instances, death may occur, most likely from hypoxemia, cardiac arrhythmias, pneumonia, or aspiration of vomit while unconscious. Detoxification is rarely required for the patient who has abused these substances, but psychiatric treatment may be needed to prevent relapse.

Designer Drugs

The term *designer drug* refers to illicit synthetic drugs, many of which have increased potency in comparison with their parent compounds. The most common designer drugs include analogs of fentanyl, meperidine, piperazine, and methamphetamines. The best-known fentanyl derivatives are α-methyl fentanyl *(China white),* parafluorofentanyl, and 3-methyl fentanyl. Because these drugs are approximately 1000 times as potent as heroin, it is not surprising that fatal overdoses from respiratory depression have been reported.

The major meperidine derivatives are 1-methyl-4-phenyl-4-propionoxypiperidene (MPPP) and 1-methyl-4-phenyl-1, 2, 3, 6-tetrahydropyridine (MPTP), each of which produces euphoria similar to that caused by heroin. In some users, MPTP causes neuronal degeneration in the substantia nigra, which produces an irreversible form of Parkinson's disease.

Piperazines, a new class of designer drugs of abuse, are commonly sold as party pills in the form of tablets, capsules, or powders on the drug black market and in so-called head shops or over the internet under the names of Frenzy, Bliss, Charge, Herbal ecstasy, A2, Legal X and Legal E. 1-Benzylpiperazine (BZP) is the most prevalent of these compounds. Aside from BZP and 1-(3,4-methylenedioxybenzyl) piperazine (MDBP), the phenylpiperazine derivatives 1-(3-trifluoromethylphenyl) piperazine (TFMPP), 1-(3-chloro phenyl) piperazine (mCPP), and 1-(4-methoxyphenyl) piperazine (MeOPP) are often abused. Because piperazines and amphetamines cause similar pharmacologic symptoms, piperazine poisoning can easily be wrongly diagnosed as amphetamine poisoning. Furthermore, piperazines are not detected by routinely used immunochemical screening procedures for drugs of abuse, but they require an appropriate toxicologic analysis (e.g., by gas chromatography-mass spectrometry). The methylenedioxy synthetic derivatives of amphetamine and methamphetamine are generally referred to as *ecstasy* and include 3, 4-methylenedioxy methamphetamine (MDMA, also known as *Adam*); 3, 4-methylenedioxy-ethylamphetamine (MDEA, also known as *Eve*); and N-methyl-1-(3, 4-methylenedioxyphenyl)-2-butanamine (MBDB, also known as *Methyl-J* or *Eden*). These drugs have CNS stimulant and hallucinogenic properties. They produce elevated mood and increased self-esteem and may cause acute panic, anxiety, paranoia, hallucinations, tachycardia, nystagmus, ataxia, and tremor. Deaths in some users have been attributed to cardiac arrhythmias, hyperthermia with seizures, and intracranial hemorrhage.

Prospectus for the Future

Recent research is focused on so-called vaccine strategies, whereby protein-conjugated analogues of cocaine would be administered to produce anti-cocaine antibodies that bind cocaine, thereby preventing its passage across the blood-brain barrier. A novel pharmacokinetic approach to the treatment of drug toxicity involves the development of compounds that can be administered safely to humans and that accelerate the metabolism of the drug to inactive components. For example, catalytic antibodies have been developed to accelerate cocaine metabolism and are administered parentally. In experimental animals, mutations of human butyrylcholinesterase (one of the enzymes responsible for the metabolism of cocaine) accelerate cocaine metabolism and antagonize cocaine's behavioral and toxic effects.

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