



AMERICAN
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SPECIAL ISSUE

TESTIMONY ON THE FISCAL YEAR 2009 BUDGET REQUEST

**Department of Health and Human Services
National Institutes of Health
National Institute of Dental and Craniofacial Research**

Senate Subcommittee on Labor-HHS-Education Appropriations

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Mr. Chairman and Members of the Committee:

I am pleased to present the President's budget request for the National Institute of Dental and Craniofacial Research (NIDCR) of the National Institutes of Health (NIH). The Fiscal Year (FY) 2009 budget of \$390,535,000 includes an increase of \$377,000 over the FY 2008 appropriated level of \$390,158,000.

SIXTY YEARS OF PROGRESS

In June 1948, President Harry Truman signed Public Law 755 that created the then National Institute of Dental Research. This law set in motion a national investment in oral health research that enabled the nation to make great strides towards the most pressing problem of the day -- reducing rampant decay and tooth loss. Sixty years later, the benefits derived from this wise investment continue to be woven into everyday American culture, yielding improved health for many in our Nation.

The National Institute of Dental and Craniofacial Research (NIDCR) embarks upon its seventh decade with a wave of promising discoveries entering or moving through the research pipeline. Disfiguring birth defects and dysfunctional organs and systems of the craniofacial complex are among the most common and tragic anomalies seen at birth. Cleft lip with or without cleft palate is the most common of all the craniofacial anomalies. The Centers for Disease Control and Prevention estimate the lifetime cost of treating the children born each year with cleft lip or cleft palate to be \$697 million. Numerous other craniofacial disorders such as ectodermal dysplasia, while considerably rarer, also have profound life-long functional and social consequences. The FaceBase project that NIDCR will launch in FY 2009 will enable researchers to decode the highly complex genetic blueprint that directs formation of the head and face and understand how genes interact with environmental, nutritional and behavioral factors to perturb Nature's plans. This integrated source of knowledge will speed identification of new strategies to prevent craniofacial birth defects, and provide the basis for developing better treatments.

Teams of bioengineers, biochemists and oral health researchers have now systematically catalogued the thousands of proteins and other molecules that are found in oral fluids, including many potential biomarkers that may be used to monitor health as well as the onset and progression of disease. The relative ease of saliva collection opens up the extraordinary opportunity to expand the versatility of point-of-care diagnostics in community or home settings. For example, an NIDCR-supported investigator at the University of California, Los Angeles recently reported on a cluster of proteins and peptides that are elevated in primary Sjögren's syndrome. Another research team at the University of Texas at Austin has been able to rapidly

analyze cells floating in oral fluid for telltale signs of oral cancer. Early detection of oral cancer is the key to lifesaving treatment.

Complex diseases and conditions require comprehensive approaches. Continued research is leading to a better understanding of the many factors that underlie temporomandibular joint and muscle disorders. An ongoing longitudinal study being coordinated at the University of North Carolina seeks to delineate the potential biological, environmental, genetic, neurological, physiological and psychological factors that contribute to this set of conditions.

NIDCR is contributing significantly to the recently launched Roadmap initiative on the human microbiome. For the first time investigators will be able to delineate all bacteria that make the cheeks, gums, palate, saliva, teeth, tongue and tonsils their home. By identifying these microorganisms, most of which have never been studied before, investigators will begin to unravel the attributes of this complex eco-system in health and disease.

Despite the many advances it is clear that the broader benefits of dental, oral, and craniofacial research have yet to adequately reach all persons in our Nation. The reasons are complex and include biological, behavioral, cultural and social factors. In 2001, the Institute expanded its ongoing effort regarding research on these issues with the establishment of Centers for Research to Reduce Oral Health Disparities at five sites across the country. Each center now serves as a nexus of research teams that are targeting oral health issues within underserved communities, including oral cancer, cleft lip and/or palate, rampant dental disease and apprehension about seeking care. The goal has been to unravel the underlying biological, behavioral, and/or cultural factors of these issues and produce scientifically valid strategies to combat the problem. To empower patients, practitioners, and communities to improve oral health, these strategies must be cost-effective, easy to implement, and acceptable to underserved populations. For example, researchers from the center at the University of California, San Francisco have demonstrated that infants and small children who receive at least one fluoride varnish treatment per year can cut their dental caries rate in half. This is an inexpensive and easy-to-deliver treatment.

Perhaps most importantly, the oral health disparity centers have demonstrated that it is essential to partner with communities throughout the research process in order to fully understand what factors contribute to dental disease in each community. This information leads to development of strategies that are appropriate to that community, and therefore more likely to improve the health of its people. For example, the center at the University of Michigan found that only 14 percent of the tooth decay found among children in the poorest sections of Detroit can be attributed to “classical” risk factors. A community’s cultural beliefs about preventive care, understanding of the importance of “baby” teeth, mistrust of drinking tap water, maternal health fatalism, fear of dental care, and even the proximity to places of worship and grocery stores are examples of risk or preventive factors related to oral health. These findings have led some centers to develop novel multidimensional conceptual models that will guide researchers for years to come. The models acknowledge that, to reduce oral health disparities, oral health models cannot stand alone, but must understand and address individual, family and community level determinants through multilevel, tailored interventions.

As these initial projects near completion in 2008, NIDCR has issued an open re-competition and soon will support a second generation of disparity centers that will begin to test specific interventions on a community-wide scale.

ORAL HEALTH IN 2030

By the year 2030, one can envision that dentistry will have become even more integrated into the primary health care network of the Nation. Bioengineers will have succeeded in creating a lab-on-a-chip that will be placed on a small orthodontic bracket within the mouth. Real-time

surveillance of hundreds of biomarkers will now alert individuals to consult with their health professionals at the earliest moment of disease.

Dental patients may never have the need to see or hear a drill. Dentifrices, floss and mouth rinses will be augmented with small molecules that disrupt the formation of the biofilm on the tooth surface, making dental decay a rare condition. Routine dental examinations will include examination with high-resolution imaging devices to better visualize the topography of the hard and soft tissues of the craniofacial complex. Results from the human microbiome initiative have led to predictive tools that will characterize the bacteria underlying periodontal infections and the specific nature of the immune response, so personalized treatments can effectively target and eliminate both. In the rare instance that the disease persists and destroys tooth-supporting bone, dentists will know how to turn on and off various mechanisms of the natural inflammatory response to stop bony degradation, regenerate new bone and prevent tooth loss.

For people with oral autoimmune diseases, either localized or part of a complex syndrome, health professionals will now have gene-transfer approaches perfected to effect local treatment of salivary glands before they are ravaged by the body's own defense system. Oral cancer that advances to a deadly or disfiguring state may be a thing of the past, because dentists and physicians will possess high-resolution imaging devices to easily spot any unusual sores inside a patient's mouth. They also will have handy an array of tools to perform rapid molecular pathology tests to tell them whether a sore contains abnormal cells that might turn cancerous. If so, they can preemptively characterize the internal molecular patterns of these cells and match them with a chemotherapy drug that will kill the tumor cells, leaving the healthy cells unscathed. To reduce the chances of recurrence, tools that use the tissue's natural fluorescent qualities will illuminate whether other tumor cells are inconspicuously seeded nearby. Following this fluorescent trail, doctors can remove all diseased cells.

Individuals who suffer facial disfigurement will benefit from the investment in FaceBase, a tool that has integrated information on developmental pathways, leading to new approaches to repair or replace the hard and soft oral structures. One also can envision fewer Americans living with chronic pain and suffering the ravages of inflammatory diseases. It is reasonable to expect that fewer Americans will live with the uncertainty of drawn-out or ambiguous diagnoses. More will know precisely what ails them and, more importantly, which treatments will best target their affliction.

Oral health disparities within our Nation can be dramatically reduced. Investments that began in the mid-twentieth century will culminate during the twenty-first in community-based participatory research led by diverse interdisciplinary collaborations of biologic, behavioral, and clinical investigators. These teams will have the ability to devise preventive strategies that can be implemented across a continuum of care in a cost-effective and egalitarian manner.

DENTISTRY AT A CROSSROADS

When Congress established NIDCR sixty years ago, our Nation's oral health was uniformly poor. At that time, no one could have anticipated the concept of oral health disparities. Research will continue to yield new and effective diagnoses, treatments, and novel ways to prevent disease and disability. However, to realize the possibilities outlined for 2030, we must continue to make the research investments required to develop interventions that will be as revolutionary to oral health as fluoride was in the 1950s, an advance that improved public health for all.