VCOM 2018 Research Retreat

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Senior Science Advisor

American Defense International
JDG BACKGROUND

- Virology, UNC Chapel Hill
- Army, USAMRIID and WRAIR…BSL 4 arenaviruses and flaviviruses
- University of SC School Medicine…Micro. & Immuno.
- Clemson University/Greenville Hospital Biomedical Alliance…bioengineering/orthopedics
- Pentagon (DOD Undersecretary for Health Affairs)…research policy & funding priorities
- Uniform Services Medical School (President’s Office)
- Professor Emeritus Clemson University, Clinical Res. Prof. USC, Texas A&M
• Organization of medical research within DOD
• Agencies funding biomedical research
• Finding best fit
• “Socializing” ideas & building relationships
• CRADAs, white papers, and quad charts
• VCOM’s alignment with DOD needs
• Lessons learned…A “seasoned” approach to DOD funding
Organization of Medical Research Within DOD

1. Acquisition, Technology and Logistics
   - OUSD (Acquisition and Sustainment)
   - Defense Threat Reduction Agency (DTRA)
   - Defense Advanced Research Projects Agency (DARPA)

2. Office of the Assistant Secretary of Defense (Health Affairs)
   - Uniformed Services University of the Health Sciences (USUHS)
   - Armed Forces Radiobiology Research Institute (AFRII)

3. U.S. Army Medical Research and Material Command (MRMC)
   - Walter Reed Army Institute of Research (WRAIR)
   - Medical Research Institute of Infectious Diseases (USAMRIID)
   - Congressional Directed Medical Research Programs (CDMRM)
   - Medical Research Institute of Chemical Defense (USAMRICD)
   - Combat Casualty Care Research Program (CCCRP)
DOD BIOMEDICAL RESEARCH FUNDING

FY 2019 Total = $6.23 Billion

- DARPA: $3359.48M
- ARMY BIOMED RESEARCH: $2111.76M
- DTRA: $469M
- DHP: $288 M
BASIC vs MISSION AGENCIES

**Basic research agencies (NSF, NIH)**
- Relatively stable research agendas
- Broad goals
- Agenda relatively unaffected by changes in political leadership

**Mission agencies (DOE, DOD, NASA, NOAA, etc.)**
- Focused mission set by Congress
- Agendas can change quickly
- Strongly affected by changes in political leadership
- Typically strong intramural research
INTRAMURAL vs EXTRAMURAL RESEARCH

• Some agencies fund only research by outside scientists e.g. DTRA and DARPA

• Some fund research by internal scientists e.g. NIST and the National Labs

• Many fund both intramural and extramural research e.g. NIH, DOE, DOD, etc.
DOD AGENCIES THAT FUND RESEARCH

- Air Force Office of Scientific Research (AFOSR)
- Office of Naval Research (ONR)
- Army Research Office (ARO)
- Defense Advanced Research Projects Agency (DARPA)
- Defense Threat Reduction Agency (DTRA)
- US Army Medical Research & Materiel Command (MRMC)
- Congressionally Directed Medical Research Program (CDMRP)
AGENCY MISSIONS

• **MRMC** – Solutions to medical problems of importance to the warfighter at home and abroad

• **DARPA** – High risk, high pay-off research that may benefit any of the DoD branches (e.g. artificial intelligence/machine learning)

• **DTRA** – Medical countermeasures & technology innovation

• **CDMRP** – Medical research as directed by Congress (not part of DoD’s core mission)
6.1 Basic Research
   • Usually type funded at universities

6.2 Applied Research
   • May be continuation of 6.1
   • Defense company partners with university

6.3 Application Research
   • New technology applied to a defense system
TECHNOLOGY READINESS LEVELS
FINDING BEST FIT

Long-range Broad Agency Announcement (BAA)
- Outlines research interests and priorities of agency over a several-year range
- Provides guidance for investigator-initiated proposals

Targeted BAAs
- Specific competitions

Other Targeted Solicitations (RFPs)
- Address specific need or priority

SBIR & STTR
- Phase I and II

WHAT TO LOOK FOR

• What are current priorities?
• What’s the need and is there a niche for you to fill?
• Do they fund unsolicited proposals?
• Do they have an intramural research program?
• What’s the proposal process?
THE PROCESS: “Relationship Building”

- Establish a relaxed dialogue with program officer
  - Socialize your ideas
  - Focus on agency mission & technology
  - Have a clear game plan with milestones and goals focusing on agency needs
  - Emphasize technology platform to expand DOD capabilities

- Request meeting at program office to visit onsite laboratories and research staff
THE PROCESS: “Expand Your Ideas”

• Visit laboratories and bases...meet your counterparts
• Connect with research staff...invite to campus for a seminar
• Identify key collaborators in and out of DOD
• Present how your technology meets current needs & expands capabilities
• Propose pathways to mature your technology (Technology Readiness Level)
• Provide milestones for final product
THE PROCESS: “Developing Relationships”

• Expand collaborations with internal scientists
  ✓ Cooperative Research and Development Agreements (CRADAs)
  ✓ Joint publications

• Active involvement as a visiting researcher
  ✓ Become part of the “family”
  ✓ “Get your nose under the tent”
Description
A Cooperative Research and Development Agreement (CRADA) is a written agreement between one or more federal laboratories and one or more non-federal parties under which the government, through its laboratories, provides personnel, facilities, equipment or other resources with or without reimbursement.

When a CRADA is Appropriate
CRADAs provide an easy way to collaborate with DOD labs. CRADAs allow DOD researchers to exchange technical expertise with non-federal partners, and protect the researcher’s rights to inventions. CRADAs are appropriate when ideas, staff, materials, and equipment are to be exchanged over a period of time for the purpose of collaboration and/or an invention may result.
THE IMPORTANCE OF A CRADA

- “Foot-in-the-door” for DOD applications
- Establishes a formal relationship with DOD scientists
- Documents DOD’s interest in your research capabilities and your credibility
- Often encourages DOD PI to support grant applications or even contribute as co-investigators
FUNDING FOR RELATIONSHIP BUILDING

- Multidisciplinary University Research Initiative (MURI)
- Defense University Research Instrumentation Program (DURIP)
- Young Investigator Programs
  - ONR Young Investigator Program (YIP)
  - AFOSR Young Investigator Program
  - DARPA Young Faculty Award Program (YFA)
- Faculty Exchanges and Summer Facility Positions in DoD Labs
  - Summer Faculty Research Program (ONR)
  - University Resident Research Program (AFOSR)
  - Oak Ridge national Labs (ORISE)
- Defense Experimental Program to Stimulate Competitive Research (DEPSCoR)
THE PROCESS: “IL Cuore” The White Paper

• Also called “concept papers” or Phase I applications
• Provides critical info. to help program officer determine fit
• Usually brief 2 pager, program officer provides guidance
• Approval results in an invitation to submit Phase II full proposal
“HEILMEIER CATECHISM”

- What are you trying to do? Articulate your objectives with absolutely no jargon.
- How is it done today, and what are the limits of current practice?
- What’s new in your approach and why do you think it will be successful?
- Who cares?
- If you’re successful, what difference will it make?
- How much will it cost?
- How long will it take?
- What are the midterm and final “exams” to check for success?

George H. Heilmeier
DARPA Director (1975-1977)
COMPELLING WHITE PAPERS

- Focus on outcomes and benefits
- Clearly describe the problem and “state of art”
- How does your approach differ from others
- Concise overview of what you will do
  - Not “we will explore phenomenon x” – too vague
  - Rather, “In Task 1 we will measure x; in Task 2 we will develop y; in Task 3 we will evaluate z…”
- Include a “strategic” Quad Chart with milestones and deliverables
## Project Title with PI and Collaborators

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<td>Illustration</td>
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<tr>
<td>Approach</td>
<td>Key Milestones and Cost</td>
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<tr>
<td>HOW will the task be accomplished?</td>
<td>WHEN will the key milestones of the project will be accomplished &amp; how much it will cost?</td>
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HOLLOW FIBER BIOREACTORS (HFBRx): A FLEXIBLE MANUFACTURING SYSTEM FOR RAPID PRODUCTION OF LIVE VIRUS, VIRUS-LIKE PARTICLES, AND MONOCLONAL ANTIBODIES

Mark Hirschel, Ph.D., Biovest Int., CDR Patrick Blair, Naval Health Research Center (NHRC)

**Objective:** Establish the role of HFBRx technology as a flexible manufacturing platform for medical countermeasures against emerging infectious diseases.

**Description of Effort:** Establish HFBRx systems as a modular, functionally closed manufacturing platform for high yield expression of vaccines. The objective is to expand on pandemic influenza virus data generated under a CRADA with NHRC. These expanded studies are proposed to include process optimization for other live viruses, virus-like particles, viral neutralizing antibody, and diagnostics (Phase I & II). Phase III will demonstrate extended production capability using candidate agents selected by DTRA.

**Benefits of Proposed Technology:** HFBRx are compact, scalable and economical for large scale virus production. In contrast to batch mode, perfusion provides several benefits: 1) controlled culture conditions, 2) space efficiency & high yield production and 3) selective dilution/removal of inhibitory byproducts.

**Challenges:**
1. Cost effective high yield manufacturing platform
2. High density culture leading with a small footprint
3. Automation for reduced labor and user interactions
4. Single-use containment for BSL-2 & BSL-3 facilities

**Maturity of Technology:** TRL 5 (Component and breadboard validation in relevant environment)

**Hollow fiber bioreactor systems designed for R&D (Primer™), pilot (AutovaxID™) and commercial (Xcelerator™) scale production of biologics.**

**Milestones:** Year 1-establish HFBrx as flexible cGMP platform for rapid, robust production of live virus. Year 2-confirm unique capability for high yield expression of virus-like particles and neutralizing antibody. Year 3-process optimization and transition to large-scale scale manufacturing of two DOD candidate biologics

**Proposed Funding:** Y1: $.75M, Y2: $1.5M, Y3: $2.5M

**Period of Performance:** Jan. 1, 2012- Dec. 31 2015

**PI Contact:** Dr. Mark Hirschel, CSO, Biovest Int., Mpls., MN 763-355-1548 mhirshel@biovest.com, Co-PI

**Contact:** CDR Patrick Blair, Director, Div. Resp. Diseases, Naval Health Research Center, San Diego, CA (619)-767-4842 patrick.blair@med.navy.mil
• Failure to connect research to outcomes of interest to DoD
• Long, wordy academic introduction
• Vague plan
• Unclear outcomes and deliverables
• Stress technology platform and product development…DoD wants a product, not research project
Primary

- Technical merits/preliminary data/why are you better than competition
- Relationship to DoD missions
- Technology platform
- Technology Readiness Level

Other evaluations

- Likelihood to develop new research capabilities
- Capability assessment (PI’s and team’s qualifications, facilities, etc.)
Military Infectious Diseases (MIDRP)  
Combat Casualty Care (CCCRP)  
Military Operational Medicine (MOMRP)  
Clinical and Rehabilitative Medicine (CRMRP)  
Medical Chemical & Biological Defense (via DTRA)  
Medical Simulation & Information Sciences  
Radiation Health  
Congressionally Directed Medical Research Program (CDMRP)  

http://mrmc.amedd.army.mil/index.cfm
Medical Research and Development

The U.S. Army Medical Research and Materiel Command manages and executes research in five basic areas: military infectious diseases, combat casualty care, military operational medicine, chemical biological defense, and clinical and rehabilitative medicine. The USAMRMC is program coordinator for DoD medical research programs focused on the prevention, mitigation and treatment of blast injuries as well as the manager for the JTAPIC program which informs solutions that prevent or mitigate injury during the full range of military operations, by collaborative collection, integration, analysis and storage of data from operations, intelligence, materiel and medical sources.

Military Infectious Diseases Research Program

- Medical readiness
- Vaccines
- Biotechnology
- Prophylaxis/treatment drugs
- Diagnostics/prognostics
- Vector control
- Medical C4ISR
- HIV countermeasures

Combat Casualty Care Research Program

- Damage control resuscitation
- Traumatic brain injury
- Combat trauma therapies
- Health monitoring & diagnostic technology
- Combat dentistry
Military Operational Medicine Research Program

- Injury prevention and reduction
- Psychological health and resilience
- Physiological health
- Environmental health and protection

Clinical & Rehabilitative Medicine Research Program

- Neuromusculoskeletal rehabilitation
- Regenerative medicine and transplants
  - Armed Forces Institute of Regenerative Medicine (AFIRM)
    - Extremity Regeneration
    - Craniomaxillofacial Regeneration
    - Burn Injury and Skin Regeneration
    - Genitourinary/Lower Abdomen Reconstruction
    - Composite Tissue Allotransplantation and Immunomodulation
- Vision restoration
- Pain management

Medical Chemical Biological Defense Research

- Medical Biological Defense
  - Vaccines
  - Therapeutics
  - Diagnostics
  - Basic research
- Medical Chemical Defense
  - Pretreatments
  - Therapeutics
  - Diagnostics
  - Basic research
- Laboratory Infrastructure
Fund cutting edge research in reconstruction, rehabilitation, and definitive care to improve the standard of care and outcomes.

Targeted research:
- Neuromusculoskeletal Injury
- Pain Management
- Regenerative Medicine
- Sensory Systems

Focus on rehabilitative care innovations required to reset wounded warriors, both in terms of duty performance and quality of life. The program has multiple initiatives to achieve its goals, including improving prosthetic function, enhancing self-regenerative capacity, improving limb/organ transplant success, creating full functioning limbs/organs, repairing damaged eyes, treating visual dysfunction following injury, improving pain management, and enhancing rehabilitative care.
MMRC and SOCOM BAA
See W81XWH-18-S-SOC1

1. Exposure to Environmental Extremes
2. Sensory Optimization and Protection
3. Trauma Resuscitation
4. Non-Traditional Anesthesia Protocols
5. Optimization of Canine Performance & Nutrition
6. Pre & Post Trauma Training / Behavioral Issues
What Does CDMRP Stand for?
Congressionally Directed Medical Research Programs

The CDMRP...
- Transforms healthcare for Service Members and the American public through innovative and impactful research.
- Includes consumers who are either survivors, family members, or caregivers throughout its processes.
- Conducts two levels of review through open competition to determine the best, most relevant research with potential for high impact.
- Funds research at national, international, for-profit, nonprofit, public, and private organizations.
- Receives congressional appropriations for targeted research in specific diseases, conditions, and injuries.
- Provides management support for Defense Health Program core research program areas.
- Encourages innovative research that will fill gaps and address issues in prevention, diagnosis, treatment, and quality of life to improve health and well-being for the military and the public.

http://cdmrp.army.mil
This brochure is a brief summary describing a few important aspects of CDMRP funding opportunities.

Full details for application submissions are provided in Announcements and General Application/Submission Instructions for each funding mechanism as funding becomes available and Announcements are released.

http://cdmrp.army.mil
See our website for funding opportunities, program information, highlights, news, and videos.
E-mail us at help@EBRAP.org to request notifications of new CDMRP funding opportunities.
CDMRP Research Funding for 2019

- **Breast Cancer** Research Program - $130.0 million
- **Chronic Pain Management** Research Program - $10.0 million (*new for FY19*)
- **Combat Readiness Medical** Research Program - $15.0 million (*new FY19*)
- **Gulf War Illness** Research Program - $22.0 million
- **Kidney Cancer** Research Program - $20.0 million
- **Joint Warfighter Medical** Research Program - $50.0 million
- **Melanoma** Research Program - $10.0 million (*new for FY19*)
- **Military Burn** Research Program - $8.0 million
- **Orthotics and Prosthetics Outcomes** Research Program - $10.0 million
- **Ovarian Cancer** Research Program - $20.0 million
- **Parkinson's** Research Program - $16.0 million
- **Peer Reviewed Alzheimer's** Research Program - $15.0 million
- **Peer Reviewed Cancer** Research Program (15 Topics) - $90.0 million
- **Peer Reviewed Medical** Research Program (49 Topics) - $350.0 million
- **Peer Reviewed Orthopaedic** Research Program - $30.0 million
- **Prostate Cancer** Research Program - $100.0 million
- **Spinal Cord Injury** Research Program - $30.0 million
- **Tick-Borne Disease** Research Program - $5.0 million
Defense Advanced Research Projects Agency

“Transforming Revolutionary Concepts and Even Seeming Impossibilities into Practical Capabilities”

FY2019 Budget = $3.44 Billion
FY2018 Budget = $3.17 Billion
DARPA: “REVOLUTIONARY CONCEPTS”

- Looking for high payoff transformational projects
- Program officers have a lot of discretion
- Expect quick results (e.g., a “feelie”)
- Can cut your funding in the middle of a project if progress is not satisfactory
- Office-wide BAA; 3-9 month seed grant that can lead to individual BAAs (5 years mega $$$$)
Biological Technologies: Neurophysiology, musculoskeletal enhancement, mitochondrial biogenesis & stamina, disease detection

Defense Sciences Office: Math, computation & design

Information Innovation Office: Cyber security

Microsystems: Microprocessors & photonic devices

Strategic Technologies: Networks in warfare fighting

Tactical Technology Office: Revolutionary platforms in ground, maritime, air, and space systems
Defense Threat Reduction Agency

The Defense Threat Reduction Agency enables the DoD and the U.S. Government to prepare for and combat weapons of mass destruction and improvised threats and to ensure nuclear deterrence

Three-pronged mission:

1. Counter threats posed by weapons of mass destruction, including chemical, biological, radiological, nuclear, and high-yield explosives
2. Counter threats posed by improvised threats, including improvised explosive devices, car bombs and weaponized consumer drones, as well as the tactics, technologies and networks
3. Ensure a safe, secure, effective and credible nuclear weapons deterrent
Basic & Applied Science (plant-based pharmaceutical production)

Chem-Bio. Countermeasures (therapeutic antibodies, Z-Map for Ebola, emerging virus vaccines, filoviruses, flaviviruses...Zika)

Counter WMD (broad spectrum antivirals)

Nuclear Detection/Survivability (dirty bomb clean-up; “day after pill”)

Data Integration & Analysis
LESSONS LEARNED: A “SEASONED” APPROACH TO DOD FUNDING

- Identify DOD needs and find the best fit
  - What are your technical strengths & how do you use them to expand DOD capabilities
- Identify program officers & research staff
- Socialize ideas with program officers and staff
- Pursue CRADAs with specific objectives and work scopes
- Pursue faculty/student exchanges
- Submit joint manuscripts, white papers & full proposals
- Be persistent, continue to sharpen ideas & proposals
- Maintain relationships
LESSONS LEARNED: FINAL THOUGHTS

- Be proactive
  - Find right BAA
  - Identify agency need and your niche
  - Know your competition
  - Focus on a technology platform to expand DOD capabilities
- Find your “champion”
- White papers are key
- Remember “persistence wins”
Extended Slide Set
SCHEDULE AND MILESTONES

- What do you expect to have accomplished after 6 months? After 1 year? After 18 months? Etc.
- Provides easy-to-find synopsis of your approach for reviewers
- Demonstrates that your project is properly scoped
- Shows that your project is well thought out
PUT YOUR PROJECT IN CONTEXT

The Big Question or The Big Need

Preliminary Work

Funded project

Project Goals/Specific Aims
- Outcomes

Further work
## EXAMPLE FLOW CHARTS AND SCHEDULES

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<tr>
<th>Objective 1: Development of the hoosits</th>
<th>Year 1</th>
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<th>Year 3</th>
<th>Year 4</th>
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<td>Integration and calibration</td>
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<td>Optimization of frumpits measurement methodology</td>
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<th>Objective 2: Assess XYZ</th>
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<td>XYZ spectroscopy</td>
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<tr>
<td>MOA microscopy</td>
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<tr>
<td>ABC testing</td>
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<td>Pandax studies</td>
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<tr>
<th>Objective 3: Integrate hoosits with XYZ</th>
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<tr>
<td>Instrument integration</td>
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<tr>
<td>Instrument testing</td>
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<tr>
<td>Demonstration</td>
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HAVE A CLEAR STRUCTURE

For example...

- Project Goals
- Objectives
- Research Questions/Hypotheses
- Phases
- Tasks
- Subtasks
PLANNING YOUR PROJECT

Idea that Supports Agency Mission

Proposed Project

- What will your outputs be?
- How long will it take?
- What will your approach be?
- What have you done so far?
- How will the outcomes advance DoD program goals and DoD mission?
TARGETED BAAS/RFPS

- Look for pre-release workshops or conferences e.g. DARPA Proposers Day
- Get to know the program officer and intramural scientists in your area
- If BAA is out and you didn’t know about it already it’s probably too late
The Joint Program Committee-6/Combat Casualty Care Research Program (JPC-6/CCCRP) seeks to drive medical innovation through the development of knowledge and materiel solutions for the acute and early management of combat-related trauma; including point-of-injury, en route, and facility-based care. The JPC-6/CCCRP strives to optimize survival and recovery from combat-related injury by targeting the following research areas:

• Hemorrhage Control and Resuscitation
• En Route Care
• Forward Surgical and Intensive Critical Care
• Neurotrauma and Traumatic Brain Injury
• Traumatic Tissue Injury

Research planned, programmed, and managed by JPC-6/CCCRP is gap-driven and motivated with the urgency to generate solutions (clinical practice guidelines or FDA-approved products) to benefit the warfighter and the American public. JPC-6/CCCRP supports the complete range of research activities needed to achieve its goals from foundational science to improvements in health care services and delivery.
Medical Simulation & Information Sciences Research Program (MSIS)

- Joint Evacuation and Transport Simulation (JETS)
- Point of Injury Training System (POINTS)
- Theater/Operational Medicine (TOM)
- Military Healthcare Services (MHS)
- Autonomous and Unmanned Systems
- Medical Robotics
- Virtual Health

DoD Blast Injury Research Program Coordinating Office

- Injury prevention
- Acute treatment
- Reset

The command is the executive or lead agency responsible for:

- Military Human Immunodeficiency Virus R&D Program (Acquired Immune Deficiency Syndrome)
- Global Emerging Infections Surveillance and Response System
- Use of Investigational New Drugs for Force Health Protection
- DoD Food and Nutrition Research, Development, Test, Evaluation, and Engineering Program
- Combat Dentistry Research Program
- Gulf War Illnesses/Force Health Protection Research Program
- Peer Reviewed Medical Research Program

The command ensures all research strictly conforms to all regulatory guidance.