, which were prohibited by their religion (Weil & Rosen, 1998). Ephedrine was isolated from the ephedra plant in 1892 by Chinese and Japanese scientists, and by the 1920s, the pharmaceutical company Eli Lilly was mass-producing it for the treatment of asthma (Gahlinger, 2001). Soon after this, a synthetic version of ephedrine, pseudoephedrine, was developed, which

remains a common ingredient in many cough and cold medications. The similarity of these substances to amphetamines is further illustrated by the fact that methamphetamine can be synthesized from ephedrine or pseudoephedrine with common household products (e.g., drain cleaner and table salt). This has prompted many grocery stores and pharmacies to place over-the-counter cold products containing pseudoephedrine, such as Sudafed and Claritin-D, behind the pharmacy counter, requiring buyers to show identification and sign a log book when purchasing them (D. Barry, 2004; see also Chapter 7). Several states have also proposed or passed legislation requiring a prescription for cold medicines containing pseudoephedrine (Mapes, 2005).

### **Ritalin**

Methylphenidate, more commonly known by its trade name Ritalin, is a chemical relative of the amphetamines used

predominately in the treatment of attention deficit hyperactivity disorder (ADHD) or attention deficit disorder (ADD) (Gahlinger, 2001). ADHD and ADD diagnoses typically involve children who have difficulty learning despite average or even above-average IQ scores (Ray & Ksir, 2004). The utility of amphetamines for treating these conditions was discovered accidentally when a doctor in Rhode Island administered Benzedrine to children who had undergone spinal taps, in an effort to reduce the headaches commonly experienced after this procedure. While the substance was not effective in reducing the children's headaches, it did result in an increase in their activity level and also improved their academic performance, so amphetamines then came to be used for this purpose (Diller, 1998). It was during the 1950s that the Swiss pharmaceutical company Ciba began selling Ritalin to treat these conditions, and the FDA approved the drug for sale in the United States in 1961 (Davenport-Hines, 2001; Diller, 1998).

Ritalin is often called "Vitamin R" or "R-Ball" on the street, and it is common for users to crush and snort Ritalin pills in order to obtain a "speed-like" high (Zernicke & Petersen, 2001).

Despite the fact that Ritalin is often regarded as "different" from other stimulants, likely because it is a widely prescribed "medical" drug, it is important to stress that there is little difference between Ritalin, cocaine, and methamphetamine if one considers the effects of the substance rather than the motivation for taking it. For example, the *Journal of the American Medical Association* noted in 2001 that Ritalin "acts much like cocaine" (Vastag, 2001), and others have noted that the effects of Ritalin when abused "are similar to those produced by methamphetamine"

(Gahlinger, 2001, p. 209). This should come as no surprise as Ritalin and other drugs prescribed for the treatment of ADHD, such as Adderall and Dexedrine, all operate on the same neurotransmitters as cocaine and are classified, along with cocaine, as **Schedule II controlled substances** under U.S. law. As with cocaine, Ritalin can have serious side effects, particularly when misused. Negative side effects of Ritalin include a racing heart, nausea, headaches, and insomnia, and prolonged or heavy abuse may result in a state of "paranoid psychosis identical to

that of chronic methamphetamine abuse” (Gahlinger, 2001, p. 209).

The problems associated with Ritalin use and abuse are of particular concern because the DEA (2000) estimates that 11 million prescriptions are written for this drug every year, and more adolescents have used the substance illegally than are taking it as a result of a doctor’s prescription (Diller, 1998). In part because it is so widely prescribed, illicit access to the drug (especially among students) is very high. This is true in Canada as well as the United States. Data from a survey of college students in the Atlantic provinces of Canada found 14.7% reported having given, and 7.3% reported having sold, some of their prescribed stimulants to other students (Poulin, 2001), and a study conducted by researchers at the University of Wisconsin found that one-fifth of college students had consumed Ritalin without a prescription at least once, with many of them apparently taking the substance to allow them to study without sleeping (Almer, 2002). The increasing abuse of Ritalin is further reflected in emergency department data collected by the Drug Abuse Warning Network. For example, in 1990, there were only 40 admissions to hospital emergency rooms for Ritalin in the 10- to 14-year-old age category, but in 1995, there were 400 cases for the same age group. While this number may seem small on the surface, when considered in the context of the number of young people using the substance, it is identical to the number of 10- to 14-year-olds admitted to emergency rooms for cocaine in the same year (Diller, 1998).

### *Ecstasy*

The drug commonly known as ecstasy (3-4 methylenedioxymethamphetamine or MDMA) was invented by German psychiatrists in 1912 in the mistaken belief that it

might be an effective appetite suppressant (Gahlinger, 2001). In the early 1950s, ecstasy was also tested and rejected as a possible “truth drug” by the U.S. Army Office of Strategic Services (which later became the CIA). Later (and currently on a limited basis), ecstasy was used by psychiatrists and other doctors in order to facilitate psychotherapy (Davenport-Hines, 2001). An early advocate of the healing properties of the drug, Dr. George Greer, noted that ecstasy “enabled people to communicate ideas, beliefs, opinions, and memories that may have long been repressed in them” (cited in Gahlinger, 2001, p. 340). At a scientific conference in 1983, Ralph Metzner, Dean of the California Institute of Integral Studies, proposed the name “empathogen” for MDMA, reflecting the ability of the drug to stimulate empathy and feelings of closeness, but by then it had come to be known as ADAM (rearranging the letters of MDMA) on the street (Gahlinger, 2001). The boom in the use and sale of the drug reportedly occurred when it was dubbed “ecstasy” in the apparently accurate belief that this would sell better than calling the drug “empathy” (B. Eisner, 1993).

The effects of ecstasy are distinct from those produced by other stimulants, and some have referred to the drug as a “hallucinogenic amphetamine” (Valentine, 2002). This is because ecstasy has effects that are similar to both mescaline and amphetamines (the “MA” in MDMA stands for methamphetamine), although it does not have as strong a stimulatory effect as other amphetamines (Valentine, 2002). Partly because of this strange combination of effects, a clear grouping of this drug into one category or another is difficult, which is illustrated by the fact that in laboratory studies, animals trained to recognize amphetamines recognized ecstasy, but animals trained to recognize hallucinogens also

recognized ecstasy (Gahlinger, 2001). The reason for the distinct effects of ecstasy is that like all amphetamines, its use increases levels of serotonin, dopamine, and adrenaline in the brain, but as compared to other amphetamines, ecstasy results in a much greater release of serotonin (which causes perceptual and mood effects) (Gahlinger, 2001).

As in therapeutic trials of the drug, recreational users of ecstasy report feeling much more empathy and closeness to others, as well as feelings of compassion, openness, and caring while on the drug (Valentine, 2002). Ecstasy also induces heightened mood, increased self-confidence, extroversion, and emotional excitability (Valentine, 2002). Heightened physical sensations, especially tactile, are also typically associated with the use of ecstasy, and because of this, ecstasy is sometimes regarded as an aphrodisiac or sexual aid. While it is true that many people report feeling sexually aroused and close to others while on the drug, ecstasy may also interfere with the ability of males to achieve an erection, and it may cause both men and women to have difficulty reaching orgasm (Weil & Rosen, 1998).

Currently, many in the mental health community remain convinced that MDMA is an invaluable therapeutic resource and struggle to have its experimental use permitted for medical research purposes. Some have proposed that MDMA be considered the prototype for a new group of drugs referred to as **enactogens**, which are substances thought to have the ability to help mental patients to access painful and heavily guarded emotions (Valentine, 2002). MDMA has also been found to be useful in treating depression, addiction, anxiety, eating disorders, and other mental problems, but research on these connections has been limited due to MDMA's status as a **Schedule I controlled substance**. In spite of

this, Harvard Medical School psychiatrist John Halpern is currently planning a trial test of whether MDMA can relieve anxiety and pain in end-stage cancer patients (Adam, 2005), and the FDA recently approved a study on the effects of MDMA as a treatment for post-traumatic stress disorder (Valentine, 2002). Other research on the treatment efficacy of MDMA is also being conducted abroad.

Along with the potentially beneficial therapeutic effects and the desired recreational effects of ecstasy, the drug may also have a number of negative consequences. According to the Office of National Drug Control Policy (ONDCP) "Fact Sheet" on ecstasy, the psychological effects associated with use of the substance include confusion, depression, anxiety, sleeplessness, and paranoia (2002b). Among the physical effects are muscle tension, involuntary teeth clenching, nausea, blurred vision, feeling faint, tremors, rapid eye movement, sweating, and dehydration, particularly when combined with intense exertion, such as at dance raves (Weil & Rosen, 1998). The negative side effects of ecstasy can be exacerbated when alcohol and other drugs are used in combination with it, and many of these symptoms may occur due to withdrawal from ecstasy. For example, because tolerance to ecstasy develops quickly, the drug is often used in increasing quantities to get the same "high," and some users refer to the withdrawal effects they experience after a weekend ecstasy binge as the "Terrible Tuesdays" (Gahlinger, 2001). Many of the problems associated with ecstasy result from the fact that pills sold as ecstasy are often contaminated with other drugs including ephedrine, amphetamine, methamphetamine, dextromethorphan, ketamine, PCP, and analogous synthetics such as MDA, MDEA, and 2C-B, many of which are more dangerous than pure ecstasy (Valentine, 2002).

## DEPRESSANTS

Depressants are substances that reduce the energy level of the nervous system, dampen sensitivity to external stimulation, and, in high enough doses, induce sleep. These drugs are also called sedative-hypnotics because they sedate users at low doses and can induce sleep (i.e., hypnotize) at high doses. Although it is not commonly known, depressants are more dangerous than stimulants due to the fact that the use of such drugs can kill people by interfering with vital centers in the brain (Weil & Rosen, 1998). Many depressants, including alcohol, are also characterized by severe physical withdrawal symptoms, and, unlike other forms of drugs—including narcotics such as heroin—there is a real possibility of death due to withdrawal when quitting depressants after a period of long and extensive use (Weil & Rosen, 1998).

### *Alcohol*

Alcohol is an intoxicant that is more widely used than any other, at least partially due to the fact that all types of plant species, from cereal grains to fruits and others, can be turned into alcohol (Walton, 2002). Mead may date back as far as 8000 B.C., beer and berry wine were used by Neolithic man as far back as 6400 B.C., and grape wine dates to 300 to 400 B.C. (Ray & Ksir, 2004). Distillation is necessary to produce beverages with alcohol concentrations above 12% to 15% because when the concentration reaches this point, it kills the yeasts that act to produce alcohol; distillation probably originated in the Arabic world around 800 A.D. (Gahlinger, 2001). Distilled spirits came to medieval Europe around 1250 A.D. and arrived in America with the colonial explorers. Europeans and early American settlers used alcohol in a wide variety of ways; it served as “a social beverage, a before-meals aperitif, a

thirst-quenching beverage, during meals, an after dinner drink, an evening drink, a nightcap, a tranquilizer, a sedative, a religious offering, a deliriant, and as a means of getting drunk” (Brecher, 1972). Alcohol was widely consumed historically, in part because it kills bacteria, so alcoholic beverages were safer to drink during times when a large portion of all deaths were due to infectious disease. Many early Europeans and Americans even viewed alcoholic beverages as especially healthy and beneficial to the user (Ray & Ksir, 2004). For example, the early Puritans viewed alcohol as “the Good Creature of God” despite their strict and austere ways of living (Ray & Ksir, 2004, p. 272).

Attitudes towards alcohol, especially in the United States, can best be described as ambivalent, if not schizophrenic. Sullum (2003a) recounts how this ambivalence is reflected in a passage from the Hebrew Bible:

Seeing Noah plant his vineyard, Satan offers to help. He slaughters a lamb, a lion, a pig, and an ape, pouring their blood into the soil. “This signifies,” says the legend, “that before a man drinks wine he is simple like a lamb, who doesn’t know anything. . . . When a man drinks as is customary, he is bold like a lion, saying there is no one like him in the world; when a man drinks too much, he becomes like a swine, peeing on himself; and when he is drunk, he becomes like a monkey, standing and dancing and acting foolishly, and says inappropriate things in front of everyone, for he does not know what he is doing.” (p. 61)

As is reflected in this passage, most people are aware of the fact that individuals react to alcohol consumption in different ways. Individual reactions to alcohol vary depending on the amount consumed, the individual’s personality, the mood of the user at the time of consumption, and the social setting in which one consumes alcohol.



The effects of alcohol are also influenced by individuals' expectations, as several experimental studies have demonstrated. For example, Lang, Goeckner, Adesso, and Marlatt (1975, cited in Bushman & Cooper, 1990) found that in an experimental situation, subjects were more likely to administer electric shocks when they *believed* they had consumed alcohol, regardless of whether they really had or not. Other research on the effects of alcohol, expectations, and behavior includes that by

Hull and Bond (1986), which noted that alcohol expectancies, rather than consumption per se, had the greatest impact on involvement in socially deviant behaviors. Thus, it is important to recognize that the behavioral effects of alcohol (and many other drugs) are, in part, due to their ability to lower social inhibitions and allow individuals to "cut loose" or misbehave with the knowledge that, if necessary, they can always excuse this behavior later as a result of their drinking.

**Debate surrounds the production and marketing of flavored malt beverages, as many feel these products target underage drinkers. One of these beverages is "Tilt," a raspberry-flavored malt beverage that is spiked with energy drink ingredients such as caffeine, guarana, and ginseng and as much as 6.6% alcohol. Anheuser Busch claims that the 16-ounce beverage will help workers make the transition from a day at work to their night-time social activity, giving the user a "boost" before a night on the town ("Anheuser Busch Blends," 2005).**

Because alcohol is a widely used psychoactive drug with a relatively high level of toxicity, the number of deaths due to alcohol are roughly 25 times the number attributed to all illegal drugs combined (Gahlinger, 2001). Deaths resulting from alcohol consumption occur in a variety of ways. As with other depressants, alcohol can kill by overdose because it depresses the respiratory function of the brain. Thus, if intoxication is severe enough, this can "shut down" respiration, causing death (this is more likely to occur when alcohol is combined with other depressants, such as sleeping pills). Alcohol can also cause death via overdose when individuals regurgitate but are so sedated that they don't awake, and thus asphyxiate on their own vomit. Indirectly, alcohol is related to tens of thousands of deaths resulting from accidents; it is also a contributor to a significant number of traffic deaths in the United States

(National Highway Traffic and Safety Administration [NHTSA], 2002), and it is involved in a large portion of all assaults, homicides, and suicides.

Although the short-term consequences of alcohol use are substantial, it is the long-term effects of alcohol that are most damaging. The prolonged use of alcohol can cause considerable physical damage, including cirrhosis of the liver, heart disease, cancer, and brain damage, particularly at high levels of consumption. Cirrhosis is an irreversible disease associated with alcohol abuse that involves normal liver cells being replaced by useless tissue and is one of the leading causes of death in the United States, particularly among men between the age of 25 and 65 (Ray & Ksir, 2004). Although limited alcohol consumption can be good for cardiovascular health (discussed below), alcohol abuse can damage the heart muscle itself (cardiomyopathy) as well as cause cardiovascular

disease (Ray & Ksir, 2004). Additionally, because alcohol exerts effects on the brain and peripheral nervous system, individuals who are dependent on the substance develop the shakes, amnesia, and even problems with intellectual functioning (Weil & Rosen, 1998). As with the physical withdrawal, negative mental effects may be especially pronounced when one stops consuming alcohol

after long-term heavy use. For example, upon quitting, alcoholics may develop *delirium tremens*, which involve hallucinations, delusions, disorientation, and severe shaking. The pronounced physical dependence associated with alcoholism is further illustrated by the fact that withdrawal from such a state is medically difficult and in severe cases can result in death (Ray & Ksir, 2004).

#### AWOL—ALCOHOL WITHOUT LIQUID

Recently, a new product has emerged for the consumption of alcohol. AWOL, which stands for Alcohol Without Liquid, is a machine similar to an asthma inhaler that vaporizes hard alcohol and allows people to inhale the resulting alcohol mist. When mixed with oxygen, this provides a "euphoric high," and the AWOL Web site claims the product "reduces the effects of a hangover and is low carbohydrate" ("Alcohol Machine," 2005).

Another major public health problem associated with alcohol abuse is **fetal alcohol syndrome (FAS)**, a condition in which some babies born to alcoholic mothers display neurological problems, low birth weight, mental retardation, and facial malformations (Carroll, 2003). Although he was unable to identify the physiological mechanisms that produce FAS, George Howard (1918) was one of the first to mention this condition, noting "the child of the female drunkard is not born with a direct alcoholic tendency, but is probably born with ill-nourished tissues, and especially with a badly developed brain and nervous system" (p. 75).

Prior to the formal discovery of FAS in the 1970s, some doctors assumed that alcohol was such a harmless substance that it was administered intravenously to women who were thought to be at risk of losing their pregnancies (Carroll, 2003). However, since 1989, all beer, wine, and liquor products sold in the United States must have Surgeon General's warnings advising that

"women should not drink alcoholic beverages during pregnancy because of the risk of birth defects."

It is important to recognize that it is by no means inevitable that women who drink alcohol when pregnant will give birth to babies with FAS. As the former director of the National Institute on Alcoholism and Alcohol Abuse, Morris Chafetz, notes, "Recent studies reaffirm the finding that fetal alcohol syndrome is a danger only to women who are chronic excessive drinkers" (as quoted in Sullum, 2003a, p. 90). In most cases, even when their mothers drink heavily during pregnancy, children do not develop FAS (Carroll, 2003): Only 23 to 29 out of 1000 births to women who are "problem drinkers" result in FAS babies (Ray & Ksir, 2004). There is also very little scientific evidence to suggest that the light consumption of alcohol during pregnancy will cause harm to the fetus (Ray & Ksir, 2004).

The myriad health problems associated with alcohol illustrate the fact that if our

current substance policies are intended to minimize public harm, then perhaps they are directed at the wrong drugs. In fact, as H. L. Ross (1992) suggests, “were alcohol to be introduced as a new drug, it would very likely fail to be approved by the FDA on the grounds that its side effects are too damaging to warrant its benefits” (p. 80). However, while it is true that serious health problems are associated with the heavy use of alcohol, as with all drugs there are also health benefits associated with alcohol consumption. For example, a study of Vancouver, Washington and Portland, Oregon area residents conducted by the Kaiser Permanente Health Care company found that 25% of the 3,803 people surveyed were abstainers from alcohol, but these individuals had both worse health and worse health habits than light to moderate drinkers (cited in Olsen, 2001). Research has also shown that moderate daily consumption of alcohol may prevent Alzheimer’s disease and other forms of dementia (E. Ross, 2002). The authors of this study suggested that the blood-thinning and cholesterol-lowering properties of the ethanol contained in alcohol may reduce the probability of dementia, which is frequently caused by blood vessel problems. It is also possible that low levels of alcohol in the bloodstream stimulate the release of acetylcholine, which is believed to facilitate learning and memory (E. Ross, 2002).

As mentioned above, perhaps the most well-known health benefit of light to moderate alcohol consumption is its role in the prevention of heart attacks. Red wine was the first alcoholic beverage identified as having positive health benefits when, in 1979, researchers reported that the higher a country’s average per capita wine consumption, the lower its rate of coronary heart disease (Zuger, 2002). France was at one end of the spectrum with very low rates of heart disease, while Finland, Scotland, and the United States, countries where far less wine

is consumed, had rates of heart disease almost four times higher. It has been suggested that the pattern of drinking, rather than the type of alcohol consumed, is the primary reason for the relationship between wine consumption and protection from heart disease. This is because most wine consumers drink in small amounts, several days per week, rather than in larger amounts on only one or two days per week (National Institute on Alcohol Abuse and Alcoholism, 2000b).

### *Barbiturates*

Sometimes called downers, tranquilizers, sedatives, or sleeping pills, barbiturates have been used for over 100 years. All barbiturates are based on barbituric acid, first discovered in 1864, with the first barbiturate sleeping pill, barbital, appearing in 1903 (Weil & Rosen, 1998). Since that time, over 2,500 different types of barbiturates have been synthesized, but even during their heyday in the 1950s only about 50 were marketed for human use, and today this figure is only about a dozen (Gahlinger, 2001).

Barbiturates are loosely grouped into either the “long-acting” or “slow-acting” category. Long-acting barbiturates such as Phenobarbital are slowly metabolized and eliminated by the kidneys, producing effects that last 12 to 24 hours (Weil & Rosen, 1998). These barbiturates are used as daytime sedatives and for the treatment of anxiety disorders or seizures. Because their psychoactive effects are more diffuse than the fast-acting variety, long-acting barbiturates are rarely abused. Conversely, fast-acting barbiturates produce effects that are very similar to alcohol. Lasting six to seven hours, barbiturates such as amobarbital (Amytal) and secobarbital (Seconal) produce pleasant, euphoric feelings at low to moderate doses and, at high doses, produce a heavy, drunken stupor (Weil & Rosen, 1998).

As the famous writer William Burroughs described the "drunkenness" associated with barbiturate use in a letter to the *British Journal of Addiction* in 1956 and later in his book *The Naked Lunch* (1959),

The barbiturate addict presents a shocking spectacle. He cannot coordinate, he staggers, falls off bar stools, goes to sleep in the middle of a sentence, drops food out of his mouth. He is confused, quarrelsome, and stupid. Barbiturate users are looked down upon in addict society: "Goofball bums. They got no class to them." The next step down is coal gas and milk or sniffing ammonia in a bucket. (p. 123)

The effects of barbiturates are similar to alcohol because, like alcohol, barbiturates depress the brain by interfering with oxygen consumption and producing a reduction in central nervous system activity, leading to drowsiness and a lack of muscular coordination (Schilit & Lisansky-Gomberg, 1991). Also like alcohol, the use of barbiturates results in hangovers, and when taken in excess, barbiturates can kill the user by severely depressing the respiratory center of the brain (Weil & Rosen, 1998). In fact, the potential lethality of barbiturates is perhaps what they are best known for (many celebrities have died from barbiturate overdose, including Marilyn Monroe and Elvis Presley) because by far, barbiturates represent the greatest threat of death by overdose of any class of drugs (Gahlinger, 2001). This is because barbiturates have a very narrow **therapeutic ratio**, meaning that the amount of the drug needed get a desired or therapeutic effect is close to the amount that is dangerous or even lethal to the user (Ray & Ksir, 2004). This is compounded by the fact that when barbiturates are combined with alcohol or another depressant such as Valium, the effects are additive—meaning that if one simultaneously drinks an amount that he or she is used to (and has no problems with) and also takes a dose of barbiturates that would be fine on its own, together this combination can kill the person (Weil & Rosen, 1998).

Although effective as sleeping aids and sedatives, barbiturates have a very high potential for overdose, which has caused them to be replaced, both therapeutically and recreationally, by other depressants. Initially, non-barbiturate downers such as methaqualone, known better by its trade-name Quaalude, filled this role, as the effects of these drugs are very similar to barbiturates but the drugs were thought to be less likely to result in abuse and overdose (Weil & Rosen, 1998). Unfortunately, methaqualone turned out to be very similar to the barbiturates in terms of abuse and overdose potential, and all medical use of the drug was banned in 1984. Although some non-barbiturate depressants are still used medically and recreationally, another class of depressants, the benzodiazepines, are now the most widely used recreational downers and are some of the most widely medically prescribed drugs in the world.

### ***Benzodiazepines***

Like the barbiturates, the benzodiazepines are commonly referred to as sedatives, tranquilizers, or downers. The first benzodiazepines were developed in the 1950s to offer a safer alternative to the barbiturates. These drugs *are* much safer than barbiturates because their wider therapeutic ratio makes death by overdose much less likely (Ray & Ksir, 2004). The first

benzodiazepine was chloradiazepoxide, patented by the Hoffman-LaRoche pharmaceutical company in 1957 and given the trade name Librium, perhaps with the thought that it could “liberate one from anxieties” (Ray & Ksir, 2004). Librium was the top-selling pharmaceutical drug for several years when, in the early 1960s, Hoffman-LaRoche identified and marketed a new benzodiazepine, Valium (diazepam). Five times stronger than Librium, Valium quickly became the best-selling psychoactive pharmaceutical drug ever. The use of Valium in the U.S. is reflected in domestic sales of the drug that increased from \$27 million in 1963 to \$200 million in 1970 (Davenport-Hines, 2001). From 1972 until 1978, Valium dominated the psychoactive pharmaceutical market, leading sales for all medical drugs in those years.

At least part of the reason the benzodiazepines became so widely used was that pharmaceutical companies aggressively marketed these products as cures for the stresses associated with everyday life. For example, advertisements in medical journals for Librium stressed that the drug would assist college girls whose “newly stimulated intellectual curiosity may make her more sensitive to and apprehensive about national and world conditions” (cited in Weil & Rosen, 1998, p. 76). Other advertisements encouraged the use of tranquilizers by mothers and housewives, from the “woman who cannot get along with her new daughter-in-law” to the “newcomer in town who can’t make friends” (as quoted in Weil & Rosen, 1998, p. 76). Valium was even referred to as “Mother’s Little Helper” by the Rolling Stones in their song of the same name on their 1966 album *Aftermath*.

The most widely used tranquilizer in the present day is Xanax (alprazolam), a drug for which approximately 80 million prescriptions are written annually (Kotaluk, 2002). Xanax, and similar drugs such as Halcion (triazolam), Ativan (lorazepam),

and Restoril (tempazepam) work by triggering the release of dopamine in the brain (drugs with names ending in “am” indicate they are benzodiazepines). Initially developed and marketed as a less addicting substitute for Valium, research now indicates that Xanax and similar drugs may have an even stronger addiction potential, and along with Valium and certain narcotic-based painkillers, Xanax is one of the most widely prescribed and abused pharmaceutical drugs (Wartell & La Vigne, 2004).

Another widely used benzodiazepine is flunitrazepam, better known by the trade name Rohypnol. Made by Hoffman-La Roche, Rohypnol (also called “roofies”) is not approved for medical use in the United States, but it is marketed (and even sold over the counter) in many countries in Europe and Central and South America for the treatment of anxiety, sleep disorders, and alcohol withdrawal (Gahlinger, 2001). Rohypnol, which is roughly 10 times stronger than Valium, has also been called a “rape drug.” This is because, especially when combined with alcohol, Rohypnol can cause paralysis, extreme sedation, unconsciousness, and anterograde amnesia, meaning that “users” may not recall what happened in the hours following the ingestion of the drug. Although it may be used in order to facilitate rape, some also use Rohypnol recreationally (particularly in the club or “rave” scene) because it can produce a drunken state and heavy sedation cheaply and without the hangover of alcohol. However, Rohypnol can also cause visual disturbances, dizziness, confusion, and difficulty urinating, and when taken at high doses, especially when combined with alcohol or other depressants, the use of Rohypnol may result in coma and death (Gahlinger, 2001).

It is important to note that all benzodiazepines (including those that are medically prescribed) are addictive. Although drugs such as Valium and Xanax may be medically useful as short-term tranquilizers,

when people use them for weeks or months at a time they are likely to generate anxiety, depression, and insomnia and to make the user dependent on the drug (Weil & Rosen, 1998). Benzodiazepine withdrawal is similar to the withdrawal associated with alcohol, and individuals who suddenly stop using these drugs after a period of use are likely to experience shakiness, a loss of appetite, muscle cramps, memory and concentration problems, insomnia, agitation, and anxiety (Ray & Ksir, 2004).

### **GHB**

Another depressant of recent note is gamma-hydroxybutyric acid, commonly known as GHB. First synthesized in 1960 by a French researcher seeking a better anesthetic, GHB was sold by U.S. health food stores, gyms, and through the mail and Internet as a “natural” sleep aid and as a

nutritional supplement (Gahlinger, 2001). Bodybuilders began to use GHB in the 1980s in the belief that it would facilitate muscle growth and reduce body fat, a claim that has never been supported by research. The drug grew in popularity in the early 1990s (soon after being banned by the FDA in 1990) when “clubbers” or “ravers” began to use it recreationally because of its euphoric effects. The drug is generally dissolved in water where it is odorless, colorless, and looks just like water (it is also called “salty water,” as well as “liquid ecstasy”). Like Rohypnol, GHB can be used as a rape drug because in addition to causing euphoria and reduced inhibitions, at high doses the drug can cause heavy sedation and sometimes sleep. As with alcohol and methaqualone (drugs with similar effects), an overdose of GHB, especially if combined with alcohol or other drugs, can depress the respiration to the point that coma or death results (Gahlinger, 2001).

**In one of the first criminal trials involving GHB, four Detroit men were charged with manslaughter after spiking 15-year-old Samantha Reid's soft drink with GHB in January of 1999. Reid went into a coma and died the next day, and three of the men were subsequently convicted of manslaughter, with the fourth convicted of being an accessory to manslaughter and other charges ("Four Guilty," 2000).**

Complications arise in the regulation of GHB because, like many other drugs including methamphetamine, it is easily produced from legal and widely available products. Although GHB is illegal in the United States, related drugs such as GBL (gamma-butyrolactone) and BD (1,4-butanediol), although prohibited for illicit use, are not illegal per se due to their wide use as industrial solvents and in products such as nail polish remover (Gahlinger, 2001). For example, GBL, which users claim is even more potent and longer lasting than GHB, is available through the Internet, with sites

noting that although their solvent products “contain GBL” (as if this were vital information for industrial purchasers), the product is for “external use only.”

### **Inhalants**

Inhalants are a broad class of drugs that are grouped together due to their method of ingestion: They include a wide variety of household products that induce psychoactive effects when inhaled. The effects of many inhalants are similar to alcohol and include disorientation and the impairment

of judgment and coordination (Weil & Rosen, 1998), but because the inhalants involve so many different chemicals with many distinct effects, they do not fit neatly into any drug category. However, these substances perhaps best illustrate the point that people will consume virtually any substance that acts to alter their consciousness.

The inhalants can be grouped into four general categories of products. The first category is the *volatile solvents*. These are liquids that vaporize at room temperature and include paint thinners and removers, dry-cleaning fluids, gasoline, glues, and felt-tip markers. A second form of inhalants are the *aerosols*, which are sprays that contain propellants and solvents and include products such as spray paint, deodorant and hair sprays, vegetable oils used for cooking, and fabric protector sprays. It is more difficult to use aerosols than other forms of inhalants because the aerosol propellants come out of the can mixed with other substances, which must often be separated from the gas (e.g., by spraying into a balloon) before the propellant can be inhaled (Weil & Rosen, 1998). A third category of inhalants is the *gases*, which are found in many household products including butane lighters, propane tanks, whipped cream dispensers, and refrigerants. Finally, the *nitrites* are a group of inhalants that have effects somewhat similar to anesthetics and are primarily used as sexual enhancers (National Institute on Drug Abuse, 2000). Although amyl nitrite (also called Amy, Poppers) is only available via prescription (as a heart medicine), butyl nitrite and isobutyl nitrite produce the same effects and are legally available in “herbal high” stores or head shops. Although butyl nitrite and isobutyl nitrite are typically sold as “liquid incense” or something similar, those who buy these products generally do so for their psychoactive effects (Weil & Rosen, 1998).

Because of their wide availability as solvents, fuels, and the like, these products have been used for their psychoactive effects since at least the 1800s, and “scares” about their use have periodically erupted. One of the first inhalants to be widely used was ether, which was also the first anesthetic to be used in surgical procedures. Prior to the use of ether as an anesthetic, surgery was a horrible and painful process in which “patients had to be tied down, and their screams could be heard far from the operating rooms” (Weil & Rosen, 1998, pp. 78–79). Once its role in surgery and medicine became well-known, the recreational use of ether spread to the general public. Ether parties were common throughout the 1800s, with people gathering for the purpose of sniffing ether fumes and becoming intoxicated, and many users who abstained from alcohol chose to use ether as an alternative drug (Walton, 2002; Weil & Rosen, 1998).

Another inhalant of note is nitrous oxide or “laughing gas.” Because nitrous oxide is much weaker than ether and cannot produce unconsciousness, nitrous oxide is not useful as major anesthetic but is still used to relax patients during dental work or minor surgery (Weil & Rosen, 1998). Discovered in 1776 by Joseph Priestly (who also discovered oxygen), the effects of nitrous oxide come on almost immediately when inhaled and disappear almost immediately when the use is stopped (Weil & Rosen, 1998). Nitrous oxide has been claimed to lead to “revelations,” and among those who used this substance were the poets Coleridge and Southey, Roget of *Roget's Thesaurus*, and Dr. Oliver Wendell Holmes of the Harvard Medical School (Brecher, 1972). Other effects of nitrous oxide include silliness and laughing, which is why it is called “laughing gas.” Historically, traveling medicine shows and carnivals allowed members of the public to pay a small fee

to consume a minute's worth of nitrous oxide, after which the crowds were often said to erupt in uncontrollable laughter that quickly and awkwardly stopped once the effect of the drug wore off (Weil & Rosen, 1998).

In more recent times, it has been estimated that more than 1,000 common household products are inhaled for their psychoactive effects (Fackelmann, 2002). Although inhalants are used by adults, this is much less frequent because “grownups tend to regard glue, gasoline, paint thinner, and the rest as cheap highs—easy to obtain and not very good” (Weil & Rosen, 1998, p. 128). Conversely, inhalants are widely used by the young because they are often the only intoxicating substances available at this age. This is particularly troubling because many inhalants are acutely toxic. Because they are such a wide group of drugs, it is impossible to make generalizations about their harms, but some substances, especially solvents and gases such as toluene, benzene, gasoline, butane, and propane, are extremely dangerous and can potentially result in death from even one use. Conversely, the nitrites, if used occasionally, are unlikely to result in ill effects (Weil & Rosen, 1998).

## OPIATES

The opiates are all products and derivatives of *opium*, a milky extract contained in the seedpod of certain poppy plants that grow in regions throughout the world. Raw opium contains over 40 pharmacologically active alkaloids, but the two most important of these are morphine (which constitutes 4% to 20% of dried opium) and codeine (1% to 5% of dried opium) (Gahlinger, 2001). Other opiates, such as heroin, are semi-synthetic, and finally, some (called opioids) are purely synthetic, created entirely in the lab (Weil & Rosen, 1998).

The opiates were among the first drugs ever to be used by humans, with records of their use dating back at least as far as 5000 B.C. Early Egyptian texts suggest that opium was used to alleviate the pain of wounds, and an Ebers papyrus scroll dating to 1500 B.C. mentions opium as useful “to prevent the excessive crying of children” (Ray & Ksir, 2004). Homer’s *Odyssey*, published in approximately 1000 B.C., also makes reference to a drug believed to be opium, and Hippocrates, after which the Hippocratic oath of physicians is named, wrote of opium’s ability to relieve pain (Gahlinger, 2001). Similarly, Galen, the last of the great Greek physicians, lauded opium as the cure to all that ails:

[It] resists poison and venomous bites, cures chronic headache, vertigo, deafness, epilepsy, apoplexy, dimness of sight, loss of voice, asthma, coughs of all kinds, spitting of blood, tightness of breath, colic, the iliac poison, jaundice, hardness of the spleen, stone, urinary complaints, fevers, dropsies, leprosy, the troubles to which women are subject, melancholy and all pestilences. (as quoted in Ray & Ksir, 2004, p. 379)

Although Galen might have been accused of overprescribing today, opium was widely used in the Arab world for thousands of years as well. This was mostly for its psychoactive rather than medicinal properties and, at least in part, because the Koran forbade the use of alcohol in any form (Ray & Ksir, 2004). The arrival of the drug in Western Europe occurred in 1524 when the Swiss physician Paracelsus, often called the Father of Scientific Medicine, brought from Constantinople a tincture of opium in alcohol that he called “laudanum” (Gahlinger, 2001). Later, the famed Dr. Thomas Sydenham would refine laudanum by combining this mixture with substances such as saffron, cinnamon, cloves,



and wine to remove the bitter taste (Ray & Ksir, 2004). Sydenham, often called the English Hippocrates for his great contributions to the field of medicine, claimed that “without opium the healing art would cease to exist” (cited in Ray & Ksir, 2004, p. 379). Among the early users of laudanum were Benjamin Franklin, who reportedly consumed it to deal with gout and respiratory failure (Davenport-Hines, 2001), and Thomas De Quincey, who wrote the book *Confessions of an English Opium Eater* in 1821. De Quincey initially used laudanum to relieve a toothache, then came to take up to 8,000 drops of laudanum per day (a dose that would easily kill a person who had not developed De Quincey’s tolerance level) (Weil & Rosen, 1998). Upon first taking laudanum, De Quincey proclaimed,

What a resurrection, from its lowest depths, of the inner spirit! What an apocalypse of the world within me! That my pains had vanished was now a trifle before my eyes. . . . Here was a panacea . . . for all human woes; here was the secret of happiness, about which philosophers had disputed for so many ages, at once discovered; happiness might now be bought for a penny, and carried in the waistcoat pocket; portable ecstasies might be had corked up in a pint-bottle; and peace of mind could be sent down by the mail. (De Quincey, 1971, p. 1)

De Quincey continued to regularly use laudanum for over 50 years—the rest of his life—and died at the age of 74 (Weil & Rosen, 1998).

Opiates are often considered a subclass of the depressants because one of their effects is to depress the central nervous system. These drugs cause constricted pupils, slurred speech, drowsiness, and a release of histamine in the body, and they also suppress cough, which is why codeine remains one of the most prescribed

medicines in the world. The opiates also affect the nausea center of the brain, which often causes people to vomit once they have ingested opiates, and some heroin users are even pleased when vomiting occurs in this context, seeing it as evidence that they have taken “good stuff” (Gahlinger, 2001, p. 377). A small amount of these drugs generates a short-lived feeling of intense euphoria, which some have described “as a whole body orgasm that persists up to 5 or more minutes” (Ray & Ksir, 2004, p. 399), followed by several hours of mental and physical relaxation (Gahlinger, 2001). People under the influence of opiates often display an unusual head-nodding behavior, which is why using these drugs is sometimes referred to as being “on the nod.” The opiates are also among the best *analgesics*, or painkillers, known to humans, which is why they are carried by all hospitals, in virtually every ambulance, on the battlefield, and by emergency medicine technicians.

One of the greatest fears associated with the opiates is the physical dependence that can result from their use. As noted earlier, although tolerance and physical dependence are definitely cause for concern with these drugs, despite media images to the contrary, the physical withdrawal from opiates is less problematic than withdrawal from sedative-hypnotic drugs such as alcohol. However, the ability of the opiates to generate psychological dependence is high and is likely the most difficult part of recovery from opiate addiction (O’Brien, 1997; Ray & Ksir, 2004). Although opiate use and addiction, particularly the intravenous use of opiates, may be accompanied by a number of indirect health risks (e.g., HIV, hepatitis, overdose due to unpredictable potency of the drug) the *direct* physical consequences of long-term opiate use are, in fact, relatively minor compared to alcohol and other depressants, with the worst chronic medical

effect of regular narcotic drug use being severe and chronic constipation (Weil & Rosen, 1998). As Brecher (1972) comments,

There is thus general agreement throughout the medical and psychiatric literature that the overall effects of opium, morphine, and heroin on the addict's mind and body under conditions of low price and ready availability are on the whole amazingly bland. (p. 27)

### *Morphine*

Morphine was extracted from opium in 1806 by Frederick Serturmer, and even today, morphine remains one of the most effective drugs for the relief of severe pain. Upon its discovery in 1806, Serturmer named morphine after Morpheus, the Greek god of dreams. The widespread use of morphine resulted from several factors. One of these was the invention of the hypodermic syringe by Dr. Alexander Wood in 1853. The development of the syringe allowed morphine to be injected, which not only generated a much stronger effect than ingestion, but it also allowed the drug to take effect much faster. Probably because of the "medical context" of injection, this was also thought to be less likely to result in addiction, although this proved not to be the case (Ray & Ksir, 2004).

The other major factor involved in the increased use of morphine was several large military conflicts in the second half of the 19th century, including the American Civil War (1861 to 1865), the Prussian-Austrian War (1866), and the Franco-Prussian War (1870). The countless severe injuries generated by these conflicts led to the widespread use of morphine as a painkiller, and so many soldiers returned from these wars addicted to morphine that morphine addiction came to be called "soldier's disease" or "army disease" (Ray & Ksir, 2004).

The above-mentioned factors contributed to the widespread recreational use of morphine. However, during the late 1800s and early 1900s, most users of narcotic drugs were women, primarily because the drugs were prescribed for menstrual disorders and advertised for "female troubles" (Brecher, 1972). For example, a 1902 report in the *British Medical Journal* referred to morphine being used by women at tea parties, noting, "After the service [of tea] the ladies would be invited to draw up their sleeves and receive an adorably divine injection of morphine from their hostess" (cited in Walton, 2002, p. 157). Although morphine continued to be widely used and remains in use today, in 1874 morphine was slightly altered to produce a new drug in the hopes that it would be less addicting than morphine and codeine. The drug was heroin.

### *Heroin*

Heroin, or diacetylmorphine, was first marketed for public use by Bayer Laboratories (of Bayer aspirin) in 1898. The name we know the drug by today was invented by Bayer, who marketed the drug under the trade name "Heroin" (Davenport-Hines, 2001).

At this time, tuberculosis and pneumonia were the leading causes of death in the United States, and heroin was widely sold in patent medicines designed to help with coughs. As an article in the *Boston Medical and Surgical Journal* noted on the advantages of heroin in 1900, "it possesses many advantages over morphine. It's not hypnotic, and there's no danger of acquiring a habit" (cited in Askwith, 1998). Clearly this proved not to be the case, but although heroin is often regarded as the most "evil" of all drugs, it is important to recognize that it is extremely similar to morphine, which remains widely used in the United States for

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medical purposes. The only distinction between these drugs is that there are two acetyl groups added to the morphine molecule, and this increases the drug's lipid solubility and thus allows it to enter the

brain more rapidly (Ray & Ksir, 2004). This enables heroin to produce the same effects as morphine but more quickly and at smaller doses, but once the drug is in the body it is quickly converted back to morphine

(a positive drug test for heroin comes up morphine-positive) (Weil & Rosen, 1998). Although heroin is illegal and without any approved medical uses in the United States, doctors in England use it for extreme pain because it can be given in smaller doses than morphine, making it preferable for some patients who are sensitive to the nauseating effects of opiates (Weil & Rosen, 1998).

One of the major concerns with heroin (and morphine as well), and a rationale often provided for the illegal status of heroin, is that it has a high potential for overdose. Although the overdose potential for heroin is high, this is largely a function of its illegal status. As noted by Ray & Ksir (2004), "heroin was once sold in small doses in tablet form. If it were still available in that form as a prescription drug, many more people would be taking it but almost none would die from it" (p. 26). The high overdose rate associated with heroin results from the wide disparity in the purity of the drug available to users. Heroin is often cut with various additives such as starch, sugar, talcum powder, baking powder, powdered milk, and other drugs such as methamphetamine, PCP, and

cocaine (Gahlinger, 2001). Because there is significant variation in the purity of the drug, and because heroin is a powerful central nervous system depressant, overdoses are likely when there are changes in the supply or availability of the drug on the street (e.g., if a dealer is arrested, forcing users to get heroin from unknown sources). One tragic example of this occurred in 1979, when an illegal lab in California produced a variant of the synthetic narcotic fentanyl, which is about 30 times more potent than heroin, and marketed it as "China White" heroin. Batches of this substance varied in potency as much as 300-fold, and as a consequence there were over 100 overdose deaths from the drug in a short period of time (Henderson, Harkey, & Jones, 1990). Similar events have occurred since that time, with the most recent in 2005, when a mixture of heroin and fentanyl distributed mainly in Chicago and several cities on the east coast caused over two dozen overdose deaths and more than 300 hospitalizations in only three weeks (Leinwand, 2006). Similar "overdose outbreaks" will occur in the future, barring major changes in drug policy.

**Heroin is far from the strongest opiate. For example, as noted by Gahlinger (2001), Entorphine is approximately 10,000 times as strong as morphine, and a scratch from a needle contaminated with the drug may be sufficient to kill a person. The only practical application of Entorphine is as a dart-gun anesthetic to sedate elephants and rhinoceros. The drug was accidentally discovered in Edinburgh in 1960 when the scientists' morning tea was inadvertently stirred with a glass rod used in an experiment. All the scientists involved were put into a coma due to their ingestion of trace elements of the drug, but they subsequently recovered.**

As noted earlier, the direct effects of heroin on the body are surprisingly mild. There is no scientific evidence that indicates any long-term consequences of heroin to any tissue or organ system, although, as mentioned, there are indirect risks associated with injecting these drugs (Ray & Ksir,

2004). Conversely, a serious concern with heroin, and opiates more generally, is the risk of addiction. The claim that if you "try it once you're addicted" is an exaggeration, but the risk of psychological dependence for heroin is substantial. Because the effects of heroin are less intense and immediate if

the drug is not administered intravenously (such as by snorting, smoking, or even subcutaneous injection, known as “skin popping”), these forms of heroin use are less likely to result in psychological dependence. For example, as Weil and Rosen (1998) comment, “people who snort heroin can do so on and off for long periods of time without becoming strongly addicted” (p. 88). Even some intravenous heroin users may be able to use the drug only occasionally (known as “chipping”) and not become dependent, but a high percentage of these users do eventually become addicted to the drug (Weil & Rosen, 1998). Interestingly, although heroin can result in physical dependence, many intravenous users report being as addicted to the process of using the drug as to the drug itself (leading to the term “needle freaks”) (Weil & Rosen, 1998). For example, Powell reports one user as saying,

Once you decide to get off it is really exciting. It really is. Getting some friends together and some money, copping, deciding where you're going to do it, getting the needles out and sterilizing them, cooking up the stuff, tying off, the whole thing with the needle, booting, and the rush, that's all part of it. Sometimes I think that if I just shot water I'd enjoy it as much. (1973, cited in Ray & Ksir, 2004, p. 396)

Physical dependence on heroin can result in withdrawal that may begin, for chronic users, as soon as the effects of the drug begin to wear off. Heroin withdrawal has been compared by some to “having a good case of the flu,” and symptoms include nausea, vomiting, diarrhea, cramps, chills, hot flashes, and shakes, which grow progressively worse with the time elapsed since the last dose, peaking in 24 to 72 hours and then subsiding (Gahlinger, 2001). However, as noted earlier, it is a common misconception that the physical withdrawal from heroin alone can be fatal.

In order to treat heroin addiction, a synthetic narcotic known as methadone is often used to wean users off heroin or to keep them off the drug over time (this is known as “methadone maintenance”). Methadone can be taken orally and was first invented by German researchers during WWII in order to provide a synthetic substitute for morphine, which was in short supply due to the war (Gahlinger, 2001). Although it is still used for pain relief, methadone's most common use is to treat heroin addiction. Methadone can provide users with the pleasant euphoric feeling typical of narcotics, but the effects last much longer (up to 24 hours) and do not include the intense “rush” immediately following the injection of heroin or morphine (Gahlinger, 2001). As a result of these effects and also its (typically) oral administration, methadone is thought by some to be less addicting, but it is important to recognize that like heroin, methadone also causes addiction and physical withdrawal. We discuss methadone maintenance therapy in detail in our discussion of drug treatment in Chapter 9.

### *Codeine*

Along with morphine, codeine is the primary psychoactive element in opium. Isolated from opium shortly after morphine in 1832, codeine is weaker than morphine in terms of its psychoactive and physical effects, but it is absorbed well if taken orally (unlike morphine). Codeine is often prescribed to treat moderate levels of pain, such as those originating from back injuries, surgical recovery, migraine headaches, or broken bones. The analgesic effect of the drug along with its strong cough-suppressant effect has led to its wide marketing, either alone or along with a non-opiate analgesic such as acetaminophen (e.g., *Tylenol 3*) (Gahlinger, 2001).

Codeine is by far the most widely used narcotic in the world and is available over

the counter in numerous countries, including Canada and Mexico. Although it has psychoactive effects that are similar to morphine if taken in sufficient quantities, the amount of codeine contained in medications such as Tylenol 3 are low enough that the person may overdose on the acetaminophen contained in Tylenol 3 before achieving the euphoric effects of the codeine. There are several semi-synthetic versions of codeine as well, the most prominent being hydrocodone. Hydrocodone is about six times as strong as codeine, and it is found in many prescription painkillers (e.g., Vicodin). Due to its strength and availability, hydrocodone is a very commonly abused prescription drug (Gahlinger, 2001).

### *Oxycodone*

Oxycodone is another semi-synthetic opiate that is synthesized from *thebaine*. Like morphine and codeine, thebaine is present in raw opium, but it does not have psychoactive properties in its natural form. Oxycodone is contained in products such as

Percodan (oxycodone and aspirin) and Percocet (oxycodone and acetaminophen), but most recently it has been used to make OxyContin. Manufactured by Purdue Pharma, OxyContin is a sustained-release formula of oxycodone used to treat serious and chronic pain. Prescriptions for OxyContin have essentially doubled every year since its release in 1996, and in 2000, doctors wrote more than 6.5 million prescriptions for this drug, making it the 18th best-selling prescription drug in the United States (Tough, 2001). The drug is at least equivalent to morphine in its analgesic effect, and it is potentially as strong as or even stronger than morphine in terms of its psychoactive effect (Tough, 2001). This is particularly the case when users engage in the common practice of crushing OxyContin pills into a powder and snorting or injecting them. When this is done, the effects of OxyContin, designed to be released over a 12-hour period, are felt immediately and the associated high is claimed to be “as strong as that of heroin” (Gahlinger, 2001, p. 366; see also Martin, 2002).

OxyContin has also been referred to as “hillbilly heroin” because the earliest reported cases of OxyContin abuse were in rural Maine, western Pennsylvania, and the Appalachian areas of Virginia, West Virginia, and Kentucky (Janofsky, 2004).

Currently, OxyContin abuse has become relatively prevalent throughout the United States, but the highest rates of abuse are typically found in areas characterized by high unemployment and fairly large populations of disabled and chronically ill people who require pain relief. These areas are also more likely to be geographically remote and thus separated from major illegal drug trafficking routes on interstate highways (Tough, 2001). In many of these areas, the use of OxyContin as a recreational drug

reportedly rivals the use of marijuana and cocaine (Gahlinger, 2001).

Partly because of this rising pattern of abuse, OxyContin was implicated in over 450 drug overdose deaths in the United States in 2000 and 2001 (Brink, 2002). However, as is the case with many drugs, research has also shown that, taken alone, oxycodone is seldom deadly. For example, a 2003 study published in the *Journal of Analytic Toxicology* reviewed records of 1,243 oxycodone-related cases

from August 1999 through January 2002 and found that in the vast majority of overdose cases, the individual had at least one other drug in his or her system, and often more. Only 30 deaths were found to have resulted solely from oxycodone, and only 12 of these involved OxyContin as the source of oxycodone (Cone et al., 2003).

With the increased use and demand for OxyContin, there have been reports of increases in pharmacy robberies in several jurisdictions in the United States, ostensibly linked to the drug (Butterfield, 2001a). Individuals have even attempted to illegally obtain OxyContin by posing as potential homebuyers, building inspectors, and law enforcement officers in order to obtain access to houses and subsequently look for OxyContin and related substances in medicine cabinets. There have also been reports of addicts scanning newspaper obituaries for people who died of cancer or other conditions associated with considerable pain, so that when the family of the deceased attends the funeral the thieves break into their homes and search for any leftover painkillers (Leinwand, 2003b).

### NON-OPIATE ANALGESICS

The non-opiate analgesics have no psychoactive effects and thus will be discussed only briefly. Like the opiates, the non-opiate analgesics have a painkilling effect (although much weaker than the opiates), they can be misused, and they also result in a significant number of overdoses and deaths every year. This class of drug includes acetylsalicylic acid (patented and marketed as "Aspirin" by Bayer in 1899), acetaminophen, and ibuprofen. Aspirin has an antipyretic effect, meaning it reduces body temperature when elevated by fever, and it also has an anti-inflammatory effect, as it reduces swelling and inflammation (Ray & Ksir, 2004). Acetaminophen does

not provide the anti-inflammatory effect of aspirin, but may be the best option for pain relief, and ibuprofen provides only a very limited antipyretic effect, but it is an effective anti-inflammatory and may be the best choice for this (Ray & Ksir, 2004).

All of these drugs can cause serious health complications, particularly those relating to the liver, and even death via overdose, if abused. In the event of a serious overdose, symptoms are generally not realized for 24 to 48 hours, when the individual's impaired liver function becomes evident, but at this point it is often too late to help the individual (Ray & Ksir, 2004).

The toxicity of non-opiate analgesics when abused, combined with their extremely wide use, generates significant public health problems. As Alexander (1990) notes, "because of the risk of gastric, liver, and kidney damage, it seems likely that regular, heavy use of ASA [acetylsalicylic acid]-like drugs is more physically harmful than the use of many other drugs, including the opiates" (p. 223). Despite this, a large portion of users take these drugs in ways that place them at increased risk for adverse effects. For example, research on the patterns and effects of over-the-counter analgesics such as ibuprofen (called non-steroidal anti-inflammatory drugs, or NSAID) presented at the annual meeting of the American Gastroenterological Association (AGA) in 2004 found that in 2003, 44% of respondents said they took more than the recommended dose of these medications. This was a significant increase from the 26% who reported misuse in 1997, and according to Dr. Byron Cryer, lead author of the study and associate professor of medicine at the University of Texas Southwestern Medical School,

Each day, more than 30 million Americans take an NSAID for quick, easy pain relief from common ailments like headaches

and arthritis. Because these drugs are easily accessible and can be very effective, there is a misperception out there that they have no risks. In reality, there are serious side effects associated with inappropriate use that patients need to recognize. (AGA, 2004)

Available data indicate that the use of NSAID leads to more than 103,000 hospitalizations and 16,500 deaths each year in the United States (AGA, 2004), which is approximately twice the number of fatalities resulting from the use of all illegal drugs combined (discussed in further detail in Chapter 6).

The following chapter will continue our discussion on the effects of drugs, focusing on hallucinogens, PCP and ketamine, marijuana, antidepressants and aphrodisiacs, and steroids and other performance-enhancing drugs.

## REVIEW QUESTIONS

1. What criteria are used to group drugs into the schedules established by the Controlled Substances Act? What supposedly distinguishes Schedule I drugs from Schedule II drugs?
2. Distinguish between acute and chronic toxicity and provide an example of these effects for a particular drug or group of drugs.
3. What is a therapeutic ratio and how does it relate to acute toxicity?

4. How do we know whether a drug can cause physical dependence?
5. What is tolerance? How does tolerance relate to physical dependence?
6. Ritalin is similar in its effect to what drugs?
7. In terms of withdrawal, how do the depressants compare to other categories of drugs?
8. How are opium, morphine, and heroin related?
9. How does drug purity affect the potential for overdose associated with the use of "street" opiates such as heroin?
10. What are inhalants and in what ways are they problematic?
11. How many hospitalizations and deaths annually result from the misuse of aspirin, acetaminophen, and ibuprofen?

## INTERNET EXERCISE

Access data from the Drug Abuse Warning Network (DAWN) at <http://www.dawn.info.samhsa.gov> and compare the number of emergency department visits resulting from illicit drug use. How do the number of emergency department visits prompted by cocaine use compare to emergency department visits prompted by methamphetamine use? Examine emergency department visits caused by misuse of pharmaceutical drugs (referred to as "overmedication" by DAWN). How do these patterns compare to the visits related to the use of various illegal drugs?