NATIONAL INSTITUTE OF DENTAL AND CRANIOFACIAL RESEARCH

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Mission:
The mission of the National Institute of Dental and Craniofacial Research (NIDCR) is to improve oral, dental and craniofacial health through research, research training, and the dissemination of health information. We accomplish our mission by:

- Performing and supporting basic and clinical research;
- Conducting and funding research training and career development programs to ensure an adequate number of talented, well-prepared and diverse investigators;
- Coordinating and assisting relevant research and research-related activities among all sectors of the research community; and
- Promoting the timely transfer of knowledge gained from research and its implications for health to the public, health professionals, researchers, and policy-makers.

NIDCR is entrusted with the science base of the nation's dental and oral health — an area encompassing diseases and conditions that are common, frequently painful, often chronic and nearly always complex. Recent advances in imaging, tissue engineering, stem cell biology, and clinical research have created new opportunities for oral health scientists and other researchers to create unique multidisciplinary partnerships to address oral, dental and craniofacial diseases and disorders in innovative ways that could not have been imagined a decade ago.

Selected Achievements and Initiatives:
Validation of New Technologies for Clinical Assessment of Tooth Surface Demineralization: Despite dramatic reductions in tooth decay in the United States over the past 50 years, dental caries remains a rampant public health problem, particularly among lower socioeconomic groups. In recent years, experimental treatments have emerged that have the potential either to prevent the demineralization process or to remineralize areas of early tooth decay. However, the necessary clinical trials to evaluate the safety and efficacy of these potentially revolutionary treatments have been slowed by a lack of scientifically validated imaging technologies to measure their therapeutic effects. Research is needed to validate the effectiveness of high-resolution, real-time clinical imaging technologies to accurately measure the demineralization and remineralization of tooth enamel. Such validation studies would greatly facilitate clinical trials of methods to prevent or reverse tooth decay.

Clinical Research on Osseointegrated Dental Implants: Since their introduction in North America over 20 years ago, dental implants have been used in a variety of designs, types, and surgical protocols. However, few clinical trials have been conducted that adequately compare the various surgical and prosthetic protocols, their success in various locations of the mouth, the potentially compromising effects of systemic disease on implant success, and patient outcomes over time. NIDCR will work to expand the body of high

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quality, scientific evidence that is available to patients and practitioners on the outcomes of osseointegrated dental implants. Patients and practitioners would benefit greatly from a series of clinical trials that explore these critical issues and provide objective scientific data to better inform their choices. Studies would compare outcomes of the various surgical and prosthetic protocols now used in the field, assess the effect of systemic diseases, such as osteoporosis and diabetes, on success rates, and examine patient preferences and quality of life compared to other methods, such as removable prostheses, for restoring the dentition.

Building a Tooth: Bridging Biology and Material Science: Despite a marked decline in total tooth loss, or edentulism, since the late 1950's, it remains a significant public health problem, particularly among lower socioeconomic groups. By age 50, most Americans have lost approximately eight teeth; by age 65, nearly one in four Americans is edentulous. In addition, tooth agenesis — the lack of one or more permanent teeth — is the most common congenital malformation in humans. While dental implants or dentures are often quite effective replacements, science has progressed to the point that it may be possible to generate replacement teeth from scratch, which would mark a truly historic advance in oral healthcare and in our understanding of human biology. Building on its investments in the biological and material sciences, NIDCR is embarking on the long-term goal of drafting science-based blueprints from which to bioengineer complete, fully functional replacement teeth. Whereas just a few years ago tooth regeneration was far beyond the reach of science that is no longer the case. An historic opportunity now awaits dental science to learn to seed and reproducibly control the complex, tightly orchestrated molecular interactions involved in producing a tooth and its supporting structures. The crucial first steps will be to: identify existing gaps in our knowledge of tooth formation; pursue viable solutions from throughout the biological and physical sciences to bridge these gaps; and, based on these comprehensive analyses, to formulate interdisciplinary blueprints from which to design a complete tooth. Relying on the best of these blueprints, interdisciplinary teams of scientists would begin the process of engineering replacement teeth. It is possible that these investigations will initially yield functional replacement parts, such as enamel or periodontal ligament, but eventually would permit complete tooth regeneration.

Appropriations History
($ in thousands)

FY 2001	$306,211 (+13.9%)
FY 2002	$342,664 (+11.9%)
FY 2003	$371,636 (+8.5%)
FY 2004	$383,282 (+3.1%)
FY 2005	$391,829 (+2.2%)

Extramural Research Project Grants
(Includes SBIR/STTRs)

FY 2001	647
FY 2002	643
FY 2003	657
FY 2004	717
FY 2005	714

Success Rate — Research Project Grants

FY 2001	34%
FY 2002	29%
FY 2003	27%
FY 2004	30%
FY 2005	25%

Research Training Positions Supported

FY 2001	281
FY 2002	273
FY 2003	330
FY 2004	335
FY 2005	351

Research Centers

FY 2001	13
FY 2002	12
FY 2003	12
FY 2004	7
FY 2005	7