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# ALCOHOL ALERT

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## ALCOHOL AND TOBACCO

Alcohol and tobacco<sup>1</sup> are among the top causes of preventable deaths in the United States (1). Moreover, these substances often are used together: Studies have found that people who smoke are much more likely to drink, and people who drink are much more likely to smoke (2). Dependence on alcohol and tobacco also is correlated: People who are dependent on alcohol are three times more likely than those in the general population to be smokers, and people who are dependent on tobacco are four times more likely than the general population to be dependent on alcohol (3).

The link between alcohol and tobacco has important implications for those in the alcohol treatment field. Many alcoholics smoke, putting them at high risk for tobacco-related complications including multiple cancers, lung disease, and heart disease (i.e., cardiovascular disease) (4). In fact, statistics suggest that more alcoholics die of tobacco-related illness than die of alcohol-related problems (5). Also, questions remain as to the best way to treat these co-occurring addictions; some programs target alcoholism first and then address tobacco addiction, whereas others emphasize abstinence from drinking and smoking simultaneously. Effective treatment hinges on a better understanding of how these substances—and their addictions—interact.

Understanding just how alcohol and tobacco interact is challenging. Because co-use is so common, and because both substances work on similar mechanisms in the brain, it's proving difficult to tease apart individual and combined effects of these drugs. In this *Alcohol Alert*, we examine the latest research on the interactions between these two substances, including the prevalence of co-occurring tobacco and alcohol use disorders (AUDs), some of the health consequences of combined use, biological mechanisms and genetic vulnerabilities to co-use and dependence, barriers to the treatment of tobacco dependence in patients with alcohol and other drug (AOD) use disorders,<sup>2</sup> therapies that are proving effective in



treating co-occurring tobacco and alcohol dependence in depressed patients, and treatment interventions for adolescent patients with co-occurring tobacco and AOD use disorders.

### HOW PREVALENT ARE ALCOHOL AND TOBACCO USE?

The National Institute on Alcohol Abuse and Alcoholism's (NIAAA's) 2001–2002 National Epidemiologic Survey on Alcohol and Related Conditions (NESARC), which is one of the largest comorbidity studies ever conducted, included extensive questions about alcohol and tobacco use and related disorders. NESARC data confirmed the widespread use of alcohol with tobacco: Approximately 46 million adults used both alcohol and tobacco in the past year, and approximately 6.2 million adults reported both an AUD and dependence on nicotine (6).

Alcohol and tobacco use varied according to gender, age, and ethnicity, with men having higher rates of co-use than women (7). Younger people tended to have a higher prevalence of AUDs, nicotine dependence, and co-use (6). Although Whites were more likely to drink alcohol, American Indians/Alaskan Natives were most likely to smoke, or to smoke and drink concurrently (6). Asians/Native Hawaiians/Pacific Islanders were least likely to smoke or drink, or smoke and drink concurrently (6).

Comorbid mood or anxiety disorders are another risk factor for both alcoholism and nicotine dependence. NESARC data show that alcohol abuse is strongly correlated with a co-occurring mood or anxiety disorder (3). The presence of comorbid mental illness also raises risk for tobacco addiction.

<sup>1</sup> Tobacco is available in several forms (e.g., cigarettes, cigars, pipes, and snuff and chewing tobacco); however, most comorbidity studies focus on cigarette smoking alone (6). In this article, tobacco use will refer to tobacco in any form, smoking will refer to cigarette smoking, and nicotine will refer to the psychoactive ingredient in tobacco products.

<sup>2</sup> Studies define AOD use disorders differently. For the purposes of this article, AOD use disorders will refer to both abuse and dependence.

In another study, Williams and Ziedonis (8) found that 50 to 90 percent of people with mental illness or addiction were dependent on nicotine.

## HEALTH RISKS ASSOCIATED WITH ALCOHOL AND TOBACCO USE

Alcohol and tobacco use may lead to major health risks when used alone and together. In addition to contributing to traumatic death and injury (e.g., through car crashes), alcohol is associated with chronic liver disease, cancers, cardiovascular disease, acute alcohol poisoning (i.e., alcohol toxicity), and fetal alcohol syndrome. Smoking is associated with lung disease, cancers, and cardiovascular disease (9). Additionally, a growing body of evidence suggests that these substances might be especially dangerous when they are used together; when combined, alcohol and tobacco dramatically increase the risk of certain cancers (10).

**Cancers of the Mouth and Throat**—People who drink and smoke are at higher risk for certain types of cancer, particularly those of the mouth and throat (12–14). Alcohol and tobacco cause approximately 80 percent of cases of cancer of the mouth and throat in men and about 65 percent in women (11,16–18). For people who both smoke and drink, the danger of mouth and throat cancer increases dramatically—in fact, the combined risk is greater than or equal to the risk associated with alcohol multiplied by the risk associated with tobacco (15). Alcohol and tobacco co-use appears to substantially increase the risk of at least one type of cancer of the esophagus (19).

**Liver Cancer**—During the past decade, the incidence of liver cancer has increased dramatically in the United States (20). Although some studies have reported that alcohol and tobacco may work synergistically to increase the risk of liver cancers (21,22), more research is needed to explore this issue.

**Cardiovascular Disease**—The American Heart Association (23) estimates that more than 34 percent of the United States population has some form of cardiovascular disease. Tobacco use and alcohol consumption both are major risk factors for various forms of cardiovascular disease. However, little evidence exists to suggest that drinking and smoking together raise the risk more than the sum of their independent effects (24).

Determining the risk factors for cardiovascular disease is difficult because the issues involved are extremely complex. First, cardiovascular disease encompasses a variety of condi-

tions (such as heart attack, stroke, and hardening or narrowing of the arteries), which result from numerous factors (25). Second, although tobacco has been shown to raise the risk for cardiovascular disease in a dose-dependent manner—the more a person smokes, the more his or her risk of developing cardiovascular disease increases—alcohol's effect on cardiovascular disease depends on many factors, including gender, age, and drinking patterns. Overall, moderate drinking appears to reduce the risk for many forms of cardiovascular disease (26), whereas drinking large amounts of alcohol generally increases the risk (27).

## BIOLOGICAL AND GENETIC FACTORS INVOLVED IN CO-USE

Why do tobacco and alcohol use co-occur so frequently? Clearly environmental factors contribute to the problem. Both drugs are legally available and easily obtained. Over the past two decades, however, it also has become clear that biological factors are at least partly responsible. Although tobacco and nicotine have very different effects and mechanisms of action, Funk and colleagues (27) speculate that they might act on common mechanisms in the brain, creating complex interactions. These possible mechanisms are difficult to study because alcohol and nicotine can affect people differently depending on the amount of the drugs consumed (28–30) and because numerous factors, including gender and age, influence the interaction between nicotine and alcohol (31,32). Still, a common mechanism might explain many of the interactions between tobacco and alcohol, as well as a possible genetic link between alcoholism and tobacco dependence.

**Mutual Craving**—Studies show that consuming tobacco and alcohol together can augment the pleasure users experience from either drug alone. For example, in a study by Barrett and colleagues (33), subjects were given either nicotine-containing or nicotine-free cigarettes and asked to perform progressively more difficult tasks in order to earn alcoholic beverages. The subjects who smoked nicotine-containing cigarettes worked harder and drank more alcohol than those smoking nicotine-free cigarettes. Conversely, Rose and colleagues (34) showed that drinking alcohol enhances the pleasure reported from smoking cigarettes. This research is supported by animal studies (35–37), which show that nicotine-treated animals consumed more alcohol than did control animals.

**A Common Brain System**—Evidence increasingly suggests that both alcohol and tobacco may act on the mesolimbic dopamine system, a part of the brain that is involved in reward, emotion, memory, and cognition (27). Brain cells (i.e., neurons) that release dopamine—a key brain chemical involved in addiction—have small docking molecules (i.e., receptors) to which nicotine binds.

“*For people who both smoke and drink, the danger of mouth and throat cancer increases dramatically.*”

Evidence suggests that the interaction between alcohol and tobacco may take place at these nicotinic receptors. When nicotinic receptors are blocked, people not only tend to consume less nicotine (38) but also less alcohol (39). This common mechanism of action may explain some of the interactions between alcohol and tobacco, including why alcohol and tobacco can cause users to crave the other drug and the phenomenon of cross-tolerance.

**Tolerance and Cross-Tolerance**—A decrease in a person's sensitivity to a drug's effects often is referred to as *tolerance*. This phenomenon occurs when a person must consume more of a substance in order to achieve the same rewarding effect. In the case of alcohol and tobacco, this puts him or her at greater risk for developing dependence. *Cross-tolerance*—that is, when tolerance to one drug confers tolerance to another—also has been documented in people who smoke and drink (27).

**Genetic Factors**—Recent studies suggest that common genetic factors may make people vulnerable to both alcohol and tobacco addiction. Clearly, both alcohol and nicotine dependence runs in families. Identical twins (who share 100 percent of their DNA) are twice as likely as fraternal twins (who, like all siblings, share 50 percent of their DNA) to be nico-

tine and alcohol dependent if the other twin is dependent (40–42). Strains of mice have been bred to be more or less tolerant to alcohol's effects (27). And recently, the Collaborative Study on the Genetics of Alcoholism—the first study to examine the human genetic makeup (or genome) for regions that involve both alcohol dependence and smoking—has identified genes and regions of genes that may be involved in both AUDs and nicotine dependence (4). Davis and De Fiebre (43) suggest that some overlap may exist between genes that code for sensitivity to alcohol and those that influence sensitivity to nicotine. People may be more or less sensitive to alcohol and tobacco's effects because of natural genetic variations in the number and type of nicotinic receptors that they possess (44).

## TREATING CO-OCCURRING DISORDERS

More than half of patients in treatment for AOD dependence die from tobacco-related illnesses (45). Yet, tobacco addiction often is not addressed in recovering alcoholics. One of the major barriers to treating tobacco dependence in patients with a co-occurring AUD is the notion that it is too difficult to quit both alcohol and tobacco and that attempts

## ADOLESCENTS WITH AOD USE DISORDERS

During the high school years, adolescents' use of AODs escalates significantly (1). People ages 14–18 typically start using tobacco and alcohol prior to other drugs (2)—that is, they are considered gateway drugs.

Adolescents in treatment for AOD use disorders also are likely to smoke (3). Like adults, adolescents who pass through treatment programs—even those who stay abstinent—are likely to continue smoking after treatment; 80 percent of those who smoked at the time of treatment were still smoking 4 years later (4).

Treating adolescents and young adults can pose special challenges, because this population is developmentally different from adults (5). Adolescents identify strongly with their peers (6), and the social rules (or norms) and expectations that govern behavior may have greater influence on adolescents than on adults (7). Adolescent nicotine dependence also differs from adults—adolescents are likely to become nicotine dependent from a smaller daily dose (8).

Several recent studies suggest that the most effective way to treat adolescents with AOD use problems who smoke is to use client-centered therapies that motivate adolescents to change their behavior (7). When therapies that have been developed for adults are modified with adolescents in mind—for example, by emphasizing group over individual interventions, using motivational approaches, and educating patients about the effects of tobacco and nicotine—they can be effective in helping adolescents quit smoking, and do not negatively affect AOD-related outcomes (9,10). In treating adolescent smoking, clinicians should pay particular attention to how the adolescent's peer group views smoking, and to the role cigarettes play in his or her social life, and should teach skills to resist the temptation to smoke (11).

## REFERENCES

- (1) Johnston, L.D.; O'Malley, P.M.; Bachman, J.G.; and Schulenberg, J.E. *Monitoring the Future National Results on Adolescent Drug Use: Overview of Key Findings, 2005*. (NIH Pub. No. 06-5882). Bethesda, MD: National Institute on Drug Abuse, 2006. (2) Ellickson, P.L.; Hays, R.D.; and Bell, R.M. Stepping through the drug use sequence: Longitudinal scalogram analysis of initiation and regular use. *Journal of Abnormal Psychology* 101:441–451, 1992. PMID: 1500601 (3) Eckhardt, L.; Woodruff, S.I.; and Elder, J.P. A Longitudinal analysis of adolescent smoking and its correlates. *Journal of School Health* 64:67–72, 1994. PMID: 8028302 (4) Myers, M.G., and Brown, S.A. Smoking and health in substance abusing adolescents: A two year follow-up. *Pediatrics* 93:561–566, 1994. PMID: 8134209 (5) Mermelstein, R. Teen smoking cessation. *Tobacco Control* 12 (Suppl. 1):i25–i34, 2003. PMID: 12773783 (6) Greenberg, M.T.; Seigel, J.M.; and Leitch, C.J. The nature and importance of attachment relationships to parents and peers during adolescence. *Journal of Youth and Adolescence* 12:373–386, 1983. (7) Myers, M.G. Smoking intervention with adolescent substance abusers: Initial recommendations. *Journal of Substance Abuse Treatment* 16:289–298, 1999. PMID: 10349601 (8) Colby, S.M.; Tiffany, S.T.; Shiffman, S.; et al. Are adolescent smokers dependent on nicotine? A review of the evidence. *Drug and Alcohol Dependence* 59 (Suppl. 1):S83–S95, 2000. PMID: 10773439 (9) Sussman, S.; Dent, C.W.; and Lichtman, K.L. Project EX: Outcomes of a teen smoking cessation program. *Addictive Behaviors* 26:425–438, 2001. PMID: 11436934 (10) Myers, M.G.; Brown, S.A.; and Kelly, J.F. A smoking intervention for substance abusing adolescents: Outcomes, predictors of cessation attempts, and post-treatment substance use. *Journal of Child and Adolescent Substance Abuse* 9:77–91, 2000. (11) Myers, M.G., and Kelly, J.F. Cigarette smoking among adolescents with alcohol and other drug use problems. *Alcohol Research & Health* 29(3):221–227, 2007.



to quit tobacco might adversely affect the patient's recovery from alcoholism (46,47). Treatment facilities often concentrate on the "primary" addiction to alcohol and treat tobacco use as a more benign addiction. Fewer than 1 in 10 treatment facilities ban tobacco use on their grounds (48), and many treatment facilities do not screen for or treat tobacco dependence. Moreover, Ziedonis and colleagues (49) note that many treatment facilities enable patient smoking by adjourning meetings for "smoke breaks" and allowing staff to smoke openly with patients.

Studies show that quitting smoking does not cause abstinent alcoholics to relapse and may actually decrease the likelihood of relapse (50). However, it is less clear whether co-occurring tobacco and alcohol addictions ought to be addressed one at a time or concurrently. Study results are mixed. Although some studies show that simultaneous treatment of tobacco and alcohol addiction improves outcomes (51,52), others suggest that concurrent treatment can worsen outcomes (53–55). Kodl and colleagues (56) suggest that some of these contradictory results may be attributed to differences in what is considered to be "concurrent" treatment from study to study—some researchers began smoking cessation treatment early in substance abuse treatment (57,58), whereas others began smoking cessation after sobriety was achieved or between two treatments (59,60). Other studies (46,61) had methodological limitations (56).

**One State's Experience**—New Jersey is the first State to require that residential addiction treatment facilities address tobacco dependence as well as dependence on a primary substance. The new policy requires residential facilities to assess and treat patients for nicotine dependence and to maintain smoke-free grounds. Despite initial concerns that the new regulations would negatively affect treatment (e.g., that patients might leave treatment early, before the full course was completed), preliminary results are encouraging (62). But this study had obvious limits. New Jersey's Division of Addiction Services implemented the program but did not enforce penalties for facilities that failed to comply (i.e., failure to comply did not result in citation or loss of license). Foulds and colleagues (62) suggest that this might have compromised the effectiveness of the program.

## WHEN A PATIENT IS DEPRESSED

Patients with co-occurring disorders, such as major depression, AUDs, and nicotine dependence, are increasingly common in clinical settings. Treating these patients presents challenges because the relationship between alcohol and tobacco dependence and major depression is complex and self-sustaining. Patients may drink or smoke in an attempt to "self-medicate" to alleviate their feelings of depression (63–65). Additionally, depression and anxiety are associated with cravings for alcohol and nicotine (66). And long-term use of alcohol and nicotine can produce low levels of the brain chemical serotonin, which might trigger or worsen

depression (67). Given the apparent link between drinking, smoking, and depression, Ait-Daoud and colleagues (68) suggest that clinicians must address both addictions and major depression in order to treat these patients effectively.

Medications and psychotherapy can be useful in treating these patients. The researchers conclude that combining pharmacotherapy with psychotherapy might be the best mode of treatment.

## MEDICATIONS

**Bupropion**—Bupropion is the only antidepressant that has been approved by the Food and Drug Administration for the treatment of nicotine dependence. Slow-release bupropion has been shown to be effective in the treatment of depression and nicotine dependence; however, it has not been shown to be effective for the treatment of alcohol dependence (68).

**Nicotine Replacement Therapy (NRT)**—Although NRT has not been shown to reduce drinking, it might be an important treatment component in patients who use tobacco and alcohol to self-medicate for a mood disorder. Research suggests that NRT may improve the mood of depressed abstinent smokers (69), in addition to helping them quit smoking.

**Varenicline**—Varenicline works at the nicotine receptor level to diminish nicotine's effects (68). Recent studies have shown that it is significantly more effective than placebo in helping patients to quit smoking (70,71).

**Topiramate**—Topiramate is an anticonvulsant drug. Johnson and colleagues (72) demonstrated that subjects who received 300 mg/day of topiramate were much more likely to abstain from both alcohol and tobacco than patients receiving only brief therapy. In this study, topiramate had no effect on mood.

## CONCLUSION

Because of the mortality and morbidity associated with both tobacco and alcohol abuse, it is important to address both addictions. Research is beginning to explain some of the reasons behind the frequent co-occurrence of these disorders. Treating co-occurring disorders remains a challenge; however, evidence suggests that combining treatments might be the most effective way to address concurrent addictions. Special populations, such as depressed patients and adolescents, present additional challenges, but research is exploring new strategies targeting these groups. Although more work needs to be done, it is clear that research already is helping to improve the lives of people with co-occurring addictions to alcohol and nicotine.

## REFERENCES

- (1) Mokdad, A.H.; Marks, J.S.; Stroup, D.F.; and Gerberding, J.L. Actual causes of death in the United States, 2000. *JAMA: Journal of the American Medical Association* 291:1238–1245, 2004. PMID: 15657315
- (2) Bobo, J.K., and Husten, C. Sociocultural influences on smoking and drinking. *Alcohol Research & Health* 24(4):225–232, 2000. PMID: 15986717
- (3) Grant, B.F.; Hasin, D.S.; Chou, S.P.; et al. Nicotine dependence and psychiatric disorders in the United States: Results from the National Epidemiologic

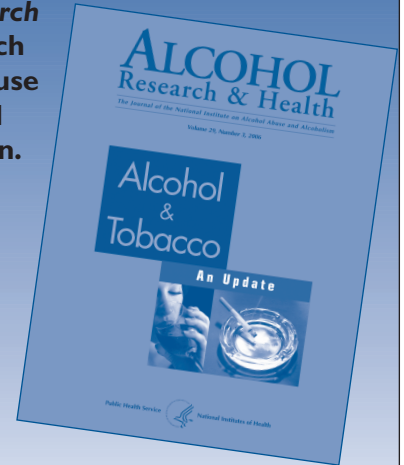
Survey on Alcohol and Related Conditions. *Archives of General Psychiatry* 61:1107–1115, 2004. PMID: 15520358 (4) **Gruca, R.A.**, and Beirut, L.J. Co-occurring risk factors for alcohol dependence and habitual smoking: Update on findings from the Collaborative Study on the Genetics of Alcoholism. *Alcohol Research & Health* 29(3):172–177, 2007. (5) **Hurt, R.D.**; Offord, K.P.; Croghan, I.T.; et al. Mortality following inpatient addictions treatment. *JAMA: Journal of the American Medical Association* 275:1097–1103, 1996. PMID: 8601929 (6) **Falk, D.E.**; Yi, Hsiao-ye; and Hiller-Sturmhöfel, S. An epidemiologic analysis of co-occurring alcohol and tobacco use disorders: Findings from the National Epidemiologic Survey on Alcohol and Related Conditions. *Alcohol Research & Health* 29(3):162–171, 2007. (7) **Anthony, J.C.**, and Echeagaray-Wagner, F. Epidemiologic analysis of alcohol and tobacco use. *Alcohol Research & Health* 24(4):201–208, 2000. PMID: 15986714 (8) **Williams, J.M.**, and Ziedonis, D. Addressing tobacco among individuals with a mental illness or an addiction. *Addictive Behaviors* 29:1067–1083, 2004. PMID: 15236808 (9) **Harwood, H.** *Updating Estimates of the Economic Costs of Alcohol Abuse in the United States: Estimates, Update Methods, and Data*. Rockville, MD: National Institute on Alcohol Abuse and Alcoholism, 2000. (10) **Pelucchi, C.**; Gallus, S.; Garavello, W.; et al. Cancer risk associated with alcohol and tobacco use: Focus on upper aero-digestive tract and liver. *Alcohol Research & Health* 29(3):193–198, 2007. (11) **Blot, W.J.**; McLaughlin, J.K.; Winn, D.M.; et al. Smoking and drinking in relation to oral and pharyngeal cancer. *Cancer Research* 48:3282–3287, 1988. PMID: 3365707 (12) **Franceschi, S.**; Talamini, R.; Barra, S.; et al. Smoking and drinking in relation to cancers of the oral cavity, pharynx, larynx, and esophagus in Northern Italy. *Cancer Research* 50:6502–6507, 1990. PMID: 2208109 (13) **Zheng, T.Z.**; Boyle, P.; Hu, H.F.; et al. Tobacco smoking, alcohol consumption, and risk of oral cancer: A case-control study in Beijing, People's Republic of China. *Cancer Causes and Control* 1:173–179, 1990. PMID: 2102288 (14) **Zheng, T.**; Boyle, P.; Zhang, B.; et al. Tobacco use and risk of oral cancer. In: Boyle, P., Gray, N., Henningfield, J., Seffrin, J., and Zatonski, W., eds. *Tobacco: Science, Policy and Public Health*. Oxford: Oxford University Press, 2004. pp. 399–432. (15) **Negri, E.**; La Vecchia, C.; Franceschi, S.; et al. Attributable risk for oral cancer in Northern Italy. *Cancer Epidemiology, Biomarkers, and Prevention* 2:189–193, 1993. PMID: 8318870 (16) **Hayes, R.B.**; Bravo-Otero, E.; Kleinman, D.V.; et al. Tobacco and alcohol use and oral cancer in Puerto Rico. *Cancer Causes and Control* 10:27–33, 1999. PMID: 10334639 (17) **Bosetti, C.**; Negri, E.; Franceschi, S.; et al. Risk factors for oral and pharyngeal cancer in women: A study from Italy and Switzerland. *British Journal of Cancer* 82:204–207, 2000. PMID: 10638990 (18) **Altieri, A.**; Garavello, W.; Bosetti, C.; et al. Alcohol consumption and risk of laryngeal cancer. *Oral Oncology* 41:956–965, 2005. PMID: 15927525 (19) **Howe, H.L.**; Wingo, P.A.; Thun, M.J.; et al. Annual report to the nation on the status of cancer (1973 through 1998), featuring cancers with recent increasing trends. *Journal of the National Cancer Institute* 93:824–842, 2001. PMID: 11390532 (20) **Kuper, H.**; Tzonou, A.; Kaklamani, E.; et al. Tobacco smoking, alcohol consumption and their interaction in the causation of hepatocellular carcinoma. *International Journal of Cancer* 85:498–502, 2000. PMID: 10699921 (21) **Marrero, J.A.**; Fontana, R.J.; Fu, S.; et al. Alcohol, tobacco and obesity are synergistic risk factors for hepatocellular carcinoma. *Journal of Hepatology* 42:218–224, 2005. PMID: 15664247 (22) **American Heart Association.** *Heart Disease and Stroke Statistics—2005 Update*. Dallas, TX: American Heart Association, 2005. (23) **Taylor, B.**, and Rehm, J. When risk factors combine: The interaction between alcohol and smoking for aerodigestive cancer, coronary heart disease, and traffic and fire injury. *Addictive Behaviors* 31:1522–1535, 2006. PMID: 16443330 (24) **Mukamal, K.J.** The effects of smoking and drinking on cardiovascular disease and risk factors. *Alcohol Research & Health* 29(3):199–202, 2007. (25) **Corrao, G.**; Rubbiati, L.; Bagnardi, V.; et al. Alcohol and coronary heart disease: A meta-analysis. *Addiction* 95:1505–1523, 2000. PMID: 11070527 (26) **Klatsky, A.L.** Alcohol and hypertension. *Clinica Chimica Acta* 246:91–105, 1996. PMID: 8814973 (27) **Funk, D.**; Marinelli, P.W.; and Lê, A.D. Biological processes underlying co-use of alcohol and nicotine: Neuronal mechanisms, cross-tolerance, and genetic factors. *Alcohol Research & Health* 29(3):186–190, 2007. (28) **Moore, T.O.**; June, H.L.; and Lewis, M.J. Ethanol-induced stimulation and depression on measures of locomotor activity: Effects of basal activity levels in rats. *Alcohol* 10:537–540, 1993. PMID: 8123213 (29) **Nanri, M.**; Kasahara, N.; Yamamoto, J.; et al. A comparative study on the effects of nicotine and GTS-21, a new nicotinic agonist, on the locomotor activity and brain monoamine level. *Japanese Journal of Pharmacology* 78:385–359, 1998. PMID: 9869274 (30) **Schaefer, G.J.**, and Michael, R.P. Task-specific effects of nicotine in rats. Intracranial self-stimulation and locomotor activity. *Neuropharmacology* 25:125–131, 1986. PMID: 3703168 (31) **Acheson, A.**; Mahler, S.V.; Chi, H.; and de Wit, H. Differential effects of nicotine on alcohol consumption in men and women. *Psychopharmacology (Berlin)* 186:54–63, 2006. PMID: 16565827 (32) **Grant, J.D.**; Scherrer, J.F.; Lynskey, M.T.; et al. Adolescent alcohol use is a risk factor for adult alcohol and drug dependence: Evidence from a twin design. *Psychology and Medicine* 36:109–118, 2006. PMID: 16194286 (33) **Barrett, S.P.**; Tichauer, M.; Leyton, M.; and Pihl, R.O. Nicotine increases alcohol self-administration in non-dependent male smokers. *Drug and Alcohol Dependence* 81:197–204, 2006. PMID: 16054779 (34) **Rose, J.E.**; Brauer, L.H.; Behm, F.M.; et al. Psychopharmacological interactions between nicotine and ethanol. *Nicotine and Tobacco Research* 6:133–144, 2004. PMID: 14982697 (35) **Potthoff, A.D.**; Ellison, G.; and Nelson, L. Ethanol intake increases during continuous administration of amphetamine and nicotine, but not several other drugs. *Pharmacology Biochemistry and Behavior* 18:489–493, 1983. PMID: 6867054 (36) **Larsson, A.**, and Engel, J.A. Neurochemical and behavioral studies on ethanol and nicotine interactions. *Neuroscience and Biobehavioral Reviews* 27:713–720, 2004. PMID: 15019421 (37) **Smith, B.R.**; Horan, J.T.; Gaskin, S.; and Amit, Z. Exposure to nicotine enhances acquisition of ethanol drinking by laboratory rats in a limited access paradigm. *Psychopharmacology* 142:408–412, 1999. PMID: 10229066 (38) **Corrigall, W.A.**; Coen, K.M.; and Adamson, K.L. Self-administered nicotine activates the mesolimbic dopamine system through the ventral tegmental area. *Brain Research* 653:278–284, 1994. PMID: 7982062 (39) **Soderpalm, B.**; Ericson, M.; Olausson, P.;

## Resources

Source material for this *Alcohol Alert* originally appeared in *Alcohol Research & Health*, Volume 29, Number 3, 2006. Articles highlight the latest research on alcohol and tobacco, including the prevalence of alcohol and tobacco use and co-use, biological mechanisms and genetic factors behind co-use, and strategies to treat patients with co-occurring alcohol and tobacco addiction.

For more information on alcohol and tobacco, see also:

- ▶ *Alcohol Research & Health*, Vol. 24, No. 4, 2000: Covers a range of topics, including prevalence of alcohol and tobacco use; behavioral, sociocultural, and genetic risk factors for smoking and drinking; the effects of tobacco use during and after pregnancy on exposed children; and preventing alcohol and tobacco use through life skills training in high school students.
- ▶ For these and other resources, visit NIAAA's Web site, [www.niaaa.nih.gov](http://www.niaaa.nih.gov)



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