10th Special Report to the U.S. Congress on Alcohol and Health

HIGHLIGHTS FROM CURRENT RESEARCH

From the Secretary of Health and Human Services

June 2000

U.S. DEPARTMENT OF HEALTH AND HUMAN SERVICES
Public Health Service
National Institutes of Health
National Institute on Alcohol Abuse and Alcoholism

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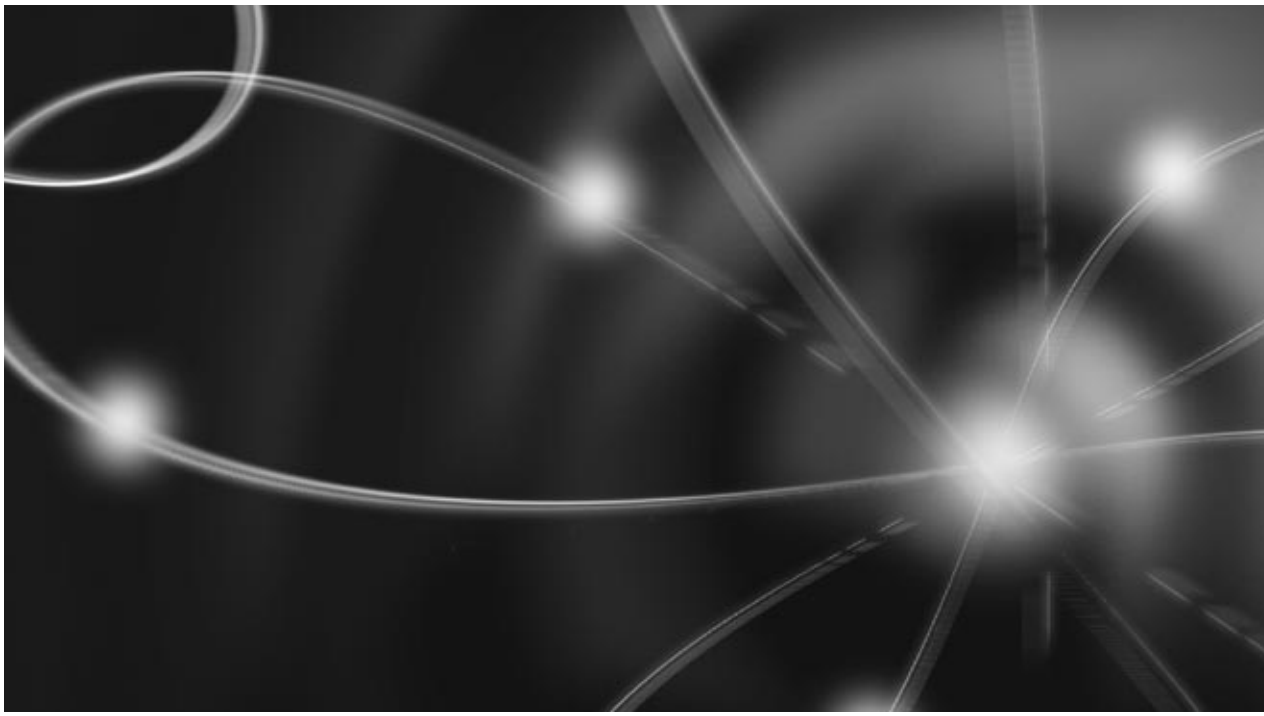

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Foreword

I am pleased to present the *Tenth Special Report on Alcohol and Health* to the U.S. Congress, and through them to the American people.

Alcohol problems, both those of individuals and those that affect society at large, continue to impose a staggering burden on our Nation. Domestic violence, child abuse, fires and other accidents, falls, rape, and other crimes against individuals such as robbery and assault—all are linked to alcohol misuse. Alcohol misuse also is implicated in diseases such as cancer, liver disease, and heart disease. Although often not aware of it, everyone shares a portion of this burden. For example, an estimated 20 to 40 percent of patients in large urban hospitals are there because of illnesses that have been caused or made worse by their drinking. This means that out of every 100 patients in such hospitals, *almost half* may be there because of their alcohol use. Each of us shares the price of these illnesses through rising health care costs. Because one in four children under the age of 18 lives in a household with one or more family members who are alcohol dependent or who abuse alcohol, our Nation will continue to be robbed of its future. As these children grow up, they too will be at risk for continuing the cycle of alcohol abuse and dependence that has plagued too many of our citizens for too long.

As overwhelming as these facts are, the real tragedy is that many people do not yet understand that alcohol problems can yield to scientific investigation and medical intervention in the same way as other health conditions, and in many cases more successfully.

The research findings presented in the *Tenth Special Report to the U.S. Congress on Alcohol and Health* clearly demonstrate that continued support for alcohol research, and the use of findings from research in prevention and clinical applications, offer the best hope for reducing the costs we all pay for alcohol problems. I commend it to your attention.

Donna E. Shalala
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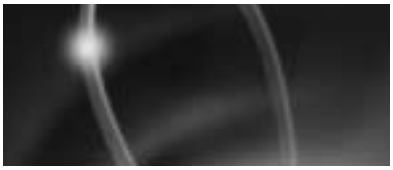
Preface



During the latter half of the twentieth century, we witnessed an unparalleled era of progress in medical science. Among other important scientific advances, we discovered the genetic code and are well on our way toward mapping the entire human genome, we began to explore how our brains work in concert with other body systems to promote or to impede health, and we developed increasingly sophisticated medical devices and technologies that allow us to look at the actual functioning of the myriad systems that make up human beings.

The *Tenth Special Report to the U.S. Congress on Alcohol and Health* presents significant new scientific findings about alcohol abuse and alcoholism since the last Special Report, issued in 1997. These findings clearly demonstrate that alcohol investigators working in fields as diverse as epidemiology, genetics, neuroscience, toxicology, prevention, and treatment are using the very latest tools and techniques of science to expand our knowledge of how to prevent, reduce, and treat alcohol problems. Because alcohol use problems exact such a personal, social, and economic toll on the American people—an estimated 100,000 lives and $184.6 billion annually—the scientific progress described in the *Tenth Special Report* is heartening.

As important as this progress is for those whose lives have been affected by alcohol use, I believe that the *Tenth Special Report* serves a greater purpose. Science does not happen in a vacuum. Rather, it is a cumulative process that builds upon the knowledge developed by many scientists working in many different areas of investigation. Therefore, what is discovered about one disease or health condition may very well provide important clues about other diseases and conditions, clues that will help in the development of medications, treatments, and preventive approaches that can be widely applied. Because alcohol affects virtually all body systems and because alcohol use problems affect all levels of human interaction, the alcohol research field represents, in many respects, a microcosm of science in its entirety. Thus, the findings described in the *Tenth Special Report* about genetics, neural circuitry, the effect of the environment on gene expression, fetal development, cognition, psychological therapies, prevention and education, and treatment contribute significantly to the knowledge we need to solve not only the problems associated with alcohol abuse and alcoholism, but also the problems of human biology and behavior in general.

I would like to commend the scientists who participated in the development of the *Tenth Special Report* and the staff of the National Institute on Alcohol Abuse and Alcoholism for their efforts to bring this important information to the attention of the U.S. Congress and the American people.

Ruth Kirschstein, M.D.
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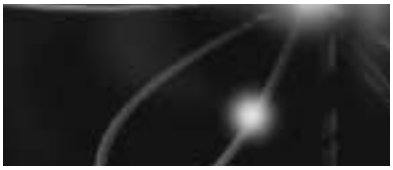
Introduction



The first *Special Report on Alcohol and Health* was presented to the U.S. Congress in 1971. In that report, and in each subsequent one, the National Institute on Alcohol Abuse and Alcoholism (NIAAA) summarized for the Congress—and the American people—the cumulative body of alcohol research findings in each area of investigation. For this, our 10th edition of the Special Report, we found ourselves in a pleasant, if somewhat daunting, position. The breadth and scope of alcohol research has grown so tremendously that summarizing the total body of alcohol research in one document is no longer manageable; so we have chosen to present the findings from alcohol research in a new way—to summarize what is known in a particular area and to describe in greater detail significant research findings that have been reported since the *Ninth Special Report*. And, in the best tradition of the *Special Reports on Alcohol and Health*, this 10th edition continues to provide both extensive information on alcohol use problems and ample cause for hope that we are well on the way to preventing and effectively treating them.

Alcohol is widely used in our society. Most individuals who use alcohol drink in ways that do not increase risk for alcohol use problems. Some, however, drink in ways or at times during their life course that increase risk to themselves or others. Still others who use alcohol may derive a health benefit from its use. Defining precisely who is at risk for alcohol use problems and assessing the risks versus benefits of alcohol use are the first steps toward providing accurate public health information and designing effective interventions to reduce alcohol use problems. The *Tenth Special Report* presents important new findings about biological and behavioral factors that affect the risks and benefits of drinking over the life span.

Perhaps the single greatest influence on the scope and direction of alcohol research has been the finding that a portion of the vulnerability to alcoholism is genetic. This finding, more than any other, helped to establish the biological basis of alcoholism. It also provided the basis—and justification—for much of the progress in genetics, neuroscience, and neurobehavior described in the *Tenth Special Report*. Today we know that approximately 50 to 60 percent of the risk for developing alcoholism is genetic. Genes direct the synthesis of proteins, and it is the proteins that drive and regulate critical chemical reactions throughout the human body. Genetics, therefore, affects virtually every facet of alcohol research, from neuroscience to Fetal Alcohol Syndrome. It is clear from the findings presented in the *Tenth Special Report* that although much remains to be discovered, progress has been made toward understanding how genes are involved in the etiology of alcohol use problems, including how genes interact with other genes and with the environment to produce disease.

The progress made in the neurosciences over the last two decades has been spectacular. Alcohol investigators have taken full advantage of this progress by applying neuroscience techniques to the study of alcohol use problems. As a result, our understanding of the neural processes that underlie alcohol-seeking behavior and of how alcohol's actions in the brain are related to the phenomenon of addiction has grown dramatically. Recent progress in neuroscience research described in the *Tenth Special*

Report has yielded information critical to characterizing some of the cellular and molecular processes involved in alcohol use and has helped associate these processes with the behavioral and physiologic manifestations of alcohol use and abuse. One important tool used in both genetics and neurobehavioral research is the animal model. Alcohol scientists have applied molecular biology techniques to develop a number of important animal models that allow the study of the genes associated with traits that might influence alcohol-related behaviors. Findings from studies using both vertebrate and nonvertebrate animal models and other study results concerning the etiology of alcohol use problems are discussed in the *Tenth Special Report*.

Although the toxicology of alcohol—how alcohol damages the body—was one of the first areas in alcohol research to be studied, the acceptance of the biological foundations of alcoholism and the subsequent increase in alcohol-related biological research helped to focus scientific attention on the mechanisms by which this damage occurs. As described in several chapters of the *Tenth Special Report*, alcohol research scientists have uncovered new information about the kinds of damage that alcohol exposure can cause to the brain, both during prenatal development and later in life, and to other major body organs. More important, there is a very good accounting of the progress that alcohol scientists have made toward understanding how this damage occurs. It is knowing the "how" that has the potential to produce therapeutic interventions to limit or ameliorate many of the alcohol-related health consequences.

Limited in the past, research on prevention is coming into its own. The findings from prevention research applied to various public policies already have been shown to save lives. New approaches to school-based and community prevention are demonstrating that well-planned prevention programs based on rigorously studied and validated models can reduce the magnitude and extent of our Nation's alcohol-related problems. Prevention research is also examining the role that advertising plays with respect to alcohol use and abuse.

The main goal of alcoholism treatment is to help alcoholics maintain sobriety. The *Tenth Special Report* highlights the progress that has been made toward developing both behavioral strategies and medications to help achieve this goal. Some of the most compelling questions about treatment have to do with factors that help to make treatment services effective. Some studies have shown significant reductions in drinking following treatment with extensively tested and refined behavioral therapies. Other strategies, involving brief interventions in primary care settings, have proved to be effective in reducing alcohol consumption in persons drinking at levels associated with negative health consequences. Because many individuals continue to experience problems with alcohol after treatment, there is a need to further improve treatment efficacy.

One of the principal payoffs of biological research in genetics and neuroscience is the potential for developing medications to treat a variety of alcohol use problems. Neuroscience research already has provided the groundwork for new medications for treating alcoholism. Researchers now are looking for new medications that target the mechanisms of the addiction itself, such as drugs that interfere with the reward properties of alcohol or craving, which are thought to be major factors in relapse. It is likely that no one medication will be effective for everyone nor that there will be the proverbial "silver bullet" of pharmacotherapies for alcoholism. Just as there are different types of medications with different mechanisms of action to treat complex diseases like diabetes, it is likely that there will be a range of medications, coupled with verbal therapies, available to clinicians.

Last, like everyone else during this ending of one century and beginning of a new century, I would like to share my thoughts on where we are heading in alcohol research. Finding the genes for alcoholism is probably one of the most important goals in alcohol research. However, it is the

beginning of the story rather than the end. For this information to be of practical use, we must understand how biology and behavior interact to produce disease. There is a welcome trend in the alcohol field toward reciprocal work between the biological and behavioral sciences. The potential success of this type of collaboration has been well demonstrated by major research efforts such as the Collaborative Study on the Genetics of Alcoholism, which involved both biological and behavioral science and scientific principles. Other examples of this type of work can be found in research on the effects of alcohol on the fetus, where there are excellent behavioral studies of children with Fetal Alcohol Syndrome and other alcohol-related birth defects as well as detailed information from imaging studies about the tremendous structural changes in the brains of children exposed to alcohol in the womb. We also are learning about the proper connectivity among neurons. In this work it appears that alcohol actually prevents the appropriate expression of certain genes.

The trend toward studying the whole human animal, not just its genetic or neural parts, will continue to be advanced, I believe, by a rejection of the "reductionist" view, which seeks to define humankind in terms of its genes, and acceptance of the tenet that genes are not (or even mostly) destiny, just as humankind is not just the sum of its neurons and circuits.

That we are continuing to expand our knowledge of alcohol use problems is clear from the material presented in this Special Report. The scientists, and the NIAAA staff who have worked so diligently to present the *Tenth Special Report* to the Congress, have my thanks for their efforts. The task now for each of us who is concerned about the impact of alcohol abuse and alcoholism on our society is to accelerate the pace of research that has enabled us to come this far to ensure that the new millennium brings new successes.

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