Literature and film are full of stories about characters who have risky sexual relationships with strangers after drinking too much. Alcohol is a motif that often figures in attempts to escape from loneliness or in relationships characterized by manipulation and victimization. Unfortunately, these painful scenarios reflect real-life narratives that appear in the media and that clinicians hear from clients with HIV. How does drinking increase vulnerability to HIV infection and so many other problems? Does it subtly shift a person’s expectations of romance? Does it activate some neural system that craves alcohol while diminishing anxiety and self-awareness? Can it make one forget to take critical medications? How can research provide a vocabulary for the complex effects of alcohol while validating interventions for people who abuse alcohol and are HIV-infected or are at risk for HIV infection?

Many complexities arise when trying to carry out research on these issues. However, researchers have been successful in demonstrating a range of robust relationships between alcohol use and sexual risk taking, HIV incidence, and medication adherence. Rates of HIV infection significantly higher than in the general public are found among clinical samples of alcoholics and of individuals who meet criteria for alcohol dependence; and reduction in alcohol use in treatment samples is associated with reduced sexual risk. Higher levels of alcohol use have also been shown to predict higher incidence of infection and reduced time to seroconversion among gay men, and non-adherence to medical regimens among infected individuals. Although there is limited research among impoverished women who are at increasing risk for HIV infection, alcohol use has been linked to increased sexual violence and susceptibility to HIV infection. These are just some of the findings regarding the role of drinking in HIV. This article attempts to heighten the awareness about the unique role drinking alcohol plays in the AIDS epidemic as a “contextual variable” and points to some of the gaps in knowledge among clients, practitioners, and researchers.

The Complex Role of Alcohol

Alcohol is the most frequently used and abused substance in the United States, and its misuse directly results in approximately 100,000 deaths each year through accidents and alcohol-related diseases. It is estimated that 110 million people age 12 and older are current alcohol users, that 32 million to 40 million drink hazardously, and that 11 million to 14 million are diagnosed as alcohol dependent and in need of treatment. Individuals with hazardous drinking patterns are likely to cause harm to themselves or others and represent a disproportionate number of primary care and emergency room patients. Characteristically, interventions for alcohol abuse and dependence have been conceptualized at both individual and social levels. Interventions include, for example, enactment of drunk driving laws, school-based education programs, alcohol server training among bar and restaurant employees, and alcohol treatment in a variety of settings. Yet, while drinking and its negative consequences have received some research attention, they have not been extensively addressed in terms of HIV disease.

Analyses of narrative components of assessments of HIV-positive alcoholic individuals do reveal much about the immediate role that alcohol plays in unsafe sex and
There is no question in anyone’s mind that sharing unsterilized needles is one of the most effective ways to transmit disease, and its correlation to HIV infection is longstanding. Indeed, for this reason, injection drug use, and by extension, substance use has always been associated with the AIDS epidemic.

But the effects of non-injecting drugs on HIV-related risk behaviors and the progression of HIV disease has always raised debate. To some, it seems obvious that addictive and apparently toxic substances like alcohol and nitrite inhalants must affect the judgment necessary to implement risk reduction and must suppress the immune system and the overall functioning of the body.

Over the years, however, investigators have developed alternative hypotheses and created a large body of apparently contradictory research, especially in terms of alcohol use. In particular, some European researches have questioned findings from U.S. studies that suggest alcohol influences risk behavior.

What many researchers have come to understand now, and what new studies are showing, is that alcohol does, in fact, have an effect on behavior. But this impact is dependent on the interrelationship of other factors ranging from the context of the behavior to demographic factors to culture. In the case of nitrite inhalants (also know as “poppers”), the research is now fairly convincing, however, a history of obfuscation has left many without clear guidance.

In this issue of FOCUS, Kendall Bryant and Gloria Levine, and Hank Wilson discuss some of the complexities regarding the nonadherence to AIDS medication regimens. These analyses also place these risks into context as long-term behaviors and decisions about lifestyles. Among these contexts are partnership stability and the drinking characteristics of both immediate and extended social networks.\(^1,2\) Such expanded research perspectives are beginning to clarify the relationship between alcohol and sexual risk, thus reducing barriers to effective treatment. However, many of the controversies about the exact relationship between alcohol abuse and HIV-related risk, for example, the attempt to define the causal chain from alcohol use to risky behavior in a specific situation, have distracted both researchers and practitioners from evaluating the role of alcohol prevention and treatment in controlling HIV.\(^3\)

Initial research on this relationship demonstrated a correlation between alcohol and high-risk sexual behavior in multiple samples, particularly among gay men.\(^4\) In addition, research on cohorts of gay men found that prior alcohol and other non-injection substance use predicted HIV infection.\(^5\) Assessments of male and female alcoholic inpatients from multiethnic backgrounds have indicated HIV infection rates ranging from 3 percent to 12 percent among heterosexuals who do not have substantial injection drug use histories.\(^6\) In urban samples, both risk factors, including participation in sex work and having a sexually transmitted disease (STD), were common among women in alcohol treatment. Risk factors including multiple sex partners and failure to use condoms were common among men. These factors were also reported by approximately 30 percent of individuals in alcohol treatment, which included Black, Hispanic, and White individuals; males and females; and individuals in gay alcohol treatment settings. Alcohol treatment effectively reduced HIV risk-taking behaviors by 30 percent to 50 percent in both general populations and in gay-specific treatment—reductions comparable to other HIV prevention efforts—and many interventions are being tested.\(^7,8\)

Despite these clear connections between alcohol and HIV-related risk, a recently published American Foundation for AIDS Research (AmFAR) handbook, The Complete Guide to Understanding HIV and AIDS, included only five brief references to the role of drinking in the transmission and treatment of HIV.\(^9\) While the book represents

References
While the Health Belief Model is the basis of most interventions, it does not take into account histories of poor decision-making by alcohol abusers, or the effects of past victimization.


an excellent source of general HIV-related information, it also illustrates the inadequate state of the knowledge about the role of alcohol in HIV prevention and treatment. While the AmFAR handbook indicates the need for delivery of appropriate HIV counseling, it does not directly address the issue of drinking. In this case, the lack of appropriate post-test counseling was compounded by lack of effective identification, referral, and intervention for a current drinking problem. This is significant, since recent research indicates that about one-third of HIV-infected alcohol abusers delay seeking HIV treatment for more than a year, and since there is a range of effective interventions for reducing alcohol consumption and improving medication compliance to which test counseling clients could be referred. In addition, researchers have focused on providing a more complete description of individual motivation among substance abusers for avoiding testing and seeking health care that may be informative to clinicians.10

Alcohol and HIV Interventions for Women

The contextual effects of drinking may be of particular importance for women. In the United States, women, particularly women of color, are becoming HIV-infected at ever-increasing rates and many of these women receive limited treatment for substance abuse or HIV-related conditions. The role of alcohol abuse among these women and their partners and the multiple effects of continued use over time are significant in the struggle against HIV disease.

The urgency for interventions focused on women is highlighted by the rapidly increasing rates of HIV infection among urban minority women. HIV disease is the leading cause of death among women of color ages 25 to 44. African American women account for 40 percent of AIDS cases among heterosexuals, and 60 percent of pediatric AIDS cases are among children of African American mothers. HIV-related deaths are increasing among African American women, although they are declining for other risk groups.

Researchers and public health officials have concluded that reductions in alcohol and drug abuse are critical in controlling rapid changes in HIV infection and have recommended a significant increase in substance abuse interventions as part of comprehensive prevention strategies.

Male-oriented intervention models may not be appropriate for alcohol-abusing women, and interventions need to address the interactive role of alcohol use and abuse and sexual risk taking. Harm reduction strategies may be of particular importance for low-income women who may have limited personal control over decisions that affect their lives and their partners’ drinking behaviors. Sexual victimization is reported by large numbers of women and results in a range of negative physical and psychological consequences, such as posttraumatic stress disorder, substance abuse, and increased use of health care. Very little longitudinal research has examined the relationships among sexual victimization, substance use, and sexual activity, and few studies have used representative samples.

Current intervention strategies focus on mitigating the negative consequences of alcohol abuse through consistent condom use, reduced numbers of sex partners, treatment for STDs, and development of realistic drinking goals. Women in alcohol treatment settings are observed to be at particularly high risk for both HIV infection and HIV transmission. Effective interventions need to consider issues such as child care, family and partner roles, and other potential barriers to receiving health care.

While standard components of the Health Belief Model of behavior change form the basis of most interventions, they do not often take into account histories of poor decision-making by alcohol abusers and the effects of victimization. It may be unusually difficult to change perceptions of the severity of or susceptibility to HIV infection or to promote self-efficacy among women who have had histories of victimization or abuse, which often lead to feelings of isolation. Peer interventions may overcome some of this isolation and address the complex role of alcohol abuse in vulnerability to sexual violence. Finally, women substance abusers are unlikely to change behavior when they believe that fate or inevitability plays a role in getting HIV disease, suggesting the importance of changing perceptions of control.

Adherence among Seropositive Abusers

Alcohol use or abuse is emerging as an important determinant of medication adherence among HIV-infected individuals. The impact of alcohol use may be direct, impairing behaviors necessary to follow complex medication schedules or
altering the pharmacological properties of medications, or indirect, affecting attitudes toward successful treatment or impairing the effective functioning of the social networks necessary to facilitate the sustained treatment of HIV disease. Beyond adherence issues, the toxic effects of alcohol on the body can impair HIV treatment efficacy and complicate treatment side effects. For instance, alcohol can lead to or exacerbate gastritis, enteritis, and pancreatitis, side effects of certain HIV treatments. Alcoholics are also predisposed to peripheral neuropathy, another HIV-related side effect. In addition, alcohol is a cofactor for progression of both hepatitis B and hepatitis C.

Lessons about the role of alcohol abuse and adherence can be gleaned from evaluating alcohol's role in the treatment of not only HIV infection, but also other chronic diseases, in particular, tuberculosis. Researchers are assessing the efficacy of adherence interventions through the completion of self-reporting behavioral questionnaires, computer-monitored pill usage, and biomedical data to measure levels of HIV viral load. Current research, while preliminary, suggests that the severity of alcohol abuse and dependence is directly associated with HIV medication adherence and that care providers addressing needs in these special populations should undertake three strategies.

First, they should address alcohol problems directly, raise client expectations that alcohol treatment will not interfere with HIV medication management, and link alcohol and substance use severity to HIV-related clinical outcomes. Second, they should facilitate pill taking by providing physical or social assistance, particularly during alcohol relapse, and increase client expectations that alcohol intervention will result in medication efficacy. They should also try to establish an "ecologically valid" model for client treatment, that is, one that takes into account client history and schedule. Third, they should monitor client outcomes in both alcohol and HIV intervention areas by providing appropriate follow-up, and attending to clients' affective state—in particular, depression—and continuing expectations for improved outcomes.

**Conclusion**

There are gaps in knowledge between individuals with HIV and researchers, clients and practitioners, practitioners and researchers, and alcohol researchers and HIV researchers. These gaps reflect difficulties in understanding the contexts for alcohol misuse. Dialogue is just beginning to result in the design of appropriate interventions. In response, alcohol and HIV interventions should address cross-cultural differences, the needs of HIV-positive populations with multiple psychiatric diagnoses, and the needs of populations at high risk for alcohol abuse and HIV infection (including homeless youth, prison inmates, women with histories of victimization, and injection drug users).

Researchers need to acquire knowledge about the role of substance abuse treatment and prevention in the cost of care and delivery of services to HIV-infected individuals. They also need to develop improved quantitative and qualitative methodologies to understand the impact on alcohol and HIV-related risk of situations such as coercive sex, settings such as bars, and life events such as the transition from adolescence to adulthood. Finally, researchers and providers must achieve a balance among knowledge development, primary and secondary alcohol prevention, and treatment efforts to ensure the effective delivery of services within the present health care system.

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**Clearinghouse: Alcohol and Poppers**

**References**


McNair LD, Carter JA, Williams MK. Self-esteem, gender, and alcohol use: Relationships with HIV risk perception and beha-
The Poppers-HIV Connection

Hank Wilson

When the first reports of gay-related immunodeficiency (GRID) surfaced in 1981, investigators focused on those sexual and drug-using behaviors that distinguished “fast-lane” gay men from their straight counterparts. “Poppers,” nitrite inhalants, stood out because they were used almost exclusively by gay men and in nearly all the early cases of GRID. With the discovery of HIV, the role of poppers was de-emphasized, but recently researchers have given the drug renewed attention. This article discusses “the gay drug,” its effects, its use, and its role in fueling the epidemic.

The term “poppers” originated because of the sound made when glass ampules containing amyl nitrite are crushed. Amyl nitrite, a drug used to treat heart pain, was available only by prescription until 1960 when the Food and Drug Administration (FDA) eliminated prescription requirements. By 1968, in response to widespread purchases by apparently healthy young men, the FDA reinstated the prescription requirement. Finally, during the 1970s, a proliferation of butyl nitrite products by non-pharmaceutical manufacturers led to a 1991 Congressional ban on the manufacture and sale of all “alkyl nitrites.” Today, manufacturers have circumvented that ban by slightly changing the chemical formulae and marketing poppers under names such as “video head cleaner,” “boot cleaner,” and “leather cleaner.” Poppers are sold in adult bookstores and theaters, in bathhouses, and on the Internet.

Poppers were once the most commonly used drug during sex by gay men. A 1996-1997 survey of 2,189 young gay men in three U.S. cities found that 18 percent of the men younger than 25 and 24 percent of the men older than 25 had used poppers in the previous six months.¹

References


Sex and the Effects of Poppers

Amyl nitrate is a “vasodilator,” which, upon inhalation, causes blood vessels to dilate, blood pressure to drop, and the heart to beat faster. This produces a lightheadedness and a “rush,” followed by euphoria that can be appealing to those seeking to elevate mood or escape grief, depression, and anxiety. These overall effects reduce inhibitions and increase sexual drive, which can result in more forceful anal penetration. Inhaled immediately before ejaculation, poppers intensify sensations and prolong orgasm.

Poppers also cause the anal sphincter muscle to relax, facilitating quick and pain-free penetration during anal intercourse, fisting, or sex-toy play. The “high” experienced by the receptive partner may mask pain caused by tears in the rectum, and rectal trauma increases the risk of numerous infections. Further, by making blood more available to the tissues, the dilation of vessels in the rectum possibly increases the likelihood of acquisition of viruses such as HIV, human herpes virus-8 (HHV-8; the etiologic agent for Kaposi’s sarcoma), and other sexually transmitted agents, such as hepatitis B.

Researchers have consistently found a significant relationship between the use of drugs, including poppers, and riskier sex. As far back as 1984, the San Francisco AIDS Behavioral Research Project found that the use of alcohol, poppers, and marijuana was associated with unsafe sex among men who had not engaged in risky activities and men who continued to engage in risky activities.²

Data from the Chicago arm of the Multicenter AIDS Cohort Study (MACS) demonstrated cross-sectional associations between popper use and condom use lapses over the entire observation period of 1984.
Poppers suppress natural killer (NK) cell function, increasing vulnerability to infectious agents.


Authors
Hank Wilson is a member of ACT-UP Golden Gate and a Treatment Advocate at Tenderloin AIDS Resource Center in San Francisco. He chairs the Committee to Monitor Poppers which he founded in 1981.

to 1990. Frequency of popper use was significantly associated with sexual risk at all visits, and poppers were the only substance so associated. Men who used poppers consistently participated in more high-risk sex than sexually active men who did not use poppers. The significant association between popper use and condom lapses, however, was seen only in non-monogamous men, a finding reflected in a San Francisco study.

Finally, 1992 Pittsburgh MACS data suggest that the combination of youth and popper use “conferred a particularly great risk of [unsafe sex], a risk stronger than would be expected based on the main effects of these variables alone.” Two other studies of young gay men, a 1994 San Francisco study and a 1998 Vancouver study, also found popper use a risk factor for unsafe sex.

Poppers and the Immune System
In addition to facilitating HIV infection, poppers have been implicated in damage to the immune system. Researchers have found that poppers suppress natural killer (NK) cell function, increasing vulnerability to infectious agents. A 1991 study of seronegative gay men simulated the common pattern of nitrite use and found that inhalation at only once- or twice-a-week intervals was sufficient to produce sustained alterations in the immune system. NK cell activity was the most affected immune response, with a 40 percent reduction, and was the slowest to recover.

It is important to note that a 1983 Centers for Disease Control and Prevention (CDC) study exposed mice to low doses of nitrite vapors and concluded that poppers were not immunosuppressive. Unfortunately, the government publicized this data, leading to full-page advertisements by the poppers industry. Subsequent studies using higher doses did show that poppers suppress NK function, but the government failed to publicize these findings. The result was that until the 1991 federal ban of poppers, gay and bisexual men were left with contradictory data and direction.

The immunosuppressive effects of poppers may be particularly relevant to the drug’s association with the HIV-related malignancy, Kaposi’s sarcoma (KS). Three reasons suggest that nitrite use may be a KS cofactor. First, the epidemiology of nitrite use in the United States parallels that of HIV-related KS: poppers are used by gay men more than by others; the decline in popper use has paralleled the decline of KS cases; and popper use, as KS incidence, is greater among Whites than Blacks. Second, some studies have associated KS in HIV-infected gay men with the use of large quantities of nitrite inhalants. Finally, nitrites act on blood vessels, the site of KS formation.

The finding that HHV-8 causes KS initially minimized the role of poppers. However, researchers suggest that HHV-8 alone may not cause KS. Recent studies support the relationship between poppers and KS: one was the first to document increased tumor incidence and growth, by almost four-fold, in mice exposed to nitrite vapors.

Conclusion
The combination of factors described above—related to increases in unsafe sex, type of sexual activity, and immunosuppression—may account for the accumulated evidence that nitrite use is a risk factor for seroconversion. This evidence includes studies that found that poppers actually magnified the risk of both seropositivity and unprotected anal intercourse, increased the risk of seroconversion even after controlling for a variety of other factors, and were the drug most strongly related to seropositivity. Recent studies, for example, large studies of repeat HIV antibody testers, young men, and men in six U.S. cities, continue to support such connections.

To make informed choices, all gay and bisexual men need to know about the potential risks of popper use. But, leading AIDS organizations have failed to publicize data about the immunosuppressive or behavioral effects of poppers. These organizations, public health agencies, and health and mental health care providers have an opportunity to disseminate this information and help their clients interpret it.

Comments and Submissions
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**Recent Reports**

**Alcohol, and HIV Risk and Progression**


A comprehensive review of studies found no causal links between alcohol consumption and HIV infection or HIV progression. The review comprised immunological and behavioral studies that assessed the relationships between social drinking and HIV infection, chronic drinking and HIV infection, social drinking and progression to AIDS, and chronic drinking and progression to AIDS.

The underlying premise for many of the behavioral studies analyzing the relationship between social drinking and HIV infection has focused on the "transmission hypothesis," the belief that drinking alcohol increases the likelihood of person engaging in unprotected sex. Of the 20 studies reviewed, 35 percent supported the hypothesis, 25 percent found partial support, and 40 percent found no support. Because many of the behavioral studies assess the roles of other drug use in addition to alcohol use, it is difficult to distinguish the primary effects of alcohol on risks and HIV.

Nine immunological studies in animals have found evidence that both social and chronic alcohol use heightens the rate of progression from HIV infection to AIDS by compromising the animal’s ability to ward off opportunistic infections.

In humans, laboratory studies show that chronic alcohol consumption can debilitate the immune response of human cells, but there are no human studies supporting a relationship between alcohol use and HIV progression. Laboratory studies of human immunology do suggest that alcohol decreases CD4+ and CD8+ cell functioning, but they provide little evidence that social or chronic drinking decrease resistance to HIV. Finally, behavioral studies have found no evidence that social or chronic drinking increases the rate of HIV progression.

**The Social Context of Drinking**

Seage GR III, Mayer KH, Wold C, et al. The social context of drinking, drug use, and unsafe sex in the Boston Young Men Study. *Journal of Acquired Immune Deficiency Syndromes and Human Retrovirology*. 1998; 17(4): 368-375. (Boston Department of Public Health; Boston University; ABT Associates Inc.; Fenway Community Health Center; Brown University; and Harvard University.)

Among young gay and bisexual men, alcohol use increases the likelihood of unprotected anal sex with non-steady partners but decreases the likelihood of unprotected anal sex with steady partners, according to a Boston study, which emphasizes the difficulty of making blanket statements regarding risk and alcohol use.

The study sample included 508 men with an average age of 23 years; 78 percent were White, and other groups made up less than 8 percent of the sample. Ninety-seven percent had consumed alcohol at least once in their lives, and 92 percent had consumed alcohol in the prior six months. In the previous six months, 91 percent reported having sexual partners; 26 percent of these had unprotected anal sex at least once.

The overall rates of unprotected anal sex were 17 percent after drinking and 26 percent when sober. With steady partners, men had unprotected anal sex 22 percent of the time after drinking and 27 percent of the time when sober. With non-steady partners, the rates were 9 percent after drinking compared with 3 percent when sober.

Men who were more likely to have unprotected anal sex with non-steady partners were also significantly more likely to be alcohol dependent and had almost twice as many sex partners in the previous six months as subjects who were less likely to have unprotected anal sex. These findings and others support the role of situational factors in sexual risk taking rather than simply the direct effect of alcohol’s pharmacologic properties on social behavior.

**Ethnicity, Alcohol, and Risky Sex**


According to a large national study, Hispanics are more likely than Blacks or Whites to use condoms with new partners after using alcohol. Hispanic men and women and Black women were also more likely to use condoms when they drank alcohol than when they did not drink it.

The study, focused on sexual behavior with new partners, drew from two samples balanced to ensure representation of younger respondents and a roughly equal split among Black, Hispanic, and White subjects. The total sample consisted of 916 participants who had engaged in vol-
The relative success antiviral treatment and viral load testing as a way of monitoring disease progression have led to new questions regarding HIV transmission. In the April issue of *FOCUS*, Perry N. Halkitis, MS, PhD, Professor of Applied Psychology at New York University, and Leo Wilton, MA, a New York University doctoral candidate, discuss the science behind three thorny transmission issues: the transmission of drug-resistant virus, reinfection, and the transmission risk associated with a viral load below the level of detection.

Also in the April issue, June Crawford, PhD, Susan Kippax, PhD, and Paul Van de Ven, PhD, all of the University of South Wales in Australia, discuss the concept of “negotiated safety” and other agreements that sexual partners use to reduce risk.
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