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ALCOHOL ALERT

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Alcohol, Violence, and Aggression

Scientists and nonscientists alike have long recognized a two-way association between alcohol consumption and violent or aggressive behavior (1). Not only may alcohol consumption promote aggressiveness, but victimization may lead to excessive alcohol consumption. Violence may be defined as behavior that intentionally inflicts, or attempts to inflict, physical harm. Violence falls within the broader category of aggression, which also includes behaviors that are threatening, hostile, or damaging in a nonphysical way (2). This *Alcohol Alert* explores the association between alcohol consumption, violence, and aggression and the role of the brain in regulating these behaviors. Understanding the nature of these associations is essential to breaking the cycle of alcohol misuse and violence.

Extent of the Alcohol-Violence Association

Based on published studies, Roizen (3) summarized the percentages of violent offenders who were drinking at the time of the offense as follows: up to 86 percent of homicide offenders, 37 percent of assault offenders, 60 percent of sexual offenders, up to 57 percent of men and 27 percent of women involved in marital violence, and 13 percent of child abusers. These figures are the upper limits of a wide range of estimates. In a community-based study, Pernanen (4) found that 42 percent of violent crimes reported to the police involved alcohol, although 51 percent of the victims interviewed believed that their assailants had been drinking.

Alcohol-Violence Relationships

Several models have been proposed to explain the complex relationships between violence or aggression and alcohol consumption. To avoid exposing human or animal subjects to potentially serious injury, research results discussed below are largely based on experiments on nonphysical aggression. Other studies involving humans are based on epidemiological surveys or data obtained from archival or official sources.

Alcohol Misuse Preceding Violence

Direct Effects of Alcohol. Alcohol may encourage aggression or violence by disrupting normal brain function. According to the disinhibition hypothesis, for example, alcohol weakens brain mechanisms that normally restrain impulsive behaviors, including inappropriate aggression (5). By impairing information processing, alcohol can also lead a person to misjudge social cues, thereby overreacting to a perceived threat (6). Simultaneously, a narrowing of attention may lead to an inaccurate assessment of the future risks of acting on an immediate violent impulse (7).

Many researchers have explored the relationship of alcohol to aggression using variations of an experimental approach developed more than 35 years ago (8,9). In a typical example, a subject administers electric shocks or other painful stimuli to an unseen "opponent," ostensibly as part of a competitive task involving learning and reaction time. Unknown to the subject, the reactions of the nonexistent opponent are simulated by a computer. Subjects perform both while sober and after consuming alcohol. In many studies, subjects exhibited increased aggressiveness (e.g., by administering stronger shocks) in proportion to increasing alcohol consumption (10).

These findings suggest that alcohol may facilitate aggressive behavior. However, subjects rarely increased their aggression unless they felt threatened or provoked. Moreover, neither intoxicated nor sober participants administered painful stimuli when nonaggressive means of communication (e.g., a signal lamp) were also available (5,9).

These results are consistent with the real-world observation that intoxication alone does not cause violence (4). The following subsections explore some mechanisms whereby alcohol's direct effects may interact with other factors to influence the expression of aggression.

Social and Cultural Expectancies. Alcohol consumption may promote aggression because people expect it to (5). For example, research using real and mock alcoholic beverages shows that people who believe they have consumed alcohol begin to act more aggressively, regardless of which beverage they actually consumed (10). Alcohol-related expectancies that promote male aggressiveness, combined with the widespread perception of intoxicated women as sexually receptive and less able to defend themselves, could account for the association between drinking and date rape (11).

In addition, a person who intends to engage in a violent act may drink to bolster his or her courage or in hopes of evading punishment or censure (12,13). The motive of drinking to avoid censure is encouraged by the popular view of intoxication as a "time-out," during which one is not subject to the same rules of conduct as when sober (14,15).

Violence Preceding Alcohol Misuse

Childhood Victimization. A history of childhood sexual abuse (16) or neglect (17) is more likely among women with alcohol problems than among women without alcohol problems. Widom and colleagues (17) found no relationship between childhood victimization and subsequent alcohol misuse in men. Even children who only witness family violence may learn to imitate the roles of aggressors or victims, setting the stage for alcohol abuse and violence to persist over generations (18). Finally, obstetric complications that damage the nervous system at birth, combined with subsequent parental neglect such as might occur in an alcoholic family, may predispose one to violence, crime, and other behavioral problems by age 18 (19,20).

Violent Lifestyles. Violence may precede alcohol misuse in offenders as well as victims. For example, violent people may be more likely than nonviolent people to select or encounter social situations and subcultures that encourage heavy drinking (21). In summary, violence may contribute to alcohol consumption, which in turn may perpetuate violence.

Common Causes for Alcohol Misuse and Violence

In many cases, abuse of alcohol and a propensity to violence may stem from a common cause (22). This cause may be a temperamental trait, such as a risk-seeking personality, or a social environment (e.g., delinquent peers or lack of parental supervision) that encourages or contributes to deviant behavior (21).

Another example of a common cause relates to the frequent co-occurrence of antisocial personality disorder (ASPD) and early-onset (i.e., type II) alcoholism (23). ASPD is a psychiatric disorder characterized by a disregard for the rights of others, often manifested as a violent or criminal lifestyle. Type II alcoholism is characterized by high heritability from father to son; early onset of alcoholism (often during adolescence); and antisocial, sometimes violent, behavioral traits (24). Type II alcoholics and persons with ASPD overlap in their tendency to violence and excessive alcohol consumption and may share a genetic basis (23).

Spurious Associations

Spurious associations between alcohol consumption and violence may arise by chance or coincidence, with no direct or common cause. For example, drinking is a common social activity for many adult Americans, especially those most likely to commit violent acts. Therefore, drinking and violence may occur together by chance (5). In addition, violent criminals who drink heavily are more likely than less intoxicated offenders to be caught and consequently are overrepresented in samples of convicts or arrestees (7). Spurious associations may sometimes be difficult to distinguish from common-cause associations.

Physiology of Violence

Although individual behavior is shaped in part by the environment, it is also influenced by biological factors (e.g., hormones) and ultimately planned and directed by the brain. Individual differences in brain chemistry may explain the observation that excessive alcohol consumption may consistently promote aggression in some persons, but not in others (25). The following subsections highlight some areas of intensive study.

Serotonin

Serotonin, a chemical messenger in the brain, is thought to function as a behavioral inhibitor. Thus, decreased serotonin activity is associated with increased impulsivity and aggressiveness (26) as well as with early-onset alcoholism among men (27).

Researchers have developed an animal model that simulates many of the characteristics of alcoholism in humans. Rhesus macaque monkeys sometimes consume alcohol in sufficient quantities to become intoxicated. Macaques with low serotonin activity consume alcohol at elevated rates (25); these monkeys also demonstrate impaired impulse control, resulting in excessive and inappropriate aggression (25,27). This behavior and brain chemistry closely resemble that of type II alcoholics. Interestingly, among both macaques and humans, parental neglect leads to early-onset aggression and excessive alcohol consumption in the offspring, again correlated with decreased serotonin activity (27).

Although data are inconclusive, the alcohol-violence link may be mediated by chemical messengers in addition to serotonin, such as dopamine and norepinephrine (28). There is also considerable overlap among nerve cell pathways in the brain that regulate aspects of aggression (29), sexual behavior, and alcohol consumption (30). These observations suggest a biological basis for the frequent co-occurrence of alcohol intoxication and sexual violence.

Testosterone

The steroid hormone testosterone is responsible for the development of male primary and secondary sexual characteristics. High testosterone concentrations in criminals have been associated with violence, suspiciousness, and hostility (31,32). In animal experiments, alcohol administration increased aggressive behavior in socially dominant squirrel monkeys, who already exhibited high levels of aggression and testosterone (33). Alcohol did not, however, increase aggression in subordinate monkeys, which exhibited low levels of aggression and testosterone (6).

These findings may shed some light on the life cycle of violence in humans. In humans, violence occurs largely among adolescent and young adult males, who tend to have high levels of testosterone compared with the general population. Young men who exhibit antisocial behaviors often "burn out" with age, becoming less aggressive when they reach their forties (34). By that age, testosterone concentrations are decreasing, while serotonin concentrations are increasing, both factors that tend to restrain violent behavior (35).

Conclusion

No one model can account for all individuals or types of violence. Alcohol apparently may increase the risk of violent behavior only for certain individuals or subpopulations and only under some situations and social/cultural influences (4,36).

Although much remains to be learned, research suggests that some violent behavior may be amenable to treatment and some may be preventable. One study found decreased levels of marital violence in couples who completed behavioral marital therapy for alcoholism and remained sober during followup (37). Results of another study (7) suggest that a 10-percent increase in the beer tax could reduce murder by 0.3 percent, rape by 1.32 percent, and robbery by 0.9 percent. Although these results are modest, they indicate a direction for future research. In addition, preliminary experiments have identified medications that have the potential to reduce violent behavior. Such medications include certain anticonvulsants (e.g., carbamazepine) (38); mood stabilizers (e.g., lithium) (39); and antidepressants, especially those that increase serotonin activity (e.g., fluoxetine) (40,41). However, these studies either did not differentiate alcoholic from nonalcoholic subjects or excluded alcoholics from participation.

Alcohol, Violence, and Aggression--A Commentary by NIAAA Director Enoch Gordis, M.D.

Both alcohol use and violence are common in our society, and there are many associations between the two. Understanding the nature of these associations, including the environmental and biological antecedents of each and the ways in which they may be related, is essential to developing effective strategies to prevent alcohol-related violence as well as other social problems, such as domestic violence, sexual assault, and childhood abuse and neglect. Because no area of science stands apart from another, understanding more about alcohol-related violence also will shed light on violence in general and produce information that may be useful to reducing it.

Science has made progress on elucidating the environmental and biological antecedents of alcohol abuse and alcoholism; less progress has been made toward understanding the causes of violence. Understanding the biology of

violence will help us to clearly define the role of the environment in increasing the risk for violence and increase our understanding of who is at risk for violent behavior. This understanding also will help us to develop effective interventions—both social and medical where intended—to help those whose violence has caused trouble for themselves and others.

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