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BROAD AGENCY ANNOUNCEMENT

AREAS OF INTEREST

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U.S. Army Medical Research and Materiel Command
BAA 07-1

PREFACE

The U.S. Army Medical Research and Materiel Command's (USAMRMC) mission is to provide solutions to medical problems of importance to the American warfighter at home and abroad. The scope of this effort and the priorities attached to specific projects are influenced by changes in military and civilian medical science and technology, operational requirements, military threat assessments, and national defense strategies. The extramural research and development program plays a vital role in the fulfillment of the objectives established by the Command. General information on USAMRMC can be obtained from the USAMRMC website (https://mrmc.detrick.army.mil/).

This Broad Agency Announcement (BAA) is intended to solicit research ideas, and is issued under the provisions of the Competition in Contracting Act of 1984 (Public Law 98-369), as implemented in the Federal Acquisition Regulations. This Announcement provides a general description of the Command's research programs, including specific areas of interest; general information; the evaluation and selection criteria; and proposal preparation instructions. **All Attachments that are required with the submission of a full proposal are described in the Mandatory Proposal Forms section of the BAA 07-01 General Information and Proposal Preparation document. Research proposals are sought from educational institutions, nonprofit organizations and private industry**. **This is a continuously open announcement; preproposals may be submitted and will be evaluated at any time throughout the year, unless otherwise noted or stated in a separate announcement.**

The U.S. Army Medical Research Acquisition Activity (USAMRAA) is continuing the process of preparing this BAA for electronic commerce. The BAA will be revised as other electronic processes are developed. Amendments of this brochure will be advertised on the USAMRAA website (www.usamraa.army.mil), at Grants.gov (www.grants.gov), and in Fedbizopps (www.fedbizopps.gov). Many of the programs and areas of interest may not have funding readily available, but the status of funds will be part of the advice elicited from a proposal. From time to time separate announcements or calls for proposals may supplement this BAA. These supplements will be featured on our homepage and announced at www.grants.gov.

Questions concerning the preparation of preproposals or proposals can be emailed to (QA.BAA@amedd.army.mil) or faxed to 301-619-3002, ATTN: BAA 07-1 at USAMRAA or by calling Rebecca Tama at 301-619-2381.

Mail: U.S. Army Medical Research Acquisition Activity
ATTN: BAA 07-1
820 Chandler Street
Fort Detrick, MD 21702-5014

BAA Preproposal Forms (http://www.usamraa.army.mil/pages/BAA_Forms/User/login.cfm)

U.S. ARMY MEDICAL RESEARCH AND MATERIEL COMMAND
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I. RESEARCH AREAS OF INTEREST

A. MILITARY INFECTIOUS DISEASES RESEARCH PROGRAM

The Military Infectious Diseases Research Program (MIDRP) focuses on vaccines, antiparasitic drugs, diagnostics and vector control pertinent to naturally-occurring endemic diseases with demonstrated or potential capability to decrease military operational effectiveness. Diseases of principal interest to MIDRP are malaria, dengue, diarrheal disease caused by bacteria and norovirus, leishmaniasis, meningococcal disease, hantavirus, Lassa fever, and scrub typhus. Proposals involving biothreats and nonbiological threats such as intoxicants should be submitted under Area of Interest D or E. Proposals involving wound infections, bacteremia, and sepsis should be submitted under Area of Interest B. Cancer research should not be submitted under this program,

1. Research and Development of Preventive Measures for Infectious Diseases includes:

a. Vaccines. The MIDRP supports studies to characterize infectious agents, identify pathogenesis and human protective immune responses and assess methods of vaccine delivery and candidate field sites for evaluating vaccine efficacy in humans.

b. Antiparasitic Drugs. Studies applicable to the discovery, design and development of drugs to prevent malarial and leishmanial infections (including drug synthesis, screening of compounds, characterization of mode of action and mechanisms of drug resistance) are supported. Topics of interest include investigations of parasitic metabolism, structural biology and genomics directed at identification of potential molecular targets for intervention.

c. Vector control. Investigations focusing on arthropod vectors and vector-borne diseases (with primary emphasis on malaria, dengue and scrub typhus) are funded. Current studies target vector-pathogen-human interactions, vector control (including personal protective measures), and risk assessment (including identification and classification of vectors, improved surveillance techniques, and field worthy assays for pathogens in vectors).

2. Research and Development of Therapeutic Measures for Infectious Diseases. Therapeutic drug development (including studies to screen, synthesize and develop therapeutic drugs for malaria and other militarily-relevant infectious agents) is secondary to the prophylactic development program [see 1b, above], which receives program emphasis. However, proposals dealing with novel drug delivery systems, i.e., sustained-release and methods of targeting drugs to reduce toxicity or delivery of drugs of clinical importance to the active sites) are welcomed.

3. Diagnostic Systems for Infectious Diseases for field use. MIDRP supports the development of field-deployable common diagnostic systems (including immunologically-based and nucleic acid-based platforms) pertinent to detection, surveillance and diagnosis of naturally-occurring infectious agents of military importance. Investigations to identify improved pertinent specimen-processing techniques are also funded.

B. COMBAT CASUALTY CARE RESEARCH PROGRAM

The Combat Casualty Care Research Program provides integrated capabilities for far-forward medical care to reduce the mortality and morbidity associated with major battlefield wounds and injuries. A primary emphasis of the Research Program is on the identification and development of medical techniques and materiel (medical devices, drugs, and biologics) for early intervention

in life-threatening battle injuries. Because battlefield conditions impose severe constraints on available manpower, equipment and medical supplies available for casualty care, we place a premium on medical interventions that can be used within the battle area or as close to it as possible, before or during medical evacuation. We prefer medical techniques and materiel that can be used by first responders, which means that medical materiel must be easily transportable, i.e. small, lightweight, and durable in extreme environments and handling; devices must be easy to use, low maintenance, with self-contained power sources as necessary. Drugs and biologics, ideally, should not require refrigeration or other special handling. Materiel and techniques must be simple and rapid to employ. Research efforts are needed in principles and technology available to enhance self- and buddy-aid; techniques, methods, or materials to improve basic and advanced life support for severely injured persons; monitoring, and sustainment of severely injured casualties during episodes of delayed or protracted evacuation; management of patients when treatment is delayed as a result of temporary overloading of battlefield facilities; and enhanced capability for triage of large numbers of casualties and staged treatment in the field. We are interested in existing materiel for which concept and/or patient care efficacy have already been demonstrated, but require improvement to meet our military constraints.

The following paragraphs describe objectives of particular interest:

The principal cause of death among soldiers who die within the first hour of wounding is hemorrhage. As a consequence, the Combat Casualty Care Research Program strongly supports research and development of technologies to stop blood loss, to resuscitate the casualty, and to limit the immediate, short- and long-term deleterious consequences of severe hemorrhage. Included in this area of interest are noninvasive or minimally invasive sensors to detect and warn of impending vascular collapse and/or significant tissue damage due to perfusion deficits. Examples of specific products include: local and systemic hemostatic agents, treatments to enhance oxygen delivery and perfusion of tissue, equipment and procedures for effective fluid resuscitation of casualties, and enhanced resuscitation fluids. Also of interest is the improved preservation, storage, transportability, and processing of red blood cells, platelets and plasma.

Secondary damage to organs frequently occurs after trauma. We are interested in materiel that can reduce acute secondary damage such as ischemia/reperfusion injury, cell death, general organ failure, and secondary brain/spinal cord damage. This objective includes methods to reduce cellular demand for oxygen and metabolic substrates.

The Combat Casualty Care Research Program supports additional aspects of casualty care. These include drugs or devices to protect and stabilize hard and soft tissue wounds and to mitigate secondary tissue damage and death, and the treatment and prevention of dental injury or disease in austere environments. We are interested in non-invasive sensors, algorithms, processors, simulation, modeling and physiology databases for remote triage, monitoring and management of casualties; and products to maintain casualties during prolonged evacuation.

C. MILITARY OPERATIONAL MEDICINE RESEARCH PROGRAM

Operational medicine research centers on the protection of health and sustainment of military performance in the face of stressors that confront soldiers in a deployment. Research is directed to protect and enhance soldiers in a deployment. Research is directed to an improved understanding of the physiology of the deployed soldier, the development of improved damage risk criteria to protect against materiel and environmental hazards, and development of specifications, algorithms and models for strategies and interventions to protect health and performance. This research program is closely coordinated with programs funded by the Office of Naval Research in the area

of Military Operational Medicine research. The Army Research Office also supports extramural basic research for this program in a coordinated effort on Enhancing Soldier Performance.

Current areas of emphasis include:

1. Environmental physiology and metabolic interventions such as thermal physiology and injury prevention, nonfreezing cold injury protection, sustainment in mountainous terrain, metabolic regulators to optimize performance in adverse environments, nutritional optimization of soldier mental status, optimization of physical performance and musculoskeletal injury prevention.

2. Biodynamics and injury sciences research such as blunt trauma models, soldier performance and injury-based criteria and crash injury protection; laser eye injury protection and treatment.

3. Neurobehavior and toxicology research such as deployment exposure assessment systems for environmental contaminants, rapid assessment methods for drinking water safety, combined toxic gas models, stress diagnostic methods, deployment stress factors, sleep/wake performance optimization and performance consequences, and military health behaviors promotion and interventions.

Funding opportunities are limited to extramural performers conducting research, which directly augments the current research program objectives and usually involves close coordination with and/or direct support of the intramural performing laboratories.

D. MEDICAL BIOLOGICAL DEFENSE RESEARCH PROGRAM - The Defense Threat Reduction Agency (DTRA) Joint Science and Technology Office for Chemical and Biological Defense (JSTO-CBD) manages research directed towards medical biological defense. The DTRA JSTO-CBD is funding limited proposals through the USAMRMC BAA. DTRA also solicits proposals for its requirements through the Federal Business Opportunities (FedBizOpps) and the DoD Small Business Innovative Research (SBIR) Program solicitations. For information regarding DTRA business opportunities, please visit their website at the following link: http://www.dtra.mil/be/business_opp/procurement/acq_procopp.cfm.

The Medical Biological Defense Research Program provides medical countermeasures for biological warfare agents. These countermeasures include specialized medical materiel or procedures designed to enhance protection. The priorities of the program are a) prophylaxis or pretreatment to prevent any casualty, b) identification and diagnosis of biological agents, and c) treatment or supportive care regimens.
Examples of some of the infectious agents of interest are those causing anthrax, plague, glanders; the Ebola, Marburg, Venezuelan, western and eastern equine encephalitis viruses; and poxvirus models of variola virus. Examples of toxins of interest include those from plants (ricin), bacteria (Staphylococcal enterotoxins, botulinum) and membrane damaging toxins and venoms from snakes, snails and insects.

The following are the overarching research and development goals:

1. Viral, Toxin and Bacterial Studies.

a. Identification and characterization of organisms and toxins. Molecular antigenic analysis; development of diagnostic assays; studies on structure and function that are related to mechanism of action, binding, internalization and interaction with the immune system and neutralizing antibodies; investigation of pathogenesis and immunology that will allow decision regarding the optimal approach to disease prevention and control. Specific long-term goals include development of physiological support methodologies, diagnostic tests, rational prevention and control strategies, and improvement of existing products.

b. Vaccine development, with emphasis on protection from agents in aerosol exposure, molecular approaches for development of vaccines, measurement of relevant cellular and humoral protective immune responses, and expression or production of protective antigens using recombinant technology. Development of vaccines for specific toxins and disease agents involving the generation, selection and characterization of attenuated strains or inactivated purified antigen preparations, to include polyvalent vaccines that are more broadly effective. Safer means of passive immunization such as production of human monoclonal or modified antibodies that are despeciated are also of interest. Identification of surrogate markers of protection for the agents identified above and development of assays to assess such protection are needed.

c. Development of improved methods for delivery of vaccines, including adjuvants, nucleic acid vaccines, methods for oral or nasal immunization with inactivated, live and subunit antigens; sustained release formulations; and methods for delivery of antigens for specific induction of mucosal immunity and development of methods to enhance appropriate immune responses to include co-delivery of cytokines.

d. Preparation of research quantities of highly purified and characterized toxins as well as studies on basic chemistry, mechanisms of action, metabolism and excretion.

2. Drug Development. Development, synthesis and testing of compounds that possess antiviral, antibacterial, immunomodulatory or antitoxin activities, with emphasis on compounds that provide broad, nonspecific protection against viruses, bacteria and toxins described above. Studies of their pharmacokinetics and other measurements relevant to more effective drug use are also of interest. Development of lead compound(s) that are potent, active-site inhibitors that may include combinatorial-derived organic molecules and/or rationally designed transition-state substrate analogs. Testing for potency is required. Approaches that will be considered include but are not limited to computational chemistry, combinatorial organic synthesis, high throughput *in vitro* screening and X-ray analysis of ligand-toxin co-crystals.

a. Discovery of novel or unique biochemical elements or compounds with antiviral, antibacterial or antitoxin activity against the listed organisms.

b. Development of testing models for evaluation of compounds effective against toxins of several classes, including pre- and post-synaptic toxins, membrane-damaging toxins, toxins which inhibit protein synthesis and others.

c. Mechanism of action studies of immunomodulators, including characterization of effector cells (lymphocytes, macrophages) effector mechanisms, ancillary effects on other cells of the immune system and production and characterization of cytokines released as a consequence of immunomodulation.

3. Identification and Diagnosis. The investigation and evaluation of sensitive and specific methods of identifying and diagnosing for both antigens and antibodies of viruses, bacteria and rickettsia in biological materials. Development of sensitive and specific immunologic, chemical or biological assays for the rapid (within minutes) and reliable diagnoses of (a) acute diseases due to agents of potential biological threat, (b) the identification of toxins or their metabolites in biological samples. Assay may include antigen, antibody or metabolite detection or the use of nucleic acid probes or synthetic antigens. In addition, there is interest in the development of rapid identification and diagnostic methods for the assay of toxins, metabolites and analogs in clinical specimens.

E. MEDICAL CHEMICAL DEFENSE RESEARCH PROGRAM - The Defense Threat Reduction Agency (DTRA) Joint Science and Technology Office for Chemical and Biological

Defense (JSTO-CBD) manages research directed towards medical chemical defense. The DTRA JSTO-CBD is funding limited proposals through the USAMRMC BAA. DTRA also solicits proposals for its requirements through the Federal Business Opportunities (FedBizOpps) and the DoD Small Business Innovative Research (SBIR) Program solicitations. For information regarding DTRA business opportunities, please visit their website at the following link: http://www.dtra.mil/be/business_opp/procurement/acq_procopp.cfm.

The Medical Chemical Defense Research Program seeks to preserve combat effectiveness by timely provision of medical countermeasures in response to Joint Service chemical warfare defense requirements. The fundamental orientation of the program is to protect U.S. forces from the effects of chemical warfare agents by developing protective, pretreatment, and prophylactic products, providing products usable by the individual soldier for immediate treatment of chemical warfare agent exposures, developing antidotes/therapeutics to chemical warfare agents, defining care procedures for chemical warfare agent casualties, and advancing management of these casualties. The medical countermeasures are intended to preserve and sustain the soldiers' combat effectiveness in the face of combined threats from chemical and conventional munitions on the integrated battlefield.

The broad goals of this program are:

1. Maintain the Technologic Capability to meet present requirements and counter future chemical warfare agent threats. The program will maintain the scientific base and technological capability to develop timely medical countermeasures for both current and future chemical warfare agent threats. Research funded by this program will be used to identify concepts and candidate medical countermeasures for use by the individual soldier or by medical personnel. Basic and applied research are both supported, and may address topics as diverse as determining sites/mechanisms of action and effects of exposure to chemical warfare agents with emphasis on exploitation of neuroscience technology, respiratory, ocular, and dermal pathophysiology; identifying sites and biochemical mechanisms of action of medical countermeasures; exploiting molecular biological and biotechnological approaches for development of new approaches for medical countermeasures to chemical warfare agents; and exploiting molecular modeling and quantitative structure-activity relationships in support of drug discovery and design.

2. Provide Medical Countermeasures for the individual soldier to maintain combat effectiveness and prevent or reduce injury from chemical warfare agents. This goal encompasses research supporting development of new concepts for prophylaxes, pretreatments, antidotes, and therapeutic countermeasures; development of skin protectants and decontaminants; identification of factors which influence safety and efficacy of candidate medical countermeasures; and development and maintenance of preformulation, formulation, and radiolabeling capabilities.

3. Provide Medical Management of Chemical Casualties to enhance survival and expedite the return-to-duty of chemical warfare agent casualties through definitive therapies and life support technologies. This goal includes: developing concepts and therapeutic regimens and procedures for the management of chemical warfare agent casualties; developing diagnostic and prognostic indicators for chemical warfare agent casualties; and developing life-support equipment for definitive care of chemical warfare agent casualties.

Recent changes in the security situation facing the United States have not materially reduced the threat that chemical weapons present to American forces in the field. Many third world countries and terrorist groups have the capability of producing and delivering chemical warfare agents thus posing a substantial and serious threat to the armed forces of the United States.

Classical chemical agent threat categories include vesicant or blister agents (e.g., sulfur mustard), blood agents (e.g., cyanide), respiratory agents (e.g., phosgene) and nerve agents (e.g. GA or Tabun, GB or Sarin, GD or Soman, and VX).

Examples of pertinent research topics and areas currently of interest are:

a. Characterizing the mechanisms of vesicant agent pathophysiology to identify medical countermeasures against vesicant agents.

b. Developing innovative models of the pathophysiology of vesicant agent injury.

c. Identifying, synthesizing, and/or evaluating innovative candidate medical countermeasures against vesicant agents.

d. Identifying, exploring, and developing innovative clinical diagnostic, prognostic, and management approaches to vesicant agent casualties.

e. Characterizing the ocular lesions associated with vesicant agent exposures; developing treatments to ameliorate these injuries.

f. Characterizing the mechanisms of nerve agent-induced seizures and resulting pathophysiology; to identify medical countermeasures against nerve agent-induced seizures.

g. Identifying, synthesizing, and/or evaluating innovative candidate medical countermeasures against nerve agent-induced seizures.

h. Developing innovative models of the pathophysiology of nerve agent induced seizures.

i. Developing catalytic and/or stoichiometric chemical warfare agent scavengers from biological molecules (e.g., antibodies and enzymes) which provide protection against nerve agent incapacitation and lethality for extended periods following their administration.

j. Developing innovative models for evaluation of chemical warfare agent scavengers.

k. Identifying, expressing, synthesizing, and/or evaluating biotechnologically-derived or pharmaceutically-based scavengers as candidate medical countermeasures against chemical warfare agents.

l. Developing and evaluating custom-synthesized pharmaceuticals based on a detailed understanding of the pathophysiology and mechanisms of action of the chemical warfare agent structure and the function of the intended target molecule.

m. Developing catalytic and/or stoichiometric additives for use in skin protectants, or decontaminants, to protect against chemical warfare agents, especially vesicant and nerve agents.

n. Developing innovative models for evaluation of catalytic and/or stoichiometric additives in skin protectants or decontaminants.

o. Developing candidate formulations for skin protectants or decontaminants containing catalytic and/or stoichiometric additives and evaluating these formulations against chemical warfare agents.

p. Characterizing the pathophysiology and natural progression of chemical warfare agent-induced damage to human tissues.

q. Developing and validating innovative techniques for rapid and accurate analysis of human tissues and body fluids for detection of chemical warfare agent exposures.

r. Characterizing the effects of long-term or chronic exposures to chemical warfare agents and/or medical countermeasures to these agents.

s. Identifying, exploring, and developing innovative clinical diagnostic, prognostic and management approaches to nerve agent casualties.

t. Developing and validating field usable procedures for diagnosis, prognosis, and treatment of chemical warfare agent casualties under both field and laboratory conditions.

F. TELEMEDICINE AND ADVANCED TECHNOLOGY PROGRAM

The scope of the USAMRMC's telemedicine program includes identification, exploration and demonstration of key technologies and enabling biomedical principles required to overcome technological barriers that are both medically and militarily unique. The goals of this effort are to: 1) reduce the medical "footprint" and increase medical mobility while ensuring access to essential medical expertise and support; 2) incorporate health awareness into battlespace awareness; 3) improve the skills and efficiency of care providers; and 4) improve the delivery and quality of medical/surgical care throughout the battlespace.

Achieving the goals of telemedicine will require new technologies and the application of existing technologies to uniquely military health-related problems, as well as integration with other DOD modernization initiatives in the areas of information systems, telecommunications networks and logistics systems.

Research and development is required to enhance the following operational capability elements:

1. Joint Telemedicine-Joint Readiness: Joint Readiness is operational capability to use distributed medical databases, computer supported collaborative planning, dynamic modeling, advanced distributed learning, modeling and simulation for individual and team training, surgical simulation and haptic feedback supported virtual reality and telesurgical robotics to enhance the combat trauma training of physicians, surgeons, medical corpsmen, other healthcare providers, medical teams and units, and to improve the medical readiness of all personnel assigned to the joint warfighting force prior to deployment. This operational capability is supported by three operational capability elements: Individual Medical Skills and Proficiency, Unit Medical Skills Proficiency, and Information Superiority for Medical Applications.

a. Individual Medical Skills and Proficiency is defined as the ability to use advanced medical simulations to improve the training of Joint Service battlefield healthcare providers and ensure the currency of their individual and unit related combat medical skills. At the unit level, realistic simulations using stochastic modeling systems are needed for contingency operation medical mission planning, rehearsal and dynamic mission retasking. These systems will have embedded, fault tolerant, object oriented, dynamic scenario generation capabilities, and will be deployable, scaleable, interoperable, and evolvable as mission requirements change.

b. Unit Medical Skills Proficiency is defined as the ability to provide home station training for distributed forces (active and reserve) using advanced live, linked and constructive collaborative simulations that represent joint medical task forces in realistic scenarios. Medical training systems will require sophisticated distributed, synchronized resident databases capable of automatic update and reconstruction, multilevel security with high rate, high bandwidth telecommunications support, and advanced collaboration planning capability.

c. Information Superiority for Medical Applications is defined as the ability to provide near real time information on individual and unit medical readiness of the Joint Task Force personnel prior to deployment. These systems will use intelligent agents to retrieve, filter and deconflict medical information contained in computerized medical records in large distributed medical databases, and apply artificial intelligence based analytical capabilities to proactively project health parameters and appropriate medical interventions for Joint Forces prior to deployment. These systems will also include interactive, dynamic environmental effects and

human systems performance modeling capabilities to forecast the near, mid and long term medical impacts of operational and resource decisions on the health status of the Joint Force.

2. Joint Telemedicine-Battlespace Medical Awareness: Battlespace medical awareness is the operational capability to acquire real time information about the position, status and movement of supported military personnel. Battlespace awareness provides commanders with medical situational awareness and display systems to rapidly acquire medically relevant information to precisely process and direct multimedia medical data to the appropriate user, and maintain the integrity of the processed information to provide a common view of the medical battlespace at different echelons and operational levels. Battlespace awareness is supported by functional capabilities for Medical Information Acquisition, Medical Data Fusion and Distribution, and Medical Situational Interfaces.

a. Medical Information Acquisition is defined as the ability to rapidly acquire a full spectrum of multimedia clinical and operational information. This information will enable commanders and medical providers to rapidly diagnose and treat casualties, to track soldiers and casualties during evacuation and to collect other assessment and reporting information on individual and unit casualties, activities, plans, and intentions. This capability element will ensure that commanders have dominant battlespace knowledge of their human resources. Novel user interfaces, such as those that employ voice interaction or natural language processing (NLP) are of interest. Other candidate technologies include, but are not limited to, mobile and wireless devices.

b. Medical Data Fusion and Distribution is defined as the capability to dynamically access large scale, distributed medical databases, and then integrate, process and direct multimedia medical information to appropriate users to support enhanced diagnosis, treatment and medical management of personnel within the joint battlespace. Information assurance and security is a high priority. Medical Data Fusion will include multi-echelon, real time monitoring capabilities to detect operations within the integrated combat healthcare delivery network, display deviations from plans, and rapidly recommend alternative courses of action.

c. Medical Situational Interfaces is defined as the ability to adjust the level and display of clinical, geospatial, operational and tactical situations, and tailor the presentation of information to accelerate and simplify the cognitive understanding of integrated information. Specifically, consistent battlespace understanding will integrate complex medical and tactical information with geospatial coordinates and advanced “smart” display presentations to provide commanders with a real time understanding of the medical implications of the joint operational battlespace. This information will be displayed in a manner that is congruent with the individual needs of operational commanders and the supporting medical personnel. Medical displays also encompass the use of individual displays that assist healthcare providers in the treatment of casualties.

3. Joint Telemedicine-Effective Employment of Medical Forces: Effective Employment of Medical Forces is the operational capability to more effectively and efficiently employ medical assets within the battlespace. It is dependent upon three functional capabilities, prognostics and planning, telemedical management of medical forces and execution of time-critical medical missions. These capabilities allow the commander to better monitor and project the health of the force, locate, diagnose and treat individual casualties, tailor joint medical forces to the needs of specific missions and regulate the flow of casualties throughout the battlespace. It allows commanders to dynamically integrate tactical and supporting medical assets throughout the theater and the CONUS supporting base to better coordinate health care delivery. Effective

employment of medical forces is supported by functional capabilities for medical force management and improved evacuation and treatment.

a. Medical Force Management is defined as the ability to reduce the medical footprint by using superior medical situational awareness, advanced diagnostics, communications and information technology to more effectively manage the care of friendly forces through the dynamic synchronization of medical resources in both the Theater of Operations and the CONUS sustaining base. This capability includes multi-echelon, real-time monitoring capabilities to detect operations within the integrated combat health care delivery network, display deviations from plans, and rapidly recommend alternative courses of action that optimize deployment of medical treatment and evacuation assets, reduce support and maintenance requirements, and focus medical logistics support within the joint battlespace.

b. Improved Evacuation and Treatment is defined as the ability to use integrated networks of Global Positioning Systems, specialty-specific telementoring and teleconsultation, telerobotics, and advanced life support and transport systems to rapidly locate, diagnose, treat and evacuate casualties when time is the critical variable that will determine mortality and morbidity. This includes the development of techniques and clinically focused technology systems and linkages that enable rapid identification of high priority casualty treatment requirements, real time coordination of medical treatment (intervention) and evacuation, synchronization of handoffs between Joint Service echelons of care, and execution of time critical invasive medical therapies. A premium is placed on interventions that can be used within the battle area or as close to it as possible, before or during evacuation. This capability element also includes the transmission of multimedia medical data for physician and/or computer aided analysis, teleconsultation in real time or store and forward mode, medical image analysis, 3D image processing, pre-surgical planning, and distance specialty support systems.

4. Biotechnology: The Army is currently transforming into a Future Force that will be more responsive, deployable, agile, versatile, lethal, survivable, and sustainable than the current (legacy) force. Realization of the Future Force will require soldier- centered and engineered systems that provide revolutionary operational capabilities. Specifically, soldier- centered systems will need to enhance the health and performance of soldiers; engineered systems will need to improve force projection, force protection and situational dominance. Medical forces and assets will have to be efficient, effective and capable of supporting the full spectrum of military operations.

Given the above, there are several biotechnology areas that are important for the medical technology research community to exploit in order to achieve significant gains in combat support effectiveness en route to the Future Force. Specifically, prospective Army medical applications of biotechnology include:

- Data fusion and storage;
- Biosurveillance;
- High-resolution imaging;
- Physiologic sensors; and
- Soldier therapeutics.

By extension, there are five general areas where biotechnology development is needed:

- Sensors- assay analysis, detection methods (e.g. detector arrays);
- Electronics and Computing- biocomputing (e.g. biological models), bio-molecular hybrid devices;

- Materials- tissue engineering (e.g. self-replicating systems, cartilage repair and replacement), hybrid materials;
- Logistics- miniaturization of biological devices (e.g. Microelectrical Mechanical-based systems, nanotechnologies); and
- Therapeutics- genomics and proteonomics (e.g. data gathering, analysis, and management techniques to identify and develop novel therapies).

Given the various possibilities across the five areas of development, the Army seeks to support research that identifies, develops, and demonstrates bioscience and engineering technologies that are relevant to the above- mentioned military medical applications in specific and Future Force Warrior operational capabilities in general.

5. Bioterrorism Training/Education: The 2001 episodes of Anthrax exposure demonstrated the need for well- prepared and trained "front line" military and civilian professionals, including medical and medical support personnel and "first responders." Therefore, there is a requirement to develop and implement Web- based, bio-terrorism medical response education and training programs for a diverse user audience with a differing knowledge base. The overarching objective is to create a distributed learning environment that permits the interoperability of bio-terrorism medical response learning tools and course content on a global scale. Tools - devices, systems, programs - and prototypes should be accessible, adaptable, interoperable and reusable. Additionally, tools and prototypes should address one or more of the following functional areas:

- Bioterrorism response preparedness;
- Knowledge building;
- Acquisition of new skills;
- Maintenance and enhancement of existing skills;
- Targeted delivery of information, content and services based on specific user needs.

All tools and prototypes should take into account the ongoing development and implementation of specifications and guidelines, such as the Sharable Content Object Reference Model (SCORM).

G. SPECIAL PROGRAMS

The USAMRMC is frequently directed by Congress to manage funding of research programs with specific goals and end-points for health related issues relevant to military personnel, military dependents, veterans, and the health of the American public. These research programs are generally concerned with topics relating to health-care delivery; to detection, diagnosis, control or eradication of specified diseases, conditions, or syndromes; or to other initiatives relevant to health needs. Funding of these areas is dependent upon Congressional direction and availability of funds.

Additional information on the USAMRMC's core military research and development programs organized under four Research Area Directorates (RADs) can be found at the following web site: https://mrmc.amedd.army.mil/mrdindex.asp.