

EXECUTIVE SUMMARY

In consultation with the National Advisory Dental and Craniofacial Research Council, the National Institute of Dental and Craniofacial Research (NIDCR) in 1999 established the Blue Ribbon Panel on Research Training and Career Development to Meet the Scientific Opportunities of the 21st Century. The Panel met for two days in July at the National Institutes of Health in Bethesda, Maryland. The purpose of the meeting was to identify anticipated opportunities in health-related research in the coming years and the skills that will be needed to take advantage of those opportunities. The Panel heard testimony from a series of representatives from the professional community regarding emerging research opportunities and career development issues. Based on their discussions and the formal presentations, the Blue Ribbon Panel formulated a series of recommendations regarding the further development of the Institute's research training and career development programs.

The National Institute of Dental and Craniofacial Research has been involved in research training and career development activities from the very earliest days of the Institute. In Fiscal Year 1999, approximately six percent of the Institute's budget was devoted to extramural research training and career development activities. More than \$8 million was spent on over 80 institutional and individual awards supported through the various mechanisms of the National Research Service Awards (NRSA) authority. Over 400 trainees participated in these programs, which were located at more than 30 academic health science institutions throughout the United States. In Fiscal Year 1999, the NIDCR also spent nearly \$6 million to fund more than 90 dentists and physicians for training through institutional and individual Career Development Awards (CDA).

The NIDCR continually seeks to improve its research training and career development programs to assure that the Institute's training activities produce the types of research personnel needed to address the most critical basic, behavioral and clinical research areas of the coming decades. A starting point for Blue Ribbon Panel deliberations at the July 1999 meeting was the Institute's 1997 Strategic Plan (www.nidcr.nih.gov/news/strat-plan/index.html). Dr. Harold Slavkin, NIDCR Director, told the Blue Ribbon Panel that it was his hope the Panel would describe ways that the Institute could become more effective in its efforts to recruit, train and retrain investigators to conduct cutting edge research in the coming years aimed at improving oral, dental and craniofacial health.

Research Opportunities and Investigator Competencies

To facilitate Panel discussions, each member of the Blue Ribbon Panel was asked to consider the following questions in advance of the meeting:

1. What are the most exciting scientific opportunities that have emerged in recent years or that we may anticipate in the next few decades?
2. What new skills and competencies must scientists acquire in the coming years in order to respond to emerging or anticipated scientific opportunities?

During the wide-ranging discussion that followed, several themes emerged. Three themes of particular interest were “interdisciplinary research”, “genomics and functional genomics”, and “applied research”. It was the view of the Panel that health-related research at the start of the 21st Century will be quite unlike that which we observe today.

- There will continue to be a rise in *interdisciplinary studies* in the coming years, requiring scientists to acquire a broader mix of skills and the ability to work collaboratively.
- There will be an expanded phase of *functional genomic analyses* following an extended period of rapid advances in genetics and genome-based research – especially the Human Genome Project and microbial genomes.
- There will be an even greater emphasis on *applied research*, which includes domestic and international collaborative translational and clinical research, population-based studies, epidemiology, health promotion, and health services research.

With these proposed directions, the Blue Ribbon Panel also felt that there would be an increase in the application of research findings to health promotion and disease prevention -- locally, nationally, and globally. Scientists will *at a minimum* need to be familiar with the knowledge and methods of a wider variety of “disciplines” than is presently the case, in addition to having general skills necessary for tomorrow’s scientific environment. Some examples of emerging critical competencies include: molecular biology, bioengineering, biomathematics, information science, physiology, biochemistry, endocrinology, epidemiology, behavioral and social sciences; quantitative analytic skills; team/collaborative skills; ethics and bioethics training; oral and written communication skills; management skills, entrepreneurship and knowledge of technology transfer approaches.

A "research-intensive" academic environment plays a critical role in promoting the development of health research skills. Panel members agreed that there is an important opportunity for the National Institute of Dental and Craniofacial Research in this area. The Institute can encourage research training and career development in those settings that provide the experience students will need if they are to tackle the most challenging research questions in the coming years.

As the National Institute of Dental and Craniofacial Research responds to emerging research opportunities and issues related to talent flow, it would be useful to consider a three-dimensional model to integrate research and training strategies. This model includes the integration of stages of career development with levels of scientific analysis and priority areas of research opportunities.

Invited Testimony

A number of public and private organizations and professional societies have responded to the new and emerging opportunities and challenges in the sciences. They have done so by developing unique research training and career development strategies. To learn more about these emerging efforts, NIDCR Blue Ribbon Panel invited several experts to describe their programs.

Speakers from the National Institutes of Health presented a dynamic set of research training and career development programs that have changed significantly in recent years. The National Human Genome Research Institute has, for example, expanded its portfolio of research training awards to attract a broad base of scientific talent.

The National Science Foundation, likewise, has implemented a program of graduate study that fosters the integration of graduate education to prepare students with a “new type of resume” – one that gives them both intellectual depth and breadth.

Numerous other organizations have recognized the need for promoting new skills and competencies among health scientists. These include the American Association of Dental Schools, the American Association for Dental Research, and the Association of American Medical Colleges. At the University of Maryland, Baltimore County, the Meyerhoff Scholarship program has made it possible to create a highly focused and effective atmosphere that encourages historically underrepresented students to pursue a scientific career.

Individuals actively involved in research training – either as training program directors or as trainees – also addressed the Blue Ribbon Panel. Each speaker provided important observations about the strengths of the Institute’s research training and career development programs as well as comments on those areas in which further improvements could be made.

Blue Ribbon Panel Actions and Recommendations

Based on their two days of discussion and deliberations, the Blue Ribbon Panel on Research Training and Career Development made several conclusions in response to the charges. Specifically, the Panel members felt that:

Opportunities in health-related research abound. Research discoveries are in the public good. Oral, dental, and craniofacial research is a national asset. This asset is now at risk. It is in the national interest to develop a timely plan to nurture and develop and protect this asset. NIDCR should act as a catalyst in creating this plan.

In addition, the Blue Ribbon Panel...

En dorses the 1997 NIDR Strategic Plan.

The Blue Ribbon Panel on Research Training and Career Development enthusiastically endorsed the 1997 NIDR Strategic Plan. The Plan remains a blueprint that the Panel acknowledges as having been carefully thought out and to which they give credit.

...Called for an expansion and diversification of NIDCR Research Training and Career Development Programs.

The Panel endorsed the variety of approaches and mechanisms that the Institute has developed to encourage students to pursue research careers. These programs seem flexible. The problem appears to be a lack of candidates willing to participate in the training programs. Therefore, the Panel endorsed efforts to increase the pool of candidates for careers in dental, craniofacial and oral health research. This may involve recruiting more students at the precollege level or at the undergraduate level into research careers. It also means increasing the number of underrepresented minorities, women, and individuals with disabilities in health-related research careers.

...Identified three major areas of scientific opportunity in the 21st Century.

It is clear from the material reviewed by the Panel that the most significant research opportunities in the coming years will involve a wider range of scientists working in collaboration to address pressing health needs. Therefore, the Panel suggested that the Institute place high priority on interdisciplinary research and training, expanded phases of functional genomic analyses, and applied research. There is evidence that oral health research has already moved in the direction of greater interdisciplinary arrangements. The Panel views the Institute as having a critical role in fostering the development of research through a strong portfolio of research training and career development that responds to these trends. Given the rapid developments in health research, the Panel also encouraged the Institute to assist dental schools in establishing and maintaining their competitiveness in an entirely reconfigured research environment.

...Recommended that core competencies be fostered across all research training programs.

The Panel recommended that the Institute promote needed “core” competencies across all research training programs. These core competencies may include familiarity with molecular biology, bioengineering, biomathematics, information science, physiology, biochemistry, endocrinology, epidemiology, behavioral and social sciences; quantitative analytic skills; team/collaborative skills; ethics and bioethics training; oral and written communication skills; management skills, entrepreneurship and knowledge of technology transfer approaches.

...Described an Implementation Plan.

In addition to responding to the primary charge, the Blue Ribbon Panel also suggested an implementation plan. These suggestions are organized around four themes:

1. Diversify the NIDCR Research and Training Portfolio

Student debt, misperceptions about careers in research, and a *lack of mentors* remain major challenges in increasing the flow of talent into clinical research careers – including research that addresses dental, craniofacial and oral health. Estimates indicate that dental schools have less than half the faculty needed to provide a strong research environment.

Several organizations, including AADR and AADS, already have taken steps to facilitate the flow of talent into dental, craniofacial and oral health research. Indeed, a number of speakers at the Blue Ribbon Panel meeting offered important insights into innovative strategies to increase the flow of talented individuals into health research.

What is needed is an expansion of the NIDCR research and training portfolio to stimulate the scientific talent base in this area. To that end, the Blue Ribbon Panel offered the following recommendations:

- Fund programs that reach grades K through 12 and colleges, to provide positive images/role models in oral health research and dentistry.

- In general, promote and enhance the image of the “clinician scientist” in dentistry.
- Work with professional organizations to link constituencies in new ways so that information about opportunities in oral health research reach more people.
- Promote collaboration among federal student assistance programs for health professions education and training, including scholarship and loan forgiveness programs.
- Provide “bridging awards” that foster research opportunities for scientists at key points in the formation of their careers.
- Develop assessment procedures that capture the range of career outcomes available to health scientists, including clinical researchers.
- Facilitate lifelong learning so that scientists in midcareer status can be retrained and become current.

2. Focus on the Training Environment

Although it is difficult to be certain about the direction that health research will take in the coming years, the Panel identified several important trends. These trends include the rise of interdisciplinary research in the health sciences, the emergence of molecular studies after a period of reductionist research in genetics, and the growing importance of applied research – including domestic and international collaborative translational and clinical research, population-based studies, epidemiology, health promotion and health services research.

Specific competencies that will be needed include familiarity with a range of scientific specialties, as well as an ability to work cooperatively on teams, deal with ethical issues, and manage complex, interdisciplinary studies.

The Panel also learned that a research-intensive environment is essential in the preparation of skilled scientists given the anticipated direction of health-related research and training. As a result, the Blue Ribbon Panel suggested that the National Institute of Dental and Craniofacial Research:

- Place high priority on interdisciplinary research training, with an emphasis on genomics and functional genomics, and translational research.
- Be selective about awarding training grants to institutions that are research intensive, committed to interdisciplinary research, and to guiding/mentoring trainees.
- Ensure that all trainees have experience with international collaborative research.

3. Expand the Mix of Disciplines in Dental, Craniofacial, and Oral Health Research

All scientists will need to acquire new skills over the course of their careers, as well as to be ready to work with individuals from new and emerging disciplines, and to serve as mentors for the next generation of researchers. More than ever, science needs individuals who know the benefits of – and have the skills necessary for -- interdisciplinary team-based research and who are able to establish and pursue domestic and global collaborations.

Based on these findings and deliberations, the Blue Ribbon Panel encourages the Institute to:

- Be inclusive rather than exclusive in research training – involve dentists, physicians, and other health professionals, and PhDs in the basic and behavioral sciences.
- Train a cadre of PhDs who have clinical interest for research careers in oral health.
- Given the trend towards translational, clinical and population-based research studies, NIDCR should place more emphasis on training programs that focus on research related to health services, prevention, health promotion, epidemiology, access, and public health.

4. Adopt New Strategies to Promote Diversity in the Scientific Workforce

Recognizing that research related to dental, oral and craniofacial research should reflect the diversity of the United States, the NIDCR has developed and collaborated in several programs to increase the participation of individuals from underrepresented racial and ethnic minority groups, women, and those with disabilities in research careers. Programs like the Meyerhoff Scholarship Program at the University of Maryland, Baltimore County, have demonstrated that certain techniques for attracting and retaining “high achieving” minorities into research careers are effective.

Given the continuing need to promote scientific workforce diversity, the Blue Ribbon Panel urged the Institute to consider the following recommendations:

- NIDCR should establish formal liaisons and work together with NIH programs, other departmental agencies, and professional organizations involved in the recruitment and training of talented individuals from underrepresented groups, women, and individuals with disabilities for careers in research.
- NIDCR should explore and develop pedagogical programs with institutions that serve underrepresented minorities and that reflect those practices that have proven effective in recruiting and nurturing talented individuals into research careers.

In summary, the recommendations suggested by the Blue Ribbon Panel should result in the development of a cadre of skilled scientists who will advance dental, craniofacial and oral health through their research in the 21st Century.