

*Editorial***Translational Research and Good Behavior**Robert A. Hiatt,¹ Suzanne M. Miller,² and Sally W. Vernon³¹University of California, San Francisco, School of Medicine, San Francisco, California; ²Fox Chase Cancer Center, Cancer Prevention and Control, Philadelphia, Pennsylvania; and ³University of Texas-Houston School of Public Health, Division of Health Promotion and Behavioral Sciences, Houston, Texas

Spurred in part by the sequencing of the human genome, there has been increasing emphasis on the importance of translational research to convert biomedical discoveries in cancer into useful clinical applications. Heightened interest in translational research is reflected more generally in the growing prominence of evidence-based medicine and the perspective of population health. Factors contributing to the intensifying focus on translational research include public demands for accountability, changes in health care financing, public-to-private shifts in responsibilities for the delivery of health services, and the increasing involvement of nontraditional partnerships (1).

Unfortunately, conspicuous, by its absence, from much of the discourse and many of the research priorities addressing translational research in cancer is the role of behavior. Yet, human behavior is a pervasive and decisive factor that may account for as much as 50% of cancer incidence (2). Basic and applied findings in behavioral and social science research—together with basic discoveries in biomedical science—jointly provide the basis for translation to useful applications (3). We see this in the development of effective interventions across the cancer control continuum, including those in prevention, early detection, treatment decision-making, symptom management, quality of life, provider-patient communication, partner support, and survivorship/end of life. These interventions include those applied in the clinic (e.g., diagnosed patients), as well as those applied to population health (e.g., the community, health plans, health departments) and those that involve changes in policy.

In terms of effect at the population level, the behavioral and social sciences have made huge inroads into reducing the cancer burden through modification of behavioral risk factors and policies (3). Tobacco control interventions stemming from early epidemiologic discoveries were translated into programs and policies

nationwide, ultimately resulting in changes in societal norms and expectations related to tobacco use. The prevalence of current tobacco users in the United States for adults >18 years of age has continued to decline (15% in the last 8 years) to 21%,⁴ largely due to these policies and social interventions. Other behavioral risk factors have undergone, or are expected to undergo, population-level shifts with measurable reductions in cancer incidence and mortality. These include increased use of cancer screening (e.g., for breast, colorectal, and cervical cancer) and improvements in dietary practices, physical activity, safe sexual practices, and reduced sun exposure. Applications of behavioral and social science interventions in genetic susceptibility testing, screening tests using biomarkers and new imaging technology, and in improving the quality of life of cancer survivors will be key features of future cancer research agendas.

Behavior-based advances in cancer control at both the clinic and population health levels are consistent with definitions of translational research. The NIH Clinical and Translational Science Awards consortium, for example, defines translational research, in part, as "... the process of applying discoveries generated during research in the laboratory, and in preclinical studies, to the development of trials and studies in humans." The Clinical and Translational Science Award consortium's definition goes on to state that translational research includes efforts "aimed at enhancing the adoption of best practices in the community."⁵ We believe that it is useful to recognize "community" to include not only public health venues (e.g., neighborhoods, health departments, medical care systems, health plans, schools, and the workplace), but also clinical settings (e.g., physician offices, medical inpatient, and outpatient settings). We also see a distinction between the translation of basic discoveries into effective interventions and the dissemination of effective interventions into the community, although we recognize the process as a continuum from discovery to implementation.

The first aspect of behavioral translational research encompasses the application of a broad range of theories and models to the development of interventions that can prevent, detect, and alleviate the burden of cancer. It also requires the evaluation of the efficacy and effectiveness of interventions (4, 5). Behavioral and social scientists work along with biomedical scientists in both the "bench to bedside" or "bench to trench" paradigm (6).

Cancer Epidemiol Biomarkers Prev 2007;16(11):2184–5

Grant support: NIH grants R01 CA104979 and 2P01 CA057586-09A2, as well as the Fox Chase Cancer Center Behavioral Research Core Facility P30 CA06927; Department of Defense grants DAMD 17-01-01-1-0238, DAMD 17-02-1-0382, W81XWH-06-1-0099, and W81XWH-06-1-0194; American Cancer Society grant TURSG-02-227-01-PBP; Pennsylvania Department of Health grant SAP no. 4100026777 (Dr. Miller) and ROI CA 97263 and PRC SIP19-04 U48DP000057 (Dr. Vernon).

The costs of publication of this article were defrayed in part by the payment of page charges. This article must therefore be hereby marked *advertisement* in accordance with 18 U.S.C. Section 1734 solely to indicate this fact.

Requests for reprints: Robert A. Hiatt, University of California, San Francisco, School of Medicine, Lobby 2, Suite 6600, 185 Berry Street, San Francisco, CA 94107.
E-mail: rhiatt@cc.ucsf.edu

Copyright © 2007 American Association for Cancer Research.

doi:10.1158/1055-9965.EPI-07-2669

⁴ <http://www.cdc.gov/tobacco/>

⁵ <http://grants1.nih.gov/grants/guide/rfa-files/RFA-RM-07-007.html>

The second aspect of translational research is less well-appreciated and has been described with many terms, including "T2 research", "dissemination and implementation", "dissemination research", "knowledge uptake and exchange", and "knowledge integration." It comprises studies designed to develop and evaluate strategies for promoting the uptake of cancer control interventions by target groups, as well as studies to evaluate the effectiveness of these strategies (7, 8). It often moves the process of translation outside the biomedical field and sometimes outside of the scientific realm in order to work with urban planners, engineers, teachers, politicians, and other decision-makers. Here, the role of behavioral and social science becomes even more critical and typically requires expertise in fields such as decision-analysis, organizational theory, economics, anthropology, and community psychology. Examples of strategies for dissemination of cancer control interventions include both those that target systems that provide health care (e.g., train the trainer, role modeling, workshops, educational facilitators, treatment algorithms, practice guidelines, postal delivery of booklets to physicians), and those that target groups of individuals in organized or defined units (e.g., media-awareness campaigns, peer educators at work sites). Examples of dissemination efforts that make use of these strategies might include integrating evidence-based psychosocial interventions to improve cancer screening in primary care practice networks; incorporating telephone-based barriers counseling for improving adherence and adjustment to abnormal test results (e.g., Pap smears) into regional Medicaid services; using enhanced counseling protocols and adjunct decision-making aids for genetic-risk assessment, testing, and prevention strategies; and applying Web-based neurocognitive testing to patients undergoing chemotherapy in community cancer clinics. Behavioral and social scientists who work in cancer are integral players in both aspects of translational science: developing and testing the efficacy and effectiveness of cancer control interventions and developing and testing strategies for promoting the uptake and implementation of such interventions.

Finally, all translational science is most likely to be accomplished effectively with a "team science" or transdisciplinary approach. Although there are certainly examples of talented scientists who, because they are trained in multiple disciplines, have individually made and translated key discoveries into practice, the Institute of Medicine and numerous National Cancer Institute initiatives have emphasized the shift to team science from the traditional entrepreneurial solo scientist paradigm. A team science approach implies the need for a transdisciplinary approach in which behavioral and social scientists must play a critical role. True transdisciplinary research goes beyond "multidisciplinary" or "interdisciplinary" research and transcends traditional disciplinary perspectives (9). These transdisciplinary teams involve scientists from multiple disciplines working together on a common problem (e.g., obesity and cancer) and using a common conceptual understanding or model to meld elements from their respective disciplines as a means to define a new scientific

approach. The result is the creation of new theory and new methods at the interface of traditional disciplines (9). Examples of attempts to implement a transdisciplinary approach in cancer control research include initiatives from the National Cancer Institute and the National Institute for Environmental Health Sciences for Transdisciplinary Tobacco Use Research Centers, Centers of Excellence in Health Communications Research, Centers for Population Health and Health Disparities, and Transdisciplinary Research in Energetics and Cancer.⁶ Other more traditional funding mechanisms include the Specialized Programs in Research Excellence grants that were designed to foster interdisciplinary work and Program Projects. All these mechanisms are critical for transdisciplinary and translational research and should be strongly supported by those who devote their careers to the application of cancer research discoveries.

Certainly, implementing a transdisciplinary approach, although promising, could pose complex problems. Methods to evaluate how successful it is in advancing science and the careers of investigators are under study (10, 11). Behavioral and social scientists, along with their colleagues in basic, clinical, and other population sciences can, and should, take a leadership role in transdisciplinary science and its evaluation in cancer control, especially with respect to translational research. The time has come to translate good individual behavior into good team behavior in order to make more rapid advances in cancer prevention and control at the population level.

Acknowledgments

We are indebted to John Scarpato for his technical assistance.

References

- White C, Dignan M. Translation of research into public health practice. In: Miller SM, Bowen DJ, Croyle RT, Rowland J, editors. Handbook of cancer control and behavioral science: a resource for researchers, practitioners, and policy makers. Washington (DC): American Psychological Association; 2007.
- Willett W. Cancer prevention and early detection. *Cancer Epidemiol Biomarkers Prev* 2003;12:252.
- Hiatt RA, Rimer BK. A new strategy for cancer control research. *Cancer Epidemiol Biomarkers Prev* 1999;8:957-64.
- Glasgow RE, Lichtenstein E, Marcus AC. Why don't we see more translation of health promotion research to practice? Rethinking the efficacy-to-effectiveness transition. *Am J Public Health* 2003;93:1261-7.
- Glasgow RE, Davidson KW, Dobkin PL, Ockene JK, Spring B. Practical behavioral trials to advance evidence-based behavioral medicine. *Ann Behav Med* 2006;31:5-13.
- Miller SM, Bowen DJ, Croyle RT, Rowland J. Handbook of cancer control and behavioral science: a resource for researchers, practitioners, and policy makers. Washington (DC): American Psychological Association; 2007.
- Ellis P, Robinson P, Ciliska D, et al. A systematic review of studies evaluating diffusion and dissemination of selected cancer control interventions. *Health Psychol* 2005;24:488-500.
- Glasgow RE, Emmons KM. How can we increase translation of research into practice? Types of evidence needed. *Annu Rev Public Health* 2007;28:413-33.
- Rosenfield PL. The potential of transdisciplinary research for sustaining and extending linkages between the health and social sciences. *Soc Sci Med* 1992;35:1343-57.
- Stokols D, Harvey R, Gress J, Fuqua J, Phillips K. *In vivo* studies of transdisciplinary scientific collaboration: lessons learned and implications for active living research. *Am J Prev Med* 2005;28:202-13.
- Stokols D, Fuqua J, Gress J, Harvey R, Phillips K, Baezconde-Garbanati L. Evaluating transdisciplinary science. *Nicotine Tob Res* 2003;5:S21-39.

⁶ <http://cancercontrol.cancer.gov/>