

**MEETING SUMMARY
PRESIDENT'S CANCEL PANEL
PROMOTING HEALTHY LIFESTYLES
TO REDUCE THE RISK OF CANCER**

September 11, 2006
Minneapolis, MN

OVERVIEW

The President's Cancer Panel (PCP, the Panel) is seeking input to help develop its recommendations to the President of the United States, the U.S. Congress, the Secretary of Health and Human Services (HHS), and the broader community of researchers, policy makers, advocates, and others within the cancer community.

This meeting was the first in the 2006-2007 series focusing on ways to reduce the risk of cancer incidence and mortality through the promotion of healthy lifestyles. In two of the meetings in this series, the Panel will hear reports on factors linking obesity, physical activity, and nutrition to cancer risk. The other two meetings will focus on the factors linking tobacco use and environmental tobacco smoke to cancer risk.

PARTICIPANTS

President's Cancer Panel (PCP)

LaSalle D. Leffall, Jr., M.D., F.A.C.S., Chair

Margaret Kripke, Ph.D.

Lance Armstrong

National Cancer Institute (NCI), National Institutes of Health (NIH)

Abby Sandler, Ph.D., Executive Secretary, PCP, NCI

Doug Ulman, Director's Consumer Liaison Group, NCI

Speakers

Rachel Ballard-Barbash, M.D., M.P.H., Associate Director, Applied Research Program, Division of Cancer Control and Population Sciences, National Cancer Institute

Leslie Bernstein, Ph.D., Professor and AFLAC Chair in Cancer Research, Keck School of Medicine and USC/Norris Comprehensive Cancer Center

Tim E. Byers, M.D., M.P.H., Deputy Director, University of Colorado Comprehensive Cancer Center

Kathy Cunningham, M.Ed., R.D., L.D., Senior Program Manager, Boston Steps, Boston Public Health Commission

Gregory A. Curt, M.D., Member, CEO Roundtable Working Group

Deb Galuska, Ph.D., M.P.H., Associate Director for Science, Division of Nutrition and Physical Activity, Centers for Disease Control and Prevention

Alvaro Garza, Founder and President, Snack Essentials

Robert W. Jeffery, Ph.D., Director, Obesity Prevention Center, University of Minnesota

John H. Kersey, M.D., Director, University of Minnesota Cancer Center

James A. Levine, M.D., Ph.D., Professor of Medicine, Mayo Clinic College of Medicine

Kathryn H. Schmitz, Ph.D., M.P.H., Assistant Professor, University of Pennsylvania School of
Medicine

Marty Slattery, Ph.D., M.P.H., Professor, University of Utah School of Medicine

Paul Stitt, M.S., Executive Director, Nutritional Resources Foundation

OPENING REMARKS—DR. LaSALLE D. LEFFALL, JR.

On behalf of the PCP, Dr. Leffall welcomed invited participants and the public. He provided a brief overview of the history and purpose of the Panel and the aims of the current series of meetings on reducing the risk of cancer incidence and mortality through the promotion of healthy lifestyles. Dr. Leffall explained that the meeting would consist of three panel discussions—two addressing current knowledge and one on community-based programs. Dr. Leffall thanked Dr. Kersey and the University of Minnesota for hosting this meeting.

WELCOME—DR. JOHN H. KERSEY

Background

Dr. Kersey is the founding director of the University of Minnesota Cancer Center, which became a National Cancer Institute-designated comprehensive cancer center in 1998. He currently holds the Children's Cancer Research Fund Endowed Chair and is a Professor in the University of Minnesota Departments of Laboratory Medicine/Pathology and Pediatrics. Prior to founding the University of Minnesota Cancer Center, Dr. Kersey directed the university's Blood and Marrow Transplant Program from 1974-1995. The program has trained scientists from around the world and annually receives millions of dollars in National Institutes of Health research grants. As Blood and Marrow Transplant Program director, Dr. Kersey led the team that completed the world's first successful bone marrow transplant for malignant lymphoma in 1975. The marrow stem cell recipient has now been free of his disease for more than 30 years. Dr. Kersey's research accomplishments include pioneering work in the development of some of the earliest studies of monoclonal antibodies for leukemia in the early 1980s, and the subsequent use of these antibodies for cleansing the bone marrow of leukemia cells prior to reinfusion of a patient's own bone marrow.

Key Points

- < The University is strongly committed to research and education on the impact of cancer on all of our lives. Minnesota was the first state in the nation to begin investigating the possibility of a correlation between lifestyle and cancer. More than 40 years ago, a University of Minnesota epidemiologist, Len Schuman, from the School of Public Health, was instrumental in the landmark Surgeon General's report on smoking and cancer. During the same period, Dr. Lee Wattenberg began pioneering work on the anticancer effects of vegetables and became one of the founders of the field of cancer prevention.
- < In 1999, NIH selected the University of Minnesota Cancer Center to host one of seven Transdisciplinary Tobacco Use Research Centers (TTURC) for research on tobacco use and addiction. This program is led by Dr. Dorothy Hatsukami, with able assistance from Dr. Steve Hecht. The mission of this program is to reduce harm associated with tobacco use through research, training, and outreach.
- < Last year the NCI established a center for Transdisciplinary Research on Energetics and Cancer (TREC) at the University of Minnesota Cancer Center to conduct research on obesity and cancer. The leader of that center, Dr. Robert Jeffery, is one of the speakers today. Another speaker, Dr. Kathryn Schmitz, is a former faculty member of the University of Minnesota School of Public Health.

PANEL I

DR. LESLIE BERNSTEIN: The Relationship Between Physical Activity and Breast Cancer

Background

Dr. Bernstein, a professor of preventive medicine at the University of Southern California (USC) Keck School of Medicine, holds the AFLAC Chair in Cancer Research at the USC/Norris Comprehensive Cancer Center where she directs the Women's Cancers Program. Since 1988, Dr. Bernstein has been the Scientific Director for the Los Angeles County Cancer Surveillance Program, a population-based cancer registry that is one of the NCI's Surveillance, Epidemiology and End Results (SEER) registries. Dr. Bernstein trained as a biostatistician and focuses her research studies on the etiology of breast cancer. Her major research interests include how lifestyle factors (particularly physical activity) influence breast cancer risk, how breast cancer treatment may interact with risk factors to affect the subsequent risk of other chronic diseases, and how lifestyle practices impact breast cancer prognosis and survivors' quality of life. Dr. Bernstein also is conducting an ongoing study of non-Hodgkin's lymphoma in women and continues her research and interest in the etiology of adenocarcinoma of the esophagus. Dr. Bernstein directs the California Teachers Study, a cohort of 133,000 women formed in 1995 who are being followed prospectively to address ongoing questions in cancer etiology and survivorship. She is also the co-director of the USC center for TREC.

Key Points

- < Mechanisms that have been considered as possible mediators of the relationship between physical activity and breast cancer include immune regulation, inflammation, antioxidant defense, insulin sensitivity, growth factor production, DNA repair, and hormone production.
- < The acute effects of physical activity on hormone levels can differ from the chronic effects. Long-term, chronic effects are more relevant to cancer-related research. This is particularly true for some of the effects on circulating hormone levels, growth factors and proteins that bind them, and immune function.
- < When Dr. Bernstein began researching the relationship between ovarian hormones and breast cancer in the 1980s, the established risk factors for breast cancer included early age at menarche, late age at first full-term pregnancy or nulliparity, late age at menopause, use of hormone therapy during or after menopause, and postmenopausal obesity.
- < In her early studies, Dr. Bernstein addressed the question of whether physical activity could affect age at menarche. Her team collected diet and physical activity data on more than 700 premenstrual young women. They found that participants who engaged in 5 or more hours of physical activity per week were substantially less likely to experience menarche at an early age, thus reducing their risk of breast cancer.
- < In response to findings from a study in Finland showing that early age at menarche is predictive of higher frequency of ovulation following menarche, Dr. Bernstein became interested in the effect of physical activity on frequency of ovulation. In a study of 149 adolescent girls, her team found that those who engaged in 2 to 3 hours of physical activity per week were at least twice as likely to experience anovulatory periods (controlling for the effects of age at menarche identified in the Finnish study). Based on the theory that breast cancer risk is associated with cumulative exposure to estrogen and progesterone during ovulatory menstrual cycles during a woman's reproductive years, this finding suggests that physical activity reduces breast cancer risk.

- < Dr. Bernstein's team also conducted a study of the effects of physical activity on breast cancer risk in the 10 years after menarche among premenopausal women. This study found a 30-percent reduction in risk for women who exercised 3 or more hours per week. Women who had exercised an average of 4 hours per week throughout their reproductive years experienced more than a 50-percent risk reduction.
- < A second study focused on women between the ages of 55 and 64. Rather than using hours of exercise per week (which varies more for older women), the team converted information on specific activities into metabolic equivalents of energy expenditure. A similar association between physical activity and reduced risk was revealed.
- < Studies involving specific ethnic groups found similar reductions in breast cancer risk associated with physical activity, from almost 50 percent in Asian-American women to about 23 percent in African-American women.
- < A recent study conducted by this team (currently under review by *JAMA*) analyzed data from the California Teachers Study, which is following a cohort of 133,000 women to determine factors associated with breast cancer risk, including physical activity. Findings include a 30-percent reduction in risk for *in situ* cancer and a 15-percent reduction in risk for invasive cancer in physically active women. Further examination of data from this study has shown that the most significant effect of physical activity is a strong dose-response effect for estrogen-receptor-negative (ER-negative) breast cancer.
- < In light of the findings from the California Teachers Survey, Dr. Bernstein revisited the above-mentioned study of older women and found a greater reduction in risk for ER-negative tumors than for ER-positive tumors (although this difference was not statistically significant). These findings are expected to help provide further insights as ongoing stem cell research around the country sheds more light on ER-negative and ER-positive tumors.
- < This type of research is limited by the difficulty of obtaining historical data on physical activity that is not self-reported. Accurate methods are needed to capture information on the frequency, duration, and intensity of an individual's activities. Seasonal factors, changing opportunities to engage in physical activity, and changes associated with aging are also confounding factors.
- < Further research will be needed not only to improve measures of physical activity but also to address questions relating to optimal levels of activity (duration and frequency) at different points in a woman's life. Factors that affect the likelihood that women will benefit from physical activity—such as obesity, family history of breast cancer, and having children—need to be examined. Some women may benefit more than others from physical activity due to genetic differences; if so, the discovery of biomarkers that predict the impact of activity could make intervention studies feasible.
- < Those designing interventions will have to address questions about how they should be targeted. Options include school-based programs, physician training, and preparation of the population for behavior change through social networks or family-based social systems. Women will need access to exercise equipment and safe, unpolluted environments for outdoor activities.

DR. TIM E. BYERS: Cancer, Heart Disease, and Diabetes: Common Nutritional Factors

Background

Since 1995 Dr. Byers has held the position of Professor of Preventive Medicine at the University of Colorado School of Medicine in Denver, Colorado. He is also the Deputy Director of the

University of Colorado Comprehensive Cancer Center. He was formerly Chief of the Chronic Disease Prevention Branch of the Nutrition Division at the Centers for Disease Control and Prevention (CDC) in Atlanta. Dr. Byers is an expert in cancer prevention research. He has worked in various settings in clinical medicine, public health, and academic medicine. He has a particular interest in epidemiologic studies of the role of early detection, diet, and nutrition in the prevention of cancer. He has published over 250 papers in peer-reviewed scientific journals. Dr. Byers' current research at the University of Colorado School of Medicine includes epidemiologic and clinical studies of nutrients as protective factors in prostate, colon, breast, and lung cancer, studies of cancer treatment decision-making by patients and physicians, studies of cancer genetics, and studies to promote the early detection of cancers of the breast and colorectum.

Key Points

- < Nutritional factors play similar roles in three major chronic diseases—cancer, heart disease, and diabetes. Behavioral factors these diseases have in common include diet, physical activity, and excess body fat (adiposity). Common metabolic factors include insulin, insulin-like growth factor, cytokines, and hormones. Policy makers should be searching for ways to construct public health messages that are informed by the linkages between these diseases.
- < Obesity and lack of physical activity are major risk factors for many different cancers. Interestingly, diabetes is associated with risk of cancer independent of adiposity through intermediary metabolic factors.
- < The discovery that physical activity is protective for both men and women was first made in relation to cardiovascular disease and diabetes. This overlaps with obesity because maintaining a physically active lifestyle is one of the keys to maintaining a healthy body weight. The realization that physical activity and cancer are also related, for both men and women, is a more recent development.
- < For diabetes and heart disease, intermediate endpoints and variables associated with adiposity and physical activity—such as serum lipids, insulin resistance, and blood pressure levels—are well known. Cancer researchers are working to discover the corresponding mediators and markers for cancer.
- < Fruit and vegetable consumption is associated with lower risk for several cancers, including gastrointestinal sites and lung cancer, as well as for diabetes and heart disease. Numerous questions remain about the mechanisms of this association. Most of the epidemiological research in the cardiovascular field has focused on fiber because of the intermediate variables of lipids, and on food patterns. In the cancer literature, there has been an emphasis on the role of antioxidants. Recently, cancer researchers have begun to think more broadly about other mechanisms.
- < With breast cancer, the primary mechanism is estrogen. Other factors may include inflammatory mechanisms linking nutrition, body weight, and physical activity to breast cancer risk. Breast cancer's shared risk factors with diabetes and heart disease include obesity and physical activity, and may also include estrogens and cytokines as intermediate factors. Many of the intermediary variables associated with diabetes are now being intensively studied with regard to breast cancer risk.
- < Colorectal cancer also shares behavioral risk factors with diabetes and heart disease, including nutritional factors and behaviors related to obesity and physical activity. Diabetes also seems to be directly linked to colon cancer, independent of adiposity. Diabetics may be at higher risk of colorectal cancer due to intermediary variables.

- < The nutritional and physical activity guidelines of the American Cancer Society (ACS), the American Heart Association (AHA), and the American Diabetes Association (ADA) are almost identical. The only debate focuses on frequency and duration of physical activity.
- < Moving beyond guidelines that relate to individual choice, these organizations are beginning to make recommendations for community action. ACS recommendations in this area include increasing access to healthy foods in schools, work sites, and communities and providing safe, enjoyable, and accessible environments for physical activity in schools and for transportation and recreation in communities.
- < ACS also provides recommendations for cancer survivors, although the evidence base in this area is weaker than that for prevention guidelines. Nevertheless, these recommendations have been well received due to the general lack of guidance from other sources. Planned revisions will place a greater emphasis on physical activity and weight control. It has been recognized that many patients gain weight during cancer treatment, and survivors' need for rest following treatment has been overemphasized.
- < Remaining research questions could be addressed through primary prevention trials measuring the effects of weight reduction and increased physical activity on cancer endpoints. However, there is an ethical issue associated with maintaining large trials with cancer endpoints when early benefits of the interventions have already been proven for diabetes and heart disease. Limiting this type of study to high-risk populations would probably not be worthwhile because those populations are less likely to benefit from the intervention. Trials that focus on cancer prevention and improvement of quality of life using multiple endpoints may be more productive.
- < The convergence of evidence for risk factors associated with these three major chronic diseases may provide an opportunity in the policy arena for reversing the obesity epidemic. A partnership between ACS, AHA, and ADA has already produced a joint publication outlining coordinated prevention strategies, and these organizations are collaborating on public service messages and guideline development.

DR. KATHRYN H. SCHMITZ: Cancer Rehabilitation: Establishing the Need

Background

Dr. Schmitz is an exercise physiologist whose work focuses on exercise, obesity, and cancer. Her current NCI-funded research focuses on the safety of twice-weekly strength training for breast cancer survivors at risk for developing and worsening of lymphedema. A recently completed R01 from the National Institute of Diabetes and Digestive and Kidney Diseases (NIDDK) demonstrated the efficacy of twice-weekly strength training to attenuate age-associated increases in intraabdominal fat. Her ongoing NCI TREC Initiative is assessing the efficacy of aerobic exercise to reduce oxidative stress and alter estrogen metabolism among young women. She is an assistant professor in the Center for Clinical Epidemiology and Biostatistics at the University of Pennsylvania School of Medicine, in addition to being an adjunct associate professor in the Division of Epidemiology in the School of Public Health at the University of Minnesota. She serves on an NCI working group to report on the empirical evidence regarding the mechanisms by which physical activity may prevent breast cancer. Her other honors include the Jeremiah and Rose Stamler Award for new investigators from the American Heart Association Council on Epidemiology and Prevention, the Student and Junior Investigator Award in the Mechanisms category from the Physical Activity and Cancer Conference at the Cooper Institute for Aerobics Research, and the Trudy Bush Fellowship in Cardiovascular Research in Women's Health from the American Heart Association Council on Epidemiology and Prevention.

Key Points

- < The public health importance of cancer survivorship outcomes is underscored by the fact that we have over 10 million cancer survivors alive in the United States today, compared with a little over 2 million in the 1970s and 1980s. Sixteen percent of the U.S. adult population over age 65 are cancer survivors.
- < The increasing success of curative treatment for common cancers has led to an increasing focus on preventing recurrence, reducing mortality, and providing rehabilitative support to reduce the impact of long-term and late effects of cancer and its treatment.
- < The 2006 NCI strategic plan includes among its priorities the expansion of research on biologic and physical mechanisms that affect a cancer patient's recovery from treatment and overall survival. A 2005 Institute of Medicine report, *From Cancer Patient to Cancer Survivor: Lost in Transition*, recommended development of a strategic care plan for adult cancer survivorship after the end of primary cancer treatment in recognition of the fact that cancer survivors will, indeed, have unique needs.
- < The framework that is commonly used by Dr. Schmitz and others working in the area of physical activity and cancer is called "Framework PEACE." The acronym PEACE stands for Physical Exercise Across the Cancer Experience. This framework provides an overlay of potential cancer control outcomes that can be affected by physical activity or lack of activity across the cancer continuum.
- < The model for the emerging concept of cancer rehabilitation is cardiac rehabilitation. Many cardiac rehabilitation programs are supported by third-party payers because there is convincing evidence that physical exercise prevents recurrence, reduces mortality, and restores physical function.
- < Recent analysis of data from the Nurses Health Study indicated that the risk of death from breast cancer for survivors who had at least 9 metabolic equivalent task (MET) hours of physical activity per week was about 50 percent lower than the risk for survivors who had 3 MET hours per week. (Three MET hours is equivalent to walking at an average pace of 2 to 2.9 mph for 1 hour.)
- < Another analysis of Nurses Health Study data showed that women who had 18 MET hours per week also had a 50-percent reduced risk of colorectal cancer-related death compared with sedentary women with 3 MET hours or less per week. The same author found similar reductions in a follow-up study of participants in a chemotherapy trial.
- < The evidence base for cardiac rehabilitation includes numerous studies on hormonal and nonhormonal mechanisms associated with recurrence and mortality. However, the strength of the evidence of direct links between these factors and recurrence and mortality is not as great as the evidence for physical activity. The relevance of these factors to the cancer process is limited because cancer researchers studying recurrence and mortality are primarily looking for risk factors that involve translation from malignancy to metastasis.
- < The next steps for building the evidence base for cancer rehabilitation should include not only observational studies like those previously described, but also development of interventions and trials to evaluate their effect on recurrence and mortality as well as on mechanism of recurrence. These trials will be difficult to conduct because of the large sample sizes that will be required.
- < An equally important research question that needs to be addressed relates to quality of life and the restoration of physical function following cancer treatment. Can physical activity reverse a decline in function associated with cancer as it does for cardiac patients? Is reduced physical function caused by cancer and its treatment?

- < In 2005, Dr. Schmitz published a review of 12 randomized, controlled trials on exercise among cancer survivors, most of whom were breast cancer survivors. Using objective measures of physical function, all of the studies found statistically significant improvements associated with exercise.
- < The evidence that cancer and its treatment decrease physical function is weaker and is based on self-reported data. There have been no studies of objective measures of physical functional status that have followed cancer patients over time starting at the point of diagnosis. However, self-reports of survivors consistently report worse physical function than those of women who have never had cancer.
- < New studies are needed using objective physical function data, collected starting at the point of diagnosis and compared with healthy controls, to establish a link between cancer and loss of physical function. Research is also needed on the mechanisms for this loss so that interventions can be targeted towards specific mechanisms.
- < The hypothesis that cancer intersects with aging to accelerate the natural loss of physical function should be tested. While some people may experience little loss of function after cancer treatment and others may recover full function following a brief loss, it is likely that many cancer survivors experience a loss of function, regain most function after a short period, and then, as they age, experience an early decline in function compared with those who have not had cancer. This effect has been compared to postpolio syndrome.
- < Some cancer survivors may not need cancer rehabilitation, just as some myocardial infarction survivors do not need cardiac rehabilitation. However, if risk could be better assessed and clinicians could tell their patients that a particular treatment is usually associated with specific functional changes, individuals would be in a better position to make informed choices about their treatment and follow-up care.

DR. MARTY SLATTERY: Physical Activity and Colorectal Cancer

Background

Dr. Slattery is a Professor of Epidemiology at the University of Utah Medical School in Salt Lake City, Utah. During her 21 years of epidemiological research at the University of Utah, she has published more than 225 manuscripts looking at diet, physical activity, smoking, reproductive factors, and genetic factors as they relate to cancer and other chronic diseases. She has done extensive research in cancer with a major focus on colon, rectal, and breast cancers. These studies have focused on the diversity of the population living in the southwestern United States. In her large study of breast cancer, she has attempted to describe how diet and activity patterns influence breast cancer among Hispanic and non-Hispanic white women living in the Southwest. Additionally, she is Principal Investigator on a large cohort study of American Indians and Alaska Natives. Many of the health problems being evaluated in that study focus on the areas of diet, physical activity, and obesity. Dr. Slattery has served on several national and international committees to evaluate the role of physical activity and health. She was an editor of the Surgeon General's report on physical activity. In that capacity, she was responsible for the epidemiologic overview of physical activity as it relates to health. Additionally, she was part of the working group that compiled the International Agency for Research on Cancer (IARC) *Handbook of Cancer Prevention* that evaluated the role of weight control and physical activity as they relate to cancer.

Key Points

- < Physical activity is a behavior, and energy expenditure can be described as the energy cost of that behavior. Scientists who study physical activity are faced with the task of relating

information on physical activity (obtained through observation or self-reports) to measures of energy expenditure.

- < There is a great deal of variation in the level of detail and specificity of questions about physical activity in instruments used for epidemiologic research, especially in the amount of information collected on intensity of physical activity.
- < It has been estimated that 13 percent of all new cases of colorectal cancer could be attributed to physical inactivity. Most factors associated with risk of colorectal cancer vary between the proximal, distal, and rectal sections of the colon, whereas the reduction of cancer risk associated with physical activity is between 40 and 50 percent for all three sections.
- < The development of recommendations for duration and intensity of exercise to reduce the risk of colorectal cancer is hindered by the way data are collected. The studies that have reported the beneficial effect of physical activity have not used consistent measures. Some have converted reported activities into MET hours, while others have reported actual hours; some have reported hours per week, and others hours per day, hours per month, or lifetime hours. Some researchers have reported on calories consumed rather than hours of exercise. Recommendations range from 2 hours of very vigorous activity to 5 or more hours of moderate activity per week.
- < Dr. Slattery's team analyzed data on dose response to determine the point at which maximum effect is achieved. Their findings show that a protective effect is reached when subjects report 4 to 5 hours of activity per week. The gain in protection between 1 and 5 hours is much greater than the gain between 5 and 12 hours.
- < Dr. Slattery conducted a literature review to look for evidence of the mechanisms through which physical activity might be associated with colorectal cancer. The mechanisms often studied include transit time of colonic contents, insulin resistance, antioxidants, maintenance of energy balance, immune function, and prostaglandins. The protective effects associated with most of these mechanisms have been linked with more vigorous levels of activity.
- < Energy balance is probably one of the most important mechanisms associated with colon cancer. This seems to be a less important mechanism for rectal cancer, primarily because obesity does not appear to be associated with rectal cancer.
- < People who are physically inactive, as well as those with higher body mass index (BMI), experience an increased risk of colon cancer. People who have low physical activity and are obese have the highest risk of colon cancer. Thus, activity may have some benefit not only through intermittent effects, but also through modifying other risk factors.
- < To demonstrate a causal relationship, a temporal relationship must be established. Multiple studies have shown a clear temporal relationship between physical activity and colon cancer. The association between lack of physical activity and colon cancer is considered to constitute a moderate risk. The dose-response relationship is very consistent.
- < As others have observed about heart disease, it may not be possible to design a randomized clinical trial to study physical activity and colon cancer because active people would resist randomization to an inactive group, and vice versa. This problem is compounded by lack of agreement on targeted outcomes and the difficulty of measuring activity.
- < However, there is evidence of a strong benefit in reducing colon cancer risk associated with 3 or more hours per week of vigorous physical activity.

DISCUSSION: PANEL I

Key Points

- < Early initiation of physical activity is important. Those who are active as children are likely to continue to be active as adults; those who start a regimen of activity as adults are less likely to maintain an active lifestyle.
- < Little research has been conducted on the possible role of “fitness genes” in maintaining an active lifestyle.
- < The Scandinavian countries are doing a better job than the United States in addressing the need for policies related to health education focused on diet and exercise. Finland, in particular, made great progress against cardiovascular disease through policy changes concerning fat content of foods combined with public health messages about physical activity.
- < In the United States, children are adversely affected by school policies that emphasize test scores at the expense of physical education activities. Children now watch 2 to 3 hours of television per day and spend much of their remaining free time using computers.
- < The United States has led the world in tobacco control. The lessons learned in that effort could be applied to physical activity. There does not have to be a dichotomy between efforts to change policy and basic research. Policy research needs to be done in partnership with research on behavioral and pharmaceutical interventions that can alter disease trajectories. The issue of physical activity and cancer differs from tobacco control in that much remains to be learned about the relationship of physical activity to various cancers.
- < The incomplete understanding of these relationships should not impede promotion of policy-related and educational activities to increase physical activity that are justified by existing evidence, especially with regard to heart disease, diabetes, and breast and colorectal cancers.
- < The fact that activity is associated with reduced risk for colon cancer but not for rectal cancer may result from the involvement of different mechanisms of effect. The low number of rectal cancer cases makes it more difficult to detect statistically significant associations.
- < The effects of activity and diet on colon cancer risk are probably independent but interrelated. It is difficult to separate the independent mechanisms associated with lifestyle factors. It has been shown that the benefits of change in lifestyle factors are additive.
- < Given that third-party payers provide support for cardiac rehabilitation, intervention studies are needed to demonstrate the benefits of a healthy lifestyle for cancer survivors and develop guidelines that could guide the reimbursement process. A major challenge is developing survivor registries for recruitment. Barriers include Health Insurance Portability and Accountability Act (HIPAA) regulations and poor response rates among underserved populations. Cancer centers need to play a major role in providing infrastructure for recruiting survivors into studies focusing not only on quality of life, recurrence, and mortality as outcomes, but also on the effects of interventions on those outcomes.
- < Chronic inflammation is a factor associated with cancer risk, and obesity is an inflammatory condition. Some chemoprevention studies have shown reduced cancer risk is associated with the use of drugs that intervene in inflammatory pathways, such as cyclooxygenase inhibitors. However, heart disease risk is associated with the use of those interventions. Insulin-like growth factors present a similar situation. Increases in these factors are associated with decreased risk for diabetes and cardiovascular disease but also with increased cancer risk. In the future, what is learned about nutrition and physical activity should aid decision making concerning the need for chemopreventive agents.

- < Research progress is often inhibited by preconceived notions. Only about 2 years ago, it was widely assumed that the mechanism driving the association of physical activity and breast cancer was estrogen. Now there is evidence that physical activity benefits women with ER-negative tumors and that adiposity is an adverse prognostic factor for ER-negative breast cancer survivors.

PANEL II

DR. RACHEL BALLARD-BARBASH: Optimizing Energy Balance— Highlights of Progress in Building Research Capacity

Background

Dr. Ballard-Barbash directs research examining the association of diet, weight, and physical activity with cancer risk and prognosis in order to identify targets for prevention and control of primary and recurrent disease; improving systems for evaluating cancer control in national and local populations; and examining health care utilization in cancer control. She serves as the Associate Director of the Applied Research Program within the Division of Cancer Control and Population Sciences at the National Cancer Institute. Dr. Ballard-Barbash has published widely and participates in national and international reviews, including the 2002 IARC review on Weight Control, Physical Activity and Cancer, the 2005 book *Cancer Prevention and Management through Exercise and Weight Control*, the 2006 textbook on *Cancer Epidemiology and Prevention*, and the 2006 update of the *ACS Nutrition and Physical Activity Guidelines*. She leads an NCI-wide effort to advance research on the role of energy balance in cancer and serves as the NCI representative on the NIH Obesity Research Task Force.

Key Points

- < NCI supports clinical trials on diet and cancer, but currently there are no trials focusing on weight control or physical activity as they relate to cancer incidence and prognosis.
- < NCI studies have shown a strong link between obesity and increased cancer risk. In 2002, an IARC report estimated that obesity and physical inactivity accounted for 25 to 30 percent of several major cancers. Another study concluded that about 20 percent of cancer deaths in women could be attributed to obesity.
- < Because many cancer patients are being diagnosed earlier and living longer, there is an increasing concern within the survivorship community that interventions other than treatment are needed to improve the overall health of cancer survivors. There is expanding evidence that for many survivors, reducing weight and increasing activity will play a primary prevention role in reducing their risk of recurrence and developing new cancers.
- < A predominant focus of research at NIH has been micro-level factors, including physiological, behavioral, and genetic factors, as they relate to disease outcomes. These factors are studied in the context of micro-level variables such as sociocultural, environmental, and institutional factors.
- < Approximately 3 years ago, NCI launched its Energy Balance Initiative to understand the causes of adverse patterns of weight, physical activity, and diet; define their contribution to cancer; and apply this knowledge to cancer prevention and control. The specific objectives of the Initiative are to: (1) understand how these factors interface with genetics and environment over a lifetime to affect the cancer process; (2) monitor trends in and determinants of diet, weight, and physical activity and their cancer-related consequences at the population level by expanding nationwide research and surveillance infrastructure; (3) develop improved measurement methods for body mass and composition, physical activity and fitness, diet, and

bioactive food components through self-report measures and advances in technology for objective reference measures; and (4) improve cancer-related health outcomes, especially in high-risk populations, by accelerating research on energy balance-related behaviors and developing interventions.

- < To address the first objective, the TREC project was recently established. The TREC mission is twofold. It will enhance understanding of the mechanisms underlying associations with energy balance and carcinogenesis and move ahead on developing effective approaches with broad population impact at the social, environmental, and policy levels for prevention and control of obesity. The intent is to move the science “from cell to society.” Program announcements have been issued for “Studies of Energy Balance and Cancer in Humans” and “Diet Composition and Energy Balance.”
- < Under this initiative, TREC centers at the Fred Hutchinson Cancer Research Center, University of Minnesota, University of Southern California, and Case Western Reserve University are addressing a wide range of research questions ranging from basic mechanistic studies to population-based research.
- < Declining budgets have limited the number of centers NCI could fund. At the upcoming TREC meeting in Cleveland, NCI discussions will focus on how to link this initiative to other NCI and NIH initiatives to leverage these resources.
- < To address objective two, which relates to monitoring, NCI has partnered with the Centers for Disease Control and Prevention and regional health monitoring programs. Activities include expansion of the CDC’s National Health and Nutrition Examination Survey (NHANES) to include measures of diet and physical activity and enhanced surveillance of energy-balance-related health behaviors through the National Health Interview Survey (NHIS) and the California Health Interview Survey (CHIS).
- < NCI has committed to paying for physical activity monitors for use within NHANES to provide objective data on activity. In the past, studies of physical activity have relied on self-reports. Accelerometry data from NHANES show that actual activity levels are much lower than self-reported levels.
- < In collaboration with other NIH Institutes and Centers, CDC, and the Agency for Healthcare Research and Quality (AHRQ), NCI is conducting a provider survey of health behaviors to learn what primary care physicians are doing in the area of assessing, monitoring, advising, and counseling with regard to health behaviors related to diet, weight, and physical activity.
- < Other monitoring activities are addressing the extent to which our culture, especially in terms of transportation and urban planning policies, affects the ability to lead an active lifestyle. A study of self-reported walking and cycling activities is comparing clusters of these activities in San Diego and Los Angeles to examine how these clusters relate to physical characteristics of the environments in which people live and to other factors such as socioeconomic status.
- < NCI supports several efforts to improve assessment methods, which is the focus of objective two: (1) participating in a trans-NIH program announcement on “Improving Diet and Physical Activity Assessment”; (2) testing new technologies for capturing physical activity information in real time; (3) collaborating with the National Food Safety System (NFSS) on bioengineering approaches for prevention and treatment of overweight and obesity; (4) assessing cross-cultural equivalence of survey questions; and (5) hosting the 2009 International Conference on Dietary Assessment.
- < NCI has also supported development of tools for researchers, including: (1) a public-use food history questionnaire; (2) short dietary screeners (developed in collaboration with CDC) for local and state surveillance; (3) a database of glycemic index values; (4) translated

questionnaires (in Spanish and several other languages); and (5) a public-use, automated, self-administered, 24-hour recall instrument.

- < To address objective four, which focuses on intervention and implementation, NCI has sponsored a number of activities, including interventions developed as part of the TREC initiative, as previously mentioned. An RFA has been issued to study long-term cancer survivors, with a growing emphasis on physical activity. NCI continues to work on the 5-A-Day Program, although oversight for the program is now provided by the CDC. Other initiatives are examining how communication science can help promote behavior change through improving the effectiveness of messages delivered to the public and studying mechanisms of physical activity behavior change.
- < The NCI is also engaged in development of policy research resources to provide consistent metrics for evaluating the impact of different interventions in different parts of the country. NCI and NIH have a role to play in developing evaluation tools needed by grassroots initiatives, many of which are not research initiatives but efforts to effect change.
- < At the national level, a major factor mobilizing policy-related activities at the grassroots level is concern about children. Some have compared the issues of children's physical inactivity, poor diets, and increasing rates of obesity to earlier concerns surrounding the effects of environmental tobacco smoke on disease outcomes.
- < Other NCI efforts to support research and grassroots efforts include: (1) tracking and evaluating physical activity legislative policies; (2) coding and rating youth obesity-related policies; (3) understanding public health recommendations in the Physical Activity and Nutrition: Health Promotion Model in the Health Information National Trends Survey (HINTS); and (4) tracking nutrition and physical activity measures targeted by grassroots policy action.
- < NCI led development of a trans-NIH initiative to explore the economics of diet, activity, and energy balance. Topics to be addressed include consumer economics; the effects of industrial organization (e.g., food production, distribution, and marketing and healthcare reimbursement policies); community structure; policies related to issues such as advertising, food aid, and taxation; and cost-effectiveness and cost-benefit studies.
- < The NIH Obesity Research Task Force was established in 2003 and spans the interests of basic, clinical, and population sciences. The Task Force coordinates the NIH strategic plan for obesity research and supports trans-NIH initiatives, including efforts to enhance surveillance in collaboration with NHANES and NHIS. A series of workshops was convened by the task force in 2005.

DR. DEB GALUSKA: Changing the Risk Factors for Cancer—A Public Health Approach

Background

Dr. Galuska received her undergraduate degree from the University of Wisconsin in the field of microbiology; after graduation, she worked for several years as lab specialist in the Department of Plant Pathology at the University. She attended graduate school at the University of Michigan, where she received both her M.P.H. and Ph.D. in the field of epidemiology; her research focus was osteoporosis. Since receiving her graduate degrees, she has worked at the Centers for Disease Control and Prevention in the Division of Nutrition and Physical Activity. She started with the Chronic Disease Nutrition Branch as an Epidemiology Information Services officer and then an epidemiologist. Currently she works in the Division of Nutrition and Physical Activity as the Associate Director for Science. At the CDC, she has conducted and published research in the areas of obesity and weight control, osteoporosis, and clinical preventive services.

Key Points

- < Physical activity, diet, and obesity should be included as part of cancer control because there is a proven link between physical inactivity and risk for cancer and other chronic diseases, although the mechanisms are not fully understood. In addition, few people fully comply with recommendations concerning physical activity, diet, and weight. Among adults, at least 60 percent are overweight or obese, and similar trends are seen in children.
- < A framework for changing populations' behaviors and risk factors requires scientific evidence that specific behavior change interventions are effective, combined with an understanding of the target community—its needs, its cultural composition, and its resources. The combination of these areas of knowledge can result in the development and implementation of effective community-based interventions.
- < An important source for evaluation of the scientific evidence for effective interventions is the *Guide to Community Preventive Services*, which is produced by a non-Federal task force convened by CDC. The task force conducts comprehensive reviews of the scientific literature on selected topics. When interventions are found to be supported by sufficient evidence and demonstrated effectiveness, the task force makes recommendations for their use; interventions may be “recommended” or “highly recommended.”
- < Informational, behavioral, social, environmental, and policy interventions related to physical activity have been reviewed by the task force. Of 14 interventions reviewed, the task force made recommendations concerning 8.
- < Informational interventions recommended in the *Guide* include point-of-decision prompts (e.g., a sign on an elevator suggesting that people use the stairs instead) and communitywide campaigns that go beyond media announcements by providing access to services (e.g., screening or support groups).
- < Recommended behavioral and social interventions include school-based physical education, social support interventions in community settings (e.g., buddy systems and walking clubs), and individually adapted health behavior change programs.
- < Recommended environmental and policy interventions include enhanced access to places for physical activity (combined with informational outreach), street-scale urban design and land-use policies, and community-scale design and land-use policies. These recommendations are based on observational evidence rather than randomized, controlled clinical trials.
- < The *Guide* has addressed diet-related issues to a lesser degree than physical activity, not because there is less in the literature but because funding priorities for the *Guide* have not stressed this area.
- < The task force found insufficient evidence that multicomponent school-based nutrition programs are effective. The *Guide* does not conclude that these programs are ineffective, but rather that additional research is required.
- < Community-based approaches to increase intake of fruits and vegetables are currently under review.
- < In addressing obesity, the *Guide* has recommended use of multicomponent interventions that include nutrition and physical activity among adults in worksite settings. The task force found insufficient evidence for the use of those multicomponent interventions in the school setting due to the lack of studies in this area.
- < Examples of programs at CDC that are implementing evidence-based strategies in the community in the areas of nutrition, physical activity, and obesity include the Comprehensive Cancer Control Program, the Nutrition and Physical Activity Program to Prevent Obesity and Other Chronic Diseases, STEPS to a Healthier US, and Coordinated School Health Programs.

- < The Comprehensive Cancer Control Program assists all 50 states and some tribes and U.S. territories in developing comprehensive cancer control plans. In addition to surveillance, the plans incorporate evidence-based strategies that address local needs. Program components include early detection, improved treatment, enhanced survivorship, and risk reduction. Risk reduction focuses on a number of issues, including diet, physical activity, and obesity.
- < The Nutrition and Physical Activity Program to Prevent Obesity and Other Chronic Diseases serves 28 states. Program components include a plan to address these health issues, community partnerships, and implementation of evidence-based interventions.
- < STEPS to a Healthier US, with the YMCA as a national partner, funds programs in 40 communities to focus on three risk factors—nutrition, physical activity, and smoking—to prevent asthma, diabetes, and obesity.
- < The Coordinated School Health Programs funds 23 state education agencies to help reduce chronic disease risk factors, including tobacco use, poor nutrition, and physical inactivity.
- < From a public health perspective, changing risk factors for cancer requires not only a sound evidence base, but also the knowledge and understanding necessary to implement that evidence base in communities. There are two areas of need for the future. The first is the identification of additional evidence-based strategies, which will be supported by NIH and similar agencies. The second is documentation of community experience as interventions are implemented. All of our programs require evaluation, so that experience can lead to improved interventions and new questions for scientists.

DR. ROBERT W. JEFFERY: Obesity Prevention—Can It Be Done and How?

Background

Dr. Jeffery is a psychologist by training and has done research on the treatment and prevention of obesity for approximately 25 years. He has published more than 200 peer-reviewed papers and is widely recognized as an expert in community approaches to obesity management. His work includes a number of large-scale studies directed toward assessing whether intervention efforts aimed at the population as a whole can be effective in achieving weight loss or prevention of weight gain. The studies included several projects in which attempts were made to reach the population with educational messages about diet and exercise behaviors for weight control via mass media, work sites, public health departments, and health care providers. More recently, he has been involved in several studies that have examined noneducational factors related to diet and exercise choice, such as food availability and price. Dr. Jeffery is the Director of the University of Minnesota Obesity Prevention Center (OPC), which was established in 2004 as part of the Healthy Foods, Healthy Lives Presidential Initiative. The goal of OPC is to provide leadership and coordination at the local, national, and international level for multidisciplinary research, policy, and education that focuses on understanding and responding to the epidemic of excessive weight gain and obesity.

Key Points

- < A dramatic upswing in the body weight of the U.S. population began in 1980, with an increase of about one percentage point per year. The effects of the obesity epidemic on the population are not limited to any age, racial, ethnic, or economic group. The potential health implications of this trend are beginning to frighten people in the health care industry. Studies have shown a correlation with increasing body mass and overall mortality.
- < Most people believe that this widespread shift in population weight is not driven by genetics or biology but by something in the environment. It seems to be the case that people in this country are generally not able to maintain healthy weights on their own. About 70 percent of

the population are overweight and 30 percent are obese. On any given day, half the people in the U.S. population are trying to do something to decrease their weight. It is not working. It will be necessary to look beyond the individual towards the environment and public health policy to address this epidemic. Research and action will need to focus on food supply, food policy, and public education.

- < Price and portion size are two aspects of the food supply that have attracted attention with regard to obesity. Trends in the affordability of food parallel the obesity epidemic. Between 1980 and 2000, there was a 30-percent decrease in the proportion of income spent on food. There has also been a shift away from eating at home to eating out. These phenomena suggest that Americans can have anything they want to eat.
- < Numerous studies have shown that changes in the price of food affect food choices. One study by Dr. Jeffery's group showed that reductions in the price of fruits and vegetables to the point where they cost less than high-fat snacks resulted in greater consumption of the healthier foods. An educational component of the same study produced a much smaller effect.
- < Marketing practices in the form of portion size manipulation also affect food choices. To study this effect, Dr. Jeffery's group gave small free lunches (about 700 kilocalories) to a sample of employees of a medical facility for 1 month. When the same foods were provided in double portions, the subjects began to eat 200 additional kilocalories during lunch. Over the next 1-month period, they did not adjust their intake to lower levels. This resulted in the predicted weight gain of about one-half kilogram.
- < These findings have implications for food policy. Due to the U.S. agricultural price support system, the country produces more food than it can eat. A reduction of subsidies could lead to more realistic food prices.
- < Schools, universities, and large employers form a class of food providers that does not have a vested interest in food production or marketing. Most of these organizations do not have food policies, or have policies that are not oriented toward health issues.
- < A study by Dr. Jeffery's group compared intervention schools with control schools to determine whether changes in the kinds of foods offered and the prices of foods could shift sales to more healthy food choices. Over a 2-year period, intervention schools greatly reduced sales of high-fat foods. Another study will examine the effects of pricing, portion, and calorie labeling on weight outcomes.
- < Public education to influence body weight has not been successful; one possible reason is that messages have recommended eating healthy foods but have not recommended that people eat less. These messages have also failed to recommend that people weigh themselves.
- < Dr. Jeffery's group has performed secondary analysis of data from weight studies to examine the relationship between how often subjects weighed themselves and how much they weighed. Among those in the normal weight range, the difference in body mass between frequent weighers and those who did not weigh themselves was only about 4 kilograms. The obese subjects who never weighed themselves had a body mass about 20 kilograms higher than frequent weighers. Over time, subjects in both groups who weighed themselves frequently lost some weight, whereas those who never weighed themselves gained.
- < It can be concluded that we do not know everything about obesity prevention, but we know what questions need to be asked. There are actions that can be taken now to find the answers.

DR. JAMES A. LEVINE: Human Energy Expenditure and Obesity

Background

Dr. Levine is a Professor of Medicine and the Richard Emslander Professor of Nutrition and Metabolism at the Mayo Clinic in Rochester, Minnesota. His research has focused on understanding nonexercise activity thermogenesis (NEAT), obesity, and body weight regulation. He lectures around the world and is a senior scientific advisor to NIH, the National Science Foundation, the United Nations, the Peoples Republic of China, Jamaica, and governments in Africa. In addition to Dr. Levine's peer-reviewed publications, articles and stories based on his work have appeared in a variety of newspapers, magazines, and television programs in countries as diverse as China, Russia, Australia, India, Japan, and Poland. Dr. Levine has contributed to documentaries for the Discovery Channel and BBC. He has received more than 30 national and international awards, including the American Philosophical Society's Judson Daland prize.

Key Points

- < Body fat increases when energy intake is consistently greater than energy expenditure. Excess body fat and obesity are the result of sustained positive energy balance. Since it is now normal to be overweight or obese in America, the urgency to understand why humans are gaining weight has intensified. There is controversy as to whether increased energy intake has accompanied the obesity epidemic.
- < NHANES data in this area are difficult to interpret because the method used to examine energy intake changed over time. In the absence of firm data that link increased energy intake to obesity, the role of energy expenditure in human energy balance has come under greater scrutiny.
- < The three components of human energy expenditure are basal metabolic rate, thermic effect of food, and activity thermogenesis. Basal metabolic rate is the energy required for core body functions and is measured at complete rest without food. It accounts for about 60 percent of daily energy expenditure in a sedentary person. Nearly all of its variability is accounted for by body size. The thermic effect of food is the energy expended in response to a meal. The thermic effect of food accounts for about 10 percent of daily energy expenditure and does not vary greatly among individuals. Activity thermogenesis can be subdivided into exercise activity thermogenesis and nonexercise activity thermogenesis (NEAT).
- < A European study has shown that daily energy expenditure varies by 2,000 calories a day for adults of similar size. Because basal metabolic rate and thermic effect of food cannot account for this variation, it is concluded that activity thermogenesis accounts for this variation. Does this variation result from exercise activity thermogenesis or from NEAT?
- < Most people worldwide do not exercise for the purpose of maintaining fitness; even among those who do, exercise accounts for only about 100 kilocalories per day (kcal/day). For most people, NEAT is the factor that accounts for the fact that an active person can expend 2,000 kcal/day more than an inactive person of the same size.
- < The definition of NEAT includes a wide variety of everyday nonexercise activities (e.g., walking, climbing stairs, and various leisure activities), but the primary component is work-related activities. NEAT varies by as much as 2,000 calories a day (from about 300 kcal/day among sedentary individuals to 2,300 kcal/day among those engaged in strenuous work) because of variations in the energy expenditures required for different occupations and leisure activities.
- < NEAT is biologically adjusted to counterbalance fat gain. When Dr. Levine's group overfed 16 lean volunteers by 1,000 calories a day above their weight maintenance needs, they found that changes in NEAT accounted for the energetic counterresponse to fat gain. Subjects who

increased their NEAT the most did not gain fat, even with overfeeding. Those who failed to increase their NEAT with overfeeding gained the most fat.

- < Animal studies have shown that brain peptides such as orexin can stimulate NEAT. In obesity-prone rats, obesity numbs the response to orexin, but this does not occur in lean rats.
- < To learn whether a NEAT defect could be associated with obesity, Dr. Levine's group used microsensors embedded in clothing worn continuously by experimental subjects to quantify body postures and movements, especially walking, every half second for 10 days.
- < Lean and obese subjects slept for similar periods of time. Obese subjects were seated for 2½ hours per day more than lean subjects. Sedentary lean subjects walked around spontaneously for 2 hours per day more than obese subjects. If the obese subjects were to adopt the same NEAT type as the lean subjects, they might expend an additional 350 calories a day; that is, NEAT, and specifically walking, are of substantial energetic importance in obesity.
- < If the NEAT defect in obesity is substantial, and if a century of sedentary cues have enticed people into their chairs, can we contemplate environmental changes to get people out of these chairs?
- < In order to monitor such environmental changes, Dr. Levine's group miniaturized and automated its technology. They developed a wafer-thin device that enables them to measure continuously physical activity in free-living people for months at a time.
- < Subsequently, they began to design and evaluate new activity-promoting environments to ascertain whether NEAT can, thereby, be increased and whether productivity and health outcomes improve.
- < One such design depicts an "office of the future" that incorporates office equipment with exercise equipment. At Dr. Levine's university, about 350 people have spent months working while walking on a treadmill. They have found that they work efficiently and arrive home feeling invigorated. A U.S. corporation has asked Dr. Levine to use this concept in remodeling an office for 80 workers.
- < A school without desks was introduced and tested; substantial increases were found in physical activity and attentiveness. Parents reported that children in this program were calmer and more likely to complete their homework.
- < Although a biological NEAT defect may be associated with obesity, obesity is not inevitable. Obesity has become an epidemic only in the past 20 years, and human genes have not changed within that time period.
- < Five steps will be necessary to reverse the obesity epidemic, the first of which is leadership. Obesity should be a priority for the President of the United States and members of Congress. It should be remembered that more than half of the voters in this country have weight problems.
- < The second step is to define gaps in knowledge. A national center for research on the role of activity in nutrition should be established to cross traditional boundaries between disciplines so that everyone from biologists and nutritionists to architects and city planners can work together to set a research agenda and set short- and long-term priorities.
- < The third step is to organize the response to the epidemic by evaluating interventions and disseminating accurate information about best practices. This approach would enhance local action and provide a toolbox of interventions and evaluation modules.
- < The fourth step is funding. Obesity has been described as a \$100,000,000 problem, and it will require a dynamic, sustained response.

- < The fifth step is social change. Although this step logically follows steps one through four, it is not inevitable. Social change will require unprecedented will and commitment. Early-adoption communities will need to be identified and used as examples for other communities.

DISCUSSION: PANEL II

Key Points

- < The economic impact of state initiatives to reduce obesity has not yet been evaluated. However, many state and local programs have leveraged CDC funds through other sources.
- < The relative importance of factors such as portion size, fat and sugar content, and food additives in the obesity epidemic is unknown. There is evidence that sugar-containing soft drinks and fast food are strongly connected with increases in weight.
- < Obesity may be associated with the interaction of the modern environment, which forces people into a sedentary lifestyle, and biological variants. Some individuals are better able than others to adjust their caloric intake or increase physical activity.
- < Eating behavior is probably more important in obesity than physical activity, given the fact that the average person's level of physical activity did not change significantly in 1980, when the obesity epidemic began.
- < Because all eating is voluntary, whereas 60 to 70 percent of physical activity for a sedentary person is involuntary, reducing energy intake is a simpler task than increasing energy expenditure.
- < Federal health agencies have made some efforts to promote healthy lifestyles for their employees. CDC has initiated a farmer's market to make fruits and vegetables available, worked with vendors to provide access to physical fitness facilities, and improved accessibility of stairs so that employees can avoid using elevators. NIH has made physical fitness facilities and classes available to employees; however, more needs to be done to encourage scientists to take the opportunity to engage in physical activities. In Scandinavia, for example, stairs are open so that people can find them.
- < The reduction of physical education programs, which is becoming commonplace in U.S. schools, sends a terrible message to children. Given the chance to be active, children are usually eager to participate.
- < The school without chairs concept described by Dr. Levine may be the basis for an intervention for children with attention deficit disorder.

PUBLIC COMMENT

Key Points

- < The food industry has taken measures to make food addictive using methods similar to those used by the tobacco industry. In the 1970s, biochemists were employed to find ways to add appetite stimulants to foods. High-fructose corn syrup was adopted as a sweetener because it tastes less sweet than sugar and can thus be added in greater amounts, which results in stimulation of the appetite.
- < Cancer patients do not always have access to nutritional information through oncologists, nurses, and other care providers. Many of the facilities in which they are treated serve sugary snack foods to their patients. The speakers and others with expertise in these areas should compile useful information on nutrition and physical activity in a form that can be distributed to cancer patients and survivors at cancer centers and other locations where they receive care. Nurses and oncologists should be educated about diet and nutrition.

- < Consideration should be given to spiritual aspects of behavior that may affect obesity. In the past, medical schools did not address nutrition, much less spirituality; today, almost half of U.S. medical schools have courses on spirituality. These courses may not touch on nutrition, but the inclusion of spirituality could affect doctors' approaches to many aspects of health.
- < There is no single policy or intervention that will solve the problem of obesity. Multiple efforts on the part of numerous stakeholders will be necessary. The United States will not regress to become an agricultural society in the future; the answer lies in modifying the existing environment to reduce obesity. Different solutions will be needed to address the needs of different populations.

PANEL III

MS. KATHY CUNNINGHAM: Boston's Fight Against Obesity—Promoting Healthy Lifestyles to Reduce Chronic Disease

Background

Ms. Cunningham is Senior Program Manager/Dietitian for the Boston Steps program, one of the Steps to a Healthier US Initiatives. Through Boston Steps, she directs multiple nutrition education activities throughout the city of Boston, including nutrition education for developing healthy lifestyles and maintaining weight, the Boston BestBites restaurant campaign, and successful implementation of the NIH pilot program "WE CAN!" (Ways to Enhance Children's Activity and Nutrition), a parent education curriculum to develop healthy nutrition and physical activity habits for the whole family. Ms. Cunningham is also a co-founder of the Boston Organization of Nutritionists and Dietitians (BOND) of Color. This organization has been providing a cultural approach to nutrition, health, and wellness since 1990 to minority communities. BOND has conducted weight management classes in faith-based organizations, as well as healthy lifestyles nutrition education for community health centers, YMCAs, and community centers.

Key Points

- < In 2003, the Boston Public Health Commission received a 5-year Steps to a Healthier US grant. This has provided a little more than \$1,000,000 to implement a multifaceted chronic disease prevention and control program as part of a broad community collaboration. The program focuses on reducing incidence of diabetes, obesity, and asthma. Key factors being addressed include physical activity, nutrition, tobacco use, environmental triggers for asthma, and disease management support.
- < The program targets eight neighborhoods with the highest rates of chronic disease. Target populations are African Americans, Latinos, and low-income residents. The program addresses the entire lifespan.
- < The program is based on an ecological model. Determinants of behavior are addressed at multiple levels: (1) individual (knowledge, attitude, skills); (2) interpersonal (family, friends, social networks); (3) organizational (work, school, other institutions); (4) community (environment, norms, marketing); and (5) public policy (local, state, and Federal levels).
- < Most of the people living in the area served by the Commission are overweight or obese, and there is a significant lack of physical activity and consumption of fruits and vegetables.
- < The overarching message of this program is abbreviated as "5-2-1-0": each day, people should eat 5 or more fruits and vegetables, watch 2 hours of television or less, engage in 1 hour or more of physical activity, and have zero tolerance for tobacco.
- < To encourage physical activity, the program sponsors the NeighborWalk program, through which 55 groups convened by grassroots organizations have completed 2,325 walks.

Participants walk an average of 2.4 miles per day. Groups are provided with health education sessions and pedometers for measuring progress. Walking group members are losing from 5 to 10 pounds as a result of their participation.

- < Neighborhood advocates have conducted walkability audits to identify sidewalks in need of repair, traffic signals in need of adjustment, and littered streets in need of cleaning. The Steps program is working with the transportation department to help ensure a safe and welcoming environment for walking.
- < Steps to Wellness programs have been established in collaboration with 14 community-based organizations. These provide weekly physical activity opportunities and health education (including nutrition components) through 10-week sessions.
- < Worksite physical activity programs have included a Stairwell Initiative at the Commission's headquarters. It was found that "point-of-sale" signs posted near elevators were not effective in encouraging use of stairs. The program developed an initiative called the Mountain Challenge, in which groups within a building compete as if racing to the top of a mountain. The success of the Mountain Challenge has led to a plan to replicate the program at Boston's City Hall.
- < Steps has established a training program for family daycare providers, who are required by law to incorporate physical activity into their services. Sessions have been attended by 156 licensed daycare providers using the Healthy Kids and Healthy Snacks curricula. The next step will be training the providers to pass on their training to parents.
- < To learn how to reach young adult and middle-aged men, focus groups were conducted in barber shops. Men indicated that they had heard messages about healthy eating, but they did not know how to shop and cook in healthy ways. This led to development of the Beyond the Burger program, a collaboration with a Men's Health program to provide nutrition education, cancer screening, and physical activity opportunities through barber shops. Cooking demonstrations utilized the George Foreman Grill™.
- < Steps is participating in pilot testing the new NIH initiative called We Can! Ways to Enhance Children's Activity and Nutrition. This program targets parents and youth ages 8 to 13 to meet the overall goal of preventing obesity. It uses two existing youth curricula and a new parents' curriculum. Partners include the YMCA, Boston Organization of Nutritionists and Dieticians, Boston Public Schools, and Boston Centers for Youth and Families. Curricula were adapted for cultural appropriateness. A major focus is on access to opportunities for physical activity.
- < People in the target neighborhoods have difficulty finding and affording fruits and vegetables. As part of its efforts to change the food environment, Steps supported a food resource assessment conducted by the Boston Medical Center. The assessment led to strategies for bringing healthier foods and beverages to the neighborhoods through corner stores. The program also supports a new farmer's market in Roxbury, the poorest neighborhood in Boston. Recipes and tips on buying fresh produce are provided.
- < A Healthy Restaurant Campaign provides free nutritional analysis and assistance in selecting low-calorie, reduced- sodium, and reduced-fat menu items. Free "Boston Best Bites" marketing materials are provided for use within restaurants and in advertising.
- < A Food in the Hub Summit brought together multiple partners to brainstorm on improving access to healthy foods in the community. This has enabled the program to apply for additional funding for interagency efforts to change the food environment.
- < Steps is conducting body mass surveillance in the schools (in the first, fourth, seventh, and tenth grades). Letters are sent home after screenings with tips on accessing physical activity and other advice for parents and caregivers. A nutritional and physical activity curriculum for

middle school students is provided to schools. Healthy beverage and snack policies are being instituted and have been well received by the students. These policies are also being applied to foods sold during fundraising efforts.

MR. ALVARO GARZA: Snacking 101—The Next Generation of Snacking

Background

After his first job following college—working with Barney, the purple dinosaur of children’s television—Mr. Garza opened two health food/sports nutrition stores in Richardson and San Marcos, Texas. While managing and running these stores, he realized that the market for the health food industry was expanding. It was about this time that legislators in Texas and around the country were beginning to discuss changes in school policies concerning nutrition and student health. Mr. Garza decided to sell his stores and begin experimenting with healthier options in vending machines. He had identified a real need but met with difficulty in making the idea economically and logistically viable. One problem he discovered with existing vending machines was the fact that the buyer could not read the product’s nutritional profile till after it had been purchased. Mr. Garza created a program called Snacking 101 to educate the customer at the point of purchase about healthy lifestyle options. This program has expanded beyond the vending market to include corporate and school wellness programs. Snacking 101 is currently a national sponsor for the school-based Distributive Education Clubs of America (DECA).

Key Points

- < Mr. Garza’s company, Snack Essentials, created a program called Snacking 101 in response to new policies concerning diet and nutrition. Snacking 101 is a positive marketing option for promoting healthier food choices. The program’s primary goal is to offer better food choices for the vending, school, and corporate wellness markets, especially choices that do not include high-fructose corn syrup or partially hydrogenated oils. Its secondary goal is to proactively offer solutions to current health problems like obesity, hypertension, and heart disease.
- < Schools have encountered problems in obtaining products that fulfill the new policies being put into place by state legislatures. Corporate food services are encountering similar problems. Products that are available through standard distribution companies do not meet the new standards. School bureaucracies can be difficult to change and are often contractually tied to specific distributors that do not sell healthy products.
- < The food industry is faced with problems in determining how to comply with the standards of school wellness and nutrition programs, which vary from place to place.
- < In addition, communication barriers frustrate efforts to encourage students to change their eating habits. Students are accustomed to certain foods, and the messages they receive do not adequately explain why they should change. Policy suggestions can be confusing, and revised school nutrition policies usually do not include an educational component.
- < The existence of independent school stores, operated by clubs that promote entrepreneurship, present an opportunity to bring new ideas into the schools because these clubs operate outside the school bureaucracy. Snacking 101 is working with the Distributive Education Clubs of America to implement Snacking 101 principles as a way to implement legislatively mandated changes.
- < Snacking 101 is based on the business model of companies like Trader Joe’s and Whole Foods Market, in which manufacturing and distribution are linked. This model provides maximum flexibility in bringing new products into the market.

- < The program has placed a special emphasis on specialty diets. Snacking 101 can provide school wellness programs with gluten-free foods and foods that meet the needs of students with type 2 diabetes.
- < Snacking 101 promotes food knowledge by labeling items in vending machines. People can select foods the same way they usually shop. Most people select foods based on fat content, protein, or calories. Some are concerned with carbohydrates or hypoglycemia issues. Others seek organic foods, which are now available for the vending market.
- < Some corporate wellness programs have initiated creative pricing structures in their cafeterias to encourage healthier food choices. Healthy items are priced at artificially low levels, while less healthy choices are expensive. Those who choose the less healthy foods subsidize the consumers of healthier choices. Similar pricing strategies are being used in vending machines. The success of these strategies reinforces the point made by Dr. Jeffery that sales of healthy foods increase when they are priced competitively.
- < Vending companies have been successfully using the same business methods for 75 years. The only way to motivate them to offer healthier foods is to demonstrate that this would be a profitable strategy. Snack Essentials is working to make this change happen by making the Snacking 101 program available to manufacturers at no cost.
- < Snack Essentials is developing a database of new nutritional standards across the country that is cross-referenced to the company's catalog to make it easier for school wellness programs to select appropriate products.

DR. GREGORY A. CURT: CEO Roundtable on Cancer

Background

In the 1980s, Dr. Curt coordinated the intramural NCI Phase I Cancer Drug Development Program. He performed the original testing of novel agents directed at high-grade glioma as well as Phase I trials of carboplatinum, dihydroazacytidine, trimetrexate, and D4T. His basic research explored the molecular mechanisms of drug resistance in cancer cells. Dr. Curt served as Deputy Director of NCI's Division of Cancer Treatment from 1985 to 1988, overseeing the Division's extramural research grant and contract portfolios. He was appointed Clinical Director of the National Cancer Institute in 1989. During his years as Clinical Director, Dr. Curt led the intramural program at NCI increasingly towards translational research involving new therapeutic modalities including anticancer drugs, immunotoxins, and vaccines. Dr. Curt joined AstraZeneca Oncology in 2002 as Senior Director for External Scientific Affairs. Under his leadership, AstraZeneca has forged important new partnerships with NIH in cancer drug development, prevention, and treatment.

Key Points

- < The CEO Roundtable on Cancer was established in 2001 when former President Bush challenged each member CEO to be "bold and venturesome" in creating a package of cancer benefits for their corporate families. At the Roundtable's first meeting, CEOs agreed to ask and answer one important question: "What are we doing in our own companies with respect to cancer awareness, prevention, early diagnosis, and optimal treatment?" The consensus was that no single company plan comprehensively addressed cancer.
- < Evidence was presented demonstrating that cancer control is cost-effective; it was estimated in an actuarial report that a suite of cancer benefits (including prevention, detection, and treatment) produced savings of \$6.65 per employee per month, compared with a cost of \$5.70 per employee per month for the benefits package. The report concluded, "This saves money. This saves lives." Those statements got the attention of the CEOs.

- < Faced with that evidence, and supporting findings from the M. D. Anderson Cancer Center and the Mayo Clinic, the CEOs commissioned a task force to develop a corporate standard of excellence with respect to cancer, referred to as the Gold Standard. The task force included CEOs, directors of human resources, directors of benefits management, and occupational health directors of member companies.
- < The task force developed a list of building blocks for the CEO Gold Standard called the “Five Pillars”: tobacco use, nutrition, physical activity, screening and early detection, and access to quality treatment and clinical trials. The task force was also asked to develop a strategic deployment of the Gold Standard, both within member companies and nationwide.
- < The Roundtable acted boldly because they understood that cancer is expensive for corporate America, not only in dollars but in human talent. They developed a Gold Standard with three objectives: reduce the risk of cancer by changing lifestyles; detect the earliest possible stage of cancer so that treatment can improve outcomes; and provide access to high-quality treatment, including clinical trials.
- < The CEO Gold Standard was ratified and implementation has begun for the approximately 31 million employees and family members of participating Roundtable companies. The Gold Standard is being validated through partnerships with NCI, ACS, and CDC.
- < AstraZeneca has addressed the diet and nutrition issue by providing cafeteria subsidies for healthy foods, as suggested by Mr. Garza. Changes have also been made in vending machines. Vendors who provide snacks for meetings have been asked to replace cheesecake with fruit and yogurt.
- < To establish a culture of physical activity, AstraZeneca has sponsored the Race for the Cure and hosted ACS bike-a-thons. The company holds a weekly Walk-With-the-CEO power walk and has established an onsite fitness center. Employees who are traveling on company business are reimbursed for their use of hotel fitness facilities.
- < AstraZeneca employees receive birthday cards that detail age- and sex-specific screening and early detection recommendations. A card might read, “Happy birthday. Have you had your colonoscopy yet?” or “Happy birthday. Have you had your mammogram?”
- < Access to quality treatment and clinical trials is addressed through straightforward elements of AstraZeneca’s benefits package.
- < AstraZeneca has also addressed the tobacco use issue. A Gold Standard company must have a smoke-free worksite. AstraZeneca once provided a well-ventilated “barn” where employees could smoke (and be exposed to antismoking literature). This barn has been torn down and AstraZeneca is now a completely smoke-free workplace. The company’s benefits plan also includes evidence-based tobacco treatment, including medications and counseling.

MR. PAUL STITT: Vitamin D Reduces Cancer Rates

Background

Mr. Stitt was born on a farm and developed a natural interest in good nutrition and a healthy lifestyle. His early professional career included developing a single-cell protein, and developing super-nutritional food ingredients for major food companies. In 1976, he started Natural Ovens Bakery to make nutritional foods readily available to Midwestern consumers. He holds five food patents. In 1988, Mr. Stitt was the first person to introduce ground flax as an omega-3 source for animal and humans. In 1992, he was involved as an unpaid consultant for NCI’s Designer Food Program. In 1996, Paul and his wife Barbara, who holds a Ph.D. in nutrition, sponsored a 5-year nutritional lunch program at the Appleton, Wisconsin, Alternative School. The result was dramatically reduced violence and improved learning that was featured in the movie *Super Size*

Me. Since retiring from Natural Ovens, Mr. Stitt is researching methods for using Brazilian chocolate and other food products as vehicles to deliver an adequate daily level of Vitamin D. He recently authored his fourth book, *Vitamin D: Is It the Fountain of Youth?*, and has given numerous presentations on the subject to both government and business groups.

Key Points

- < Vitamin D can dramatically reduce cancer rates. It can be easily added to a wide variety of foods and is easy to use in research studies. However, vitamin D is an “orphan” with no sponsor to promote its use or study. The primary source of vitamin D is exposure to sunlight.
- < A variety of studies support the benefits of vitamin D in cancers of the lung, breast, prostate, skin, and digestive system.
- < Many non-cancer benefits are associated with vitamin D. Vitamin D plus calcium has been shown to reduce falls and fractures by 60 percent compared with calcium alone. In a study of patients at the University of Minnesota and the Mayo Clinic, it was found that 95 percent of patients reporting chronic pain had deficient levels of vitamin D.
- < In a 2005 article that remains controversial, M. F. Holick concluded that vitamin D deficiency is an epidemic in the United States that is associated with increased risk of type 1 diabetes, multiple sclerosis, and skin cancer.
- < A 2001 NIH consensus statement concluded that adequate calcium and vitamin D intake is crucial to developing peak bone mass and preserving bone mass throughout life. The 2004 Surgeon General’s report recommended that people with frail bones or vitamin D deficiency should use 50,000 units of vitamin D per week for 3 months, followed by further testing and follow-up depending upon the test results.
- < M. S. Calvo of the U.S. Food and Drug Administration (FDA) has written about the high prevalence of vitamin D deficiency around the world, associating this deficiency with increased risk of osteoporosis, diabetes, cancer, and autoimmune diseases, and other health problems. She recommends community-based vitamin D supplement trials. Others at the FDA do not agree with her conclusions.
- < A very recent unpublished double blind, placebo-controlled study has shown a 60-percent reduction in colon, breast, lung, and lymphatic cancers among 600 subjects who consumed an extra 1,100 IU of vitamin D each day for a year. Larger studies are needed to verify these findings.
- < Currently, there are only four clinical trials under way on vitamin D. One involves using anastrozole and vitamin D in breast cancer; another is using zoledronate, vitamin D, and strontium in prostate and breast cancer; a third is using vitamin D in the prevention of polyps; and a fourth is studying vitamin D and bone density.
- < One difficulty of obtaining FDA approval for vitamin D studies is the agency’s upper limit for vitamin D of 2,000 units. This can be overcome with extra effort to obtain IRB approval.
- < One critical need is determination of the ideal level of calcium in the diet for people who are consuming adequate levels of vitamin D. Previous studies of calcium needs were conducted with people who were vitamin D deficient.
- < NCI should revive the Designer Food Program, which was started in 1992 to examine extracts of various plants in search of low-cost, effective cancer treatments. Since so many current cancer therapies are expensive and have severe side-effects, this line of research should be revisited. In addition to basic research, NCI should support applied research on vitamin D and other low-cost, nonpatentable treatment methods.

- < The synergistic effects of flax and vitamin D on breast, prostate, and colon cancers should be studied, as well as the synergistic effect of vitamin D in combination with traditional chemotherapy to reduce side effects.
- < High-dose vitamin D also has potential effects on chronic pain, osteoporosis, fibromyalgia, multiple sclerosis, type 1 and 2 diabetes, and peak bone mass.

DISCUSSION: PANEL III

Key Points

- < The CEO Roundtable is an outgrowth of the National Dialogue on Cancer (NDC), now known as C-Change. The NDC, established in 1988, was the first cancer organization formed through collaboration of the public, private, and not-for-profit sectors. Former President George H. W. Bush was instrumental in launching the NDC as well as the Roundtable. Dr. Leffall recalled visiting President Bush in Maine in the company of Dr. Andrew von Eschenbach and others to recruit him as a founding leader of the NDC. At first, the President was hesitant because he feared his participation would be perceived as politically motivated. His visitors pointed out that his daughter, born in 1953, died of leukemia before the age of 4. If diagnosed with the same disease today, they reminded him, she would have had an 80- to 85-percent chance of being cured. President and Mrs. Bush agreed to participate in the organization.
- < Cancer prevention efforts have been hindered by the failure of third-party payers to cover screening and other prevention interventions. However, CEO Roundtable members are convinced that benefits packages should include coverage for evidence-based screening. Further research to document savings in sick days and other costs associated with late diagnosis of cancer is likely to persuade other employers of the value of prevention and early detection.
- < Roundtable members are required to make their companies smoke free in the United States. Johnson & Johnson is going beyond that with a plan to make the company globally smoke free over the next 2 years. This will require a significant culture change in Asia and Europe and will set a strong example for other corporations.
- < The success of the Boston Steps program has resulted primarily from cooperative efforts with important elements of the community, ranging from grassroots health and advocacy organizations to barber shops. The community in general has been ready, willing, and able to partner with the program.
- < The most difficult challenge for Snacking 101 has been convincing people that access to healthier food options is possible.
- < It is unclear why the research community has not shown more interest in the potential benefits of vitamin D. Although thousands of articles have been written on vitamin D, very few clinical studies have been conducted. One problem is the lack of potential for profit.

PUBLIC COMMENT

Key Points

- < An audience member commented for the record that the presentation on vitamin D greatly underestimates the potential toxicity of high doses of this vitamin.
- < Finding funds to support implementation and evaluation of evidence-based cancer control programs is an ongoing challenge. Often, funding announcements for program initiatives do

not allow participation by research institutions, and vice versa. Potential partnerships among NCI, CDC, and the CEO Roundtable may provide a solution to this challenge.

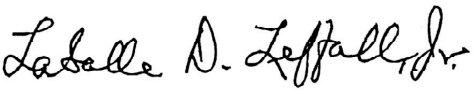
- < The separation of research, implementation, and evaluation is a problem. One question that needs to be addressed is whether evaluation is in fact a research activity. The Roundtable might be an excellent way to combine the process of developing practice-based evidence and implementing evidence-based practice.
- < An implementation plan has to include evaluation to determine whether evidence-based messages are effective when applied in the community.
- < The CEO Roundtable has discussed working with the NCI Division of Cancer Prevention to develop a research model for estimating risk for colorectal cancer through a survey of the 16,000 employees of Roundtable members. The Roundtable is eager to partner with epidemiologists and others to conduct such a survey and share the results.
- < Stress management should be included among the lifestyle changes that could reduce cancer risk and improve cancer survivorship. Some people reduce their physical activity and fail to follow dietary guidelines after cancer treatment due to lack of hope.
- < The NCI Office of Cancer Complementary and Alternative Medicine is open to queries and suggestions concerning issues such as the role of stress management in cancer care.
- < Much unhealthy behavior is habitual (e.g., snacking while reading). Research on behavior modification is important in order to help people change behaviors of which they are unaware.
- < Researchers should bear in mind the role that private industry can play in turning policies into action. If new products and distribution methods are not available in the marketplace, new policies cannot make a difference in public health.

CLOSING REMARKS—DR. LEFFALL

- < Dr. Leffall thanked Panel members Lance Armstrong and Dr. Margaret Kripke and the invited speakers. He concluded that the Panel has listened carefully, will fully discuss this testimony, and will make its recommendations to the President and Congress.
- < It was pointed out during this meeting that everything we do in cancer research is for the benefit of the patient. The patient must always have the role of primacy. Whenever that fails, we have stopped doing our job.

CERTIFICATION OF MEETING SUMMARY

I certify that this summary of the President's Cancer Panel meeting, *Promoting Healthy Lifestyles to Reduce the Risk of Cancer*, held September 11, 2006, is accurate and complete.

Certified by:  Date: December 14, 2006

LaSalle D. Leffall, Jr., M.D.
Chair
President's Cancer Panel