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In Memoriam: An Appreciation for the NCI R25T Cancer Education and Career Development Program

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Abstract

On September 7, 2013, the NCI R25T award mechanism ended its final "receipt/review/award cycle" after more than two decades shaping the cancer prevention and control workforce. Created in 1991 to respond to a national shortage of cancer prevention and control researchers, the R25T supported innovative institutional programs with specialized curricula preparing individuals for careers as independent scientists for the field. Required elements ensured developing transdisciplinary sensibilities and skills highly suited to team science, including conducting collaborative research with mentors of complementary expertise. R25Ts provided trainee stipends, research, education, and travel funds at levels far higher than T32 National Service Research Awards to attract individuals from diverse disciplines. Graduates are faculty at all academic ranks, and hold leadership positions such as associate directors of cancer prevention and control. Beyond its trainees, R25Ts also recruited into the field other students exposed through courses in specialized prevention curricula, as well as course instructors and trainee mentors, who did not initially consider their work to be relevant to cancer prevention. Although advances are being achieved, prevention efforts are not yet fully realized, and currently unknown is the impact on the workforce of terminating the R25T, including whether it is another barrier to preventing cancer. *Cancer Epidemiol Biomarkers Prev; 23(6); 1133–6.* ©*2014 AACR.*

A driving force in transdisciplinary research training that shaped and strengthened the field of cancer prevention and control for more than two decades, the NCI R25T award mechanism passed away quietly in Rockville, MD on Saturday, September 7, 2013. The NCI R25T received applications for its last submission date on Tuesday, May 28, 2013.

Confirmation of its final expiration came after a hard-won extension (NOT-CA-13-008) negotiated by its dedicated program director from the NCI Cancer Training Branch, Dr. Susan Perkins, after an initial announcement in a session for R25T principal investigators at the 2013 ASPO annual meeting that its PAR-10-165 would not be renewed after its originally planned expiration on May 8, 2013. The cause was not reported, but onlookers speculated that indiscreet departures from the overarching guidelines for today's NIH R25 awards, introduced in its earliest days, but overlooked in favor of its wide popularity and long-term success, finally caught up. The R25T is survived by a fraternal twin, the NCI R25E that focuses on innovative educational programs.

Born out of an experiment in 1991, the NCI R25T was created to respond to workforce needs identified by scientific experts conducting a major external review of the NCI's cancer prevention and control sciences (PAR-99-095): they "...noted a national shortage of cancer prevention and control researchers, and a pressing need for researchers educated in the new scientific paradigms that require collaborations with researchers in disparate disciplines...identified the need for a new approach to the training of prevention and control scientists requiring multidisciplinary experiences with an interdisciplinary theme and including laboratory experiences." Thus, with an objective of strengthening the workforce in cancer prevention and control, its *raison d'etre* became supporting the creation of innovative institutional programs with specialized educational curricula to prepare predoctoral students and postdoctoral fellows for launching earlier into careers as independent scientists skilled in transdisciplinary approaches for cancer prevention. Over time, the contents of its portfolio grew to include many broadly focused cancer prevention and control programs, as well as programs targeting oncology subfields such as behavioral science, pharmacology, genetics, quantitative sciences, nutrition, and tobacco control, with some oncology imaging thrown in for spice. Innovative trainee project mash-ups have included nanotech strategies for colorectal cancer screening imaging, effects of pharmaceutical

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agents on fMRI-detected brain responses to emotional stimuli during nicotine withdrawal, and description of mammography capacity over time using medical geography and epidemiologic approaches to detect areas of insufficiencies for policy implications. R25T programs spanned the nation, with notable representation in the northeast, California, and Texas, and were based at schools of medicine and public health, and most often, cancer centers. As of September 2013, the NCI supported 42 programs at a total cost of $18.3M, 16 of which report a total of more than 600 individuals trained to date. Positions held by graduates include faculty at all academic ranks, endowed chairs, associate directors of cancer prevention and control at NCI-designated cancer centers, deans, deputy director at NIH, division director at the Centers for Disease Control and Prevention (CDC), and Institute of Medicine member among others.

Typically, these renewable R25T programs were awarded for 5-year intervals and limited to $500K annual direct costs. Mostly open only to U.S. citizens and permanent residents, programs provided postdoctoral and predoctoral participants up to $75,000 and $22,000 in annual salary support, respectively, levels set far higher than T32 NSRA levels to recruit individuals from a variety of disciplines into the field of cancer prevention and control. The NCI R25T also included substantial funds for research and development support for postdoctoral fellows and predoctoral students, up to $30,000 and $20,000 per trainee per year, respectively; these funds provided trainees with their own resources for research expenses, such as supplies, equipment, and technical personnel; tuition and fees related to career development; travel for research and training; and statistical services, including personnel and computer time. In contrast, T32 awards provide at most a total of $7,850 and $4200 per postdoctoral fellow and predoctoral student, respectively, to help defray research training expenses, including health insurance, equipment, research supplies, as well as program costs [e.g., staff salaries, consultant costs, faculty/staff travel directly related to the research training program (e.g., recruitment)]. Moreover, T32s only subsidize tuition and fee costs up to 60%, whereas R25Ts paid in full. R25T programs also paid for recruitment activities, including travel, consultant costs, equipment, and program staff support but from separate funds, not comingled with trainee research and educational funds as for the T32 awards. As T32s provide limited support for trainee research and educational costs, funded research projects necessarily form the backbone of T32 programs. Such a design necessitates that NCI requires all T32 mentors serve as principal investigators for R01 (or R01-like, peer-reviewed) cancer-focused or cancer-related research support, making T32s and their trainees more vulnerable during periods of low research funding.

A key to NCI R25T success in preparing trainees for team science is a set of required structural elements that ensure trainee development of transdisciplinary sensibilities and skills. For example, all training programs require well-funded research environments, but that for R25T programs must immerse trainees in strongly interdisciplinary and cooperative environments focused on cancer prevention research, to "prepare them to conduct research in a highly collaborative research team setting" (PAR-10-165). Another required element was for programs to develop and evaluate specialized curricula in cancer prevention that expose trainees to disciplines in the field. Building from such didactic offerings and from expertise in their own discipline, trainees were required to execute plans for transdisciplinary training in cancer prevention tailored to their individual needs. Transdisciplinary exposure was also reinforced by a requirement for mentorship of trainees by scientific experts from more than one discipline, and for the support of a permanent Advisory Committee representing the multidisciplinary components involved in the R25T program. Such involvement ensures advice and feedback that encompass many perspectives, as well as fair evaluation of applicants and trainees, maintenance of high-quality training, and delivery of up-to-date and relevant educational activities in topics from across the field, all the better to prepare trainees for careers in team science.

The R25T programs also had elements that generally assured high-quality training. For example, postdoctoral fellows were required to prepare mock NIH applications (e.g., K07, K01), which were frequently submitted for review and funded. Being required to develop and exercise professional skills such as grant writing that are needed for long-term survival ensures that trainees are prepared for career success, not just research work as is the case for trainees and mentors who focus predominantly on conducting research. The R25T also provided for dedicated time for interdisciplinary training program leaders to oversee what were often widely cross-collaborative enterprises and the many activities in place to maintain the high caliber of programs like these. Having dedicated administrative support ensured the capacity to manage programs well and to meet the needs of multidisciplinary applicants, trainees, mentors, and advisors. This support was essential to R25T success at free-standing cancer centers without the infrastructure typical of universities with registrars and others responsible for managing educational activities. Over the years, the R25T was criticized by detractors for providing "luxurious" research resources, tailored educational curricula, and other professional development opportunities to trainees ("They will be too comfortable and won't work hard to finish," "They won't do what we tell them! They'll go wild!"), but it was argued that by providing dedicated funds to trainees diminished their dependence upon and restriction to their mentors' funded research projects for research training opportunities. These were often used to extend the mentors' resources in new research directions led by trainees and based more on their own interests, helping them develop independence relatively earlier in their trajectories. As a result, given the competition for positions in these programs and the high standards set by

trainee performance, R25T programs have become training program models for preparing scientists for 21st century research careers.

Overall, the strategies NCI R25T nurtured have had impact beyond the individual funded programs and the legions of cancer prevention and control scientists launched into the field. In the early years and even today, the NCI R25T has helped established scientists develop skill in cross-disciplinary collaborations when they were drawn into mentoring partnerships for trainees. Comentorship obligated research collaborations originally for the benefit of trainees, but often resulted in rich relationships between mentors that grew beyond the duration of fellowships, strengthening the field further. Also, specialized R25T curricula were often available to other students and postdoctoral fellows, thus, increasing the number of individuals knowledgeable of cancer prevention and control, potentially recruiting them to the field as well. Like some mentors, some instructors for R25T curricula have been recruited into the field, even though they may not have initially considered themselves or their work to be relevant to cancer prevention and control. Altogether, the success of professionals involved with these programs has contributed to the growth of health science institutions and cancer centers across the country, particularly those with or seeking NCI-designated comprehensive status, through their leadership and research in cancer prevention and control.

Tragically, the NCI R25T award portfolio has closed just when the field of cancer prevention and control is maturing into "a golden age." Both incidence and mortality rates from cancer have declined in recent years, and proven strategies for primary prevention and early detection screening exist for several of the most common types of cancer that together comprise half of the annual cancer incidence and mortality in the United States. In spite of this encouraging news, cancer disparities persist and screening methods are not fully used, not able to discern aggressive tumors from others less so, and not even available for all types of cancer. Many effective prevention strategies are not uniformly reimbursable by insurance and consequently, remain underused. With attention to health care expense, questions about comparative and cost effectiveness of prevention and early detection approaches are only beginning to be addressed. High global rates of tobacco consumption, large cohorts of populations aging into higher risk of cancer in developed countries, and ASCO–AAMC projections for medical oncology shortages in the United States by 2020 (1) also urgently call for greater impact on the societal burden of cancer through prevention. If insufficient numbers of professionals are available to address these issues, then clearly, the R25T has left business unfinished.

R25T programs in which funding has recently ended or will end soon will be allowed to submit type 2 T32 applications (i.e., competitive renewal) to take advantage of their past R25T success. This strategic option negotiated by the NCI to salvage programs focused on cancer prevention research training is a significant advantage to existing programs, although one which not every program will be able to exploit. Many program leaders have expressed concern that stipend levels and research support from the T32 mechanism may not be sufficient to attract high caliber trainees, particularly at the postdoctoral level and from high-demand disciplines such as biostatistics and medicine. Others describe the challenges of sustaining faculty engagement in the wide variety of R25T training activities from T32 funds, and the likelihood of falling back on existing courses that may not focus on or include cancer prevention topics *per se* in the absence of R25T resources. Absorbing the cost of staff and program leadership to manage these activities is also a point of concern. Although institutions pledge support to externally funded training programs, institutions still struggle to provide the resources for such programs, especially given the current research funding climate.

With the termination of this dedicated mechanism to recruit and prepare the next generation of scientists in cancer prevention, what will be the impact on the field, short-term and long? Will inspired and committed individuals continue to pursue careers in cancer prevention and control in numbers that will afford desirable rates of scientific advancement to prevent cancer? Will they be able to navigate to careers successfully given that the absence of clear career paths into cancer prevention science has been cited as a barrier for many, particularly for clinical professionals (2)? For those early in their careers, will they be prepared to participate in and lead team science that has proven to be especially successful against the formerly intractable and complex research questions (3, 4) common in cancer prevention and control, especially if training resources favor single discipline approaches (e.g., T32s)?

The R25T was created to fill a dearth of scientists in this field, and today, considerable dispute exists as to whether such a shortage has been met, and whether maintaining a dedicated training mechanism in cancer prevention is warranted. Thus, it is critical to consider and plan for the workforce in cancer prevention and control (5), its impact on future progress in research, and translation of findings into clinical and community interventions. Given current funding rates, a major consideration must be design of training resources to prepare researchers for team science that are less vulnerable to funding shortages, ideally borrowing a chapter from the NCI R25T.

Recently, Harvey Fineberg, president of the Institute of Medicine, brilliantly outlined 12 barriers to prevention (6). Is it possible that losing dedicated funding to prepare professionals for team science research careers in cancer prevention and control becomes a thirteenth? "And if we know what the barriers are," Nancy Hopkins, Amgen, Inc. Professor of Biology at MIT, and member of the National Academy of Sciences, wants to know (personal communication), "then why aren't we further along preventing cancer?!"

Disclosure of Potential Conflicts of Interest

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