MILITARY DENTAL RESEARCH REVIEW

October 20-22, 1999

Prepared for
OFFICE OF NAVAL RESEARCH

under
Contract No. N00014-96-C-0212
Dear Reader,

Subj: MILITARY DENTAL NEEDS REVIEW

The Office of Naval Research was selected to manage a fiscal year 2000 “congressional add” for military dental research. Since no formal requirements currently exist in the Science and Technology Requirements Guidance (STRG) or in the Defense Technology Objectives (DTOs) for dental research, ONR commissioned a review of military dental research needs. The purpose of the review was to facilitate ONR in determining which areas of dental science and technology (S&T) to apply the congressional funding. This report includes the findings of an expert, extramural review panel. Information provided in this report outlines areas of S&T opportunities that may be appropriate for near-future military dental research investment.

The opinions and conclusions of the expert panel contained in the accompanying report are solely those of the panel, and should not be construed as formal service requirements, referenced as official service requirements, nor considered an ONR endorsement or policy statement.

HAROLD E. GUARD, Ph.D.
Head, Human Systems S&T Department
FOREWORD

The Life Sciences Research Office (LSRO), an office of the American Society for Nutritional Sciences (ASNS), provides scientific assessments of topics in the biomedical sciences. Comprehensive and quick-response reports are based upon literature reviews and the scientific analyses and opinions of knowledgeable experts working in relevant areas of biology and medicine.

This report was developed for the Human Systems Science and Technology Division of the Office of Naval Research (ONR) in accordance with provisions of Contract N000014-96-1-0212. The report was prepared by Michael Falk, Ph.D., LSRO Director and the manager for this project. This report is based on the considered judgments of an ad-hoc Expert Panel whose six members were chosen for their qualifications, experience, and judgment (with due considerations for balance and breadth of experience) as well as on the information presented to the Expert Panel by representatives from stakeholder communities. The members of the Expert Panel are listed in Appendix B.

The Expert Panel met for three days in October, 1999 to address the scope of work as outlined in the statement of work (Appendix A) and expanded upon by ONR representatives. The discussions from that meeting formed the basis of a draft report; the draft report was expanded by LSRO staff and reviewed and emended by the Expert Panel. LSRO staff and the Expert Panel refined multiple drafts to produce this final report which contains the deliberations and subsequent conclusions and recommendations of the Expert Panel.

The LSRO expresses its gratitude to the members of the Expert Panel, and the many speakers and points of contact from the US Army, Navy, and Air Force. The LSRO acknowledges the time and effort that was evidenced by the many informative and persuasive presentations made to the Expert Panel (Appendix C).

This final report was approved by the LSRO Scientific Advisory Committee with respect to completeness and response to the scope of work. It does not necessarily represent the views of this committee or of the ASNS membership.

3/13/2000
Date

Michael Falk, Ph.D.
Director
Life Sciences Research Office
TABLE OF CONTENTS

INTRODUCTION ............................................................................................................. 1

   Background ............................................................................................................. 1
   Objectives .............................................................................................................. 1
   Technical Approach ............................................................................................... 1

FINDINGS OF THE EXPERT REVIEW PANEL ............................................................. 6

ADDITIONAL OBSERVATIONS AND RECOMMENDATIONS ................................. 10

APPENDIX A: Statement of Work

APPENDIX B: Dental Research Expert Review Panel

APPENDIX C: Dental Research Review Agenda

APPENDIX D: Presentations
INTRODUCTION

Background:

In anticipation of Congressional Added Funds for Dental Research for FY00, the Office of Naval Research (ONR) decided to commission an independent, objective review of military dental needs to ensure that the ONR investment strategy for these funds optimally supports military operational medicine needs. Specifically, the review was designed to obtain the input from experts in dental science and military operational medicine to identify issues that require an investment of Navy science and technology (S&T) funds. Because the funds are Congressional, ONR extended the review to envelop Army, Air Force and Navy dental research.

The Life Sciences Research Office of the American Society for Nutritional Sciences (LSRO) was commissioned to conduct this review by memorandum on July 20, 1999 under an existing LSRO contract with ONR. The Statement of Work (Appendix A) defining the charge to the LSRO, called for a verbal summary of the review findings no later than 22 October, 1999 with a full written report of findings to be submitted by 19 November, 1999. At the LSRO’s request, the deadline for submission of the full written report of findings was subsequently extended to 30 November, 1999.

Objectives:

In order to ensure proper use of S&T funds, ONR’s primary charge to the LSRO was to:

- Document the military dental needs/requirements;
- Determine if needs/requirements are being met by commercial off-the-shelf (COTS) products, or are being or will be funded by other government or non-governmental organizations; and,
- Recommend needs/requirements that should be supported by Navy S&T funds.

The Statement of Work further defines the needs/requirements that are to be addressed in the review in two ways, those that are:

- “in direct support of operational dental readiness for the maintenance of oral health and wellness of military personnel,” or
- “related to a characterization of the duties of deployed military dentists in operational settings, including operations other than war, and of the specialized support deployed military dentists currently require to perform their mission.”

The Statement of Work also requires the review to “differentiate between military dental needs requiring research and development efforts and needs related to non-operational dental care delivery, policy, and training modifications.”

The review was specifically enjoined from focusing on the technical quality of ongoing military dental research efforts. Moreover, because the setting of Navy requirements falls solely within the province of the Chief of Naval Operations and not within the province of the Chief of Naval Research, the review was enjoined from evaluating or prioritizing the needs/requirements themselves.

Technical Approach:

To accomplish the goals set forth in the Statement of Work and the Objectives, the LSRO established the following plan of action:
Date | Tasks To Be Performed
--- | ---
July 19, 1999 | - Begin project  
- Contact designees from Navy, Army, and Air Force to identify information sources
August, 1999 | - Conduct fact-finding visits to the current dental research laboratories at Great Lakes, IL and Brooks Air Force Base, TX  
- Conduct fact-finding visits to the Army Directorate of Combat and Doctrine Development, Ft Sam Houston, TX and Medical Research and Materiel Command and Directorates for Dental Research and Congressional Programs, Ft Detrick, MD  
- Conduct fact-finding visits to the Navy Operational Medicine and Fleet Support and Dental Division, BUMED, DC  
- Interview individuals within research, requirements-setting process, end-user communities, in Navy, Army, and Air Force  
- Gather available information relating to military dental research requirements  
- Interview non-military dental research stakeholders  
- Accumulate nominations for review panel
September, 1999 – October, 1999 | - Identify and hire 6 - 8 reviewers with expertise in dental science and military operational medicine, one of whom will serve as panel co-chair  
- Arrange for presentations from representatives from each service from among the dental corps, dental research commands, and military requirements setting communities, as well as from non-military dental research funding sponsors and regulatory agencies  
- Finalize plans for review meeting
October 20-22, 1999 | - Review panel to meet at the Bethesda Marriott at Pooks Hill – to be co-chaired by Dr. Michael Falk, LSRO, and RADM Richard Shaffer (ret)  
- Presentations from Army, Navy, Air Force, National Institutes of Dental and Craniofacial Research, FDA, ADA, industrial research communities on October 20-21  
- Panel deliberations on October 22  
- Oral briefing of conclusions to ONR on the afternoon of October 22 at the Bethesda Marriott at Pooks Hill
November 30, 1999 | - Delivery of written report of findings, including supporting documentation

During the conduct of the fact finding visits and informational interviews several issues were identified that shaped the plan of action.
Air Force Dental Investigative Service
While the Army and Navy have active dental S&T funded programs, the Air Force dental research activity is confined to the Dental Investigative Service (DIS) which does not conduct S&T funded research. The DIS has plans to relocate to the same facility that currently houses the Naval Dental Research Institute and the Army Dental Research Detachment. All three services foresaw potential synergies that may result from the co-location of the three dental research organizations. Although the DIS has no current or future plans to conduct S&T funded program, they expressed great interest in the outcome of the review. The DIS provided an unofficial list of needs from the perspective of the Air Force dental community. As a result of these findings, the DIS agreed to make a presentation at the review and to be present during the review, but the review was primarily directed at the Army and Navy dental research programs.

Official Dental Research Requirements
For the purposes of this report, when the term Requirements is employed to refer to official Requirements it is capitalized. Both the Army and Navy were found to have clearly defined Requirements setting procedures and share the same definition of the term. However, the process for identifying, evaluating, and validating the Requirements was found to differ between the two services. There were no official, current dental Requirements identified during the review process for either service. Although the Statement of Work refers both to “military dental needs” and “military dental requirements,” the use of the word requirements was interpreted as unofficial and equivalent to the term “needs.” Thus, the review focused on identified military dental needs or needs/requirements and limited time was devoted to the Requirements development process.

Breadth of the Subject Matter
During the course of the informational interviewing phase of this review military dental research needs were identified that encompassed a broad cross-section of the dental disciplinary fields of the civilian community. The breadth of the subject matter led to the decision that material to be presented to the panel be organized in broad, cross-disciplinary categories and further, became an important factor in developing criteria for the selection of review panel members.

Stakeholder Communities Contacted
During the informational interviewing and networking phase of the review, key individuals were contacted from the following organizations:

American Association for Dental Research
American Association of Public Health Dentistry
American Dental Association
Academy of Dental Materials
American College of Dentists
International College of Dentists
International Association for Dental Research

American Dental Trade Association
Dental Manufacturers Trade Association
Block Drug Company

US Air Force Dental Investigative Service
US Army Dental Research Detachment
US Army Directorate of Combat and Doctrine Development
US Army, Fort Belvoir Dental Clinic Command
US Army Medical Research and Material Command, Combat Casualty Care Division
US Army Medical Research and Material Command, Dental Research
US Army Medical Research and Material Command, Congressional Programs
Naval Dental Research Institute
US Navy Bureau of Medicine and Surgery, Operational Medicine and Fleet Support
US Navy Bureau of Medicine and Surgery, Dental Division
US Navy Bureau of Medicine and Surgery, Dental Healthcare Analysis Division,

Indiana School of Dentistry
Northwestern University Dental School
Southern Illinois University Dental School
University of Florida Dental School
University of Kentucky Dental School
University of North Carolina Dental School

Center for Devices and Radiological Health, Food and Drug Administration
National Institute for Dental and Craniofacial Research
National Institute for Science and Technology
US Congress, House of Representatives

Fact-finding site visits were conducted to:

Naval Dental Research Institute, Great Lakes Training Command, Illinois
Army Dental Research Detachment, Great Lakes Training Command, Illinois
Army Directorate of Combat and Doctrine Development, Ft. Sam Houston, Texas
Air Force Dental Investigative Service, Brooks AFB, Texas
Army Congressional Programs Office, Ft Detrick, MD
Army Medical Research and Materiel Command, Ft Detrick, MD
Bureau of Medicine and Surgery, Operational Medicine and Fleet Support, MED-02
Bureau of Medicine and Surgery, Dental Division, MED-06

Selection Criteria for Review Panel Members
The Statement of Work specifies the review committee be comprised of six to eight individuals with expertise in dental science and military operational medicine, including dental missions. Review panel members were selected on the basis of their broad experience and having attained senior leadership positions in the dental community. These criteria were thought to afford the panel members an overview of processes and requirements of the various dental disciplines, both within and outside of the military dental community. Because military dental research needs were found to involve such a broad range of dental disciplines, it was not possible to include representatives from each discipline on the panel. Thus, broad and varied experience was valued over specific disciplinary expertise.

Various sources contacted during the informational interviews recommended representation by individuals with a non-military public health experience and as well as those with prior military dental research experience. Care was taken to insure that representatives with prior military dental research experience be sufficiently removed from that experience and have subsequent non-military dental research experience with which to balance their views. The panel was selected to include representation from both Army and Navy dental missions, experience in military dental research and in military dental operational settings, experience in military and in civilian dental communities, and representation from the academic, corporate, and governmental communities. Every effort was made to insure a knowledgeable, balanced, and unbiased panel of nationally and internationally renowned expertise.
The final panel was selected from over 40 nominated individuals. Each panel member completed and signed a conflict of interest disclosure form that was reviewed by the LSRO Director. There were no conflicts identified.

The composition of the Expert Review Panel is enclosed as Appendix B.

**Construct of the Review**

In consideration of the breadth of subject matter and short time-lines required to complete the report, it was decided not to prepare any written material prior to convening the review panel, rather to identify representatives to present all facets of the subject. Thus, the Army, Navy, and Air Force dental research and operational communities were invited to present their perspectives to the panel. Because the objectives of the review were to characterize the best means for the government to meet these needs, it was necessary to present to the panel the spectrum of resources available to the meet the military’s needs. Representatives from the non-military government funding agencies, non-military governmental and non-governmental agencies conducting dental research, governmental agencies with regulatory oversight over dental devices, the civilian corporate community, and dental professional associations were invited to present their perspectives to the panel.

Because the short time frame imposed by the Statement of Work did not allow for the preparation of multiple iterative drafts during the construct of the report, ample time was accorded to each presenter to allow for discourse between presenters and the review panel. The review panel was instructed to identify key issues during the presentation, call for more information where members felt it was needed, sift the information, identify the military dental research needs, and characterize the type of resources required to satisfy these needs under the stated objectives.

This construct allowed for a balanced presentation, wherein all stakeholders could be sure of equal and sufficient time to present their best case and to ensure that the panel would be presented with factually accurate and balanced information.

The agenda for the review meeting is enclosed as Appendix C.

**Organization and Format of the Report**

The military dental needs/requirements identified by the panel are grouped according to the source of information. Most of the needs/requirements were identified to the panel during the presentations on October 20-21, 1999. During the course of deliberations, the review panel requested a listing of needs/requirements from each of the Chiefs of the Dental Corps of the Army, Navy, and Air Force. The Chiefs of the Army and Navy Dental Corps provided lists. These lists were incorporated into the report in Finding #3 below.

Prior to listing the military dental needs/requirements and characterizing the resources required to meet them, the expert review panel expressed what it characterized as overarching findings. In the Additional Observations and Recommendations the panel has provided additional recommendations and conclusions which it recognizes as not necessarily within the Statement of Work, but which ONR may find useful and relevant to its mission with respect to dental research.
FINDINGS OF THE EXPERT REVIEW PANEL

Finding #1
The panel is concerned by the apparent lack of current oral health information that defines the denominator of need from which research needs and requirements should be determined. The panel felt that the 1994 Tri-Service Comprehensive Oral Health Survey information is dated and no longer relevant for planning purposes. It needs to be updated and extended to the total military force (active, reserve, National Guard). Because of the changing dental demographics of military recruits, continuously changing demographics of the total force, evolution of the national defense strategy, and increased op tempo it is further recommended that this survey or similar instrument be a component of the ongoing health surveillance of the military force.

The surveillance data collection and analysis is considered to be a fundamental S&T opportunity for investment and supports the six goals of military dental research as approved by Assistant Secretary of Defense for Health Affairs (ASDHA):

1. Know the problems
2. Improve pre-deployment technologies
3. Prevent dental disease during deployment
4. Improve forward dental treatment to reduce evacuations
5. Prevent oral and maxillofacial trauma
6. Improve forward management of oral and maxillofacial trauma

The panel reviewed the needs/requirements presented by Navy, Army and Air Force dental representatives to insure consistency with the above goals.

Finding #2
Although the Statement of Work charged the panel to “differentiate between military dental needs requiring research and development efforts and needs related to non-operational dental care delivery, policy and training modifications,” this charge to the panel was de-emphasized during subsequent clarification of the scope of work by representatives of the ONR. The panel found that the various divisions within the Army/Navy, dental/medical, research/operational communities do not share the same interpretation as to how these two needs should be distinguished. All the military needs/requirements listed in this report are considered by the panel to be S&T fundable research. The needs/requirements are not listed in priority order.

Finding #3
The needs/requirements in Table 1 were taken from a list provided by the Chief, Naval Dental Corps at the request of the Expert Review Panel. For the sake of brevity and focus, the panel combined some of the needs/requirements. The panel did not intend to change the conceptual meaning of any need/requirement. These needs/requirements are sufficiently broad in scope to encompass both the commonality and the individual needs of each service. Indeed, the panel found that each of these needs/requirements in Table 1 was brought before the panel in some form by representatives of each the Army, Navy, and Air Force. By focusing on broader recommendations, the panel hoped this review would have more lasting value but recognized that this approach might require some judgment when interpreting the application to individual projects. The panel members concluded they would be providing greater benefit to the Sponsor by concentrating on future needs/requirements rather than on existing programs.
Table 1. General research capabilities identified by Navy, Army and Air Force to ensure the dental readiness and oral health of Soldiers, Sailors, Airmen, and Marines.

<table>
<thead>
<tr>
<th>Need/requirement</th>
<th>Resource</th>
<th>ASDHA Goals**</th>
<th>Applicability/Source</th>
</tr>
</thead>
<tbody>
<tr>
<td>A Develop new dental materials suitable for the military environment and test existing dental materials for military suitability.</td>
<td>Military S&amp;T</td>
<td>4</td>
<td>Navy, Army, Air Force</td>
</tr>
<tr>
<td>B Develop programs to assess risk and prevent oral diseases and dental emergencies in operational forces (to include an evaluation of the present DoD dental classification system).</td>
<td>Military S&amp;T</td>
<td>1,2,3</td>
<td>Navy, Army, Air Force</td>
</tr>
<tr>
<td>C Capability to remove heavy metal contaminants from dental wastewater in military installations.</td>
<td>COTS</td>
<td>4</td>
<td>Navy, Army, Air Force</td>
</tr>
<tr>
<td>D Develop dental equipment suitable for use in an operational environment.</td>
<td>Military S&amp;T</td>
<td>3,4,6</td>
<td>Navy, Army, Air Force</td>
</tr>
<tr>
<td>E Develop and evaluate the effectiveness and efficiency of dental care delivery systems and procedures in a military setting.</td>
<td>Military S&amp;T</td>
<td>1,2</td>
<td>Navy, Army, Air Force</td>
</tr>
<tr>
<td>F Develop rapid/inexpensive methods via saliva for detection of military relevant diseases/exposures to toxins or chemicals.</td>
<td>Require more information*</td>
<td>1,2,3,4</td>
<td>Navy, Army, Air Force</td>
</tr>
</tbody>
</table>

* Chem/bio targets may be unique but not unique to dentistry, other targets may not be unique to military S&T  
** As listed on page 6.
The panel found that many of the Naval Dental Research Institute FY00 6.3 Congressional Research Projects as presented to the panel fall within the overarching needs/requirements described in Table 1. Accordingly, they have been cross-referenced to Table 1.

<table>
<thead>
<tr>
<th>Need Requirement</th>
<th>Resource</th>
<th>Table 1 X-reference</th>
</tr>
</thead>
<tbody>
<tr>
<td>Salivary diagnostic tests for systemic diseases and chem/bio threats</td>
<td>See Table 1</td>
<td>F</td>
</tr>
<tr>
<td>Forward deployed dental chem/bio and toxic hazard control systems</td>
<td>COTS</td>
<td>C</td>
</tr>
<tr>
<td>Forward deployed homeostatic dental dressing</td>
<td>Military S&amp;T</td>
<td>A</td>
</tr>
<tr>
<td>Advanced IDC dental triage informatics system</td>
<td>Military S&amp;T</td>
<td>B,E</td>
</tr>
<tr>
<td>Dental treatment needs data management system</td>
<td>Military S&amp;T</td>
<td>B</td>
</tr>
<tr>
<td>Effective protocols for dental sealant placement for military accessions</td>
<td>Military S&amp;T</td>
<td>E</td>
</tr>
<tr>
<td>Risk assessment tools for oral diseases</td>
<td>Military S&amp;T</td>
<td>B,E</td>
</tr>
<tr>
<td>Criteria to assess operational dental readiness</td>
<td>Military S&amp;T</td>
<td>B,E</td>
</tr>
<tr>
<td>Smokeless tobacco use cessation</td>
<td>COTS*</td>
<td>B</td>
</tr>
</tbody>
</table>

* Smokeless tobacco cessation programs are COTS. In some cases research protocols to evaluate the efficacy of cessation programs in unique military environments may be Military S & T.

At the request of the Expert Review Panel the Chief of the US Army Dental Corps identified the following needs/requirements.

<table>
<thead>
<tr>
<th>Need/Requirement</th>
<th>Resource</th>
<th>Table 1 X-reference</th>
<th>ASDHA Goals**</th>
</tr>
</thead>
<tbody>
<tr>
<td>Caries vaccine</td>
<td>Civilian S&amp;T</td>
<td>A</td>
<td>2,3</td>
</tr>
<tr>
<td>An improved anti-plaque rinse</td>
<td>COTS</td>
<td>A</td>
<td>2,3</td>
</tr>
<tr>
<td>Long term non-narcotic analgesic</td>
<td>Military S&amp;T</td>
<td>A</td>
<td>1,2,3,4</td>
</tr>
<tr>
<td>Ultra light weight equipment</td>
<td>Military S&amp;T</td>
<td>D</td>
<td>4,6</td>
</tr>
<tr>
<td>Paperless records</td>
<td>Military S&amp;T*</td>
<td>D,E</td>
<td>2,4,6</td>
</tr>
<tr>
<td>Hand held salivary diagnostics</td>
<td>Requires more information</td>
<td>F</td>
<td>1,2,3,4</td>
</tr>
</tbody>
</table>

* As developed for an operational environment
** As listed on page 6.
The following projects were selected from the *US Army Dental Research Detachment Current and Proposed Research Projects/Products*. Only those projects that had received a top ten priority score in a survey of all active duty US Army Dental Officers conducted by the US Army Dental Research Detachment were addressed by the Expert Review Panel.

<table>
<thead>
<tr>
<th>Need/Requirement</th>
<th>Resource</th>
<th>Table 1 Xreference</th>
<th>ASDHA Goals**</th>
</tr>
</thead>
<tbody>
<tr>
<td>Filmless dental imaging system</td>
<td>Military S&amp;T*</td>
<td>D,E</td>
<td>2,4,6</td>
</tr>
<tr>
<td>Surveillance of military dental operations</td>
<td>Military S&amp;T</td>
<td>B,E</td>
<td>1,2,3</td>
</tr>
<tr>
<td>Sustained release anesthetics and Analgesics</td>
<td>Military S&amp;T</td>
<td>A</td>
<td>2,4,6</td>
</tr>
<tr>
<td>X-ray system, dental, miniature</td>
<td>Military S&amp;T</td>
<td>D</td>
<td>4,6</td>
</tr>
<tr>
<td>Electric dental handpieces</td>
<td>COTS</td>
<td>D</td>
<td>4,6</td>
</tr>
<tr>
<td>Novel anti-plaque agent &amp; preventive dentistry items in MRE</td>
<td>Military S&amp;T</td>
<td>A,D</td>
<td>2,3</td>
</tr>
<tr>
<td>Develop more stable anesthetics (antioxidants, better containers)</td>
<td>Military S&amp;T</td>
<td>A</td>
<td>1,2,3,4</td>
</tr>
<tr>
<td>Sustained release metronidazole for the localized treatment of</td>
<td>Potentially available from</td>
<td>A</td>
<td>4,6</td>
</tr>
<tr>
<td>Periodontal and endodontic abscesses</td>
<td>other sources</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Field hand washing sink</td>
<td>Military S&amp;T</td>
<td>D</td>
<td>4,6</td>
</tr>
<tr>
<td>Predictive value of DoD dental classification criteria</td>
<td>Military S&amp;T</td>
<td>B</td>
<td>1,2,3</td>
</tr>
</tbody>
</table>

* As developed for an operational environment

** As listed on page 6
The panel addressed those needs/requirements recommended by the Air Force DIS in the *Talking Paper on Air Force Research Issues*. Many of the needs/requirements presented therein are included in Table 1. Those needs/requirements not listed elsewhere in this report are addressed below.

<table>
<thead>
<tr>
<th>Need/Requirement</th>
<th>Resource</th>
<th>Table 1 Xreference</th>
<th>ASDHA Goals*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Develop a model to predict dento-facial battle trauma in urban area warfare.</td>
<td>Military S&amp;T</td>
<td>B</td>
<td>5,6</td>
</tr>
<tr>
<td>Validate the present restriction that prohibits an aviator from flying prior to 24 hours post treatment for endodontic and like dental procedures.</td>
<td>Military S&amp;T</td>
<td>B</td>
<td>2,3</td>
</tr>
</tbody>
</table>

* As listed on Page 6.

**ADDITIONAL OBSERVATIONS AND RECOMMENDATIONS**

#1

The panel recognizes the past and present programs represent *state-of-the-art* dental research but are hampered by discontinuous funding streams. The panel recommends that each of the Services provide a core budget to these programs that will provide the continuity in staffing and base programs needed to continue this vital research.

#2

The Expert Review Panel applauds the Naval Dental Research Institute, the US Army Dental Research Detachment, and the Air Force Dental Investigative Service for their highly successful, mission relevant, mission oriented programs. The panel finds the ratio of products (defined as deliverables to the operational forces) per resources invested to be significantly higher than most programs. There are enough military S&T opportunities presented during the course of this review to merit S&T investment far greater than $3,000,000.

#3

The panel finds that a tri-service command structure offers significant advantages over simply co-locating the three dental research organizations. The diversity in mission and capabilities of the three services provide a comprehensive program of basic research, applied research, and translation to deployment for new and improved technologies and methodologies. Tri-service command offers not only cost savings and increased effectiveness and efficiency but also creates a threshold of talent that is critically important for continuity of effort.
APPENDIX A
APPENDIX A

Office of Naval Research
Dental Research Review
Statement of Work

We anticipate that Congressional Added Funds for Dental Research ($3M) will be provided to the Navy for FY00. As the Navy's science and technology organization the Office of Naval Research (ONR) must ensure that the investment strategy for these Congressionally added funds optimally supports military operational medicine needs.

ONR desires to commission a review of military dental needs with the objective of identifying any issues that require an investment of Navy science and technology funds. Since the funds are Congressional it is appropriate to review Army, Air Force, and Navy dental research. The main objective of the review is to assess specific military dental requirements and determine if there are militarily unique problems that require defense science and technology funding to ensure operational dental readiness for our military forces.

It is essential to establish that identified dental research requirements are in direct support of operational dental readiness for the maintenance of oral health and wellness of military personnel. Moreover, it is imperative to identify those dental medical requirements that directly support military dental science and technology research vice requirements that support off-the-shelf dental technology or efforts supported within the civilian dental health research sector. A critical aspect of the review is to differentiate between military dental needs requiring research and development efforts and needs related to non-operational dental care delivery, policy, and training modifications.

Additionally, the review should delineate requirements related to a characterization of the duties of deployed military dentists in operational settings, including operations other than war, and of the specialized support deployed military dentists currently require to perform their mission. It is important to define what dental circumstances must be addressed to maintain military oral health to prevent dental emergencies and to ensure a rapid return to operational duty for deployed military personnel.

The commissioned review will not focus on the technical quality of ongoing military dental research efforts.

The review committee should be comprised of six to eight individuals with expertise in dental science and military operational medicine, including dental missions. Individuals selected to serve on the review committee require the approval of ONR with input from the military services.

A verbal summary of the review findings should be presented to ONR not later than 22 October, 1999 with a full written report of findings, including supporting documentation, to be submitted by 19 November, 1999.
APPENDIX B
APPENDIX B

DENTAL RESEARCH EXPERT REVIEW PANEL

James Cecil, DMD
Public Service Program
University of Kentucky, College of Dentistry
Former Commanding Officer, Naval Dental Research Institute
Former Senior Advisor to the Assistant Secretary of Defense for Health Affairs

Frederick C. Eichmiller, DDS
Director, Paffenbarger Research Center
Polymers Division
National Institute of Standards and Technology

RADM Robert J. (Skip) Collins, DMD, MPH (USPHS, RET)
Deputy Executive Director
International Association for Dental Research
American Association for Dental Research
Former Chief of Public Health Service Dental Corps

Daniel M. Meyer, DMD
Associate Executive Director for Science
American Dental Association
Former Chief Scientist, Naval Dental Research Institute

MG John J. Cuddy (DC, USA, RET)
Dental Associates
Former Chief of Army Dental Corps

RADM Richard G. Shaffer (DC, USN, RET)
Co-Chairman of Review Panel
Former Chief of Naval Dental Corps
Former Officer of International College of Dentists

Life Sciences Research Office Staff

Michael Falk, Ph.D
Director
Project Manager

Carol Rilley
Administrator
APPENDIX C
**Wednesday, October 20**

0730  Breakfast

0750  Welcome  
Dr. Michael Falk, Director  
Life Sciences Research Office

0800  Introduction  
Dr. Harold Guard, Head  
Human Systems S & T Department, ONR

0830  Navy Dental Needs/Requirements  
RADM Jerry Johnson  
Assistant Chief for Dentistry (MED-06)  
Chief, Navy Dental Corps (MED-00DC)

0930  Navy Dental Requirements and Funding Environment  
CAPT Robert Kelly, CO  
Naval Dental Research Institute

1030  Break

1045  Naval Dental Research Institute Program  
CAPT Gordon Jones  
Naval Dental Research Institute

1230  Lunch

1330  Industrial Perspective  
Dr. David Alexander  
Block Drug, Inc.

1430  FDA Perspective  
Dr. Susan Runner  
CDRH, FDA

1530  Break

1545  Panel Discussion

1730  Close of Day One
Thursday, October 21

0800  Breakfast and Executive Session

0830  Air Force Dental Research Program

0930  NIH Dental Research Program

1030  Break

1045  Army Requirements Determination Process
Performers of Biomedical Research in the US Army
The Dental Threat, Research Funding Programs

1145  Army Combat Developments Process

1230  Lunch

1330  Army Dental Needs
Viewpoint of the Dentist Warfighter

1415  Congressional Special Interest Programs

1445  Army Dental Research Detachment Program

1530  Break

1545  Army Dental Research Detachment Program (continued)

1700  Panel Discussion

1730  Close of Day Two

---

Friday, October 22, 1999

0830  Breakfast and Executive Session
<table>
<thead>
<tr>
<th>Time</th>
<th>Event</th>
</tr>
</thead>
<tbody>
<tr>
<td>0900</td>
<td>Panel Deliberations - Executive Session</td>
</tr>
<tr>
<td>1030</td>
<td>Break</td>
</tr>
<tr>
<td>1045</td>
<td>Panel Deliberations - Executive Session</td>
</tr>
<tr>
<td>1230</td>
<td>Lunch</td>
</tr>
<tr>
<td>1330</td>
<td>Panel Deliberations – Executive Session</td>
</tr>
<tr>
<td>1400</td>
<td>Panel Briefing to ONR Staff</td>
</tr>
<tr>
<td>1600</td>
<td>Close of Day Three/Close of Meeting</td>
</tr>
</tbody>
</table>
Appendix D
NAVY
Dental Research Review

October 20, 1999

Harold Guard, Ph.D.
Head, Human Systems S&T Department
Goal

Review military dental needs with the objective of identifying issues that require an investment of Navy Science and Technology funds.
Perform an independent, objective review defining S&T opportunities to meet the Navy's dental needs.
The Chief of Naval Operations determines the Navy's needs and requirements.
Meeting Requirements

The Chief of Naval Research determines those areas where S&T is needed to meet the CNO's requirements.
Panel’s Charter

- Document needs/requirements
- Determine if needs/requirements are being met by “other” sources (e.g. COTS/NIH/university/industry)
- Recommend needs/requirements that should be supported by Navy S&T funds
Follow-On

Panel's findings will be considered in the development of Navy's future investment strategy for Dental S&T.
NAVAL DENTAL RESEARCH INSTITUTE

LIFE SCIENCES RESEARCH OFFICE STUDY

CAPT J. Robert Kelly
CAPT Gordon K. Jones
20 October 1999

NAVAL DENTAL RESEARCH

- Navy Research Environment
- Naval Dental Research Program
  - Specific Projects, Requirements, and Customers
  - Recent Historical Perspectives
  - Expenditures and Personnel Issues
- NDRI Alignment Efforts
Assessment of Naval CONUS Medical Research Laboratories

Final Report
16 February 1999

PriceWaterhouseCoopers

Navy Dental/Medical Research Environment

- Fundability Criteria
- Requirements Process
FUNDING

Change Driver

- **Funding code change.** Research dollars formerly coded as “M” for medical research are now coded as “R” for general research.

Impact

- **Competition.** Navy Medical Research Labs must now compete with all Navy research assets for continued funding.

PWC

---

"ONR funding strategy is more aggressive."

- Military-relevant
- Cost-effective
- Scientifically meritorious

PWC
Military-relevant: Providing a Future Navy "Capability"

Enabling Capabilities:

• Healthy and Fit Force
• Casualty Prevention
• Casualty Care Management

ONR

Healthy and Fit Force

Supporting Capabilities

• Physical and psychological performance enhancers.
• Preservation of health.
• Mitigation of fatigue and stress.

ONR
Casualty Prevention

Supporting Capabilities

- Protect the warfighter against all CBRE/ID threats.
- Provide warfighter CBRE/ID situational awareness.
- Smart uniform - (personal protection, cognitive and psychological monitoring/report, hazard warning).
- Biomedical engineering for escape and survival.

ONR

Casualty Care Management

Supporting Capabilities

- Resuscitative medicine - Far forward autonomous medical care & shipboard care.
- Maintenance of performance with minor injuries:
  - Stabilization, sustainment, and restoration of health and performance for military specific injuries.
- Critical care en-route during evacuation without trained caregiver.

ONR
Programmatic Funding Categories

- **Program 6:** Research & Development
- **Program 8:** Training, medical, and other general personnel activities.
  - (inc. health care delivery)

Planning, Programming, and Budgeting System

- **Planning:** Future Strategy
- **Programming:** 2 - 7 y in Future
- **Budgeting:** 2 - 3 y in Future

↓

Program Objective Memorandum (POM)

DOD
Navy Research POM Process

- **Program 6:**
  - Introduce “research requirements” into the ONR POM.

- **Program 8:**
  - Introduce “requirements” into the BUMED (Dental Corps - MED-06) POM.
  - Submit competitive applications for ONR core funds (if available).

“Requirements” Process has Changed for Naval Medical Research

- **Science and Technology Requirements Guidance (STRG) no longer exists (FY99).**
- **JCTG1 (Dental Research) was disestablished (FY98).**
Military Dental Research
Facilities - 74,800 Ft²

NTC Great Lakes, IL
Buildings 1H, 43-H, 14-BH

- 35,500 Ft² - Navy
- 34,300 Ft² - Army
- 5,000 Ft² - Air Force

Naval Dental Research Institute
Manpower

[Pie chart showing the breakdown of manpower by branch and role]
US Navy Biomedical Research Organization

Naval Dental Research Institute

Definitions

Requirements = ONR Requirements

"Requirements" = S & T requests directed to NDRI
Naval Dental Research Institute
DoD Background

- Armed Services Biomedical Research Evaluation and Management (ASBREM) Board
- Joint Technology Coordinating Group (JTCG) 1
- DoD Biomedical Technology Area Review and Assessment (TARA) Board
- DoD Vision 21 Plan
- JTCGs 5 and 6 - Combat Casualty Care and Military Operational Medicine (1998)
- DTO Process (FY98 & FY99)

Naval Dental Research Institute
DoN Background

- Manual of the Medical Department, Chapter 6
- DoN S&T Round Table (N091)
- DoN Science and Technology Requirements Guidance (STRG)
- Direct requests from N46, CinC PAC, CinC US NAV EUR, HQMC, BUMED 06, and NDCs
- MED 06 Dental Research Alignment Committee (DRAC)
- Vanguard War Game
- Future Naval Capabilities Process
Naval Dental Research Institute
DoN Background

- DoN Science and Technology Requirements Guidance (STRG)

11. Operational Medicine

3. Prevention

   h. Improve Dental Readiness

   Priority = Low

Naval Dental Research Institute
Basic “Requirement”
MANMED (CH. 6)

“The primary objective of naval dental research is to increase operational readiness of Navy and Marine Corps personnel”
Naval Dental Research Institute

Customers
THE FLEET
CinCs, HQMC, Line, NDCs, DoD, Army, Air Force

Others
N-091 (1998 STRG), MED 06 (1999 DRAC), Civilian Universities, Congress, Environmental Protection Agency, Veterans Administration, Government Services Administration

---

Naval Dental Research Institute
Specific “Requirements”

- **N-46**
  - SMART Card Technology

- **BUMED 06**
  - Managed Dental Care Evaluation
  - Sealant Effectiveness

- **Headquarters, USMC**
  - Dental Emergency Analysis
  - Risk Assessment
  - Electronic Dental Data Transfer/SMART Card Technology

- **CinC Pac**
  - Managed Dental Care Evaluation
  - Dental Emergency Analysis
  - Risk Assessment
  - Multimedia Diagnostic Systems
  - C/B Contaminant Removal

- **CinC USNavEur**
  - Multimedia Diagnostic Systems

- **NDC Great Lakes**
  - 3rd Molar Diagnosis

- **NDC Camp Pendleton**
  - Data Transfer Technology
### Naval Dental Research Institute

#### S&T History

<table>
<thead>
<tr>
<th>FY</th>
<th>Driver</th>
<th>Funding</th>
<th>Priority</th>
</tr>
</thead>
<tbody>
<tr>
<td>FY98</td>
<td>Various (Long Term Work Units)</td>
<td>ONR P 6</td>
<td>STRG Low</td>
</tr>
<tr>
<td>FY99</td>
<td>MED 06 DRAC (Projects)</td>
<td>Congressional P 6</td>
<td>None</td>
</tr>
<tr>
<td>FY00</td>
<td>MED 06 DRAC Future Naval Capabilities</td>
<td>Congressional P 6</td>
<td>IPT High</td>
</tr>
<tr>
<td>FY01</td>
<td>Future Naval Capabilities</td>
<td>Congressional P 6</td>
<td>IPT High</td>
</tr>
<tr>
<td>FY02</td>
<td>Future Naval Capabilities</td>
<td>ONR P 6, P 8, BUMED P 8</td>
<td>IPT High</td>
</tr>
</tbody>
</table>

### Naval Dental Research Institute

#### Congressional Funding

Defense Appropriations bills contain funds specifically for Military Dental Research (NDRI and USADR together)

- **FY 98** - $2 M (Army P 6.3)
- **FY 99** - $3 M (Navy P 6.3)
- **FY 00** - $3 M (Navy P 6.3)
Naval Dental Research Institute
NDRI Funding FY97- FY00

Naval Dental Research Institute
Current Products
Grant/Alternative Funding

- Bis Phenol A/Sealant Reports
- Hg Contaminant Controls
- SMART Technology
- Tobacco Cessation Tools
- Genetic Biomarkers
Naval Dental Research Institute

**FY98 6.1 ONR Work Units ($200K)**

<table>
<thead>
<tr>
<th>Project Description</th>
<th>Funding</th>
</tr>
</thead>
<tbody>
<tr>
<td>Operational Dental Readiness Evaluation Methods</td>
<td>$128K</td>
</tr>
<tr>
<td>Protein Pattern Recognition (Det)</td>
<td>$72K</td>
</tr>
</tbody>
</table>

**FY98 6.3 ONR Work Units ($630K)**

<table>
<thead>
<tr>
<th>Project Description</th>
<th>Funding</th>
</tr>
</thead>
<tbody>
<tr>
<td>Diagnosis of Militarily Relevant Diseases</td>
<td>$100K</td>
</tr>
<tr>
<td>Diagnostics for the Assessment of Dental Readiness</td>
<td>$70K</td>
</tr>
<tr>
<td>Surgical Complications in Active Duty Women</td>
<td>$90K</td>
</tr>
<tr>
<td>Control of Chemical and Biologic Contaminants</td>
<td>$0K</td>
</tr>
<tr>
<td>Dental Readiness thru Prioritization of Treatment</td>
<td>$85K</td>
</tr>
<tr>
<td>Control of Operational Dental Casualties</td>
<td>$45K</td>
</tr>
<tr>
<td>Management of Field Dental Emergencies</td>
<td>$25K</td>
</tr>
<tr>
<td>Dental Material Failure Analysis (Det)</td>
<td>$60K</td>
</tr>
<tr>
<td>Develop Oral Diagnostic Techniques (Det)</td>
<td>$105K</td>
</tr>
<tr>
<td>Periodontal and Endodontic Infections (Det)</td>
<td>$50K</td>
</tr>
</tbody>
</table>

---

Naval Dental Research Institute

**FY99 6.3 Congressional Research Projects ($1,491K)**

<table>
<thead>
<tr>
<th>Project Description</th>
<th>Funding</th>
</tr>
</thead>
<tbody>
<tr>
<td>IDC Automated Dx Program (HTML)</td>
<td>$78.9K</td>
</tr>
<tr>
<td>Readiness through Prioritization of Tx</td>
<td>$105.0K</td>
</tr>
<tr>
<td>Tx Needs on Ships without Dental Officers</td>
<td>$143.5K</td>
</tr>
<tr>
<td>Dental Sealant Effectiveness</td>
<td>$217.5K</td>
</tr>
<tr>
<td>Salivary Dx of Militarily Relevant Diseases</td>
<td>$203.6K</td>
</tr>
<tr>
<td>Salivary Dx with Fluorescence Polarization</td>
<td>$158.3K</td>
</tr>
<tr>
<td>Diagnostics for Assessment of Readiness</td>
<td>$133.4K</td>
</tr>
<tr>
<td>Far-Forward Dental Restorative Materials</td>
<td>$178.2K</td>
</tr>
<tr>
<td>Bioactive Apatitic Cements</td>
<td>$152.6K</td>
</tr>
<tr>
<td>Contaminant Controls for Dental Field Units</td>
<td>$80.0K</td>
</tr>
<tr>
<td>Estrogenicity of Dental Sealants</td>
<td>$40.0K</td>
</tr>
</tbody>
</table>
Naval Dental Research Institute
S & T Products
1995-98

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Papers</td>
<td>8</td>
<td>8</td>
<td>6</td>
<td>9</td>
<td>31</td>
</tr>
<tr>
<td>Abstracts</td>
<td>10</td>
<td>8</td>
<td>16</td>
<td>16</td>
<td>50</td>
</tr>
<tr>
<td>Patents/CRADAs</td>
<td>2</td>
<td>7</td>
<td>3</td>
<td>3</td>
<td>15</td>
</tr>
<tr>
<td>Other</td>
<td>1</td>
<td>1</td>
<td>3</td>
<td>3</td>
<td>8</td>
</tr>
<tr>
<td>Total</td>
<td>21</td>
<td>24</td>
<td>28</td>
<td>31</td>
<td>104</td>
</tr>
</tbody>
</table>

Naval Dental Research Institute
Deliverables

- Image Quiz CD - Delivered
- IDC CD - Delivered
- C/B Contaminant Removal Systems - Delivered
- Bis Phenol NIH/NIDCR (Pilot) - Delivered
- Third Molar Emergencies - Delivered
- SMART Card (Exam Module) - Delivered
- Data Transfer Program - Delivered
- Bis Phenol NIH/NIDCR (Main) - Fall 99
- MuSt, PA, Lacto Tests to Licensing - Winter 00
- Tuberculosis Test Patent - Spring 00
- IDC HTML - Summer 00
- Tobacco Cessation - Ongoing
**Naval Dental Research Institute**  
FY00 6.3 Congressional Research Projects ($1,410K)

- Salivary Dx Tests for Systemic Diseases and CB Threats (H)
- Forward Deployed Dental CB and Toxic Hazard Control Systems (H)
- Forward Deployed Homeostatic Dental Dressing (H)
- Advanced IDC Dental Triage Informatics System (C)
- Dental Treatment Needs Data Management Systems (C)
- Effective Protocol for Dental Sealant Placement for Military Accessions (C)
- Risk Assessment Tools for Oral Diseases (C)
- Criteria to Assess Operational Dental Readiness (C)
- Smokeless Tobacco Use Cessation (I)

**Naval Doctrine for the 21st Century Operational Maneuver From The Sea (OMFTS)**

350-500 Miles

- Dental Officers
- IDCs
- Naval Doctrine for the 21st Century
- Ships 150 to 200 miles offshore
- Land forces 200-300 miles inland
- All support directly from ships by air
- No logistics “pipeline” or depots ashore
Dental Capabilities in Support of Operational Maneuver From The Sea

- Salivary Diagnostic Tests for CB Threats
- Forward Deployed Dental CB Control Systems
- Forward Deployed Restorative Material
- Advanced IDC Dental Triage Informatics System
- Risk Assessment Tools for Oral Diseases
- Criteria to Assess Operational Dental Readiness

SCIENCE AND TECHNOLOGY CORPORATE BOARD
FUTURE NAVAL CAPABILITIES INFORMATION MEMORANDUM

"On 17 June, 1999, you approved a new process for the DON Science and Technology Program in which approximately half of the S&T budget will be focused on programs that enable the highest priority future Naval capabilities to be delivered to the fleet/force."

PAUL G. GAFFNEY II
Rear Admiral, U.S. Navy
Chief of Naval Research
SCIENCE AND TECHNOLOGY CORPORATE BOARD
FUTURE NAVAL CAPABILITIES
INFORMATION MEMORANDUM

12 Future Naval Capability Areas
RADM Gaffney's Criteria

⇒ Represent true Naval needs of the future
⇒ Ensure the transition focus on fleet/force introduction and intermediate programs

SCIENCE AND TECHNOLOGY CORPORATE BOARD
FUTURE NAVAL CAPABILITIES
INFORMATION MEMORANDUM

Integrated Product Teams

⇒ One for each capability area
⇒ Lead by OPNAV of USMC Flags
⇒ Define and prioritize Specific Capabilities
⇒ Begin development of an S&T program to enable realization of those capabilities
FUTURE NAVAL CAPABILITIES

Warfighter Protection

Future Naval Capability

Enabling Capabilities

Supporting Technologies

- Combat Casualty Care and Management: Maximize the continuum of care with lifesaving interventions as far forward as possible in an increasingly lethal battlespace with reduced infrastructure and logistics
- Casualty Prevention: Enhance Warfighter situation awareness and counter threats from disease, battle and non-battle injuries
- Healthy and Fit Force: Preserve health and enhance fitness of ready forces against physical and psychological threats through the continuum of peace and war

Significant Interfaces:
- Information Distribution
- Decision Support
- Expeditionary Logistics
- Capable Manpower

VADM R.A. Nelson
SG
Chair

CAPT G. Critenden
MED-01
Acquisition Lead

CAPT L. Franks
ANDR-01
S&T Lead

CAPT M. Linenthal
N01
Executive Secretary

SCIENCE AND TECHNOLOGY CORPORATE BOARD
FUTURE NAVAL CAPABILITIES INFORMATION MEMORANDUM

Warfighter Protection IPT

- Met 8 Oct 99
- Determined and prioritized Specific Capabilities for inclusion in FY02-07 POM
Naval Dental Research Institute
Specific Capabilities in ONR POM 02-07

HIGH PRIORITY
ONR Program 6 Funds

- Salivary Diagnostic Test for Systemic Diseases and CB Threats
- Forward Deployed Dental CB and Toxic Hazard Control Systems
- Forward Deployed Homeostatic Dental Dressing

Rapid Salivary Diagnostic Tests

- Strep Mutans
- Lactobacillus
- Protease Activity
- Fluorescence Polarization

- Tuberculosis
- Hepatitis C
- Latex Allergy
- INH Compliance
USS Wasp - TB

First Outbreak
* Summer 1998
* Identify, locate, contact, and PPD all hands and all visitors during deployment
* 500-600 PPD Converters
* INH for 6 months with monthly F/U and counseling

Second Outbreak
* Summer 1999
* One crewmember stopped INH, not picked up in F/U, Active Case
* 23 new converters
* Repeat above for them

CB and Toxic Hazards Control Systems

Hg - Now

Ag - Near Future

Cd, Cu, Pb, Zn, Co(II), Ni, Fe(II), Mn
- In the Wings
CB and Toxic Hazards Control Systems

- Dental wastewater effluent from USADR/NDRI-developed field dental units are contaminating battlefields with hazardous chemical waste (Hg, Ag, et al.).
- Hg and Ag-free Dental Amalgam substitutes are under development, but no viable, cost-effective product is likely to be available for 10 to 15 years, at the earliest.
- Co-located (by FY01) Army, Navy, and Air Force dental S&T activities are uniquely situated to conduct dental battlefield contaminant research.
- NDRI has been an Illinois EPA certified Hg S&T facility since 1997.

CB and Toxic Hazards Control Systems

- Local EPA authorities are making this a Tri-service issue affecting capability to provide dental care in garrison, afloat, and in the field, since Military Dental Treatment facilities, due to their size and volume of treatment provided, are prominent targets of opportunity.
- Local EPA standards are constantly being revised downward, requiring constant reinvention of technology.
- NDRI proprietary S&T product has enabled Navy clinics to remain on-line and saved Navy Dental Corps >$150K/year in disposal costs.
- COTS technology is not capable of achieving latest EPA Standard (1631) compliance.
CB and Toxic Hazards Control Systems

2nd Generation - 1996 BDC 1017

1st Generation
1994 Norva

3rd Generation
1998 BDC 237

Annual Hg Removal Cost
FY95 = $150,000
FY97 = $ 6,500

Annual Hg Removal Cost
FY93 = $150,000
FY95 = $ 20,000

Savings thru FY98 = $902 K
Total Cost = $310 K

CB and Toxic Hazards Control Systems

Current and Emerging Technologies

- Biosorbents
  Developed by NRL
  *E. coli* metabolize Hg
- Role of line cleansers
- Line burden
- EPA Test 1631

New Customers - 1999

- NNDC Bethesda
- NDC Far East
- NDC Northwest
- BDC Winter Harbor, ME
- BDC Washington Naval Shipyard, DC
- BDC Ingleside, TX
Deployed Dental Dressing

The Problem

40% of all dental casualty's involve lost tooth structure or restorations

Deployed Dental Dressing

Today's Solution

1950s

1980s
Deployed Dental Dressing

Tomorrow’s Solution

1980s

• Glass Ionomer/Compomer Hybrid
• Unidose, Compact, Long Shelf Life, Manual Delivery System
• No Mechanical Instrumentation
• Durable

2000s

Naval Dental Research Institute
Specific Capabilities in ONR POM 02-07

ONR P 6.3 or Core P 8

★ Advanced IDC Dental Triage Informatics System
★ Dental Treatment Needs Data Management Systems
★ Effective Protocol for Dental Sealant Placement for Military Accessions
★ Risk Assessment Tools for Oral Diseases
★ Criteria to Assess Operational Dental Readiness
Triage Informatics System
Information Technology

DDS / DMD

IMAGEQuiz

Dental Sealant Protocol

In FY96 Navy began placing dental sealants on molars of selected recruits

NDRI tasked by MED 06 with determining the effectiveness of this program

No extant literature concerning use of sealants in young adults
Risk Assessment Tools

* Caries Risk Assessment Protocol
* Rapid Oral Fluid Tests for Dental Caries and Periodontal Disease
* Treatment Outcomes Assessments
* Subtractive Radiographic Assessment of Caries Progression

Dental Readiness Criteria

**IMAGEQuiz**

80% of Dental Emergencies come from service members with an ODR of 1 or 2

ODR is moderately predictive for a population (i.e. 70 dental casualties in a crew of 1000 with an ODR of 80% during a six month deployment)

ODR is NOT predictive on an individual basis
Naval Dental Research Institute
Specific Capabilities in ONR POM 02-07

Referred to Integrated
Navy Lab Research (P 6.3 & P 8)

★ Smokeless Tobacco Use Cessation

Smokeless Tobacco Use Cessation

★ FY97 - Naval Environmental Health Center grant $275K
★ FY99/00 - DoD Health Promotions Request for Proposals $803K
NDRI Alignment Efforts

★ PriceWaterhouseCoopers
★ MED 06 Dental Research Alignment Committee
★ DOD Vision 21

★ Owner is not Sponsor

"The disconnect between the main research sponsor (ONR) and the owner of the labs (BUMED) [...] and the customers, inc. MED-06 [...] is the source of much of the tension and uncertainty at the labs."

__________________________

PWC
NDRI/MED-06 Requirements
Process Goals

• Continue to be aware of, and responsive to, existing and emerging fleet and dental command needs.

• Establish a more formal mechanism to involve Chief, Dental Corps in identifying, validating and prioritizing research needs.

NDRI Alignment

Vision 21, Section 912(C)

★“Seeks to organize military RDT&E assets into integrated, cross-service laboratories by co-locating Army, Air Force, and Navy facilities.”

✔ Done
NDRI Alignment

PriceWaterhouseCoopers

“Strong external scientific review”
★ Validates worthwhile research programs
★ Critical in marketing
★ Adds credibility

✓ In-process

NDRI Alignment

PriceWaterhouseCoopers

★ “Center management attention on research programs.”
★ “Realign research projects into focused research programs.”
★ “Market and conduct integrated science programs.”

✓ In-process
"Navy Labs Provide Capabilities"

★ Ready access to military personnel and equipment.
★ Credible to the Fleet for research applications.

PriceWaterhouseCoopers

Sponsor Driven Research

• Dentist-scientist re-states the sponsor’s requirement as a scientific problem (hypothesis driven research).
• Formulates the scientific issue(s) so that proper literature can be searched/applied and appropriate technologies engaged.

Need military scientists who are fully versed in the operational environment to maximize intellectual success...
NAVAL DENTAL RESEARCH INSTITUTE

Questions?

Visit our Web Page at www.navymedicine/ndri

Naval Dental Research Institute
Research Partners

Government
- DoD(HA)
- VA
- EPA
- NCI
- NIH
- NIDCR
- NIST
- AFRRI
- N-46
- Naval Weapons Systems Crane

Universities
- Eastman Center
- NUDS
- USUHS
- UCLA
- UIC
- Rush Medical School
- U. of Texas, San Antonio
- William and Mary
- Lake Forest College
- U. of Michigan

Industry
- ADA
- GeoCenters
- H.M. Jackson Foundation
- Optiva, Inc.
- 3GI
- Mayo Clinics
- National Medical Systems
- Cary Industries
- L.D. Caulk
Army Co-location

LABS

Bioengineering
Chemistry

Microbiology
Pathology

Surgery

PERSONNEL

<table>
<thead>
<tr>
<th></th>
<th>Billets</th>
<th>Assigned</th>
<th>Aboard</th>
</tr>
</thead>
<tbody>
<tr>
<td>Officers</td>
<td>14</td>
<td>10</td>
<td>10</td>
</tr>
<tr>
<td>Enlisted</td>
<td>27</td>
<td>17</td>
<td>17</td>
</tr>
<tr>
<td>Civilian</td>
<td>2</td>
<td>1</td>
<td>1</td>
</tr>
</tbody>
</table>

Air Force Co-location

Spaces

Dental Equipment  Dental Materials

Dental Laboratory

PERSONNEL

<table>
<thead>
<tr>
<th></th>
<th>Billets</th>
<th>Assigned</th>
<th>Aboard</th>
</tr>
</thead>
<tbody>
<tr>
<td>Officers</td>
<td>6</td>
<td>5</td>
<td>0</td>
</tr>
<tr>
<td>Enlisted</td>
<td>2</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>Civilian</td>
<td>2</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>
Future Status and Role

- Efficiencies and savings resulting from consolidation and coordination of both administrative functions and research activities.
- Functional consolidation, decreased redundancy, reduced infrastructure IAW DoD guidance for FY 2005.
- Provide timely response to mission demands from direct operational support activities.
- Provide “one-stop” shopping for the Tri-Service Dental Chiefs in meeting mission requirements from concept inception through product development, testing and implementation or acquisition.
- Biomaterials Lab.
- Consolidation?

Chronology of Air Force Collocation

15 Apr 1998 - Initial discussions held
15 May 1998 - Familiarization packages sent to DIS
11 Jun 1998 - DIS and AF MEDCOM site visit to Great Lakes
24 Jun 1998 - Input for Tri-service letter
1 Jul 1999 - AF funding for move procured
15 Nov 1999 - Preparation of spaces begun
1 May 2000 - First DIS officer arrives NTC GLAKES
31 Jul 2000 - DIS co-location completed
ARMY
Military Dental Research in the US Army

Review of Military Dental Research
20-22 October 1999

PANEL ISSUES

• Evaluate requirements for Military Dental Research:
  – Threat driven Military requirements
  – Dual-use (military/civilian applications)
  – Duplication with civilian research

• Recommendations for congressional funds for Military Dental Research
  – Should the funds be accepted?
  – How should the funds be used?
### ARMY BRIEFING TOPICS

<table>
<thead>
<tr>
<th>Topic</th>
<th>Presenter</th>
</tr>
</thead>
<tbody>
<tr>
<td>Program 6 vs Program 8</td>
<td>COL Raulin</td>
</tr>
<tr>
<td>Performers of Biomedical Research in the US Army</td>
<td>COL Raulin</td>
</tr>
<tr>
<td>The Dental Threat</td>
<td>COL Raulin</td>
</tr>
<tr>
<td>US Army Requirements Determination Process</td>
<td>LTC(P) Hamilton</td>
</tr>
<tr>
<td>Acquisition Dual-Use Strategy</td>
<td>COL Raulin</td>
</tr>
<tr>
<td>Viewpoint of the Dentist Warfighter</td>
<td>COL Murphy</td>
</tr>
<tr>
<td>USAMRMC Congressional Special Interest Research Programs</td>
<td>COL Raulin</td>
</tr>
<tr>
<td>Congressional Special Interest Appropriations for Military Dental Research</td>
<td>COL Raulin</td>
</tr>
<tr>
<td>Research Program of the US Army Dental Research Detachment</td>
<td>COL Runyan</td>
</tr>
</tbody>
</table>

---

**Leslie A. Raulin, DMD, PhD**

COL, US Army Dental Corps  
Director for Congressional Programs  
Director for Dental Research  
US Army Medical Research and Materiel Command  
504 Scott Street, Ft. Detrick, MD  
21702301-619-7074 DSN 334-7074  
Leslie.Raulin@det.amedd.army.mil
Program 6 vs Program 8

- Funding for the Department of Defense falls under 11 Major Programs
- Each Program reflects a force mission or a support mission
- Each Program contains the resources needed to achieve a time-phased objective
- Congress authorizes Major Programs
- Congress appropriates funds for Major Programs
DOD Major Programs

1. Strategic Forces
2. General Purpose Forces
3. Intelligence and Communications
4. Airlift and Sealift Forces
5. Guard and Research Forces
6. Research and Development
7. Central Supply and Maintenance
8. Training, Medical, and other General Personnel Activities
9. Administration and Associated Activities
11. Support of Other Nations
12. Special Operations Forces

Program 8
Training, Medical and Other General Personnel Activities

- Consists of resources relating to training and education, personnel procurement services, health care, permanent change of station travel, transients, family housing, and other support activities associated with personnel.
- Excluded from this program is training specifically related to and identified with another major program. Housing subsistence, health care, recreation, and similar costs and resources that are organic to a program element, such as base operations in other major programs, are also excluded from this program.
- Program 8 functions and activities, which are mainly centrally managed, provide benefits and support necessary for the fulfillment of DoD programs.
Program 8
MEDICAL BOTTOM LINE

- DOD fixed facility health care

- Education and training of DOD healthcare providers

- Clinical research sponsored by DOD health care facilities

Program 8
RESEARCH EXAMPLES

- Association between serum IL-6 levels and severity of periodontitis

- Survey to determine why dentists leave the Army

- Determination of the oral health status of active duty, reservists, and recruits

- Effectiveness of dental sealants in the prevention of dental caries in recruits
Program 6
Research and Development

- Consists of all research and development programs and activities that have not yet been approved for operational use, and includes:
  - Basic and applied research tasks and projects of potential military application in the physical, mathematical, environmental, engineering, biomedical, and behavioral sciences
  - Development, test, and evaluation of new weapons systems equipment and related programs

---

Program 6
MEDICAL BOTTOM LINE

- Research to develop medical products to help win wars

- Warzone relevant
Program 6
RESEARCH EXAMPLES
Medical Products

- Vaccines to prevent endemic infections
- Vaccines to combat biowarfare agents
- Blood replacements
- Hemostatic agents
- Pharmaceuticals that enhance soldier performance

Program 6
RESEARCH EXAMPLES
Dental Products

- Low-power lightweight dental field equipment
- Extended duration anesthetics and analgesics
- Dental materials that can be stored and used in adverse operational environments
## Types/Uses of Program 6 Dollars – Medical Materiel Acquisition Model

<table>
<thead>
<tr>
<th>6.1 Basic Research</th>
<th>6.2 Applied Research</th>
<th>6.3 Concept Exploration</th>
<th>6.4 Program Definition &amp; Risk Reduction</th>
<th>6.5 Engineering &amp; Manufacturing Development</th>
<th>Production, Fielding, Deployment and Operational Support</th>
</tr>
</thead>
<tbody>
<tr>
<td>Medical Devices</td>
<td></td>
<td></td>
<td>M&amp;G</td>
<td></td>
<td></td>
</tr>
<tr>
<td>New concepts</td>
<td>New concepts</td>
<td>New technologies</td>
<td>New concepts</td>
<td></td>
<td></td>
</tr>
<tr>
<td>New technologies</td>
<td>New technologies</td>
<td>Technology demonstrations</td>
<td>New technologies</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Experimental prototytes</td>
<td>Clinical evaluation</td>
<td>Functional tests</td>
<td>Advanced prototypes</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Limited field testing</td>
<td>Testing</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pharmaceuticals</td>
<td></td>
<td></td>
<td>M&amp;G</td>
<td></td>
<td></td>
</tr>
<tr>
<td>New concepts</td>
<td>New compounds</td>
<td></td>
<td>New concepts</td>
<td></td>
<td></td>
</tr>
<tr>
<td>New compounds</td>
<td>New compounds</td>
<td></td>
<td>New concepts</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Screen candidates</td>
<td>Pharmacokinetic studies</td>
<td>In vivo efficacy testing</td>
<td>Manufacturing practices</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Preformulation</td>
<td></td>
<td>Formulations studies</td>
<td>Long-term preclinical safety studies</td>
<td></td>
<td></td>
</tr>
<tr>
<td>studies</td>
<td></td>
<td>Preclinical safety</td>
<td>IND submission</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>studies</td>
<td>GMP drug formulation</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Phase I &amp; II clinical trials</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Biologics</td>
<td></td>
<td></td>
<td>M&amp;G</td>
<td></td>
<td></td>
</tr>
<tr>
<td>New concepts</td>
<td>New antigens or genes</td>
<td></td>
<td>New concepts</td>
<td></td>
<td></td>
</tr>
<tr>
<td>New antigens or</td>
<td>Define animal</td>
<td>Animal safety/efficacy</td>
<td>Manufacturing practices</td>
<td></td>
<td></td>
</tr>
<tr>
<td>genes</td>
<td>models</td>
<td>Limited GMP production</td>
<td>Long-term preclinical safety studies</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Define effectiveness</td>
<td>IND submission</td>
<td>IND submission</td>
<td></td>
<td></td>
</tr>
<tr>
<td>criteria</td>
<td></td>
<td>Phase II/Phase III safety efficacy</td>
<td>GMP drug formulation</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Limited challenge studies</td>
<td>Phase II/Phase III safety efficacy</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Clinical trials</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Production of 3-5 lots</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Lot consistency studies</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Phase III clinical trials</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Production</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Post market surveillance</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Post market surveillance</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Performers of P6 and P8 Army Biomedical Research

WHO PERFORMS P6 MILITARY DENTAL RESEARCH?

- Naval Dental Research Institute (NDRI)
- US Army Dental Research Detachment (USADRD)

NOTE: Air Force Dental Investigations Service (DIS) will soon move to Great Lakes. DIS performs P8 T&E (testing and evaluation).
PAST DENTAL RESEARCH RESPONSIBILITIES

- Navy Dental Research (NDRI)
  - Dental Disease
  - Dental Emergencies
- Army Dental Research (USADRDRD)
  - Combat Casualty Care

CURRENT DENTAL RESEARCH RESPONSIBILITIES

- Research restrictions eliminated
- USADRDRD and NDRI now free to perform warzone relevant research required by the user communities
- USADRDRD has a newly redesigned research program that is more focused on user needs
The Dental Threat

WHY PERFORM MILITARY DENTAL RESEARCH?
THE DENTAL THREAT

• Every deployment venue
• Maladies that remove the soldier, sailor, marine, or airman from his/her unit:
  - Dental emergencies
  - Oral & maxillofacial trauma
1994 Tri-Service Comprehensive Oral Health Survey
Percent of Military Patients by Dental Classification

- Dental disease is endemic in military populations.
- Military populations are at risk for dental emergencies.

1996 Dental Emergency Study
Percent of Dental Emergency Visits by Dental Classification

- Dental emergencies occur in all classification groups
- The incidence of emergencies for Class 1 and 2 patients increases during deployment

NDRI Study
THE DENTAL THREAT

Dental Emergencies

<table>
<thead>
<tr>
<th>Deployment</th>
<th>Rate/100 Troops/Year</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vietnam (2 studies)</td>
<td>16.3</td>
</tr>
<tr>
<td>Field Exercises (4 studies)</td>
<td>18.5</td>
</tr>
<tr>
<td>Desert Shield/Storm (1 study)</td>
<td>14.9</td>
</tr>
<tr>
<td>Somolia (1 study)</td>
<td>23.2</td>
</tr>
<tr>
<td>95% Class 1 &amp; 2 (predicted)</td>
<td>13.7</td>
</tr>
</tbody>
</table>

- Dental diseases are chronic destructive infections that cannot be cured. Class 1 & 2 patients have dental emergencies.
- Vietnam emergency rate (16.3%) was unacceptable to line commanders.
- Even with improved predeployment care, 13.7% of military personnel will have dental emergencies during deployments.
- Military Dental Research provides technologies to further decrease the incidence and impact of dental emergencies.

THE DENTAL THREAT

Oral & Maxillofacial Trauma

- Vietnam:
  - 1.06/100 soldiers/year ('67-'68)
  - 10-15% of trauma admissions
  - 68.4% battle injury/31.6% non-battle injury
  - 84.4% admitted/15.8% outpatient care
  - 58% treated by DC, 35% treated by DC/MC teams

- Military Dental Research provides technologies to:
  - Reduce incidence of trauma
  - Stabilize trauma patients prior to evacuation
  - Decrease morbidity and mortality
THE DENTAL THREAT
RAND Corporation Study - OOTW*

• OOTW missions studied:

• Balkans: "demand for emergent dental care was relatively high ... due to the low levels of dental readiness [of coalition forces]."

• Somalia: "The dentists were some of the busiest of all providers, ... as much as 20% of all outpatient visits ... were for dental care."

• Demand for services:
  - High demand:
    • Primary care
    • Dental care
    • Preventive medicine
    • Combat Stress support
    • Linguistics support
    • Veterinary support
    • Medical logistics
  - Low demand:
    • Trauma care


---

THE DENTAL THREAT
MHS and DA Performance Metrics

<table>
<thead>
<tr>
<th>Functional Area</th>
<th>MHS Performance Measure</th>
<th>MHS Report</th>
<th>MHS Strategic</th>
<th>MHS Corporate</th>
<th>DA Installation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Readiness Medical Readiness Trained &amp; Certified</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dental Readiness</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td></td>
<td></td>
</tr>
<tr>
<td>% of Troops Meeting Medical Deployment Standards</td>
<td>X</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>% of Medical Personnel Meeting Deployment Standards</td>
<td>X</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Milestones met on HISP</td>
<td>X</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Status Report from Medical SORTS (Classified)</td>
<td>X</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>DNS</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Professional Officer Filler System (PROFS) Fills</td>
<td></td>
<td></td>
<td>X</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Installation Medical Support Units - Personnel Assigned</td>
<td></td>
<td></td>
<td>X</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
THREAT DRIVEN MISSION OF MILITARY DENTAL RESEARCH

To maximize and maintain operational readiness by performing information and materiel research and development to improve preventive and interceptive care prior to deployment and to improve forward support dental care and management of maxillofacial injuries.

SIX GOALS OF MILITARY DENTAL RESEARCH

- GOAL 1 - Know the Problems: Collect and analyze contemporary data on the dental health status and needs of military personnel, especially those who are or will be deployed.
- GOAL 2 - Improve Pre-Deployment Technologies: Improve pre-deployment prediction, prevention, and treatment of individuals likely to become dental casualties once deployed.
- GOAL 3 - Prevent Dental Disease During Deployment: Identify and provide strategies and tools to counter the environmental, behavioral, and psychological aspects of deployment that contribute to dental emergencies.
- GOAL 4 - Improve Forward Dental Treatment to Reduce Evacuations: Improve forward deployed treatment capabilities and thereby decrease the need to evacuate dental emergencies. Sustain readiness through a rapid return to duty.
- GOAL 5 - Prevent Oral and Maxillofacial Trauma: Develop information and materiel to provide better protection from oral and maxillofacial trauma for the deployed soldier, sailor, and airman.
- GOAL 6 - Improve Forward Management of Oral and Maxillofacial Trauma: Decrease the morbidity and mortality associated with oral & maxillofacial trauma when it occurs.
US Army Requirements Determination Process

- Requirements are based on desired Joint and Army capabilities versus known deficiencies
- Start with the National Security Strategy, National Military Strategy, lessons learned from recent operational experiences, and future conflict scenarios
- Process:
  - Anticipate tomorrow’s required capabilities
  - Identify deficiencies in our capabilities
  - Develop requirements to resolve deficiencies
  - Seek solutions to the requirements
US Army Requirements Determination Process

**VISION**

- TRADOC Commander develops the Army's future warfighting vision
- An abstract goal of the future capability
- Influenced by National Security Strategy and National Military Strategy
- Science and technology provide a frame of reference
- Promulgated through a series of white papers discussed by the military, academia, industry, and other futurists
US Army Requirements Determination Process

CAPSTONE WARFIGHTING CONCEPT

- Macro-level translation of the Commander's vision
- Written by an Integrated Concept Team (ICT)
- ICT members are from TRADOC, Army Materiel Command, other Army commands, HQDA, other Services, academia, industry, and others
- Use National Security Strategy, National Military Strategy, Defense Planning Guidance, the Joint Vision, the Army Plan, and other documents
- Becomes the primary guide for all other concept development activities

US Army Requirements Determination Process

CAPSTONE WARFIGHTING CONCEPT

Force Health Protection Capstone Document - Sep 99

Dental Health

Dental health and fitness is an important component of overall personal health. The discomfort and pain of dental disease can cause serious interference with service members' ability to focus on mission-essential tasks. Meeting goals for reduction in the need for treatment of tooth decay, disease, and prosthodontics will be accomplished through strategies including:

- Using vaccines and pharmacological agents to minimize oral disease and fluoridation of all DoD installation water supplies, and
- Identifying individuals at high risk for dental emergencies, reducing member use of tobacco, performing periodic oral cancer screenings, and promoting the use of oral protective devices during contact sports.

Standardized DoD dental systems will be used to measure disease and treatment levels and to determine whether DoD's Dental Classification System is an adequate predictor of dental emergencies.
US Army Requirements Determination Process

WARFIGHTING CONCEPTS OF OPERATIONS

- More detailed concepts of operation
- School commandants and other Army leaders use an ICT to develop the full range of future capabilities needed by the Army to execute the Capstone Warfighting Concept
- For medical, performed by the Directorate of Combat and Doctrine Development of the Army Medical Department Center and School

US Army Requirements Determination Process

FUTURE OPERATIONAL CAPABILITIES

- Structured statements of operational capability required by the Army
- Identified for each operational concept
- Consolidated in TRADOC Pam 525-66
- The control mechanism for requirements determination activities
- Help guide S&T activities - form the basis for experiments, analyses, and other requirements determination activities
FUTURE OPERATIONAL CAPABILITIES
DRAFT 22 Jun 99

Clearing the Battlefield, MD-99-001

1. Principal objective: Enable the Combat Health Support (CHS) System to identify, locate, treat, and evacuate battlefield casualties

2. Principal operational baseline: Field Dental Services

3. Key and enabling elements:
   DRD – Develop lightweight, compact, energy efficient dental equipment, instruments, and sets
   DRD – Develop pharmaceuticals that protect dental health during deployments
   DRD – Develop pharmaceuticals and dental materials that are resistant to environmentally induced deterioration
   DRD – Develop safe expedient procedures to handle and dispose of medical waste and hazardous/toxic materials
     - Digitize health records
     - Interoperability with MC4, TMIP, FBCB2, CSSCS, and GCSS-A
     - Develop automated artificial intelligence (AI) system that requires human intervention only as necessary
   DRD – Develop lightweight field alternatives to steam and cold sterilization procedures

FUTURE OPERATIONAL CAPABILITIES
DRAFT 22 Jun 99

4. DTLOMS considerations:
   T: Increase skills of dental health providers
   DRD M: Development of new dental equipment, instruments, and pharmaceuticals

5. Warfighting concepts of operation linkages: Provide essential dental care across the range of military operations, to include NBC environments to an increasingly diverse population of deployed personnel from all the uniformed and government services, as well as contractor personnel. In addition, on order, dental care must be provided for refugees, EPW, and displaced civilians as the result of combat, civil strife, or natural disasters. Reference TP 525-50, 1 Oct 96.

6. Other considerations: Capabilities adaptable to SASO missions (Stability and Support Operations, new term for OOTW).
US Army Requirements Determination Process
EXPERIMENTATION AND ANALYSIS

- Progressive and iterative mixes of constructive, virtual, and live experiments combined with operational experience and appropriate analyses
- Yield better insights to define warfighting concepts and requirements
- Process:
  - Evaluate ability to meet capabilities
  - Identify deficiencies
  - Establish requirements
- Science and technology assets used to evaluate existing technology and develop new technology

US Army Requirements Determination Process
DTLOMS SOLUTIONS

- **DOCTRINE**: The deficiency is resolved with a change in military doctrine
- **TRAINING**: The deficiency is resolved with a change in military training
- **LEADERSHIP DEVELOPMENT**: The deficiency is resolved with new or improved leadership development programs
- **ORGANIZATION**: The deficiency is resolved with a change in military organizations
- **MATERIEL**: The deficiency is resolved with development and fielding of new materiel. This is the most costly solution and is only considered when non-materiel solutions cannot satisfy the identified requirement
- **SOLDIER**: The deficiency is resolved with additions, deletions, or modifications of the Army’s Military Occupational Classification System
US Army Requirements Determination Process

DTLOMS SOLUTIONS - EXAMPLE

- **FOC**: Provide essential dental care across the range of military operations
- **DEFICIENCY**: Dental field equipment - unreliable, large cube/weight, high power need
- **POTENTIAL SOLUTIONS**:
  - **DOCTRINE**: Do not deploy far forward; only deliver Echelon IV care (field hospital)
  - **TRAINING**: Overcome equipment deficiencies by improving dentist/auxiliary training
  - **LEADERSHIP**: Overcome equipment deficiencies by improving dentist/leadership skills
  - **ORGANIZATION**: Reconfigure dental units so they have personnel to operate/maintain equipment
  - **MATERIEL**: Evaluate COTS field equipment; develop new field equipment
  - **SOLDIER**: Add a dental equipment MOS to ensure adequate maintenance

---

![Diagram](attachment:image_url)

---

US Army Requirements Determination Process

**6.1 – 6.2**
- Basic Research
- Applied Research

**6.3**
- Concept Exploration

**6.4 – 6.5**
- Program Definition & Risk Reduction
- Engineering & Manufacturing Development
MATERIEL ACQUISITION PROCESS

6.1 - 6.2  6.3  6.4  6.5

<table>
<thead>
<tr>
<th>Determination of Mission Need</th>
<th>Concept Exploration</th>
<th>Program Definition &amp; Risk Reduction</th>
<th>Engineering &amp; Manufacturing Development</th>
<th>Production, Fielding / Deployment, and Operational Support</th>
</tr>
</thead>
</table>

Basic Research

Applied Research

PHASE 0

Analysis of Alternatives

Program Initiation

PHASE I

Demonstrate Technology is Achievable

PHASE II

Final Design, Prototypes, Testing

PHASE III

Production, Fielding, Support

Mission Needs Statement (MNS)

Operational Requirements Document (ORD)

Laboratory Research

Advanced Development

ORD Update

ORD Update

Procurement and Support

REQUIREMENTS DOCUMENTS

- **Mission Needs Statement (MNS):**
  - Initiated by the user community (AMEDD Center & School)
  - A broad statement of the materiel need
  - Required for Milestone 0
- **Operational Requirements Document (ORD):**
  - Written by the user community (AMEDD Center & School)
  - More detailed performance characteristics of the item
  - Required for Milestone I
REQUIREMENTS DOCUMENTS for Army Dental Research

- Currently, there are no MNSs or ORDs for any products being developed by USADRDC
- The Army Dental Corps is initiating efforts to request these documents

DUAL-USE STRATEGY

- Acquisition reform encourages the development of dual-use technologies
- Driven by declining resources and desire to share R&D costs
DUAL-USE STRATEGY

• Rather than maintaining defense-unique producers, seeks to foster the creation of a viable domestic industry that is competitive in global markets and able to meet defense requirements drawing on the commercial technology base.

• May call for initial government investments, but these investments will mean substantially lower future outlays as DoD acquires its products at much lower cost from commercial suppliers and relies on a healthy, dynamic, domestic commercial industry to carry the weight of future R&D investments at the leading edge.

DUAL-USE STRATEGY

• To be successful, new initiatives must be guided by six overriding principles:

1. The initiative must be of sufficient scope and duration to attract significant industry participation.

2. Industry must be willing to share in the costs of the initiative. The extent of industry willingness to bear such costs is one of the most important measures of the initiative’s value.

3. The initiative should be based on principles of competition among firms and technologies. Central to this principle is the notion that the initiative will go forward only if industry responds with acceptable proposals and plays a lead role in determining the technologies to pursue.

4. Given the international nature of modern, high-technology industries and the emphasis on achieving leading-edge capabilities, DoD programs should have the flexibility to consider participation by foreign-owned entities that satisfy program objectives.

5. The initiative should be consistent with other government policy objectives. In particular, given the leading role of the United States in supporting an open international trading system and the benefits that such a system has for our economic security, the initiative should be consistent with U.S. obligations under the General Agreement on Tariffs and Trade and the World Trade Organization.

6. The initiative must be subject to sunset provisions and include clear measures of success to force and guide decisions about the continuing necessity of the initiative over the medium- to long-term.
DUAL-USE STRATEGY

BOTTOM LINE: Development of warzone relevant products that also have civilian interest/investment are encouraged.

DUAL-USE STRATEGY

USADRD APPROACH:
- Utilize COTS or NDI items, when available
- Engage in Cooperative Research and Development Agreements (CRDAs), when possible
- Seek industrial partners, when possible
- Keep abreast of civilian research that would benefit the military
US Army Medical Research and Materiel Command

Congressional Special Interest Research Programs (CSI)

BACKGROUND

- Not in the President’s Budget
- Congressional appropriations added to the DoD budget
- Target special interest research programs
- May or may not have military relevance
- The US Army is the executive agent for many of the appropriations
- USAMRMC manages the Army biomedical research programs
- FY92-99: $1.8 billion to USAMRMC
- FY00 $488M projected
- P6 and P8 funds
USAMRMC CSI Appropriations ($M)

USAMRMC CSI Managers

Congressional Special Interest Research Programs

- Congressionally Directed Medical Research Programs (CDMRP) $219.5M
  - Disease-specific Programs, not warzone relevant

- Directorate for Research and Development - Research Area Managers (RAMs) $69.1M
  - +/- warzone relevant programs

- Telemedicine and Advanced Technology Research Center (TATRC) $73.0M
  - High technology programs, +/- warzone relevant
FY99 Programs and Appropriations ($M)

<table>
<thead>
<tr>
<th>RESEARCH AREA MANAGERS</th>
<th>CONDRP</th>
</tr>
</thead>
<tbody>
<tr>
<td>Advanced Technology</td>
<td>8.00</td>
</tr>
<tr>
<td>DOEVU</td>
<td>4.40</td>
</tr>
<tr>
<td>Epinephrine Bullets</td>
<td>1.00</td>
</tr>
<tr>
<td>Gulf War Brews</td>
<td>3.00</td>
</tr>
<tr>
<td>Insuine Membrane Oxygenator</td>
<td>0.85</td>
</tr>
<tr>
<td>Molecular Genetics</td>
<td>3.00</td>
</tr>
<tr>
<td>Musculoskeletal Injuries</td>
<td>2.00</td>
</tr>
<tr>
<td>Nerve System Studies</td>
<td>4.00</td>
</tr>
<tr>
<td>Neuron Exposure Treatment</td>
<td>20.00</td>
</tr>
<tr>
<td>Osteoporosis</td>
<td>2.50</td>
</tr>
<tr>
<td>Pharmacologic Research</td>
<td>0.25</td>
</tr>
<tr>
<td>Portable Cardiopulmonary Bypass Pump and Oxygenator</td>
<td>3.00</td>
</tr>
<tr>
<td>Post Polio Syndrome Research</td>
<td>1.00</td>
</tr>
<tr>
<td>Defense Health Research Program</td>
<td>19.50</td>
</tr>
<tr>
<td>Alcohohol Research</td>
<td></td>
</tr>
<tr>
<td>Chemical Weapons Research</td>
<td></td>
</tr>
<tr>
<td>Digital Intravascular</td>
<td></td>
</tr>
<tr>
<td>Disease Management</td>
<td>8.00</td>
</tr>
<tr>
<td>Healthcare Informbation Technology</td>
<td>10.00</td>
</tr>
<tr>
<td>Laser Eye Injury/Eye Cancer Research &amp; Treatment</td>
<td>3.00</td>
</tr>
<tr>
<td>Lung Cancer</td>
<td>4.00</td>
</tr>
<tr>
<td>Mustard Gas Research (Mustard Gas Antitox)</td>
<td>4.00</td>
</tr>
<tr>
<td>Neurological Examinon Equipment</td>
<td></td>
</tr>
<tr>
<td>Paget's Disease</td>
<td>2.00</td>
</tr>
<tr>
<td>Pediatric Asthma</td>
<td>4.00</td>
</tr>
<tr>
<td>Protein Diagnostic Imaging</td>
<td></td>
</tr>
<tr>
<td>Railon Display Technology for Cardiowascular Research</td>
<td></td>
</tr>
<tr>
<td>Sleep Management</td>
<td></td>
</tr>
<tr>
<td>Smoking Cessation</td>
<td>219.50</td>
</tr>
<tr>
<td>TOTAL CONDRP</td>
<td>219.50</td>
</tr>
</tbody>
</table>

FY99 48 Titles $365,100,000

Congressional Special Interest Research Programs
U.S. Army Medical Research and Material Command

Major Categories of CSI

- Programs with multiple competitive awards:
  - Very high to low dollar appropriations (>100M to $1M)
  - No intended congressional recipient
  - Example: Breast Cancer Research Program (FY00 $175M)

- Programs with intended extramural recipient:
  - Moderate to low dollar appropriations ($10M to <$1M)
  - Earmarked for a specific performing agency
  - Examples:
    - Diabetes Research (Joslin) (FY00 $7M)
    - Advanced Cancer Detection (FY00 $3.5M)

- Programs with intended intramural recipient:
  - Moderate to low dollar appropriations ($7.5M to $2M)
  - Earmarked for a specific DOD performing agency
  - Examples:
    - Center for Prostate Disease Research (FY00 $7.5M)
    - Military Dental Research (FY00 $3M; Navy RDT&E)
Breast Cancer Research Program

- FY00 – $175M – DHP RDT&E
- Research Goals: To eradicate breast cancer. The vision of the BCRP is to challenge the scientific community to design innovative research that will foster new directions for, address neglected issues in, and bring new investigators into the field of breast cancer research. The central theme of the BCRP is innovation. The objectives of the BCRP are to (1) prevent breast cancer, (2) detect breast cancer in its earliest stages of development, (3) cure breast cancer, and (4) improve the quality of life for individuals and their families living with breast cancer.
- Warzone Relevance: No direct military relevance. Indirect military relevance: investment in military research infrastructure, improved quality of life for military personnel and their family members, new prevention and treatment modalities for military personnel and their family members, positive public relations for the DoD.

Diabetes Research (Joslin)

- FY00 – $7M – P6
- Research Goals: Development and implementation of a teleophthalmology diagnostic acquisition system for a multi-regional diabetes pilot demonstration project to test the viability of accessing diabetic patients into a cost-effective, quality eye care program across geographic and cultural boundaries. It includes components required to identify undiagnosed Type 2 diabetes, store and retrieve data for outcome and population based studies, educate patients and health care providers, and facilitate individual diabetes case management strategies. This research program will institute pilot programs for detection, prevention and care in two regions: Hawaii, through Tripler Army Medical Center, and New England, through the Veterans Administration (VA).
- Warzone Relevance: Low.
Advanced Cancer Detection

- FY00 – $3.5M – P6
- Research Goals: (1) expand cancer screening and education systems for the public and health professionals; (2) examine new means to identify cancer at the early stages; (3) refine telemedicine methodology for targeting remote populations; and (4) extend work on defining early cellular changes in transformed cells for applications in early detection of cancer.
- Warzone Relevance: No direct military relevance. Will create the infrastructure that links the H. Lee Moffitt Cancer Center and its programs to military personnel, family members, and retired service members. A computer communications network will be developed that will link various sites (e.g., the MacDill Air Force Base and the Bay Pines Veterans Hospital) with the Moffitt Cancer Center.

Center for Prostate Disease Research

- FY00 – $7.5M – P6
- Research Goals: The mission of the Prostate-Walter Reed program is to establish a Center for Prostate Disease Research (CPDR) at the Walter Reed Army Medical Center. The vision of the Prostate-Walter Reed program is to conduct multidisciplinary basic and clinical research studies aimed at combating prostate cancer and disease at the CPDR. The overall goal of the Prostate-Walter Reed program is to develop more effective, more specific, and less toxic forms of therapy for patients in all stages of prostate disease.
- Warzone Relevance: Low.
- Funding Distribution: MIPR to DOD agency.
- Oversight: Annual reports, peer review reports.
Military Dental Research

- **FY00 – $3M – P6 (Navy; ½ for Army, ½ for Navy)**
- **Research Goals:** General Goals: (1) Know the Problems, (2) Improve Pre-Deployment Technologies, (3) Prevent Dental Disease During Deployment, (4) Improve Forward Dental Treatment to Reduce Evacuations, (5) Prevent Oral and Maxillofacial Trauma, and (6) Improve Forward Management of Oral and Maxillofacial Trauma.
- **Specific Goals:** To develop products that increase soldier's dental readiness/preparedness pre-deployment, to minimize dental emergencies in the warzone through unobtrusive plaque control methodology, to develop equipment that facilitates a rapid return to duty for soldiers experiencing a dental emergency in the warzone, to develop dental materials and anesthetic agents that can withstand the austere environment on the warzone, to identify areas that could be improved through dental research.
- **Warzone Relevance:** High. Dental emergencies constitute 10-14% of all emergencies in deployed soldiers, a level that has significant impact on combat mission accomplishment. In a year, 14% of deployed soldiers will experience a dental emergency requiring treatment. Any significant lessening of dental emergencies in the warzone will have a tremendous value added to the overall mission of the US Army.

---

**CSI Management Model**

- **INPUT**
  - U.S. Congress
  - Department of Defense
  - USAMRMC Staff
  - Funds Appropriated
  - Program Announced
  - Proposal Receipt
  - Peer (Scientific) Review
  - Programmatic Review
  - CG Approval
  - Negotiation of Awards
  - Grants Management
FY99 Congressional Language Complimenting the USAMRMC CSI

Appropriations Conf Cmte. - "The conferees commend the Army for organizing outstanding medical research initiatives in various fields of study that have received high marks from independent review panels and from various advocacy groups. The conferees note especially the 1997 review of the Army's breast cancer research program by the Institute of Medicine of the National Research Council. This review concluded that the Army's program 'fills a unique niche among public and private funding sources for cancer research ... and is a promising vehicle for forging new ideas and scientific breakthroughs in the nation's fight against breast cancer.' The conferees have received similar reports about the other medical research programs managed by the Army."

Congressional Special Interest Appropriations for Military Dental Research
Congressional Special Interest Appropriations for Military Dental Research

HISTORY

• FY96-97:
  – Commander of USADRD approached by the ADA asking if the ADA should lobby Congress for dental CSI
  – Each Service Dental Corps Chief was briefed
  – ADA was given the “go ahead”
  – Understanding between USADRD and NDRI personnel:
    • Funds would be split 50/50
    • Funds would augment core funds, not replace them
    • Seek opportunities to provide funds to DIS

• FY98:
  – $2M appropriated by Congress
  – Navy RDT&E line (P6)
  – Navy declined the funds
  – Funds reprogrammed to Army line
  – Funds received by USAMRMC
  – Funds split 50/50 between USADRD and NDRI
  – Research plan submitted
  – Research protocols not requested
Congressional Special Interest Appropriations for Military Dental Research

HISTORY

• FY99:
  - $3M appropriated by Congress
  - Navy RDT&E line (P6)
  - Funds received by ONR Apr 99
  - ONR requested research protocols
  - Approved protocols being funded

• FY00:
  - $3M appropriated by Congress
  - Navy RDT&E line (P6)
  - Disposition undetermined
Congressional Special Interest Appropriations for Military Dental Research

RECOMMENDATIONS

• Do not rely on CSI funds:
  – Core programs funds should be provided for approved core program research
  – CSI funds should be regarded as a “gift” to augment core funds and to conduct research not resourced by core dollars
  – Do not fund core program salaries with CSI funds; fund salaries of personnel hired specifically for CSI research

• Execute the CSI funds in a flexible manner:
  – Do not strictly adhere to P6 research requirements (warzone relevance)
  – Actively seek the needs of the Service Dental Corps and conduct needed research
  – Examples:
    • Epidemiology of dental diseases during deployments
    • Tri-service oral health needs study
Congressional Special Interest Appropriations for Military Dental Research

RECOMMENDATIONS

• CSI Program Management:
  - Establish a Tri-service programmatic panel to develop and oversee the dental CSI program (engage the user communities – the Service Dental Corps)
  - Provide funds for extramural contracts, grants, and cooperative agreements
  - Require protocols for intramural and extramural research
  - Conduct external peer review for scientific merit
  - Conduct programmatic review for military dental relevance
  - Provide remediation for deficiencies, as needed
  - Ultimately split the funds 50/50 Army/Navy
  - Include DIS in SOWs so DIS can benefit from CIS funds

THANK YOU

QUESTIONS?
AIR FORCE
USAF DENTAL INVESTIGATION SERVICE
USAF School of Aerospace Medicine
Brooks AFB TX
DSN 240-3502
comm (210) 536-3502
e-mail usafsamea.fedpersonnel@brooks.af.mil
http://www.brooks.af.mil/dis
Mission:
• Provide solutions to operational problems of the USAF Dental Service

Mission:
• Conduct a diversified program of investigations and technical evaluations of dental equipment, materials and procedures
Mission:

- Provide guidance on standards for dental facility design, infection control, occupational safety, and compliance with environmental standards

- Represent the Dental Service at technical conferences
  - Standards & Specifications
    - ANSI / ADA
    - ISO

Mission:

- Acts as liaison with other Federal/military research and regulatory agencies
  - Naval Dental Research Institute
  - Army Dental Research Detachment
  - Centers for Disease Control
  - Food and Drug Administration

- Special projects as directed by HQ USAF/SGD
Mission:

- Provide educational support:
  - USAF School of Aerospace Medicine courses
  - Federal Service CE courses
  - Local dental residency programs
  - Resident research design and execution
  - Publications and WWW site

Customers:

- HQ USAF/SGD
- USAF Dental Services
- Other Federal Agency Dental Services
- USAF School of Aerospace Medicine
- Air Force Medical Support Agency
- Jnt Svsc Dental Materiel Coord Group
- Defense Support Center Philadelphia
- Academic Affiliation Partners
Academic Affiliations:

- University of Texas Health Science Center-San Antonio
- Oregon Health Sciences University
- University of Nebraska
- University of Detroit-Mercy
- Indiana University School of Dentistry
- Creighton University
- Baylor University

Manpower:

<table>
<thead>
<tr>
<th>OFFICER</th>
<th>ENLISTED</th>
<th>CIVILIAN</th>
<th>CONTRACT</th>
</tr>
</thead>
<tbody>
<tr>
<td>6/5</td>
<td>3/4</td>
<td>1/2</td>
<td>1/1</td>
</tr>
</tbody>
</table>
FUNCTIONAL AREAS

Materials Evaluation
Equipment Evaluation
Facility Design
Professional Services

Equipment Evaluation
Lt Col Howard Roberts
howard.roberts@brooks.af.mil
Equipment Evaluation

- Conducts laboratory and clinical-user evaluations of dental equipment products
- Provides information to the field on new dental equipment items; assists in the resolution of equipment problems
- Reviews proposed equipment purchases for compliance with military requirements
- Resource for resolution of equipment complaints

Equipment Evaluation
Current Projects
Materials Evaluation
Col (Sel) David Charlton
david.charlton@brooks.af.mil

Materials Evaluation

- Conducts laboratory and clinical-user evaluations of dental materials products
- Provides information to the field on new dental materials products; assists in the resolution of materials problems
- Provides CE support to courses and dental residency programs in local area
- Assists dental residents with required research
Materials Evaluation
Current Projects

Facility Design
Lt Col Jim Kane
james.kane@brooks.af.mil
Facility Design
Col(sel) Greg Browning
gregory.browning@brooks.af.mil

Facility Design

• Reviews construction plans for new and remodeled dental clinics
• Attends design conferences to discuss construction review comments
• Provides design guidance for Dental Instrument Processing Centers (DIPCs)
• Serves as consultative source for information on mercury/amalgam scrap disposal and silver recovery
Facility Design
Current Projects

- Currently 41 construction projects
- Valued at $147M

Professional Services
Col Joe Bartoloni
joseph.bartoloni@brooks.af.mil
Professional Services

• Evaluates infection control products, dental radiology products, and other products directly impacting patient care
• Consultant to AF Surgeon General for Dental Infection Control and Occupational Health
• Directs and coordinates Dental Infection Control & Occupational Health Course
  • Nationally recognized speakers from academia, CDC, FDA, and other federal services
  • Attendees from all military services and VA

Professional Services

• Supervises Preventive Dentistry Course
• Supports USAF School of Aerospace Medicine courses
  • Battlefield Nursing
  • Aerospace Medicine Primary
  • Residents in Aerospace Medicine
Professional Services
Current Projects

Dental Lab Evaluation
MSgt Neal Ryerson
neal.ryerson@brooks.af.mil
Dental Lab Evaluation

- Evaluates dental laboratory materials and equipment
- Assists in the resolution of laboratory-related materials and equipment problems
- Consults with Facility Design Section on laboratory design issues

Dental Lab Evaluation
Current Projects

[Image of dental laboratory equipment]
Ancillary Personnel
MSgt Tim Belde, SSgt Mark Martin, Mr Dan King, Ms Trisha Clary

Technical Evaluation:
• Laboratory Evaluation
  • Products are tested in DIS laboratories for compliance with military specifications and/or national and international (ANSI/ADA, ISO) specifications
• Clinical-User Evaluation
  • Products are tested by users at 1 to 6 dental clinics to evaluate clinical handling characteristics and operational features
Project Prioritization:
- Feedback from the field
  - Over 5400 informational requests in FY 98
  - Annual survey
- Information gathered at dental meetings
- Information from manufacturer’s representatives
- Literature, product reports, advertisements

Products:
- DIS Publications
  - Newsletter (CD-ROM)
  - Technical Reports
  - InControl
Products:

- D.I.A.L. Program
- Web Site
  - http://www.brooks.af.mil/dis
- Consultative Services
- Education and Training
- Facilities Design and Review

Current Initiatives:

- Mercury Contamination from Amalgam Capsules
Current Initiatives:

- Dental Handpiece Testing & Evaluation

Current Initiatives:

- Air Force Medical Service Latex Policy
- Temporary Restorative Material for Field Use and NASA Shuttle Missions
  - Fuji IX Project
Future Considerations:
- Collocation of DIS with NDRI and USARD at Great Lakes Naval Training Center
- Continue Current DIS Mission
- Collaboration with USN/USA
  - Tri-Service Products by Tri-Service Personnel
  - Requirement - R&D - TE - Implementation

- DIS does not do research
  - Technical Evaluations of commercially-available equipment and materials
- Program 8 (Defense Health Program)
- Program 6 (Science and Technology)
- USAF dependent on Army and Navy for true dental research
• Collocation of DIS to Great Lakes
  • Leverage expertise & research assets
  • Combine strengths of each
  • Maximize effectiveness of all

• Lightweight Dental Field Unit
  • Joint Services Dental Materiel Coordinating Group identified need
  • Off the shelf technology does not meet all requirements

• USARD and Manufacturer (CRADA)
  • DIS objectivity would be compromised (Prototype)
  • DIS assisted USARD in evaluation
• Development of New Materials and Techniques
  • Majority of university research tests the clinical effectiveness of materials, medicaments, and clinical techniques
  • Most new materials, medicaments, and techniques developed by companies in private sector

• Four Pillars of Medical Emphasis
  • Build healthy communities (Intervention & Prevention)
  • Medical Readiness
  • Employ Tri-Care
  • Tailored Force

• AF medical leadership recognizes military medicine, including dental, is not limited to operational or deployment issues only (improvement in overall health >> benefits readiness)
• Military Unique Needs Not Considered by Civilian Universities or Manufacturers
  • Develop a model to predict dento-facial trauma in urban area warfare
    • Crucial for accurate personnel and logistics planning
    • Predictions based on data from recent bombings and aerial warfare (Oklahoma City, Beirut, Khobar Towers, Kosovo, and Bosnia)

• Military Unique Needs Not Considered by Civilian Universities or Manufacturers
  • Develop a risk assessment model for 3rd molar removal
    • Risk of infection while deployed compared to removal and risk of post-op infection while deployed
    • Scenario: Discovered on mobility line that troop is dentally not qualified due to 3rd molars
• **Military Unique Needs Not Considered by Civilian Universities or Manufacturers**
  
  • Develop medicaments, protocols, and clinical techniques to address reduced host immune system in wartime
    
    • Plaque suppressing gum in MRE(s). Similar to Xylisfresh but softer and better tasting
    
    • Antibiotic/Antimicrobial patches compared to oral or parental delivery

• **Develop medicaments, protocols, and clinical techniques to address reduced host immune system in wartime**
  
  • Effectiveness of new antibacterial/antimicrobial chips for refractory periodontitis in treatment of acute periodontal abscesses
  
  • Effect of timed-release tetracycline products in desert scenario (Photosensitive Effects)
• Military Unique Needs Not Considered by Civilian Universities or Manufacturers
  • Environmental Concerns
    • Mercury in Wastewater
    • Proper Waste Disposal in Host Nations

• Military Unique Needs Not Considered by Civilian Universities or Manufacturers
  • Development of improved temporary restorative material
    • Adhere to tooth structure
    • Have pulpal sedative effects
    • Cariostatic (fluoride release)
    • Withstand masticatory forces
    • Easy to mix, place, and shape
    • Utilized in a weightless environment
• Military Unique Needs Not Considered by Civilian Universities or Manufacturers

• Development of unit-dose materials and instruments for flight surgeons
  • Remove need for sterilization
  • Compact for use in fly-away bag
  • Stabilize dental patients

• Military Unique Needs Not Considered by Civilian Universities or Manufacturers

• Re-evaluate minimal time aviators must be DNIF during and following endodontic procedures
  • Impacts flying mission
  • Impacts aviator
  • Impacts other patients
• Military Unique Needs Not Considered by Civilian Universities or Manufacturers
  • Need for development of a less fragile digital radiology sensor
    • AF EMEDS using digital radiographs
    • Current sensors are easily damaged in office-based scenario, consider in field conditions
    • Approximately $6000 per sensor

• Military Unique Needs Not Considered by Civilian Universities or Manufacturers
  • Need for Lightweight Dental Field Unit
    • COTS technology inadequate
    • CRADA between USARD and manufacturer
    • DIS input
• Military Unique Needs Not Considered by Civilian Universities or Manufacturers

• Need for restorative materials, medicaments, anesthetics, etc., that have extended shelf life & resistance to degradation from temperature and humidity extremes

• Materials and medicaments purchased and inventoried in deployment sets frequently expire prior to use
USAF DENTAL INVESTIGATION SERVICE
USAF School of Aerospace Medicine
Brooks AFB TX
DSN 240-3502
comm (210) 536-3502
e-mail usafsamea.fedpersonnel@brooks.af.mil
http://www.brooks.af.mil/dis
NIH
Areas of Emphasis
Division of Extramural Research
NIDCR

• Genetic Dissection of Complex Diseases
• Functional Genomics
• Biomarkers/ Defense Mechanisms
• Informatics Infrastructure
• Clinical Trials
• Bioengineering
Science Areas
Division of Extramural Research
NIDCR

- Craniofacial Anomalies and Injuries
- Infectious Diseases and Immunity
- Neoplastic Diseases
- Chronic and Disabling Diseases
- Biomaterials, Biomimetics and
- Tissue Engineering
Cross Cutting Areas
Division of Extramural Research
NIDCR

- Clinical and Behavioral Research
- Health Promotion Research
- Training and Career Development
Bioengineering

- Tissue Remodeling
- Cell and Tissue Resources
- Development of Markers and Biosensors
- Bioimaging Technology
Clinical Trials Networks

- International Partnerships in Molecular Epidemiology of Craniofacial Anomalies
- Networks for Early Detection and Prevention of Oropharyngeal Cancer
- Cancer Therapy Outcomes
- International Partnerships in Oral Infection
- Genetic, SES, and Demographic Factors in Dental, Oral, and Craniofacial Diseases
- Role of Genetic Susceptibility in Health Disparities
Genetic Dissection of Complex Diseases

- Functional Genomics of Craniofacial Anomalies
- Cell Cycle Dysregulation in Oropharyngeal Cancer
- Molecular Genetics of Target Organ Involvement in Autoimmune Disease
- Genetic Regulation of Organ Development
- Whole Genome Approaches to Pathogen Research
Scientific Opportunity Areas

- Molecular Medicine
- Clinical/ Health Promotion Research
- Biotechnology/ Information Infrastructure
Biomarkers/ Defense Mechanisms

- Biomarkers in the Progression of Oropharyngeal Cancer
- Host, Genetic, and Micromial Markers in Oral Infections
- Non-Immune Host Defense Mechanisms
Human Resources

- Molecular Medicine/ Molecular Epidemiology
- Clinical Research/ Clinical Epidemiology
- Population Sciences/ Public Health
- Bioengineering
Trends in Research

- Emergence of Molecular Medicine
- Informatics Explosion
- New and Expensive Technologies
- Recognition of Multifactorial Nature of Disease
- Science Transfer Demands
- Need for Interactive Research Teams
Informatics Infrastructure

- Population and Family Based Registries
- Clinical Trials Database and Information System
- Networks for Diffusion of New Technologies
- Surveillance Systems
NIDCR Support to U.S. Academic Institutions

Amounts exclude reimbursable awards
NIDCR Support to U.S. Academic Institutions

Percent of Total Amount


Dental Schools Medical Schools Other

Amounts exclude reimbursable awards
National Institute of Dental and Craniofacial Research

Total Obligations for Grants & Contracts

By Program Area

FY 97 - FY 98 **

<table>
<thead>
<tr>
<th>Program</th>
<th>FY 97</th>
<th>FY 98</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>19,872</td>
<td>20,003</td>
</tr>
<tr>
<td>B</td>
<td>35,638</td>
<td>40,385</td>
</tr>
<tr>
<td>C</td>
<td>12,128</td>
<td>17,256</td>
</tr>
<tr>
<td>D</td>
<td>29,489</td>
<td>27,046</td>
</tr>
<tr>
<td>E</td>
<td>19,928</td>
<td>26,573</td>
</tr>
<tr>
<td>F</td>
<td>8,683</td>
<td>8,608</td>
</tr>
<tr>
<td>G</td>
<td>14,133</td>
<td>13,256</td>
</tr>
<tr>
<td>T</td>
<td>9,691</td>
<td>6,655</td>
</tr>
</tbody>
</table>
National Institute of Dental and Craniofacial Research

Total Number of Projects for Grants & Contracts

FY 97 - FY 98

** By Program Area

<table>
<thead>
<tr>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
<th>E</th>
<th>F</th>
<th>G</th>
<th>T</th>
</tr>
</thead>
<tbody>
<tr>
<td>FY 97</td>
<td>102</td>
<td>164</td>
<td>42</td>
<td>134</td>
<td>71</td>
<td>34</td>
<td>124</td>
</tr>
<tr>
<td>FY 98</td>
<td>97</td>
<td>172</td>
<td>58</td>
<td>117</td>
<td>100</td>
<td>34</td>
<td>122</td>
</tr>
</tbody>
</table>

Number of Projects