National Cancer Institute

The CURE Paradigm:
Enhancing Workforce Diversity

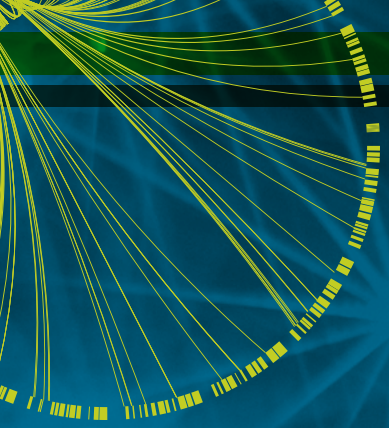


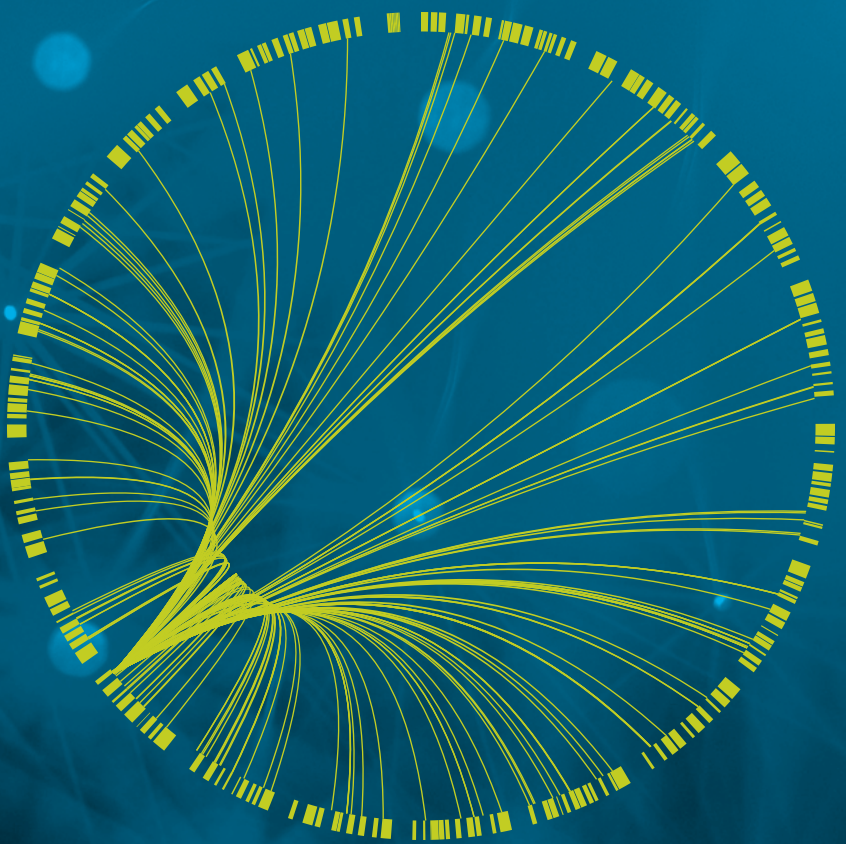

Center to Reduce Cancer Health Disparities

U.S. DEPARTMENT
OF HEALTH AND
HUMAN SERVICES
National Institutes
of Health

If we don't include as part of this agenda a very major focus on health disparities, we [will] have failed at one of our most important missions at NIH—a problem that has to be understood and ultimately solved.

Dr. Francis Collins
NIH Director, 2009-Present
NIH Town Hall





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Introduction

The National Cancer Institute (NCI) is committed to making sure that all Americans share equally in the medical advances that result from cancer research and that current disparities in the burden of several diseases, including cancers, are reduced or eliminated. We have at least three important roles to play in efforts to achieve these important objectives.

First, we are helping to build a diverse workforce for the biomedical sciences—a critical step in reducing the burden of cancer for an increasingly diverse America. Providing a smoother path towards careers in science and medicine is an important means to attract and engage the nation's most talented students, especially those from backgrounds traditionally underrepresented in cancer research and care. The resulting workforce, reflecting diverse cultural and research perspectives, can best ensure that our science addresses the health needs of all Americans.

A second critical role for NCI is to ensure that the subjects who participate in our clinical research truly reflect our nation's social, ethnic, and genetic diversity. Recruiting representation from diverse populations also benefits from having a diverse research staff conducting the recruitment, particularly in communities with inherent mistrust and misinformation. A diverse workforce and open, fair processes for enrollment of patients builds the trust required to enlist the research participants necessary to produce outstanding clinical science.

A third aspect of NCI's efforts to reduce disparities in the burden of cancer is to enhance our scientific efforts to understand the biological, behavioral, and socio-economic bases of those differences. We are doing this by supporting relevant and high quality work in every component of our research portfolio.

Over the course of my career, I have watched opportunities in biomedical research expand for individuals from varied backgrounds—but our efforts are far from fully successful. On this anniversary of the CURE program, we can celebrate its many successes in helping to build the diverse workforce we need for the future, while strengthening the commitment we have made to support its important work.

Harold Varmus, M.D.
Director
National Cancer Institute

Preface

The path to a successful career in biomedical research is a challenging one. A passion for solving human problems through science must be combined with rigorous academic preparation; opportunities to train with established researchers in one's field of interest; adequate financial resources; and mentors who help the young scientist optimize his or her talents, grow as a professional, and become an active contributor and leader in the research community.

Disparities in cancer care and cancer outcomes continue to diminish the length and quality of life of people from racial, ethnic, and cultural minorities and other underserved populations. For lack of opportunity, resources, and support, members of these populations also remain significantly underrepresented in the cancer research community, where they could make vital contributions to understanding and eliminating cancer health disparities.

This document describes a model paradigm for increasing the number of competitive cancer and health disparities researchers across the research continuum—the Continuing Umbrella of Research Experiences (CURE). The following pages trace CURE's goals, its 12-year history, the training and career development opportunities available to grantees, the program's achievements to date, and its projected future.

You also will find in these pages compelling evidence of CURE's accomplishments. In their own words, five CURE trainees describe the impact the program has had in enabling them to pursue cancer and health disparities research careers; the opportunities CURE participation has provided on the path to becoming established, competitive scientists; and their considerable successes and contributions to cancer disparities research.

It is the legacy of two women before me with passion and commitment to train cancer researchers from racially and ethnically underrepresented groups that has made CURE possible. It is my hope that CURE may provide a blueprint for developing similar programs in the public, voluntary, and private cancer research communities and in the broader biomedical research community. The ultimate success of CURE and programs like it will be achieved when diversity in the research workforce is no longer an issue.

Sanya A. Springfield, Ph.D.
Director
Center to Reduce Cancer Health Disparities, National Cancer Institute

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Lastly, and most importantly, to all of CURE's students, trainees, grantees, and their mentors: each of whom are working to diversify the cancer workforce, one face at a time.

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How do we shape research training and career development opportunities to ensure that cancer researchers in the future reflect the nation's unique demographic heterogeneity; have the skills and experiences to compete successfully for competitive research resources; are competent, valued participants in academic and institutional scientific reviews and study sections; and are fully prepared to face and embrace a new cancer landscape of challenges and opportunities?

That was the question confronting the National Cancer Institute (NCI) just over a decade ago. Despite 30 years of funding Diversity Supplements and co-funding "targeted" programs, there still was a shortage of competitive grant applications and awards for underrepresented cancer researchers and institutions, and a paucity of participants from diverse backgrounds serving as NCI reviewers and advisors.

Simply put, the training of underrepresented scientists was facing a tremendous challenge. To ensure a steady flow of well-trained investigators to focus on the challenges of fighting cancer and, ultimately, increase the diversity of the cancer research workforce, NCI created the Continuing Umbrella of Research Experiences, or CURE.

Why CURE?

Ethnic and racial groups continue to suffer higher rates of cancer incidence and mortality than the general population.[1] This disparity is compounded by a dearth of researchers and physicians from these populations entering cancer science.[2] While making up nearly a quarter of the United States' population, underrepresented groups earn only 7.2 percent of all doctoral degrees in the United States and comprise less than 10 percent of its scientific workforce.[3] NCI believes that it is essential to have a cadre of well-trained, competitive researchers from the populations who suffer from cancer disproportionately—populations traditionally underrepresented in science careers—in order to produce research that can successfully reduce that burden.

The push by the National Institutes of Health (NIH) to significantly increase the number of researchers from underrepresented groups (a population that includes Hispanics/Latinos, African Americans, Native Americans, Alaskan Natives, Hawaiians, Pacific Islanders, as well as individuals with disabilities or from underserved backgrounds) working in the basic, clinical, behavioral, and population sciences began in the early 1990s. While some organizations within NIH developed research training activities focused on specific topics of interest to underrepresented populations, these programs did not necessarily involve or develop the trainees they recruited.

NCI, however, took a different approach. NCI recognized that today's pipeline to a competitive career in cancer research is a multiyear, multi-institutional, educational, and research continuum from high school to the first professional research appointment—a pipeline, however, that struggles to retain individuals from racially and ethnically underrepresented populations. To repair this leakiness, NCI realized it would be necessary to address training at each stage of the biomedical research path. It thus created the Comprehensive Minority Biomedical Branch (CMBB), whose charge was to significantly increase the number of competitive cancer researchers from racially and ethnically underrepresented groups.

In 1999, NCI/CMBB launched the Continuing Umbrella of Research Experiences (CURE) training program, and, today, as part of the Center to Reduce Cancer Health Disparities (CRCHD), CURE is a holistic, national research training and career development strategy and philosophy.

CURE has focused on the gaps NCI recognized; namely, to re-envision the pipeline for these underrepresented investigators, sealing its gaps at important career transition points, and extending it from high school until its trainees are established as independent, competitive researchers. CURE has created and adapted funding mechanisms to provide this type of systemic support and is still expanding its portfolio of training opportunities.

FAST FACTS ON TRAINING

- Hispanics/Latinos and African Americans comprise over 25% of the U.S. population, but only 3.2% of funded Principal Investigators on research project grants, 5.5% on NIH training grants, and 10.7% on NIH fellowships.[i]
- African Americans, Hispanics/Latinos, and Native Americans make up only 6% of all practicing doctors and 12% of medical school graduates.[ii]
- Women from underrepresented racial and ethnic groups find scientific careers particularly challenging: they earn only 0.32% of all doctoral degrees in science, technology, and engineering (ST&E) fields,[iii] remain practically nonexistent in ST&E professorial positions (tenured or non-tenured),[iv] and—of those who obtain academic appointments—only a third receive Federal support.[iii]

[i] Shavers V.L., et al. Barriers to racial/ethnic minority application and competition for NIH research funding. *Journal of the National Medical Association*. 2005;97(8).

[ii] U.S. Department of Health and Human Services, Health Resources and Services Administration, Bureau of Health Professionals. The physician workforce: projections and research into current issues affecting supply and demand. Rockville (MD): HRSA; 2008 Dec.

[iii] National Science Foundation, Division of Science Resources Statistics. Women, minorities, and persons with disabilities in science and engineering: 2011. Special Report NSF 11-309. Arlington (VA): NSF; 2011.

[iv] Nelson D.J., Brammer C.N. A national analysis of minorities in science and engineering faculties at research universities. 2nd ed. Norman (OK): Diversity in Science Association; 2010 Jan.

CURE Uses a Pipeline Approach

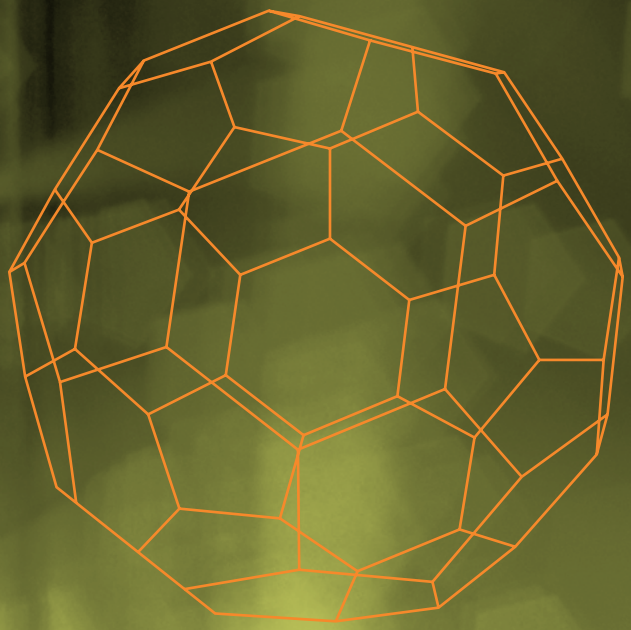
CURE Includes Ongoing Assessment and Expansion of Training and Career Development Mechanisms

CURE Emphasizes Mentorship

Peer Networking and Staff Commitment Support CURE Trainees

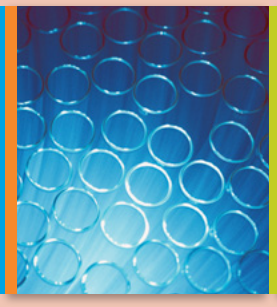
CURE Emphasizes Peer-Review Training Through Mentorship and Mock Reviews

CURE Ensures Protected Time



What makes CURE special?





In many respects, NCI's and CRCHD's CURE approach to reinforcing the standard training pipeline—sealing its leaks—is unique. CURE was—and still is—the only NIH program to offer this type of long-term support to underrepresented students and professionals.

Perhaps most importantly, CURE is exceptional in that it:

» Values the range of views that a diverse trainee pool can contribute to science

» Links trainees with supportive academic mentors who model and teach success

» Offers ongoing support and encouragement for the issues faced by underrepresented scientists

Most distinctive, however, is CURE's training approach, which revolves around six principal tenets. CURE, unlike other programs:

1. Works to repair the existing training pipeline, making it more effective for underrepresented minorities
2. Constantly expands its offerings and assesses their effectiveness
3. Includes mentorship in almost all of its funding opportunities
4. Provides trainees with extensive programmatic support and helps them build peer networks
5. Emphasizes and provides opportunities for training in peer review
6. Ensures trainees are allowed time that can be devoted strictly to research

Together, these six attributes serve as the foundation for CURE's success.

1. CURE uses a pipeline approach.

A competitive career in cancer research can only be achieved through experiences gained across many years and many different educational institutions—beginning, even, in high school. At each level of the biomedical research and educational process, CURE aims to provide substantive career-building experiences—the kind to which many investigators from underrepresented backgrounds might not typically be exposed. The goal is to be consistently adding students into the pipeline, particularly at the early stages. Increasing the cadre of competitive cancer researchers from underrepresented populations requires a steady and growing supply of trainees. By reaching back to the high school level, CURE increases awareness of and helps spark interest in biomedical research. CURE also advises students about the preparation needed both in and out of school to succeed in scientific research.

Young investigators need to be confident that they have a funding trajectory that's stable enough that there's a career for them, and that if they keep coming with good [ideas], they'll find support for them.

Dr. Francis Collins
NIH Director, 2009-Present

2. CURE includes ongoing assessment and expansion of training and career development mechanisms.

CURE's regular assessments identify gaps in training and career development opportunities and point to solutions to fill and bridge gaps between ideal practices and reality. Consistent monitoring and evaluation also allow CURE to remain flexible and creative—attributes crucial to facilitating the evolving and increasing comprehensiveness of the CURE program. Moreover, ongoing assessment of the CURE program promotes timely, rapid responsiveness in the face of dynamic and changing training needs, and strengthens CURE's ability to help its trainees both identify and investigate topics at the leading edge of cancer and cancer health disparities science, and gain experience using related emerging technologies.

3. CURE emphasizes mentorship.

CURE embraces role models who can bridge the gap between cultural perspectives and demonstrate the possibility and reality of success. Such mentors can serve as powerful motivators for individuals from underrepresented populations who are training in cancer research. Ideal mentoring involves an intense, long-term relationship between a mentor and trainee, encompassing both professional and personal domains and spanning several years—even extending far beyond the period of the structured mentorship. The mentor passes on strategies, values, skills, and knowledge while unifying and validating the experiences of the trainee. Both parties reap significant rewards as a result of the mentoring relationship and are transformed in the process—indeed, many well-mentored trainees one day become mentors themselves.

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A medical student of color coming out of school is more likely to pursue research if they see someone who looks like them who is doing research. My students NEVER thought research was for them, until they met me.

Dr. June McKoy
Assistant Professor, Northwestern University

KEY CHARACTERISTICS OF THE CURE MENTORING RELATIONSHIP

Mentor	Trainee
Shows that research is interesting and rewarding	Learns different options and how to weigh them
Provides opportunities for laboratory experiences	Identifies appropriate institutions and laboratories
Provides expertise in research area and techniques	Learns to narrow field of study
Introduces the trainee to the scientific community	Enhances research knowledge and skills; builds positively on strengths
Helps the trainee understand scientific organizations, their relationships, and various aspects of their function	Identifies potential advisors and collaborators
Provides needed resources and information	Learns scientific organizations and their functions
Acts as a sounding board for professional and personal matters	Brings new perspectives and values to the research community
Provides encouragement	Builds personal bonds and good interpersonal/ inter-professional relationships
Offers personal attention and guidance	Builds self-confidence
Helps trainee contend with academic barriers; provides advice about thesis and authorship issues	Counteracts isolation; develops social support and publication competence
Provides advice about balance between home and laboratory	Learns to evaluate abilities realistically
Provides advice about career options	Learns good communication skills
Provides help with self-promotion and professional survival	Builds professional competence; learns career mobility and forecasting

4. Peer networking and staff commitment support CURE trainees.

Underrepresented trainees often feel isolated and can benefit substantially from developing ties to a supportive community of individuals with similar backgrounds. To this end, CURE supports career development workshops that bring trainees together to discuss mutual problems and potential solutions, promote networking, and help trainees feel empowered to succeed. In addition, each CURE program staff member serves as a career navigator for his/her trainees, helping them understand NIH grant mechanisms and processes, assisting them in evaluating when they are ready to move to the next level of training or career development, and providing suggestions on how to strengthen their technical and research skills.

5. CURE emphasizes peer-review training through mentorship and mock reviews.

CURE provides a mentored peer-review experience to help trainees understand the NIH peer-review process (i.e., the process whereby scientists assess the grant applications of their fellow researchers and decide which proposals have the most scientific merit). CURE professional development workshops provide trainees with the opportunity to take part in both mock and actual peer-review sessions, during which the trainees learn grant-writing techniques, as well as how to improve their own grant applications through evaluating the strengths and weaknesses of others' applications. CURE trainees who participate in this peer-review training often go on to become ad hoc and, later, full members of NCI's internal grant review committees.

With the protected time provided by the CURE grant, I could just focus on my research and not have to teach. It would have taken me longer to get to where I am now, and so it's sort of the door that opened for me to be able to accomplish my goals.

Dr. Maria Elena Martinez, University of Arizona Mel and Enid Zuckerman College of Public Health and Arizona Cancer Center

6. CURE ensures protected time.

Academic institutions may require young researchers to earn their salaries by teaching, providing direct care to patients, or undertaking other substantial responsibilities—responsibilities that can leave relatively little time to devote to individual research. Several CURE grants offer the institution funds, which reduces the amount the institution must pay directly to the trainee. This coverage (called protected time) enables the trainee to focus solely on developing and pursuing research without the pressure of also generating revenues or having other job responsibilities.

CURE PRINCIPAL GOALS

- Increase the size of the talent pool
- Emphasize strategic and scientific areas of greatest need
- Expand and extend the period of training

CURE PROGRAM DIRECTORS

- Diversity of role models
- Continual assessment to promote progression from high school to first independent funding award
- Assistance with cultural adaptation
- Open communication and guidance via Mentoring Book and quarterly newsletter

PERSONALIZED AND CULTURALLY SENSITIVE PROFESSIONAL/CAREER DEVELOPMENT WORKSHOP

- Build interviewing and publication skills
- Network with NIH and NCI staff and peers
- Grant writing and grant review
- Research career expectations
- Competitive scientific poster session

Diversity Supplements

Predoctoral Fellowship Awards

Career Development and Transition Awards for Both Research and Clinical Science

Expanding the Diversity Training Landscape with PRCHD

Exploratory/Development Grants

How do CURE's funding opportunities fit together?





CURE has evolved thoughtfully, supplementing gaps in the pipeline as they have become apparent. CURE's commitment to continual self-assessment has allowed this evolution to proceed smoothly. In 12 short years, CURE has managed to join seamlessly a variety of funding mechanisms, ensuring that underrepresented students, trainees, and new investigators—at each transition point in their academic training—have the experiences, resources, tools, and guidance needed to become highly productive researchers and advance to the next stage in their careers.

Diversity Supplements

The first step in CURE's evolution came as a response to NCI's initial, minimally effective efforts to recruit trainees from populations underrepresented in biomedical science. At the time, the Institute funded only supplements to existing grants—allowing current recipients of NCI support to apply for money to add more underrepresented candidates to their research staffs. These Diversity Research Supplements, however, were funded only for specified periods and grants—thus, when the Supplements ended, so did the students' research training. Another NCI-sponsored program, in partnership with the National Institute for General Medical Sciences (NIGMS), provided similarly inconsistent training experiences. Examining this situation, the Center to Reduce Cancer Health Disparities soon saw that a more focused, longitudinal approach would be needed to launch trainees effectively into research.

CURE pushed these efforts a step further. In addition to the Diversity Supplements, CURE developed funding opportunities targeting underrepresented cancer researchers and trainees at the high school, undergraduate, predoctoral (F31), career development (K01, K08, K23), career transition (K22), and early investigator (R21) stages (Figure 1). For more information on these funding mechanisms, please refer to Figure 2.

Since the inception and expansion of CURE-sponsored funding mechanisms in

CURE CONTINUUM OF TRAINING AND CAREER DEVELOPMENT OPPORTUNITIES

Figure 1
ET CURE: Emerging Technologies Continuing Umbrella of Research Experiences
PRCHD: Partnerships to Reduce Cancer Health Disparities

COMPETITIVE CURE FUNDING MECHANISMS

Ruth L. Kirschstein National Research Service Award (F31): Provides support for predoctoral students pursuing a Ph.D., M.D./Ph.D., or equivalent combination of professional degrees in the biomedical, behavioral, and clinical sciences or in health services research.

Mentored Research Scientist Career Development Award (K01): Provides support to candidates with a research or health professional doctoral degree for intensive research career development under the guidance of an experienced mentor in the biomedical, behavioral, or clinical sciences leading to research independence.

Mentored Clinical Scientist Career Development Award (K08): Provides an intensive, supervised research experience for health professionals with a clinical degree, D.V.M., or equivalent degree to acquire research expertise to pursue a career in laboratory-based biomedical cancer research.

Research Scientist Career Transition Award (K22): Provides protected time and nonmentored support for individuals who are advanced postdoctoral and/or newly independent research scientists and who have been in an independent position for fewer than two years at the time of application. Awardees from each of the three "mentored" awards are eligible to apply for the K22 award.

Mentored Patient-Oriented Research Career Development Award (K23): Provides support to research-oriented clinicians to develop independent research skills and gain experience in advanced methods and experimental approaches needed to conduct patient-oriented research. Candidates must have completed their medical training, including subspecialty, if applicable, before the award.

Exploratory/Developmental Grant (R21): Provides support to investigators who have completed postdoctoral training and may need extra time to develop a full Research Project Grant (R01) proposal. This R21 enables the grantee to conduct basic science studies on the causes and mechanisms of cancer.

Figure 2

1999, the number of award recipients has risen significantly, reaching a higher level than any of NCI's earlier efforts. (Figure 3 depicts the growth of the various CURE mechanisms since Fiscal Year 2000.)

The foundation of CURE continues to be Diversity Supplements to existing NCI grants, thanks to the Supplement mechanism's versatility. Supplements are available to trainees at any point in their academic and career development and serve as an excellent introduction to cancer research. CURE, however, has helped NCI target these Supplements to reach more diverse, underrepresented, and young awardees—trainees whom CURE actively recruits into the applicant pool. (Figure 4 offers a breakdown of CURE-sponsored Diversity Supplement trainees by race/ethnicity and demographics.) These Supplements have recently been used in attempts to recruit college and high school students into the program; they have, however, not been particularly effective at this type of specific targeting—thereby inspiring CURE to develop new programs to reach out to specific demographic groups. (See "How Will CURE Grow in the Future?" for more information on CURE's evolving high school and undergraduate outreach programs.) (University of Georgia (UGA) doctoral candidate, Eladio Abreu describes his experience as a CURE-sponsored Diversity Supplement recipient in Interview 1.)

GROWTH IN CURE MECHANISMS

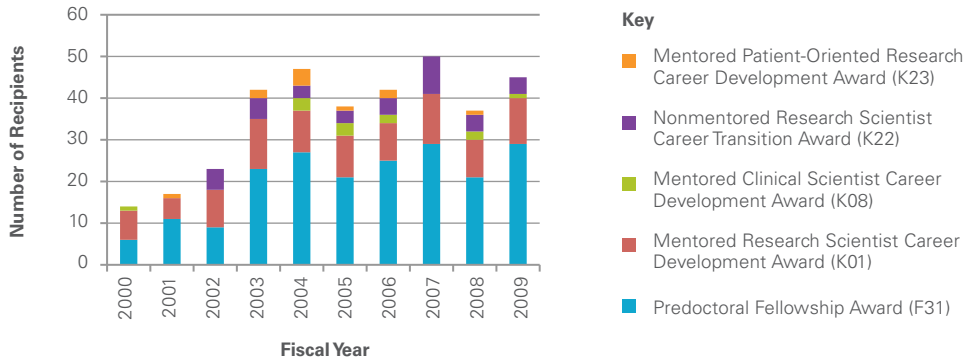


Figure 3

DIVERSITY SUPPLEMENT ELIGIBILITY DISTRIBUTION

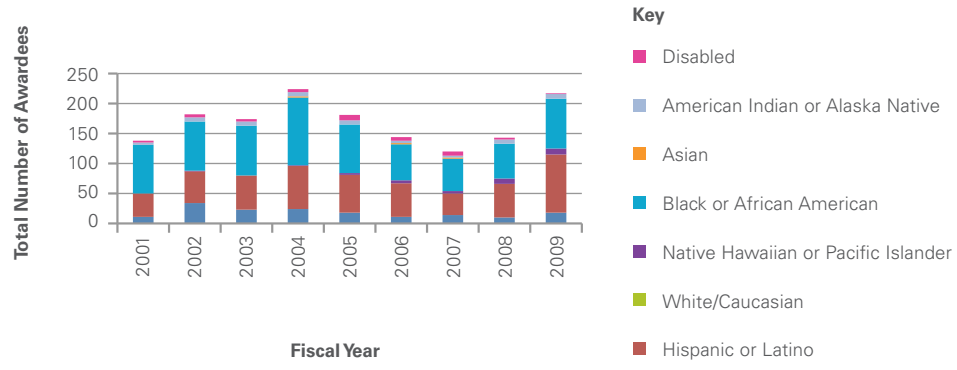


Figure 4

INTERVIEW 1:

Finding Science on the Football Field

Eladio Abreu, Ph.D. Candidate
University of Georgia
Diversity Supplement Awardee

At 16, Eladio Abreu and his parents had high expectations for his studies and his future.

"My parents always taught that you can do whatever you want…don't let anyone tell you that you aren't good enough, that you're not smart enough, that you're not determined enough," says Abreu, a Ph.D. candidate at the University of Georgia (UGA). "I've had an interest in medicine since I was very young."

His strong interest in science would not have been enough for him to overcome the preconceived notions formed about him when he moved from New York to Georgia in 10th grade, if not for the support and guidance of his parents.

"I'm black, in a southern school, and kind of a bigger guy, so I was pre-judged when I first came into my new high school. All of the teachers kept asking me, 'Are you going to play football for us? What position do you play?'" recalls Abreu. "I got that question over and over again, instead of, 'Do you like science? Do you like math? What stimulates you mentally?' It was always football and sports."

Trying to find his place at a new school and feeling the pressure to play football, Abreu joined the school's team. Standing 5'9" and weighing 230 lbs., the wide-shouldered sophomore played for only one year as a defensive tackle before his football and his future came into conflict.

"I was late for practice one day because I was taking my advanced placement biology exam," says Abreu. "When I explained this to the coach, he literally told me, 'What do you think is going to make you successful and help you get into college—getting a good grade on that bio exam, or out here throwing this football?'" That very day, with the support of his parents, Abreu quit the game. That decision proved fateful.

As an undergraduate student, Abreu was first on the pre-med track at Morehouse University. "I ended up being not that interested in a medical career; it was really the research that seemed to spark my interest," he recalls. "Everyone was 'pigeonholed' in this pre-med track. What I wanted to know was how the facts are uncovered, how the pathways are discovered."

His interest in research solidified through the National Science Foundation-funded Research Experience for Undergraduates at UGA. In this 10-week summer program, Abreu spent half his time in the genetics lab and half in the computational biology lab.

As a CURE trainee for two years (on a Diversity Supplement to a parent grant at UGA), Abreu had the opportunity to expand his knowledge in his area of interest: telomerase regulation through trafficking in the cells, particularly in cancer cells.

Abreu says that without CURE, things would have been a lot more difficult for him. "Having CURE support enabled me to move my data collection along quickly because I didn't have to teach, giving me a big advantage over my peers at UGA." He adds that "between teaching responsibilities and research and also travel, I am not sure I would have been able to get to where I am today without it. The progress reports also helped me be a little more critical. Having to reflect on my progress—reexamining and prioritizing experiments and projects—helped me make sure that I was always moving forward."

Now, with only one year left before receiving his doctorate in biochemistry and molecular biology, Abreu laughs about the coaches who once told him he didn't "look smart enough to be a scientist" and that the only way he would get into college was by being an athlete.

Abreu hopes to motivate others to enter the research field, where more students would find the chance to use their intellectual skills for success.

"Everyone needs to know, particularly in the black community, that if you want to go to school and you want to be successful, sports and entertainment aren't the only ways," Abreu says. "We have a wealth of opportunities—like CURE—that you can use to get you there."

Predoctoral Fellowship Awards

In order to target specific points in the career development pipeline, CURE added to the Diversity Supplements. CURE's program directors were particularly concerned about the predoctoral period, in which many underrepresented trainees seemed to be lost from the pipeline. In the late 1990s, less than 1 percent of NIH's predoctoral training grants were held by underrepresented individuals. Indeed, this transition point still appears to be particularly crucial in the career progress of underrepresented trainees: while 17.4 percent of all bachelor's degrees in science, technology, and engineering were earned by underrepresented minorities in 2008, the group received only 7.2 percent of that year's doctorates.[2]

To respond to this gap, CURE added the existing National Research Service Award (F31) to its mechanisms, using the funds to support researchers in the biomedical, behavioral, health services, or clinical sciences. CURE paired this award with a series of career development opportunities aimed at ensuring that specific technical skills and networks—crucial for candidates' advancement in the field—are built.

Of particular note, since 2000, the F31 fellowship mechanism has experienced a steady increase in new awards, as depicted in Figure 5. Originally an almost moribund mechanism, the F31 population has grown steadily, thanks to extensive marketing on the part of CURE program directors. The Fiscal Year 2010-2011 period was particularly successful; having consistently supported increasing levels of trainees over the past decade, CURE sponsored a total of 29 new awards in Fiscal Year 2010—the highest number for the mechanism. These CURE predoctoral trainees are involved in areas of research varying from Kaposi sarcoma to colorectal cancer—with many applications for disparity-experiencing populations. They are, moreover, being sustained in their research and allowed the protected time to pursue it fully. At this career juncture, CURE is trying to help trainees establish a solid foundation for future career success. (See Interview 2 for a profile of F31 recipient Elva Arredondo of the San Diego State School of Public Health.)

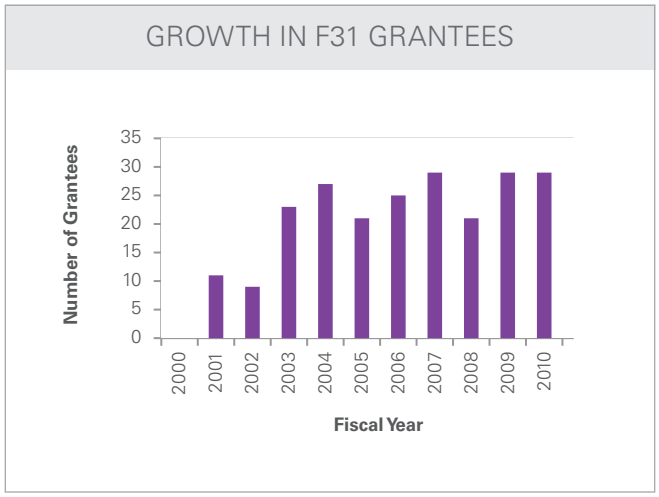


Figure 5

INTERVIEW 2:
Changing Your Culture, Changing a Lifestyle– Finding Your Research Potential

Dr. Elva Arredondo, Assistant Professor
San Diego State School of Public Health
F31 Awardee

When Elva Arredondo moved to the United States from Mexico at age 13, she never knew it would be the start of her career.

"Our entire lifestyle changed…we wanted to learn more English so we watched more television," she recalls. In addition, her mother—a single parent to three children—had to work longer hours and wasn't as available to take the family out after school. "We were living a more sedentary lifestyle."

Adopting a more sedentary lifestyle was not the only change Arredondo experienced in moving to America.

"When we first got here, we loved going to fast-food restaurants because it meant that we were making it in this country…[going to] those types of places symbolized to us that we were part of the culture," she says.

Arredondo never anticipated that the lifestyle changes she experienced as a preteen would lead her into a career as a researcher. After all, she started school wanting to be an oceanographer.

But those early experiences made her reflect on her own cultural background and led her to examine how culture plays a role in shaping people's health practices.

"I understand what the challenges are for people who immigrate to this country," she says. "I can relate to a lot of them."

Indeed, Dr. Arredondo's experiences as an immigrant to the United States have provided her with the type of cultural insight CURE hopes its trainees will bring to cancer research. As an Assistant Professor at San Diego State University, her current research program examines social determinants of Latinas' health practices and develops community-based physical activity interventions.

"Often, I would see people in the dominant group making these huge assumptions, or not understanding why people from minority groups would behave in a certain way, and I felt like I sort of had the perspective and understood why it was that Latinos don't smoke and what cultures are adopting smoking habits. Why is it that Latinas are not engaging in physical activities? I felt that I had that. I understood the culture and why people were and were not engaging in certain health practices...I understood how income and culture could play a role."

Arredondo credits her success to her family, who always told her, "It's up to you; if you want to make it and do what you want to do—you'll need to go to college."

She made it through her undergraduate and graduate degrees on scholarships, went on to become a CURE trainee through an F31 predoctoral grant, and now is the recipient of an NCI R21 Exploratory/ Development grant focused on the determinants of cervical cancer screening among Latinas.

"CURE was a huge stepping stone for me," she says. "It opened up a vast number of doors."

The funding provided by CURE also has allowed her to focus on her research. She has not had to take on teaching assistant positions that Arredondo says "can detract from the science and quality of work."

Moreover, "the experience of writing a proposal for the F31 grant helped me write competitive proposals as a postdoc and, later, as a faculty member. People are really impressed that I have had this experience," she says. "They would say, 'This is a feather in your cap,' and I didn't understand it until I began to engage in grant writing and I was like, wow, that experience really gave me the skills necessary to write strong grants early on"—skills, it seems, that are continuing to pay dividends, helping her secure her current R21 funding.

Career Development and Transition Awards for both Research and Clinical Science

With the growth of F31 awards, CURE soon identified another gap in the career development pipeline. Few of CURE's F31- or Supplement-supported trainees seemed to be independently winning either NIH Research Project Grants (R01s)—the gold standard for research success—or equivalent grants from other important funding organizations like the National Science Foundation, the Department of Defense, Susan G. Komen for the Cure, the Robert Wood Johnson Foundation, or the American Cancer Society. Indeed, studies showed that obtaining independent research funding was particularly hard for underrepresented minorities more broadly—National Science Foundation data indicate that such groups are almost 20 percent less likely than their white or Asian peers to receive federal grant funding.[2]

Preparing CURE recipients to apply successfully for such funding seemed a crucial patch for the pipeline. To this end, CURE's directors developed a three- to five-year Mentored Research Scientist Career Development Award (K01) that requires recipients to submit NIH R01 grant applications as part of the training process. To ensure that such applications are of the highest quality, CURE includes an innovative grant review experience as part of the training period—trainees participate in the same type of peer-review examination that NIH uses in evaluating grant applications. This experience is designed to teach trainees both how the peer-review process works and, by critiquing the science of other investigators' work, how to identify and strengthen weaknesses in their own applications. CURE also hopes that having this experience in grant review will encourage trainees to one day serve on NIH and/or other review committees—another area where the perspectives of individuals from underrepresented populations are still lacking.

The K01 Career Development Award includes a particular emphasis on mentorship. NCI believes that one of the best ways to teach success is to model it. This belief appears to be supported by experience; grantees routinely cite the mentorship component of the training program as one of its most positive and valuable features.[3,4] Mentoring for CURE K01 grantees often focuses on four key areas: improving the trainee's research skills, providing motivation and personal growth, providing career guidance, and promoting the trainee for scholarships and other career development opportunities. (Dr. Maria Elena Martinez describes her K01 CURE research experience in Interview 3.)

This original K01 Mentored Research Scientist Career Development Award has since been complemented by a pair of

additional Mentored Career Development Awards (K08 and K23) focused on training physician scientists. This expansion came as CRCHD increasingly realized that its training and career development opportunities were reaching Ph.D.'s and Ph.D. candidates pursuing basic cancer research, but very few grants were being awarded to individuals working in prevention, the clinical sciences, or interdisciplinary fields. As part of this realization, CURE's directors also decided to offer Diversity Supplements to existing NCI grants in clinical oncology training, cancer prevention and control, and population sciences—areas outside the basic science spectrum. Supporting clinical researchers was key to broadening the impact of CURE's philosophy as well as cancer research efforts. Similarly, supporting underrepresented physicians and clinical researchers allows for greater translational impact and effectiveness across the cancer continuum, since cancer disparities are found and addressed not only in basic science laboratories. (In Interview 4, Dr. Levi Garraway discusses how his K08 grant helped launch him into a full-blown research science career.)

These Mentored Career Development Awards were envisioned as stepping stones to the attainment of Nonmentored Career Transition Awards (K22), commonly seen as precursors to independent R01 grants. To further support this transition, CURE added the K22 Career Transition Award to its portfolio of funding mechanisms in 2001. The K22, like the K01, requires an R01 or R01-type application during the training period. Further, while the CURE-sponsored K22 originally focused on supporting basic research, its scope has since been expanded to include translational, clinical, and population research as CURE's scope has increased as well.

Taken together, these Career Development Awards—the mentored K01 for basic science research, the mentored K08 and K23 awards for clinical research, and the K22 Nonmentored Career Transition Award—form the basis of a strong and continuous research training and career development pipeline that is building a supply of trained investigators ready and able to progress through the scientific ranks. Indeed, the number of awardees has grown substantially since the K-series was implemented in Fiscal Year 2000—awardees are now working in and expanding the diversity of research science. (See Figure 6 for the annual growth of K-series awards.) Most importantly, however, awardees are progressing with great success. The recipients of CURE's K-series Career Development and Transition Awards are more successful than any other CURE trainees in their applications for R01 independent research grants: the cumulative success rate from 2005-2010 averaged 25

percent, with the clinician scientists on K08s (though small in number) performing most strongly, being awarded R01 funding, on average, 38 percent of the time, as depicted in Table 1. (In Interview 5, Dr. Annette Khaled reflects on the role CURE's K22 Career Transition Award played in her successful R01 independent research grant applications.)

GROWTH IN K-SERIES CAREER DEVELOPMENT AWARDS

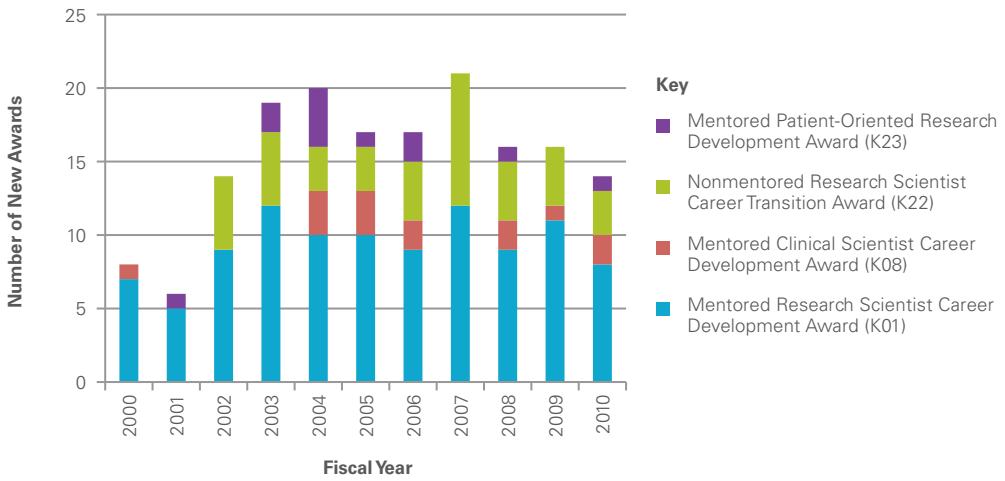


Figure 6

CAREER DEVELOPMENT AWARDEES' COMPETITIVENESS IN OBTAINING R01 INDEPENDENT RESEARCH PROJECT GRANTS (2005-2010)

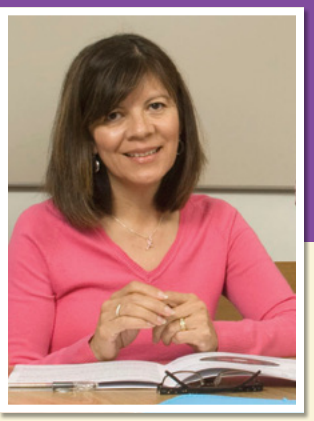
Award	Submitted Applications	Funded Awards
K01	220	59 (27%)
K08	13	5 (38%)
K22	15	5 (33%)
K23	94	15 (16%)
TOTAL	342	84 (25%)

Table 1

INTERVIEW 3:

The Mentee Becomes the Mentor

Dr. Maria Elena Martinez, Professor
University of Arizona Mel and Enid Zuckerman College of Public Health and Arizona Cancer Center
K01 Awardee



For Dr. Elena Martinez, graduating with her bachelor's degree was all she had ever planned for—until she started work as a research assistant at the M. D. Anderson Cancer Center.

"I was told that they would like whoever was hired for the research position to use the project they would be working on as part of their thesis for a master's degree." Which, she says, she was not even considering.

"But I wanted the job. So I agreed and enrolled in a master's program." That, Dr. Martinez says, is what "began it all."

Dr. Martinez credits her mentor at the time, Dr. Jan van Eys, for introducing her to the field of research. His passion for research and scientific inquiry were a motivating factor behind her pursuit of a master's degree and, subsequently, her doctoral degree.

"He was really encouraging," Dr. Martinez says, "but CURE was essential" to landing a faculty position under the direction of Dr. David Alberts at the Arizona Cancer Center. Dr. Alberts, who is now the Center's Director and Dr. Martinez's current mentor, brought her on to work in a large Program Project Grant and was able to offer Dr. Martinez a faculty position through funding provided by a CURE Diversity Supplement to the grant.

Once on the Diversity Supplement, which provided 100 percent of her salary, Dr. Alberts told her she would have to write a grant application to maintain her funding.

"I was awarded a K01 grant, and that gave me five years of stable funding to concentrate on my research and what I was going to do in my academic career." Dr. Martinez says that without the K01 it would have taken her much longer to get to where she is today—a Professor of Epidemiology at the University of Arizona's Arizona Cancer Center.

Now, as a professor, Dr. Martinez mentors both undergraduate and master's-level students. "If you are lucky enough to have received great mentoring as I have," Dr. Martinez says, "you know what it takes to be a good mentor, and hopefully you can, as they say, pay it forward."

Almost eight years after Dr. Martinez received her Diversity Supplement, Rachel Zenuk, a student at the University of Arizona Mel and Enid Zuckerman College of Public Health, was experiencing the same "what's next" confusion experienced by Dr. Martinez. That confusion ended when she met Dr. Martinez at a summer research program.

"She was a huge factor in my decision to attend graduate school," Zenuk says. "I have a lab background, but I am not completely a lab person. Dr. Martinez is a public health person. She has one foot in the lab and one foot in policy, the community, and actually getting patient interaction and community interaction." And Zenuk admits, "I didn't really know where my place was in higher education," but that "seeing a woman like Dr. Martinez excelling...and having her as a mentor really helped mold me, both as a student and a researcher."

Zenuk says that before becoming a CURE trainee and having Dr. Martinez as her mentor, she was confined to one lab and one project. Now, through a Diversity Supplement, Zenuk has been able to assist Dr. Martinez on many projects.

"The CURE program just opened up my eyes and gave me a broader perspective on research and its different avenues."

For Dr. Martinez, having the opportunity to help students like Zenuk is of the utmost importance.

"I have seen the unfortunate outcome of mentees who do not have a good mentor and it's totally different…they end up struggling a great deal, lost, and not knowing where to go," says Dr. Martinez.

Like Dr. Martinez, Zenuk would like the opportunity to "pay it forward" through the CURE program. "Dr. Martinez is in such an extraordinary position of power. It's wonderful to be able to look up to her and model myself after her, and then turn around and give back to other students."

INTERVIEW 4:
Getting Off the Launching Pad—A Son's Perspective

Dr. Levi Garraway, Assistant Professor of Medicine
Harvard University Medical School
K08 Awardee

Research has always been a part of Dr. Levi Garraway's life. His father, a plant biologist and faculty member at The Ohio State University, was always very passionate about the kind of research he did.

"I think that my early sense that research could be fun came from him," says Dr. Garraway, a Career Development Award (K08) CURE trainee. "He always viewed my going to medical school as a detour from what (to him) was really important, which was the science."

Although Dr. Garraway, an Assistant Professor of Medicine at Harvard University Medical School, has had an interest in research since high school, it was not until a stint in an organic chemistry lab the summer after his first year of college that he realized research would be a big part of his life.

"I thought I wanted to go into medicine and be a clinician," says Dr. Garraway, who was in the midst of his dissertation research on infectious diseases when he switched his path to cancer research. "I was in the middle of my Ph.D. training when I found out… my father had prostate cancer," says Dr. Garraway. "I ended up spending a lot of my spare time browsing the medical literature, and I actually was surprised at how little knowledge there was at that time in terms of basic biology and how that could be translated into the clinic."

This experience, he says, stayed with him and caused his long-term research interest to take shape. "Cancer presents both a new set of challenges and a new opportunity because of the ability of genomic technologies to elucidate so many aspects of cancer that really weren't visible before."

Dr. Garraway's (and his colleagues') research works to create "personalized cancer medicine," by recognizing critical genetic mutations that may characterize distinct subtypes of cancer. He says the question then becomes how to design and develop drugs that will block the corresponding altered proteins or cellular pathways.

These investigators currently are working to apply a variety of genomic and systemic approaches to explain the biology of cancers that are linked to particular genetic alterations that occur commonly. Their hope is to biopsy and profile the tumors of cancer patients and "identify the particular genetic alterations that are most important for each tumor," Dr. Garraway explains. Physicians would then assign a treatment regimen that is tailored to that information.

"If we take one molecular subtype at a time and come up with a better way to target that tumor subtype, then that's a victory for all of cancer," says Dr. Garraway.

Although Dr. Garraway credits his father for providing him with both the interest in research and a cause, Dr. Garraway says it was the CURE program that provided him with the essential support he needed to enter the field.

"The K08 was critical," he says. "If I had not gotten the K, I think there would have been a question as to whether I could have landed the initial faculty position—certainly, here at Harvard... If you have a K, you have a shot. If you don't have a K, you might still have a shot…but it's much tougher going," because "being able to show that you can win peer-reviewed funding is critical in terms of making you attractive for starting faculty positions."

He adds that the protected time provided by CURE (and the K award) lessened concerns that weigh on so many young scientists. In particular, he says he did not have to worry about "where my salary is going to come from," but instead could focus on "what I want to do and how I want to build my lab… with the protected time, I was able to start generating data for publications and applying for other grants."

Research is not for everyone, Dr. Garraway makes a point of saying. For him, "having been hit personally by cancer, it all feeds into the feeling that this is a worthwhile pursuit to which to dedicate a life's work."

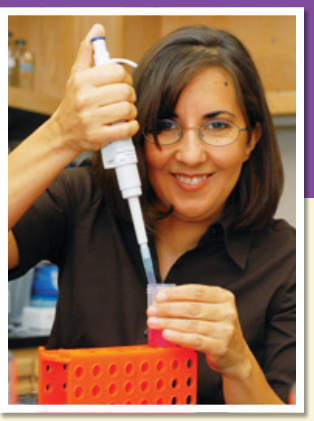
He also says the K grant provided by CURE was "a critical boost in getting me off the launching pad in terms of starting my research program."

Dr. Garraway's father passed away in 1999, four years into his battle with cancer. "Unfortunately, he died before he could see all of this come to fruition in my life," he says, "but he was always passionate about the investigational path and would have been thrilled to see it play out this way.…I think what I am doing right now is definitely what I am meant to do."

INTERVIEW 5:

Lost in the Classroom: A Need for Strong Mentorships

Dr. Annette Khaled, Associate Professor
University of Central Florida
K22 Awardee



When Dr. Annette Khaled graduated from the University of California, Irvine, she was like many recent graduates—she didn't know where to go next in life. UC Irvine was a large state school, and as Khaled recalls, this meant that "every class had hundreds of students, so you had very little interaction with professors…in terms of how they got to where they were in their careers." Indeed, the years after college were disorienting; Khaled knew she enjoyed and wanted to pursue research but was uncertain about the next steps. According to Khaled, "My problem was how to get there, how to follow that path."

So she began work as a technician, entering different research laboratories relatively haphazardly, all the while piecing together a picture of what she wanted to do with her future. Things only really started moving, however, when she entered a master's program at California State University at Long Beach and was paired with a mentor—someone who could guide and train her, and offer advice and motivation. In fact, it was only because of her mentor's offhand suggestion—"Why don't you get a Ph.D.? That is what you want to do with your career and it would really be good for you."—that Khaled entered a doctoral program in molecular genetics and microbiology at the University of Florida in 1992.

From there, Khaled found a position as a postdoctoral trainee at NCI, which was where she first heard of the CURE program. Still rather intimidated by the difficulty of getting a faculty position, Khaled applied for CURE's K22 career transition support. The CURE program seemed to be "an opportunity to progress my research and strengthen my competitiveness to help me reach my ultimate goal—getting a faculty position and starting my own lab."

As a CURE K-series trainee, Khaled participated in CURE's mock review program. According to Khaled, the review "was very helpful because I was able to see how a review really works…how the proposals are actually evaluated before they get a score."

Before the review, for instance, Khaled hadn't appreciated that the whole review group of 10 or 15 individuals ranked grants, not just the one or two primary reviewers. More importantly, she hadn't realized that the group score was just as important as the ranking of the primary reviewers.

As an already semi-independent researcher—like most K22 recipients—Khaled said this realization "really helped me to think how to best write my grant proposals so I could get through that process better and have a competitive application… the grant proposal, it actually has to be written for two audiences: the primary reviewers—who need the details; and then the rest of the reviewers and study section members who are going to evaluate the proposal in a matter of minutes."

This experience was probably key, Khaled believes, to her rapid receipt of two R01 grants while she was still a K22 CURE grantee. In addition to the K22's mock review opportunity, the award's financial support also was crucial to her success—it helped her quickly start a lab, hire research staff, and advance to assistant professor. Without CURE, Khaled believes "I would not have been able to achieve that in that period of time."

Today, Khaled is an Assistant Professor at the University of Central Florida, where she studies how the immune system's lymphocytes normally proliferate and die—a process she attempts to extrapolate and apply to what happens in abnormal cell growth, as in tumors. Khaled still wonders, however, how things would have gone if she had had better mentorship early on. "I would have done things much more quickly than I did," she admits. "I probably lost five or six years." However, CURE was able to help Khaled come from behind—the CURE funding enabled her to become competitive and accelerated her career progress after years spent finding her way.

As Khaled notes, "Having the K22 award really sped up the time that I could develop and start the lab going and move to get additional funding." Khaled applied for CURE because it seemed a good way to fulfill her dreams of having an independent laboratory—and CURE helped her realize her dream in truly record time.

Expanding the Diversity Training Landscape with PRCHD

CURE expanded once again in 2001, when it made its CURE funding opportunities available to trainees in another of the Center to Reduce Cancer Health Disparities' programs: the Partnerships to Reduce Cancer Health Disparities (PRCHD, formerly known as the Minority Institution/Cancer Center Partnership program). PRCHD's scientists work as part of collaborative partnerships between institutions serving underserved communities and NCI-designated Cancer Centers. The PRCHD attempts to increase the involvement of diverse scientists in biomedical cancer and cancer health disparities research while broadening the reach and community-level applicability of high-tech research generated at NCI-designated Cancer Centers.

Through the linking of CURE with PRCHD, CURE trainees now have access to the types of investigational research opportunities available only at research institutions—for instance, planning pilot and exploratory research, often investigating novel areas and using innovative technologies. Moreover, as CURE has sponsored more clinical scientific applications, the number of translational research projects PRCHD trainees and scientists are undertaking has grown, again expanding the research landscape for CURE trainees. In this stimulating environment, PRCHD CURE trainees gain not only valuable research experience but also the ability to build professional networks—if not full-fledged research careers—within prominent cancer research institutions. Thanks to this array of opportunities, the PRCHD program has attracted increasing numbers of trainees. As Figure 7 indicates, the numbers of PRCHD trainees at all educational levels participating in CURE have grown substantially since the program's inception, particularly at the undergraduate and graduate career

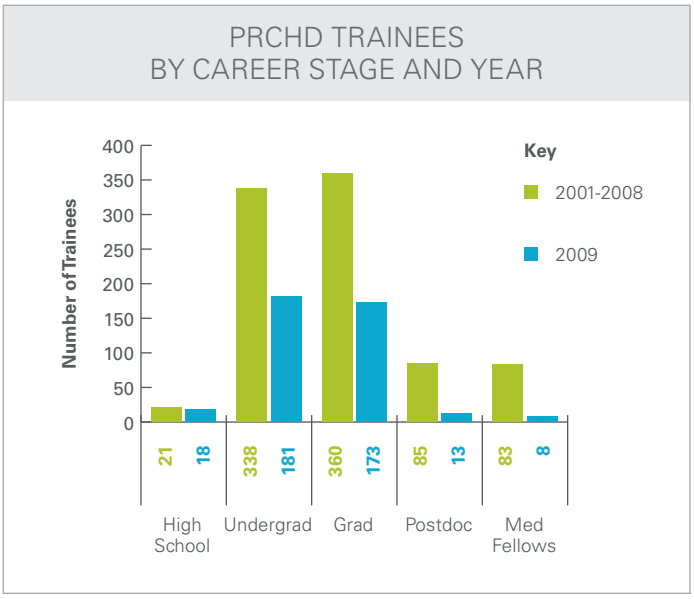


Figure 7

stages. Just as with the broad Diversity Supplements, the PRCHD program allows investigators to enter disparity-related cancer research at any point in their career trajectory. (See the example below of the role that partnerships can play in promoting biomedical career training.)

PROMOTING BIOMEDICAL RESEARCH TRAINING THROUGH PARTNERSHIPS

The Partnership to Reduce Cancer Health Disparities between the University of Massachusetts at Boston (UMB) and the Dana-Farber/Harvard Cancer Center (UMB-DF/HCC) was established in 2003. UMB-DF/HCC uses its CURE funding to train and support underrepresented students, postdoctoral fellows, and nursing Ph.D. candidates. However, unlike many CURE-sponsored attempts to reach out to young trainees, the UMB-DF/HCC partnership has been highly successful, in large part due to the long-term support and follow-up the program provides. The partnership encourages undergraduate students from the University of Massachusetts at Boston (UMB) to apply for an innovative two-year program that includes a mentored internship for two summers—in basic research, clinical research, or population science—as well as ongoing work opportunities and career support during the academic year.

In addition, the partnership has been particularly successful at targeting underrepresented populations: 85 percent of UMB students participating in CURE identify as either black or Hispanic, 41 percent are immigrants to the United States, 50 percent are the first in their families to attend college, and 78 percent are female.

Most encouraging, however, is the positive impact these research experiences are supplying. CURE participants uniformly find the research exposure helpful in both defining and strengthening their biomedical career goals. As in many of CURE's other programs, participants also highly value the support provided by their mentors. Moreover, as a result of the CURE-sponsored partnership, UMB-DF/HCC has recorded that an increased number of its students indicate interest in and, indeed, eventually go on to pursue careers in biomedical cancer research. The exposure, support, and long-term connections the PRCHD program provides can be integral to encouraging research participation by underrepresented trainees.

Exploratory/Development Grants

Most recently, in Fiscal Year 2010, the Center to Reduce Cancer Health Disparities expanded CURE's research training opportunities once again. This expansion came as a response to the observation that many CURE grantees—particularly those working within the highly innovative, exploratory environment of the PRCHD program—seemed to need additional time to gather all of the data necessary to submit a competitive R01 proposal. To this end, CURE repurposed NCI's R21 Exploratory Grant, using it as a mechanism to allow extra time for scientists from diverse backgrounds to complete their pilot studies in basic cancer research, thereby gathering sufficient data for an R01 application.

In the first two rounds of R21 awards, CURE funded 10 of 93 applications; 28 of these applicants (30%) were previous or current CURE trainees—trainees who ultimately made up 50 percent of the final grant awardees. This strong representation of CURE recipients indicates that the R21 is functioning as envisioned—acting as another link in the pipeline and boosting underrepresented trainees for a final push towards the independent NIH Research Project Grant.

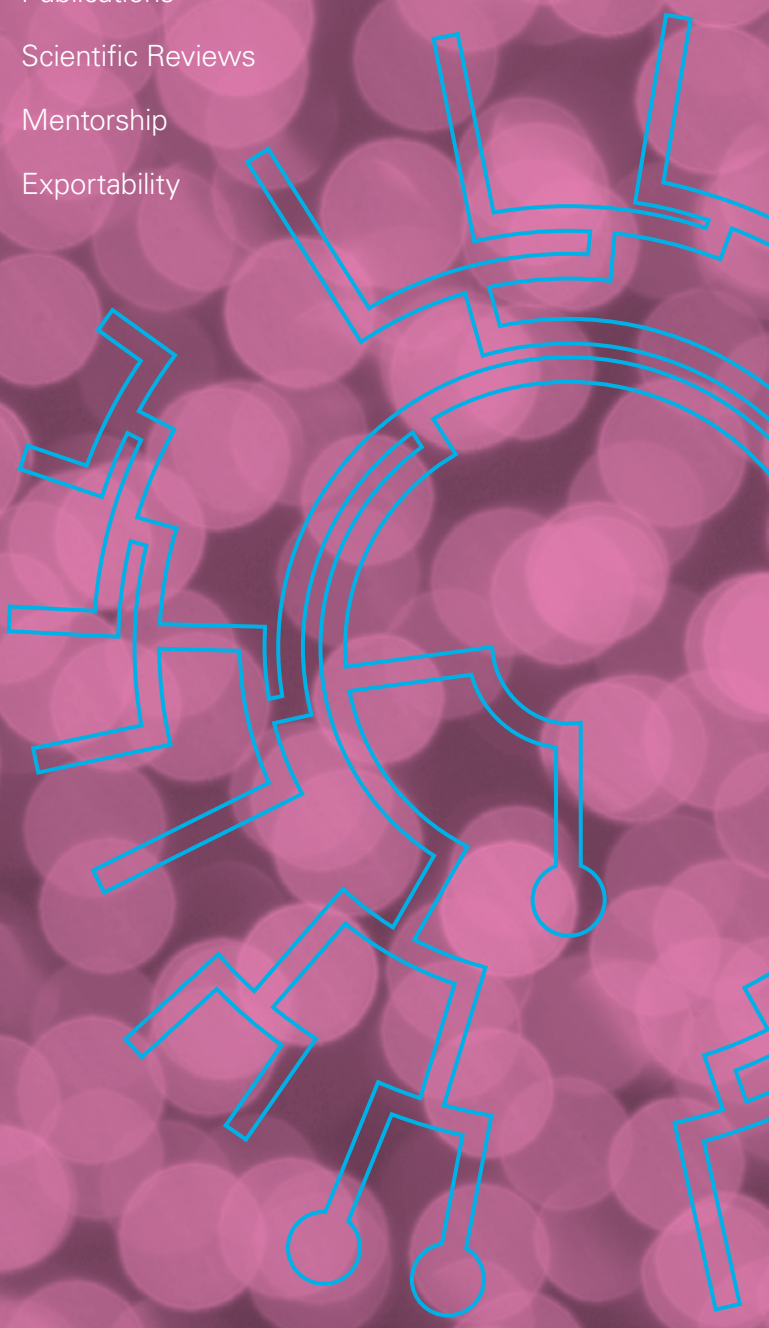
Competitiveness

Publications

Scientific Reviews

Mentorship

Exportability



How is CURE growing today?

CURE has made significant strides in attracting and supporting young scientists from populations that are underrepresented in cancer research. Through creative expansion of and addition to NCI's available grant opportunities, CURE is now supporting trainees in almost every state in the United States and at almost every point in the training continuum. Since the program's inception, CURE has awarded almost 5,000 grants, reaching almost 2,600 students and early-stage researchers. This growth can be seen in the success of CURE grantees—their competitiveness in obtaining independent research funding, their contributions to the scientific literature, their participation on peer-review boards, and their continued commitment to the program, as seen in their mentorship of current trainees and their efforts to spread the CURE principles elsewhere.

Elaine Alarid, Ph.D.

R01

Associate Professor of Oncology

University of California, Berkeley

Manuel Penichet, M.D., Ph.D.

R01

Associate Professor of Surgery, Microbiology, Immunology, and Molecular Genetics

University of California, Los Angeles

Figure 8: Past CURE Grantees—Where They Are Today

Competitiveness

The Center to Reduce Cancer Health Disparities maintains preliminary statistics related to past CURE grantees' current funding—data that indicate that CURE trainees are highly successful in receiving major grant funding. (See Figure 8 describing the accomplishments of several former CURE grantees since leaving the program.) Measuring the competitiveness of CURE trainees is a difficult undertaking, however. Measures such as the attainment of an independent R01 grant are useful but risk overemphasizing the merit and highlighting the exclusivity of NIH funding. Such measures also frame academic cancer science as the only route by which CURE graduates can meaningfully contribute to reducing cancer health disparities. Despite—and in an attempt to surmount—these drawbacks, CURE is building in better tracking capabilities so that it can more accurately follow its grantees through their post-CURE career stages and allow the program to measure more complex outcomes and successes. Tracking also will help CURE more accurately identify additional gaps in career development and assess effectiveness, which will allow the program to continue to grow responsively.

Alex Adjei, M.D., Ph.D.

R01

Senior Vice President of Clinical Research & Chairman of the Department of Medicine

Roswell Park Cancer Institute

Chanita Hughes-Halbert, Ph.D.

R01, R24

Associate Professor in the Department of Psychiatry

Abramson Cancer Center of the University of Pennsylvania

Publications

An important benchmark for determining the success of CURE grantees is measured by their publications in peer-reviewed journals. To date, trainees have contributed more than 1,700 peer-reviewed papers to the scientific literature—a number that has grown steadily over time. In 2006, for instance, there were only 25 papers published by CURE trainees, but by 2010, the number among pre- and postdoctoral trainees alone had increased to more than 175. This major leap in the reach and peer-acknowledged value of CURE grantees' research is depicted in Figure 9, which offers a yearly analysis of F31 and K-series publications. Further, the caliber of the journals currently accepting manuscripts from CURE-supported individuals has substantively increased in the last five years. The Appendix highlights recently published articles by CURE trainees—contributions that range from basic to applied science and address key cancer research questions related to America's cancer and cancer health disparities burden.

PUBLICATIONS IN PEER-REVIEWED JOURNALS BY CURE-SUPPORTED PRE-/POSTDOCTORAL TRAINEES AND CAREER DEVELOPMENT AWARDEES 2006-2010

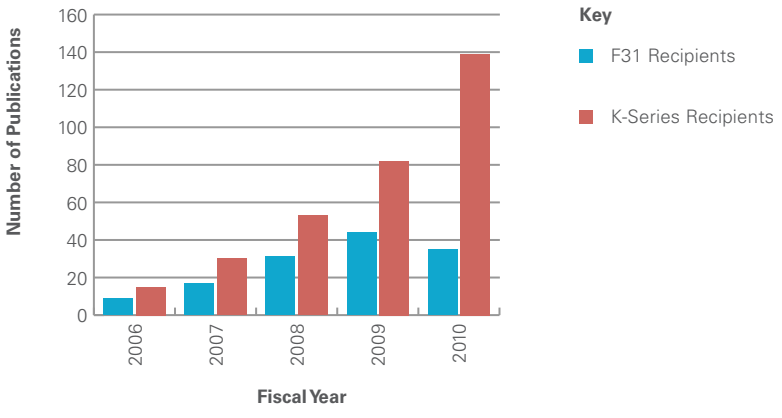


Figure 9

Scientific Reviews

CURE grantees' voluntary service on review committees is another powerful indicator of their contributions to the scientific community. Scientific review groups evaluate grant applications from other researchers, examining them on their technical merits and ability to advance the state of scientific knowledge. Serving on review boards and advisory committees helps shape the future direction of cancer research—a direction that CURE believes its grantees will be able to influence to include issues tied to cancer disparities among underserved populations.

CURE places a high value on this service and has translated that value into the peer-review training experience that is built into the Career Development Award programs. CURE grantees appear to have taken this value to heart. Table 2 lists a selection of the review and advisory committees on which former CURE grantees serve. Through this service, investigations related to cancer health disparities may be brought more strongly into cancer research priorities.

REVIEW AND ADVISORY BOARDS WITH CURE GRANTEE MEMBERS

NCI Ad Hoc Review Subcommittees
Manpower and Training (Initial Review G)
NCI/NIH IRG and CSR Review Subcommittees*
Subcommittees: F (training), G (education), I (career), J (population and patient-oriented) NCI Molecular Oncology Small Business Innovation Research Cancer Imaging Specialized Programs of Research Excellence Experimental Therapeutics
NCI Advisory/Review Committees
NCI Board of Scientific Counselors NCI Board of Scientific Advisors National Cancer Advisory Board
Co-Committees Outside NIH
Department of Defense Breast Cancer Research Program American Society of Clinical Oncology Science Committee Myeloma Research Foundation American Association for Cancer Research—Minorities in Cancer Research

Table 2
*IRG: Internal Review Group
CSR: Center for Scientific Review

Mentorship

Another measure of CURE's success can be found in its former trainees' promotion and support of the CURE program. Indeed, many early CURE grantees are serving today as mentors to the current cohort of CURE trainees. This pool of potential CURE mentors—mentors who were themselves trained through the CURE process—will only grow as more grantees join the ranks of competitive, independent researchers. They will perpetuate the cycle in which each cohort helps encourage the following cohort, thereby building a critical mass of researchers from underrepresented populations. To facilitate this cycle, CURE has begun exploring the possibility of programs to incentivize training and funding support for mentors, who traditionally receive little assistance or compensation for their efforts. Such programming may include interactive online training as well as supplemental resources for laboratories supporting trainees—easing the difficulty of this serious, but also rewarding, responsibility. By expanding the ranks of mentors and supporting them in their efforts, CURE is ensuring further expansion throughout its second decade.

DIVISION OF MEDICAL ARTS

Programs such as CURE are essential to provide not only funding but fundamental 'how-to' information and opportunities for connections to successful individuals that would not be available to potential scientists who for reasons of race, background, or education do not have access to this.

Dr. Annette Khaled

Associate Professor, University of Central Florida

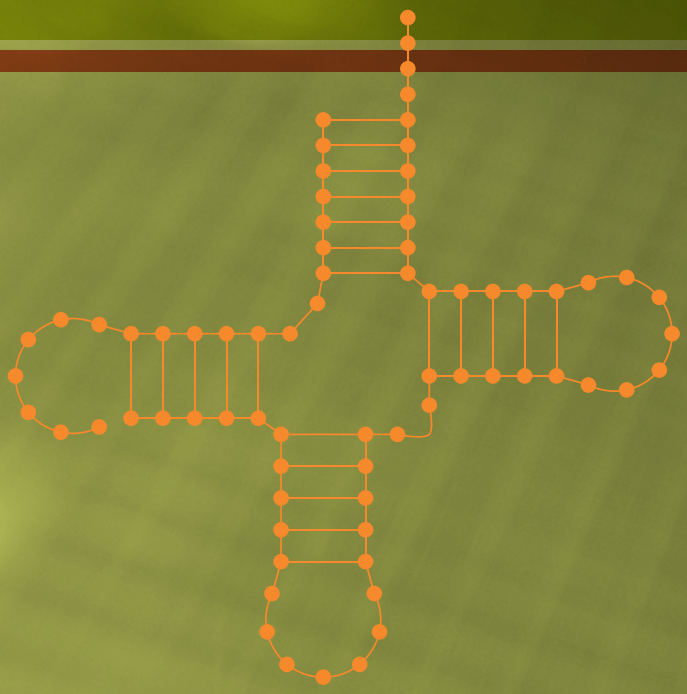
Exportability

A final measure of CURE's impact is the degree to which it is being replicated elsewhere. One such example can be found at Northwestern University's Feinberg School of Medicine in Evanston, Illinois, where former CURE trainee, June M. McKoy, M.D., has employed the six tenets of the CURE philosophy to build the Students Engaged in Elder Research (SEER) project. SEER currently supports five students from underrepresented backgrounds in summer research projects, where the trainees investigate issues related to cancer among the elderly. SEER reflects McKoy's belief in the CURE philosophy and exemplifies how CURE's reach and impact are steadily growing across the country.

NATIONAL CANCER INSTITUTE

Diversity in the lab doesn't happen overnight, but having program directors behind you, supporting and encouraging you, allowing you to just focus on your research, is a stepping stone toward the future.

Dr. Sanya Springfield
CRCHD Director, 2005-Present



Young Trainees

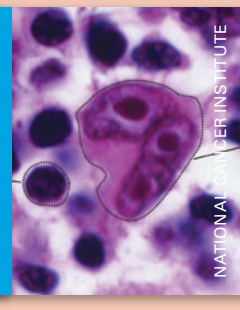
New Research Areas

Integration and Collaboration

How will CURE grow in the future?







While CURE has experienced extraordinary growth and contributed to the increasing diversity of NCI's trainee population, its mission is still incomplete. Disparities in cancer incidence and outcomes persist, as do the gaps in the numbers and success of researchers from underrepresented population groups in the United States. Further, CURE's philosophy is that it must constantly review and assess; its principal tenets embody the belief that there are always new ways to expand and improve.

Three areas in particular have been highlighted for growth by CURE's program directors in the Center to Reduce Cancer Health Disparities: improving CURE's outreach to high school and undergraduate trainees (Young Trainees), accelerating training opportunities in important new areas of cancer research (New Research Areas), and better integrating and collaborating with other NIH and extramural programs (Integration and Collaboration.)

Young Trainees

Reaching the youngest trainees in the pipeline has been a challenge not only for CURE, but for many other research and training programs. While CURE has been reaching out to young trainees through Diversity Supplements and the PRCHD program, this area of the CURE portfolio receives much less coverage compared with the later stages of the research career trajectory (see Figure 1) and has attracted only sparse and intermittent participation by the youngest trainees over the past decade. This situation may be due in part to the fact that many established mentors, without extra support, can find the mentoring and skill-teaching required by these young trainees overwhelming—a state of affairs that CURE's increased attention to mentorship hopes to address. However, CURE's current mixed success with this age group remains a concern. The literature suggests that career interests are formed primarily at the high school and undergraduate levels and that research careers are particularly encouraged by early research experiences.[5,6]

Though currently a problem, CURE has interpreted this gap as an opportunity—an opportunity to revise programmatic aims and engage younger students more effectively. To this end, CRCHD has developed the Emerging Technologies Continuing Umbrella of Research Experiences (ET CURE), which is explicitly aimed at the young trainee cohort.

ET CURE pairs underrepresented high school and undergraduate students with scientists from local cancer research centers and universities—scientists who have a particular research focus on using emerging and advanced technologies to mitigate cancer disparities. These technologies range from clinical proteomics to nanotechnology, genomics, and biophotonics—all cutting-edge areas of cancer research to which very few young trainees have access, particularly if they come from underrepresented backgrounds. See Table 3 for a list of participating institutions and the institutions' chosen electives.

Each ET CURE site has a degree of independence over its own programming, which has led to a great deal of local innovation. For instance, the University of California, Davis has developed a partnership between its medical center, its Center for Biophotonics Science and Technology, and a local Sacramento charter high school with a racially/ethnically diverse student body. The charter school students participate in a year-long Research Academy—engaging in coursework, field studies, and laboratory research in cancer science related to biophotonics. The

ET CURE PARTICIPATING INSTITUTIONS AND THEIR CHOSEN ELECTIVES

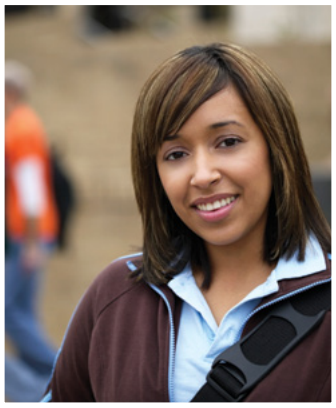
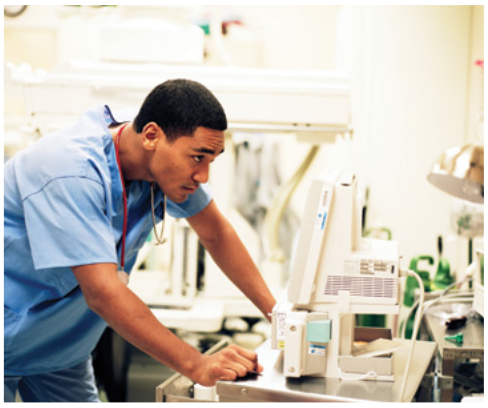
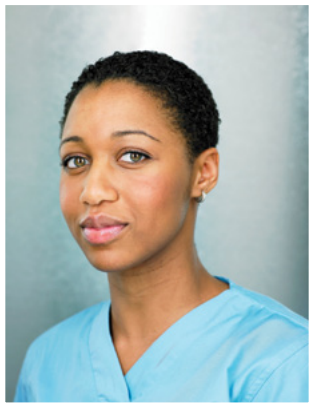
Institution	ET Elective
H. Lee Moffitt Cancer Center	Proteomics
Fred Hutchinson Cancer Research Center	Proteomics
City College of New York with Memorial Sloan-Kettering Cancer Center	Nanotechnology
University of California, San Diego	Nanotechnology
Dana-Farber Cancer Institute	Genomics
University of California, Davis	Biophotonics

Table 3

intent is to expand the horizons of these underrepresented students, encourage them to think of biomedical careers as a possibility, and give them the skills necessary to be competitive applicants to undergraduate biomedical programs.

UC Davis's high school program also is linked with its undergraduate ET CURE program, with the undergraduates serving as judges of the Research Academy's end-of-the-year poster presentation session. However, while the high school Academy focuses on teaching skills and providing science background, UC Davis's undergraduate ET CURE program aims to prepare promising college students for graduate work in cutting-edge nanotechnology cancer research—with, as per CURE's principles, the guidance and support of strong mentors.

ET CURE may exemplify the direction of the future for the CURE program. With ET CURE, CURE has created an increasingly specialized approach that specifically targets an educational level and engages that group by encouraging its involvement in ambitious, innovative, and high-profile areas of research. Moreover, the devolvement of a degree of programmatic control to the institutions themselves has the promise to create uniquely tailored programs adapted to the needs of the disparity communities surrounding those institutions. The hope is that programs like ET CURE may serve as a new model for other research promotion programs aimed at underrepresented populations and that it will help CURE continue to move promising young scientists into the research pipeline.

New Research Areas

ET CURE's focus on emerging technologies points the way toward another future CURE initiative: strengthening training and career development opportunities in novel and cutting-edge scientific arenas. In addition to ET CURE, CURE is expanding its Diversity Supplements, its PRCHD connections, and its clinical science tracks to incorporate similar opportunities to specialize in emerging technology topics.

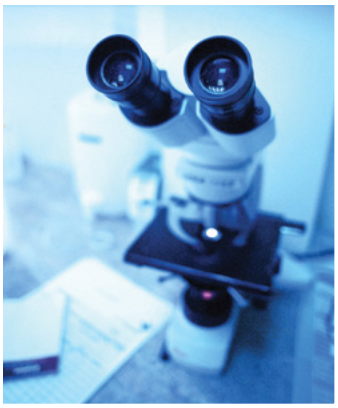
Supporting trainee involvement in these emerging fields is integral to growing a productive cancer workforce. Not only do they hold great promise for underpinning the next wave of advances in cancer science, they are currently being targeted for increasing grant funding. For example, in the U.S., almost $2 billion was devoted to nanotechnology research and development in 2010 alone.[7] Moreover, these are fields from which many underrepresented trainees have felt excluded over the past decades and consigned, instead, to less prestigious areas, where they could find employment and support. CURE targeted biological sciences for this very reason; while doctorate achievement levels by racial/ethnic and underserved groups have not been fully representative of these populations in the social and behavioral sciences, they are routinely double those of same groups in the biological sciences.[3]

Changing this situation will require attracting increased numbers of ethnically and racially diverse trainees from underrepresented populations into these emerging fields. As Dr. McKoy noted, science—and particularly the high-profile scientific specialties—will never seem approachable to underrepresented students unless the face of science looks familiar. Encouraging CURE's trainees to investigate these emerging research topics can only spark a reinforcing cycle: if those trainees go on to become the spokeswomen and spokesmen of such high-profile science, their presence will inspire many more students from similarly underrepresented backgrounds to pursue similar paths.

Integration and Collaboration

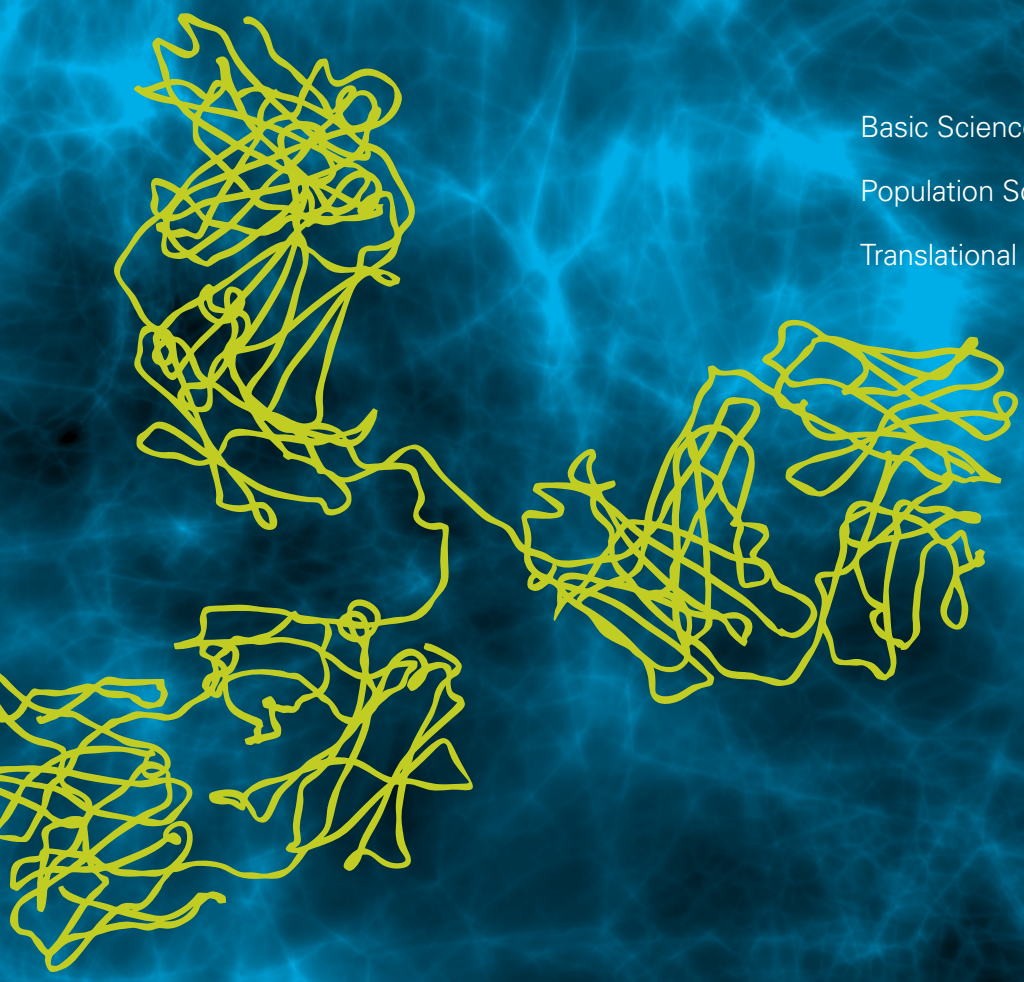
Linking across existing NCI-supported research programs will be essential to CURE's future growth. One of the indictments of NIH-sponsored racially/ethnically targeted training programs in the past has been their inconsistent coordination and lack of tracking across Institutes, Divisions, Offices, and Centers; improved linkages will help to counteract this tendency. Moreover, integrating CURE with these different institutional offerings will also help build a more secure, enmeshed pipeline for underrepresented trainees and export CURE's opportunities and philosophy to a broader audience. To this end, future CURE funding will be extended and made more accessible to several of NCI's new and existing programs. Outside of NIH, CURE will be strengthening its existing partnerships with the National Science Foundation, the American Association for Cancer Research, and the Indian Health Service—all key players in the fight to reduce cancer disparities, as well as sources of new, promising trainees who could benefit from CURE's support.

Through its continued growth, CURE hopes to model the same behaviors and values it is trying to inculcate in its trainees: the benefits of collaboration and the need for support in order to build a critical mass of researchers and assemble a similarly critical body of disparity-oriented research. Building the type of comprehensive, encompassing pipeline CURE envisions is not a solitary endeavor. It is only through team effort, support, and focused attention to the need for change that disparities can be ameliorated in both the cancer experience of America's underserved populations and the demographic makeup of U.S. cancer researchers. This is the future CURE envisions, and with the addition of each new CURE trainee, that future draws nearer.



The uniqueness of the CURE program is unparalleled by anything I was exposed to when I worked in academia. It is truly a program where the investigator, mentor, and program director work in collaboration, with the purpose of advancing cancer research and career development.

Dr. Nelson Aguila
CURE Program Director



Basic Science

Population Science

Translational Science

Appendix: CURE Trainee Contributions to the Science

Basic Science

Baker, E. (R01)

The biomechanical integrin.

Journal of Biomechanics. 2010 Jan 5;43(1):38.

This article reviews the current knowledge base of integrin mechanobiology to address gaps in cancer and other disease research, reporting that future efforts of integrin mechanobiology must focus on examining cells in 3D environments and integrating current understanding into computational models that predict the behavior of integrins in nonequilibrium interactions.

Carr, J. (F31)

FoxM1, a critical regulator of oxidative stress during oncogenesis.

The EMBO Journal. 2009 Oct 7;28(19):2908-18.

This study was undertaken to determine the mechanisms by which transcription factor FoxM1 participates in the function of tumor development and progression. Results identified FoxM1 as a key regulator of reactive oxygen species in dividing cells and revealed how tumor cells use FoxM1 to control oxidative stress to escape premature senescence and apoptosis.

Daniels, T. (K01)

Disruption of HOX activity leads to cell death that can be enhanced by the interference of iron uptake in malignant B cells.

Leukemia. 2010 Sept;24(9):1555-65.

Researchers evaluated the expression of all 39 HOX genes in a panel of six malignant B-cell lines, including multiple myeloma cells. The study found different levels of expression of HOX family members, suggesting that they also have a role in malignant B-cell survival and that disrupting HOX function using the peptide HXR9 induces significant cytotoxicity in the entire panel of cell lines—an effect that can be enhanced by combining HXR9 with ch128.1Av, an antibody-avidin fusion protein specific for the human transferrin receptor 1 (CD71). Results suggest that HOX proteins may be effective in the treatment of incurable B-cell malignancies such as multiple myeloma.

Gregory, M. (K01)

Wnt/Ca2+/NFAT signaling maintains survival of Ph+ leukemia cells upon inhibition of Bcr-Abl.

Cancer Cell. 2010 Jul 13;18(1):74-87.

This study was to identify genes whose inhibition sensitizes Bcr-Abl(+) leukemias to kill the Bcr-Abl inhibitors. Screening identified numerous components of a Wnt/Ca(2+)/NFAT signaling pathway. Targeting this pathway in combination with Bcr-Abl inhibition could improve treatment of Bcr-Abl(+) leukemias.

Guerrero, M. (F31)

BCAR3 regulates Src/p130 Cas association, Src kinase activity, and breast cancer adhesion signaling.

Journal of Biological Chemistry. 2010 Jan 22;285(4):2309-17.

This study examined the role of p130 (Cas) protein in activation of c-Src in breast cancer. The study showed, using gain- and loss-of-function approaches, that BCAR3 regulates c-Src activity in the endogenous setting of breast cancer cells and that BCAR3 regulates the interaction between Cas and c-Src, both qualitatively and quantitatively, and presented evidence that the coordinated activity of these proteins contributes to breast cancer cell adhesion signaling and spreading.

Gutierrez, A. (K08)

Inactivation of LEF1 in T-cell acute lymphoblastic leukemia.

Blood. 2010 Apr 8;115(14):2845-51.

The study examined the molecular pathogenesis of T-cell acute lymphoblastic leukemia (T-ALL) through high-resolution array comparative genomic hybridization. Findings suggest that LEF1 inactivation is an important step in the molecular pathogenesis of T-ALL in a subset of young children.

Marrero, B. (F31)

Generation of a tumor spheroid in a microgravity environment as a 3D model of melanoma.

In Vitro Cellular and Developmental Biology—Animal. 2009 Oct;45(9):523-34.

This article discusses efforts to improve 2D monolayer cell culture models to understand various cellular reactions that occur *in vivo*, as well as techniques used

to develop the first known large, free-floating 3D tissue model used to establish tumor spheroids.

Ramos, A. (F31)

Amplification of chromosomal segment 4q12 in non-small cell lung cancer.

Cancer Biology and Therapy. 2009 Nov;8(21):2042-50.
This study investigated whether PDGFRA and KIT inhibitors are potential oncogenes in non-small cell lung cancer. Further study is needed to define the specific characteristics of those tumors that could respond to PDGFRA/KIT inhibitors.

Saavedra, H. (K01)

Cdk2 and Cdk4 regulate the centrosome cycle and are critical mediators of centrosome amplification in p53-null cells.

Molecular Cell Biology. 2010 Feb;30(3):694-710.
Researchers examined the role of Cdk4 in a normal or deregulated centrosome cycle. The study concluded that the Cdk2/Cdk4/NPM pathway is a major guardian of centrosome dysfunction and genomic integrity.

Scarlett, U. (F31)

***In situ* stimulation of CD40 and Toll-like receptor 3 transform ovarian cancer-infiltrating dendritic cells from immunosuppressive to immunostimulatory cells.**

Cancer Research. 2009 Sep 15;69(18):7329-37.
The study examined whether targeting of tumor-induced immunosuppression on an individualized basis is required for boosting therapeutically relevant immunity against lethal epithelial tumors. Results showed the potential of transforming tumor-infiltrating dendritic cells from an immunosuppressive to an immunostimulatory cell type.

Scarlett, U. (F31)

Polyethylenimine-based siRNA nanocomplexes reprogram tumor-associated dendritic cells via TLRS to elicit therapeutic antitumor immunity.

Journal of Clinical Investigation. 2009 Aug;119 (8):2231-44.
Researchers examined whether linear polyethylenimine-based (PEI-based) nanoparticles encapsulating siRNA can reverse tumor-induced immune suppression in epithelial tumors. The study found that the intrinsic TLR5 and TLR7 stimulation of siRNA-PEI nanoparticles synergizes with the gene-specific silencing activity of siRNA to transform tumor-infiltrating regulatory dendritic cells (DCs) into DCs capable of promoting therapeutic antitumor immunity.

Scarlett, U. (F31)

CCL5-mediated endogenous antitumor immunity elicited by adoptively transferred lymphocytes and dendritic cell depletion.

Cancer Research. 2009 Aug 1;69(15):6331-8.
Researchers examined the effect of adoptive transfer of antitumor T cells on endogenous antitumor immune mechanisms. The study revealed a CCL5-dependent mechanism of awakening endogenous antitumor immunity triggered by *ex vivo* expanded T cells, which was augmented by tumor-specific targeting of the cancer microenvironment.

Torroella-Kouri, M. (K01)

Role of the proteasome in the downregulation of transcription factors NFkappaB and c/EBP in macrophages from tumor hosts.

Oncology Reports. 2010 Mar;23(3):875-81.
This study examined the possible role of proteolytic machinery in the decrease of nuclear factor KappaB (NFkappaB) and CCAAT enhancer-binding proteins (C/EBP) in macrophages from tumor hosts. The study found that proteasome degradation may contribute to NFkappaB and C/EBP impairment in macrophages from tumor-bearers.

Torroella-Kouri, M. (K01)

Identification of a subpopulation of macrophages in mammary tumor-bearing mice that are neither M1 nor M2 and are less differentiated.

Cancer Research. 2009 Jun 1;69(11):4800-9.
This article describes a study to examine the immune status of macrophages from peripheral compartments in tumor hosts. The study found, for the first time, that macrophage depletion is associated with increased macrophage progenitors in bone marrow.

Webb, T. (K01)

Ovarian cancer-associated ascites demonstrates altered immune environment: implications for antitumor immunity.

Anticancer Research. 2009 Aug;29(8):2875-84.
Researchers sought to identify immunosuppressive elements present in ovarian cancer-associated ascites. The study determined that ovarian cancer-associated ascites may provide an immunosuppressive environment.

Population Science

Burris, J. (F31)

Use of formal and informal mental health resources by cancer survivors: differences between rural and nonrural survivors and a preliminary test of the theory of planned behavior.

Psycho-oncology. 2010 Nov;19(11):1148-55.
This study examined use of mental health resources among rural and nonrural cancer survivors and sought to identify factors associated with mental health resource use. The study revealed that additional research is needed to expand the search for factors, particularly modifiable factors, that might account for disparities in mental health outcomes between rural and nonrural survivors.

Burris, J. (F31)

Providers practice prevention: promoting dental hygienists' use of evidence-based treatment of tobacco use and dependence.

Journal of Dental Education. 2009 Sep;73(9):1069-82.
Researchers sought to determine the impact of a provider education program in Kentucky to promote implementation of evidence-based tobacco cessation treatment among registered dental hygienists. Analyses exploring the immediate effect found the program to have had a positive impact across knowledge, attitudes, and intended clinical practices regarding tobacco use and treatment.

Doubeni, C. (K01)

Primary care, economic barriers to health care, and use of colorectal cancer screening tests among Medicare enrollees over time.

Annals of Family Medicine. 2010 Jul-Aug;8(4):299-307.
The purpose of this study was to examine the impact of primary care and economic barriers to health care on colorectal cancer (CRC) testing relative to the 2001 Medicare expansion of screening coverage. The study revealed that despite expanding coverage for screening, complex CRC screening disparities persisted based on differences in the usual place and cost of health care, type of health insurance coverage, and level of education.

Doubeni, C. (K01)

Early course of nicotine dependence in adolescent smokers.

Pediatrics. 2010 Jun;125(6):1127-33.
Conducted to characterize the early course of nicotine dependence, this study demonstrated that nondaily tobacco use triggers the emergence of nicotine dependence. Early dependence symptoms promote escalation in smoking frequency and, reciprocally, more-frequent smoking accelerates the appearance of additional symptoms of dependence. As this positive feedback progresses, the symptoms of nicotine dependence present in a typical sequence, with some individual variation.

Guerra, C. (K22)

Diffusion of breast cancer risk assessment in primary care.

Journal of the American Board of Family Medicine. 2009 May-Jun;22(3):272-9.
This study was carried out to determine the prevalence and determinants of the adoption of breast cancer risk assessment by primary care physicians. Results indicate that diffusion of breast cancer risk assessment is occurring in primary care practices, with a greater adoption of BRCA1/2 testing than of the use of risk assessment software. Adoption seems to be related to the salience of breast cancer personally (for the physician) and within the practice, as well as the size of the practice, rather than attitudes about the risk assessment methods.

Hatcher, J. (K01)

Mammography promotion in the emergency department: a pilot study.

Public Health Nursing. 2010 Nov-Dec; 27(6):520-7.
In this study to assess the need and desire for,

and applicability of, a mammography promotion project in the emergency department (ED), three-quarters of women surveyed said they would be interested in mammography promotion while waiting for care in the ED. Study results provide promise that mammography promotion activities may appropriately take place in the ED.

Hudson, S. (K01)

Breast, colorectal, and prostate cancer screening for cancer survivors and noncancer patients in community practices.

Journal of General Internal Medicine. 2009 Nov;24(2 Suppl):S487-9.

Little is known regarding the patterns of care for cancer survivors in community primary care practices. In this study, cancer survivors were more likely to self-report receipt of cancer screening than were noncancer patients; however, medical record reports were fewer than self-reports. Identification of factors that affect cancer screening among cancer survivors has implications for intervention design.

Hudson, S. (K01)

Principles of the patient-centered medical home and preventive services delivery.

Annals of Family Medicine. 2010 Mar-Apr;8(2):108-16.

This research was undertaken to determine whether the patient-centered medical home (PCMH) principles (personal physician; physician-directed team; whole-person orientation; coordination of care, quality and safety; and enhanced access) are associated with receipt of preventive services. The study determined that relationship-centered aspects of PCMH are more highly correlated with preventive services delivery in community primary care practices than are information technology capabilities.

Lathan, C. (K01)

Racial differences in the perception of lung cancer: the 2005 Health Information National Trends Survey.

Cancer. 2010 Apr 15;116(8):1981-6.

Undertaken to examine perceptions of lung cancer in the general population and whether these perceptions differ by race, this study revealed that African Americans were more likely than whites to: agree that it is hard to follow recommendations about preventing lung cancer; avoid an evaluation for lung cancer for fear that they have the disease; and believe that patients with lung cancer would have pain or other symptoms before diagnosis—beliefs that could interfere with prevention and treatment.

Mahabee-Gittens, E. (K22)

Agreement between parents and youth on measures of anti-smoking socialization.

Journal of Child and Adolescent Substance Abuse. 2010 Apr 1;19(2):158-170.

This study explored the level of agreement between parents and youth on measures of anti-smoking socialization and assess whether agreement is associated with parental smoking status and/or parental race/ethnicity. The study demonstrated that agreement between parents and youth on measures of anti-smoking socialization was associated with parental smoking status but not race/ethnicity.

McKoy, J. (K01)

Costs and cost effectiveness of a health care provider-directed intervention to promote colorectal cancer screening.

Journal of Clinical Oncology. 2009 Nov 10;27(32):5370-5.

Undertaken to assess the cost effectiveness of randomized interventions to improve colorectal cancer screening, this study found that a comprehensive, multicomponent, academic detailing intervention conducted in small practices in metropolitan New York was clinically effective in improving colorectal cancer screening rates but was not cost-effective.

Mosavel, M. (K01)

Daughter-initiated health advice to mothers: perceptions of African-American and Latina daughters.

Health Education Research. 2009 Oct;24(5):799-810.

This study addressed the gap in literature pertaining to the ability of adolescents to influence their parents' health behaviors by exploring the feasibility of daughters providing health advice to their mothers. Study data suggest that some daughters have the potential to be valuable health education conveyers in their families.

Mosavel, M. (K01)

Cervical cancer attitudes and beliefs—a Cape Town community responds on World Cancer Day.

Journal of Cancer Education. 2009;24(2):114-9.

Undertaken to examine attitudes and beliefs that affect women's cervical cancer screening behavior, this study concluded that opportunistic cancer screening events are an effective way for women to obtain Pap smears and cancer education.

Nguyen, L. (R01)

Healthy colon, healthy life (colon san, vida sana): colorectal cancer screening among Latinos in Santa Clara, California.

Journal of Cancer Education. 2010 Mar;25(1):36-42.

Conducted to identify factors associated with colorectal cancer screening among Latinos, this study determined that younger patients, women, and patients of female physicians receive the most screening.

Translational Science

Buck, M. (K22)

Decreased Jun-D and myogenin expression in muscle wasting of human cachexia.

American Journal of Physiology, Endocrinology, and Metabolism. 2009 Aug;297(2):E392-401.

This study was conducted to determine whether AIDS, cancer, and chronic inflammatory diseases cause muscle wasting. The study revealed that some molecular pathways are modulated in association with muscle wasting in patients with cancer or AIDS; however, whether or not they cause muscle wasting remains to be determined.

Gonzalez-Angulo, A. (K23)

Incidence and outcome of BRCA mutations in unselected patients with triple receptor-negative breast cancer.

Clinical Cancer Research. 2011 Mar 1;17(5):1082-9.

Study researchers sought to investigate the incidence of germline and somatic BRCA1/2 mutations in unselected patients with triple-negative breast cancer (TNBC) and determine the prognostic significance of carrying a mutation. In an unselected cohort, the study found a 19.5 percent incidence of BRCA mutations, indicating genetic testing should be discussed with TNBC patients. Patients with TNBC with BRCA mutations had a significantly lower risk of relapse.

Gresham, V. (F31)

Genomics: applications in mechanism elucidation.

Advanced Drug Delivery Review. 2009 May 20;61(5): 369-74.

This study was undertaken to identify molecular interactions associated with therapeutic and toxic drug effects early in drug development. Results indicate that genomic strategies may be used as a complementary tool in drug discovery and development.

Holt, D. (R01)

CXCR3 expression is associated with poor survival in breast cancer and promotes metastasis in a murine model.

Molecular Cancer Therapeutics. 2009 Mar;8(3):490-8.

This research was conducted to examine the relationship of chemokine receptor CXCR3 expression to clinical outcome in 75 women diagnosed with early-stage breast cancer. Results support the continued examination of CXCR3 as a potential therapeutic target in patients with breast cancer.

Hopper-Borge, E. (K01)

Chemotherapy and signaling: how can targeted therapies supercharge cytotoxic agents?

Cancer Biology and Therapy. 2010 Nov 23;10(9):839-53.

This article discusses recent advances in chemotherapy, including integrative systematic biology and RNAi approaches to counteract chemotherapy resistance and buttress the selectivity, efficacy, and personalization of anticancer drug therapy.

Lopez, M. (R01)

A (99m)Tc-labeled triphenylphosphonium derivative for the early detection of breast tumors.

Cancer Biotherapy and Radiopharmaceuticals. 2009 Oct;24(5):579-87.

Researchers sought to synthesize and characterize (99m)Tc-labeled alkyl triphenylphosphonium for the early detection of breast tumors. The study found that the agent significantly reduced cardiac uptake compared with (99m)Tc-MBIB.

Nwogu, C. (K23)

Is thoracoscopic pneumonectomy safe?

Annals of Thoracic Surgery. 2009 Oct;88(4):1086-92.

Undertaken to determine the safety of thoracoscopic pneumonectomy, this study found that thoracoscopic pneumonectomy can be done safely, which is especially important as more debilitated patients present for surgical therapy.

Nwogu, C. (K23)

Chest tube-delivered bupivacaine improves pain and decreases opioid use after thoracoscopy.

Annals of Thoracic Surgery. 2009 Apr;87(4):1040-6;discussion 1046-7.

This study aimed to compare a simplified method of intrapleural bupivacaine administration with traditional analgesic therapy to decrease postoperative pain and opioid usage in patients after thoracoscopy. Results showed that intermittent or continuous intrapleural bupivacaine infused through the chest tube reliably reduces postoperative pain and 24-hour opioid usage in thoracoscopy patients.

McKoy, J. (K01)

Cancer therapy associated bone loss: implications for hip fractures in mid-life women with breast cancer.

Clinical Cancer Research. 2011 Feb 1;17(3):560-8.

Researchers used case studies and systematic review to determine whether aromatase inhibitors (AIs) are associated with hip fractures. The study revealed that cancer treatment-induced bone loss results in hip fractures among mid-life women with breast cancer. Hip fractures occur at younger ages and higher bone density testing than expected for patients in this age group without breast cancer. Hip fractures result in considerable functional decline. Greater awareness of this adverse drug effect is needed.

Paiva, M. (K22)

Outcomes of laser therapy for recurrent head and neck cancer.

Otolaryngology—Head and Neck Surgery. 2010 Mar;142(3):344-50.

This article reviews the outcomes of a Phase II study using laser-induced thermal therapy (LITT) as a palliative treatment for 106 patients with recurrent head and neck tumors. The study concluded that the highest response rate was seen in oral cavity tumors, suggesting that tumor location at this site may be a predictor of favorable outcome with LITT.

Pollard, C. (F31)

Molecular genesis of non-muscle-invasive urothelial carcinoma.

Expert Reviews in Molecular Medicine. 2010 Mar 25;12:e10.

This study examined the etiology of non-muscle-invasive urothelial carcinoma and revealed that understanding the signaling events in non-muscle-invasive urothelial carcinoma may offer novel approaches to managing recurrence and progression of the disease.

Pollard, C. (F31)

Genoproteomic mining of orothelial cancer suggests γ-glutamyl hydrolase and diazepam-binding inhibitor as putative urinary markers of outcome after chemotherapy.

American Journal of Pathology. 2009 Nov;175(5):1824-30.

The authors evaluated an approach that combines genomic, proteomic, and therapeutic outcome data sets to identify novel putative urinary biomarkers of clinical outcome after receiving chemotherapy. Predictive results indicate that gamma-glutamyl hydrolase and diazepam-binding inhibitor can be developed as urinary markers of clinical outcomes for patients treated with chemotherapy.

Resto, V. (K08)

Case-matching analysis of head and neck squamous cell carcinoma in racial and ethnic minorities in the United States—possible role for human papillomavirus in survival disparities.

Head and Neck. 2011 Jan;33(1):45-53.

This study sought to determine whether differences in oropharyngeal tumor human papillomavirus (HPV) status may be a cause of disparities in head and neck cancer outcomes for black patients in the United States. The study demonstrated a disease-specific survival disparity for Hispanic patients, which was eliminated by case matching. The disparity for black patients persisted in matched cohorts. The oropharyngeal subsite was found to be the dominant contributor to this disparity.

Simbiri, K. (R01)

Multiple oncogenic viruses identified in ocular surface squamous neoplasia in HIV-1 patients.

Infectious Agents and Cancer. 2010 Mar 26;5:6.

Undertaken to determine the underlying cause of ocular surface squamous neoplasia (OSSN) in HIV-infected patients from Botswana, this study identified the known oncogenic viruses HPV, KSHV, and EBV in OSSN tissues. However, further studies are necessary to characterize the molecular mechanisms associated with viral antigens and their potential role in the development of OSSN.

Solorio, L. (R01)

Characterization of formulation parameters affecting low molecular weight drug release from *in situ* forming drug delivery systems.

Journal of Biomedical Materials Research Part A. 2010 Aug;94(2):476-84.

This study examined the effect of varying the formulation components on the low molecular weight (Mw) drug release profile. Results demonstrated that poly(D,L-lactide-co-glycolide) (PLGA) Mw was the most significant factor in modulating low Mw drug release from the *in situ* forming implants.

Stewart, J. (K08)

Sentinel lymph node mapping for gastric adenocarcinoma.

American Surgeon. 2009 Aug;75(8):710-4.

This study sought to determine the optimal extent of regional lymphadenectomy for gastric adenocarcinoma using sentinel lymph node mapping and biopsy to augment resection of nodal metastasis. Results revealed that although a promising modality, lymphatic mapping is not recommended for gastric cancer.

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IMAGE CREDITS

Illustrations found on opening spreads of each chapter
(NIH Division of Medical Arts):
Inside cover: circos diagram–a genetic visualization tool
Pages 6-7: transcriptional regulation network
Pages 10-11: fullerene structure
Page 19: ribbon structure of histone
Pages 36-37: gene map visualization tool
Pages 44-45: schematized tRNA
Pages 52-53: ribbon structures of antibodies

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