# CBDP BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)

DATE: **February 2005**

BUDGET ACTIVITY: **RDT&E DEFENSE-WIDE/ BA2 - Applied Research**

PE NUMBER AND TITLE: **0602384BP CHEMICAL/BIOLOGICAL DEFENSE (APPLIED RESEARCH)**

| COST (In Thousands) | | FY 2004 Actual | FY 2005 Estimate | FY 2006 Estimate | FY 2007 Estimate | FY 2008 Estimate | FY 2009 Estimate | FY 2010 Estimate | FY 2011 Estimate | Cost to Complete | Total Cost |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | Total Program Element (PE) Cost | 150898 | 168827 | 187787 | 179914 | 174754 | 164819 | 160263 | 159361 | Continuing | Continuing |
| CB2 | CHEMICAL BIOLOGICAL DEFENSE (APPLIED RESEARCH) | 84416 | 100631 | 104317 | 104741 | 96961 | 90197 | 83962 | 82303 | Continuing | Continuing |
| TB2 | MEDICAL BIOLOGICAL DEFENSE (APPLIED RESEARCH) | 44784 | 43678 | 61654 | 42401 | 35344 | 29153 | 31017 | 31606 | Continuing | Continuing |
| TC2 | MEDICAL CHEMICAL DEFENSE (APPLIED RESEARCH) | 21698 | 24518 | 21516 | 31172 | 39449 | 40969 | 40384 | 39952 | Continuing | Continuing |
| TR2 | MEDICAL RADIOLOGICAL DEFENSE (APPLIED RESEARCH) | 0 | 0 | 300 | 1600 | 3000 | 4500 | 4900 | 5500 | Continuing | Continuing |

| CBDP BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit) | DATE February 2005 |
|---|---|
| BUDGET ACTIVITY<br>**RDT&E DEFENSE-WIDE/**<br>**BA2 - Applied Research** | PE NUMBER AND TITLE<br>**0602384BP CHEMICAL/BIOLOGICAL DEFENSE (APPLIED RESEARCH)** |

**A. <u>Mission Description and Budget Item Justification:</u>** The use of chemical and biological weapon systems in future conflicts is an increasing threat. Funding under this PE sustains a robust program, which reduces the danger of a chemical and/or biological (CB) attack and enables U.S. forces to survive and continue operations in a CB environment. The medical program focuses on development of vaccines, pretreatments, therapeutic drugs, and on casualty diagnosis, patient decontamination, and medical management. In the physical sciences area, the emphasis is on continuing improvements in CB defense materiel, including contamination avoidance, decontamination, and protection systems. This program also provides for applied research in the areas of real-time sensing and immediate biological countermeasures. This PE also provides concept and technology demonstrations of new system concepts that will shape the development for environmental monitoring, medical surveillance, and data mining/fusion/analysis subsystems. The work in this PE is consistent with the Chemical Biological Defense Program Research, Development, and Acquisition (RDA) Plan. Efforts under this PE transition to or provide risk reduction for Advanced Technology Development (PE: 0603384BP), Advanced Component Development and Prototypes (PE: 0603884BP) and System Development and Demonstration (PE: 0604384BP). This project includes non-system specific development directed toward specific military needs and therefore is correctly placed in Budget Activity 2.

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PE NUMBER AND TITLE: **0602384BP CHEMICAL/BIOLOGICAL DEFENSE (APPLIED RESEARCH)**

| B. Program Change Summary: | FY 2004 | FY 2005 | FY 2006 | FY 2007 |
|---|---|---|---|---|
| Previous President's Budget (FY 2005 PB) | 151372 | 104385 | 101628 | 88519 |
| Current Biennial Budget Estimates (FY 2006) | 150898 | 168827 | 187787 | 179914 |
| Total Adjustments | -474 | 64442 | 86159 | 91395 |
| a. Congressional General Reductions | -114 | -2884 | 0 | 0 |
| b. Congressional Increases | 0 | 67325 | 0 | 0 |
| c. Reprogrammings | 3583 | 0 | 0 | 0 |
| d. SBIR/STTR Transfer | -2571 | 0 | 0 | 0 |
| e. Other Adjustments | -1372 | 1 | 86159 | 91395 |

**Change Summary Explanation:**

**Funding:** FY05 - Congressional increases to enhance projects within the science and technology base (+$38,875K CB2; +$21,700K TB2; +$6,750K TC2). Congressional general reductions and other adjustments (-$1,762K CB2; -$621K TB2; -$501K TC2).

FY06 - Enhance research efforts in physical sciences and medical/biological countermeasures (+$40,000K CB2; +$33,600K TB2; +$7,400K TC2). Inflation adjustment (+$1,542K CB2; +$654K TB2; +$316K TC2). Reprioritization of programs within the Chemical Biological Defense Program to support higher priority efforts (-$3,546K CB2; +$1,529K TB2; +$4,664K TC2).

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**Funding (cont.)**

FY07 - Enhance research efforts in physical sciences and chemical/biological medical countermeasures (+$45,000K CB2; +$12,600K TB2; +$7,400K TC2). Inflation adjustment (+$1,758K CB2; +$739K TB2; +$523K TC2). Reprioritization of programs within the Chemical Biological Defense Program to support higher priority efforts (+$5,181K CB2; +$7,104K TB2; +$11,090K TC2).

**Schedule:** N/A

**Technical:** N/A

# CBDP BUDGET ITEM JUSTIFICATION SHEET (R-2a Exhibit)

DATE: **February 2005**

BUDGET ACTIVITY: **RDT&E DEFENSE-WIDE/ BA2 - Applied Research**

PE NUMBER AND TITLE: **0602384BP CHEMICAL/BIOLOGICAL DEFENSE (APPLIED RESEARCH)**

PROJECT: **CB2**

| COST (In Thousands) | | FY 2004 Actual | FY 2005 Estimate | FY 2006 Estimate | FY 2007 Estimate | FY 2008 Estimate | FY 2009 Estimate | FY 2010 Estimate | FY 2011 Estimate | Cost to Complete | Total Cost |
|---|---|---|---|---|---|---|---|---|---|---|---|
| CB2 | CHEMICAL BIOLOGICAL DEFENSE (APPLIED RESEARCH) | 84416 | 100631 | 104317 | 104741 | 96961 | 90197 | 83962 | 82303 | Continuing | Continuing |

## A. Mission Description and Budget Item Justification:

**Project CB2 CHEMICAL BIOLOGICAL DEFENSE (APPLIED RESEARCH):** This project addresses the urgent need to provide all services with defensive materiel to protect individuals and groups from threat chemical-biological (CB) agents in the areas of detection, identification and warning, contamination avoidance via reconnaissance, individual and collective protection, and decontamination. The project provides for special investigations into CB defense technology to include CB threat agents, operational sciences, modeling, CB simulants, and CB survivability. Of special interest are two Defense Technology Objectives described as follows: (1) The fate of Chemical Warfare (CW) agents following deposition onto natural and man-made materials found in operation environments including battlefields and air bases and (2) toxicological effects resulting from low-level exposure to CW agents as well as the relationships between concentration and total exposure as measured by the product of concentration and time. This project focuses on horizontal integration of CB defensive technologies across the Joint Services. The Defense Technology Objectives (DTOs) provide a means to shape the development of selected technologies within this project. Research in this PE also supports the Joint Requirements Office (JRO) for CB Defense Baseline Capability Assessment.

## B. Accomplishments/Planned Program

| | FY 2004 | FY 2005 | FY 2006 | FY 2007 |
|---|---|---|---|---|
| Applied Research | 25636 | 0 | 0 | 0 |

# CBDP BUDGET ITEM JUSTIFICATION SHEET (R-2a Exhibit)

DATE: **February 2005**

| BUDGET ACTIVITY | PE NUMBER AND TITLE | PROJECT |
|---|---|---|
| **RDT&E DEFENSE-WIDE/ BA2 - Applied Research** | **0602384BP CHEMICAL/BIOLOGICAL DEFENSE (APPLIED RESEARCH)** | **CB2** |

**FY 2004 Accomplishments:**

- 923 Air Containment Monitoring System - Developed systems for contained air monitoring for chemical agents.
- 923 Atmospheric Plasma for Bio Defense Decontamination - Investigated technologies for atmospheric plasma for biological defense decontamination.
- 1291 Bioinformatics Network - Created linkages which interactively approach the extraction of rapid analysis of biological data.
- 3226 Consortium for Countermeasures for Biological Threats - Developed multiple technologies and implementations to counter the threat of attack using biological threat agents against civilian and military populations.
- 1937 Center for Information Assurance Security
- 5068 LSH-SAW Biosensor - Investigated acoustic wave technology for biosensors.
- 1152 Rapid Decontamination System for Nerve Agents - Explored technologies for rapid decontamination system for nerve agents.
- 923 Automated Lipid Phase Detection of Toxic Compounds - Automated lipid phase detection of toxic compounds program was baselined.
- 969 Bioinformatics Equipment - Explored technologies for bioinformatics equipment.
- 923 Remote Optical Sensing Program - Explored technologies for remote optical sensing.
- 1937 Bioinformatics - Tailored approaches to extract and rapidly analyze biological data to enhance the study of chemical and biological threat agent effects.
- 923 Early Warning and Detection Program - Explored technologies for early warning and detection.

# CBDP BUDGET ITEM JUSTIFICATION SHEET (R-2a Exhibit)

DATE: **February 2005**

| BUDGET ACTIVITY | PE NUMBER AND TITLE | PROJECT |
|---|---|---|
| **RDT&E DEFENSE-WIDE/ BA2 - Applied Research** | **0602384BP CHEMICAL/BIOLOGICAL DEFENSE (APPLIED RESEARCH)** | **CB2** |

**FY 2004 Accomplishments (Cont):**

- 2213 Detection of Chemical, Biological and Pollutant Agents in Water - Developed technology to detect CB and pollutant agents in potable water sources.
- 3228 Global Pathogen Portal - Developed tools for creating, acquiring, and analyzing molecular level biological data.

**Total** 25636

| | FY 2004 | FY 2005 | FY 2006 | FY 2007 |
|---|---|---|---|---|
| Decontamination | 3843 | 3279 | 6902 | 6102 |

**FY 2004 Accomplishments:**

- 824 Decontamination, Solid Phase Chemistry - Evaluated enhanced oxidative nanoparticles as reactive sorbents for both chemical and biological agent decontamination. Conducted a study to determine why nanoscale materials show no advantage over conventional microscale solids in sorbent operations.
- 1900 Decontamination - Oxidative Formulation (DTO CB44) Baseline Capability Assessment (BCA) #18/23/34 - Initiated chamber testing over operational temperature range, finished material compatibility testing and formulated peroxycarbonate and peracid candidates into a dry powder and/or concentrated liquid. Finalized formulation of newly added oxidative approaches and conducted material compatibility and agent testing. This DTO supported the Joint Tactical Decontamination Systems (JSTDS).

# CBDP BUDGET ITEM JUSTIFICATION SHEET (R-2a Exhibit)

DATE: **February 2005**

| BUDGET ACTIVITY | PE NUMBER AND TITLE | PROJECT |
|---|---|---|
| **RDT&E DEFENSE-WIDE/ BA2 - Applied Research** | **0602384BP CHEMICAL/BIOLOGICAL DEFENSE (APPLIED RESEARCH)** | **CB2** |

**FY 2004 Accomplishments (Cont):**

- 1119 Decontamination, Sensitive Equipment - Evaluated portable approaches for the cleaning of small sensitive surfaces for use in the interior of vehicles and aircraft. Conducted a cold weather thermal decontamination study for interior spaces. Continued studies on activated sorbent suspensions of hydrofluoro ethers (HFE) solvent systems.

**Total** 3843

**FY 2005 Planned Program:**

- 1061 Decontamination, Sensitive Equipment BCA#17/18 - Conclude studies on activated sorbent suspensions in hydrofluoro ethers (HFE) solvent systems. Initiate a new effort to develop reactive impregnated solvent based wiping systems. Initiate a new effort to develop a better filtration system for HFE solvent systems as a product improvement for the Joint Service Sensitive Equipment Decontamination (JSSED) acquisition effort.
- 2218 Decontamination - Oxidative Formulation (DTO CB44) BCA#18/23/34 - Complete chamber testing over operational temperature range, finish material compatibility testing, and formulate new oxidative approaches into a dry powder and/or concentrated liquid. This DTO completes in FY05 and supports the Joint ServiceTactical Decontamination Systems (JSTDS).

**Total** 3279

# CBDP BUDGET ITEM JUSTIFICATION SHEET (R-2a Exhibit)

DATE: **February 2005**

| BUDGET ACTIVITY | PE NUMBER AND TITLE | PROJECT |
|---|---|---|
| **RDT&E DEFENSE-WIDE/ BA2 - Applied Research** | **0602384BP CHEMICAL/BIOLOGICAL DEFENSE (APPLIED RESEARCH)** | **CB2** |

**FY 2006 Planned Program:**

- 3010 Decontamination, Sensitive Equipment BCA#17/18 - Continue effort to develop reactive impregnated solvent based wiping systems. Continue development of a better filtration system for hydrofluoro ethers (HFE) solvent systems as a product improvement for the Joint Service Sensitive Equipment Decontamination (JSSED) acquisition effort. Develop alternative approaches for small area clean up to support the Joint Platform Interior Decontamination (JPID) requirement.
- 3596 Decontamination, Solution Chemistry BCA#18/23/34 - Develop an improved decontaminant for the use on aircraft and other sensitive exteriors for transition to the Joint Service Family of Decontamination Systems (JSFDS) program. Conclude development of a chlorine dioxide based man portable decontamination system. Investigate alternative solution based technologies for man portable devices for immediate and operational decontamination scenarios.
- 296 Decontamination, Solid Phase Chemistry - Conduct survey to identify new approaches to solid phase (reactive sorbent) decontaminants.

**Total** 6902

**FY 2007 Planned Program:**

- 3824 Decontamination, Sensitive Equipment BCA#17/18 - Complete development of reactive impregnated solvent based wiping systems. Transition to Joint Platform Interior Decontamination (JPID) effort as part of the tool kit to decontaminate sensitive equipment interiors. Complete the development of an improved filtration system for hydrofluoro ethers (HFE) solvent cleaning systems and transition to the Joint Service Sensitive Equipment Decontamination System (JSSED) program as a product improvement. Transition technologies for JPID to demonstration phase.

# CBDP BUDGET ITEM JUSTIFICATION SHEET (R-2a Exhibit)

DATE: **February 2005**

| BUDGET ACTIVITY | PE NUMBER AND TITLE | PROJECT |
|---|---|---|
| **RDT&E DEFENSE-WIDE/ BA2 - Applied Research** | **0602384BP CHEMICAL/BIOLOGICAL DEFENSE (APPLIED RESEARCH)** | **CB2** |

**FY 2007 Planned Program (Cont):**

- 1938 Decontamination, Solution Chemistry BCA#18/23/34 - Continue efforts to develop an improved decontaminant for the use on aircraft and other sensitive exteriors.
- 340 Decontamination, Solid Phase - Down select candidate novel solid phase (reactive sorbent) decontaminants and initiate agent testing programs.

**Total** 6102

| | FY 2004 | FY 2005 | FY 2006 | FY 2007 |
|---|---|---|---|---|
| Detection | 16718 | 11546 | 22482 | 23393 |

**FY 2004 Accomplishments:**

- 3473 Laser Induced Surface Analysis (LISA) Prototype - Constructed and demonstrated a laser enhanced Raman system that can detect the presence of chemical agent on surfaces at a contamination level of 0.5 g/m2 and is suitable for integration into a reconnaissance vehicle to demonstrate on-the-move capability. Transitioned to Advanced Technology Development in FY05.
- 4603 Point Detection, Biological Identification - Completed development and demonstration of Force Discrimination Assay (FDA). Completed development and testing automation of chip-based phylogenetic analysis of biological materials. Identified engineering/manufacturing issues for the transition of quantum dot technology to the Critical Reagent Program for application to enhance antibody ticket technology for improved stability and sensitivity. Completed mapping of spore protein markers from biological agents for mass spectroscopy based systems.

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DATE: **February 2005**

| BUDGET ACTIVITY | PE NUMBER AND TITLE | PROJECT |
|---|---|---|
| **RDT&E DEFENSE-WIDE/ BA2 - Applied Research** | **0602384BP CHEMICAL/BIOLOGICAL DEFENSE (APPLIED RESEARCH)** | **CB2** |

**FY 2004 Accomplishments (Cont):**

- 1634 Lightweight Integrated CB Detection (DTO CB50) BCA#3/4 - Completed population of the technical parameter database. Transitioned the Analysis of Alternative (AoA) to advanced development for selection of best technology to meet the requirements of the Joint Modular CB Detector.
- 981 Point Detection, Integrated CB - Completed exploration of novel concepts in small, combined chemical and biological sensors. Continued development of millimeter wave spectroscopy.
- 4127 Stand-off Biological Aerosol Detection (DTO CB35) BCA#1 - Completed construction and laboratory characterization of breadboards to demonstrate the capability to detect and discriminate biological and non-biological agents at a concentration of 1,000 agent containing particles per liter of air (ACPLA) at a range of 1 km. This DTO supported the Joint Biological Stand-off Detection Systems (JBSDS).
- 1500 Wide-Area Aerial Reconnaissance for Chemical Agents (DTO CB53) BCA#28 - Completed the development of a 30-Hz frame rate, 64-pixel Fourier transform infrared (FTIR) hyperspectral imager (TurboFT). Continued the development of Adaptive Infrared Imaging Spectroradiometer (AIRIS). Continued characterization of the sensor performance on the TurboFT. Initiated development of off-line algorithms and signal processing techniques. This DTO supported the Joint Service Light Nuclear Biological Chemical Reconnaissance System (JSLNBCRS) and Stryker vehicle programs.
- 400 Detection of CB Contamination on Surfaces (DTO CB52) BCA#33 - Completed data collection on three surfaces for four surety agents using laser enhanced Raman spectroscopy to detect the presence of the chemical agents and transitioned data to Laser Induced Surface Analysis (LISA) prototype.

**Total** 16718

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| BUDGET ACTIVITY | PE NUMBER AND TITLE | PROJECT |
|---|---|---|
| **RDT&E DEFENSE-WIDE/ BA2 - Applied Research** | **0602384BP CHEMICAL/BIOLOGICAL DEFENSE (APPLIED RESEARCH)** | **CB2** |

**FY 2005 Planned Program:**

- 5104 Stand-off Biological Aerosol Detection (DTO CB35) BCA#1 - Evaluate breadboards in field environments to detect and discriminate (biological vs non-biological) biological and chemical agents at concentration of 1,000 agent containing particles per liter of air (ACPLA) at a range of 1 km. Conduct feasibility studies to enhance false alarm to one per week and to operate during daytime. This DTO supports the Joint Biological Stand-off Detection Systems (JBSDS).
- 1699 Wide Area Aerial Reconnaissance for Chemical Agents (DTO CB53) BCA#28 - Develop a 3-Hz, 128 x 128 tunable Adaptive Infrared Imaging Spectroradiometer (AIRIS). Perform sensor characterization tests. Develop off-line algorithms and signal processing techniques. This DTO supports the Joint Service Light Nuclear Biological Chemical Reconnaissance System (JSLNBCRS) and Stryker programs.
- 4743 Point Detection, Integrated CB BCA#28 - Continue development of first generation breadboard based on millimeter wave spectroscopy for bio detection. Initiate Raman spectroscopy for the detection/identification of biological materials. Expand effort from Lightweight Integrated CB Detection (DTO CB50) on aerosol properties for identification of chemicals.

**Total** 11546

**FY 2006 Planned Program:**

- 4700 Stand-off Biological Aerosol Detection (DTO CB35) BCA#1 - Demonstrate the optimized system performance to detect and discriminate biological agents with at least a sensitivity of 1,000 agent containing particles per liter of air (ACPLA) at a range of 1 km with an objective false alarm rate no more than one per week in both daytime and nighttime operations. Evaluate the feasibility of the demonstrated technology to also meet the chemcial stand-off detection requirements. This DTO completes in FY06 and supports the Joint Biological Stand-off Detection Systems (JBSDS).

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| BUDGET ACTIVITY | PE NUMBER AND TITLE | PROJECT |
|---|---|---|
| **RDT&E DEFENSE-WIDE/ BA2 - Applied Research** | **0602384BP CHEMICAL/BIOLOGICAL DEFENSE (APPLIED RESEARCH)** | **CB2** |

**FY 2006 Planned Program (Cont):**

- 4000 Wide-Area Aerial Reconnaissance for Chemical Agents (DTO CB53) BCA#28 - Determine optimum spectrometer performance specifications in terms of scan speed, spatial resolution, and spectral resolution. Demonstrate an enhanced Fourier Transform Infrared (FTIR) and tunable IR systems with real-time data processing on an airborne platform in a reconnaissance application using the appropriate performance parameters. Complete DTO. This DTO supports the Joint Service Light Nuclear Biological Chemical Reconnaissance System (JSLNBCRS) and Stryker vehicle programs.
- 4500 Point Detection, Integrated CB BCA#28 - Continue first generation breadboard based on millimeter wave spectroscopy for bio detection. Continue Raman spectroscopy for the detection/identification of biological materials.
- 2000 Detection of CB Contamination on Surfaces BCA#31/33 - Initiate the development of technology to meet the needs to detect contamination on surfaces in a post decontamination application.
- 3278 Point Detection, Biological Identification BCA#21- Leverage efforts from Medical Science and Technology programs in proteomics for biomarkers for the identification of biological agents in complex biological backgrounds.
- 2450 Chemical Point Detection BCA#20/33 - Initiate the development of a micro gas analyzer with technology from the Defense Advanced Research Projects Agency. Merge requirements from Increment 2 of Joint Chemical Agent Detector as the baseline technical parameters. Focus is on real-time (less than 5 sec) detection/identification of submiosis sensitivity levels (parts per trillion) and the expansion of the number of detectable materials to include the high priority toxic industrial chemicals (TICs).
- 778 Chemical Stand-off Technology BCA#7 - Initiate the development of new signatures using non-linear technologies (i.e. femtosecond spectroscopy) to reduce the false alarm rate at least and order of magnitude and increase the detection range out beyond 10 km.

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| BUDGET ACTIVITY<br>**RDT&E DEFENSE-WIDE/**<br>**BA2 - Applied Research** | PE NUMBER AND TITLE<br>**0602384BP CHEMICAL/BIOLOGICAL DEFENSE (APPLIED RESEARCH)** |
| | PROJECT<br>**CB2** |

**FY 2006 Planned Program (Cont):**

- 776 Biological Stand-off Technology BCA#1 - Initiate the development of new signatures in nontraditional regions of the electromagnetic spectrum (i.e. millimeter wave or TeraHertz spectroscopy) that reduces the false alarm rate by at least an order of magnitude.

**Total** 22482

**FY 2007 Planned Program:**

- 6000 Point Detection, Integrated CB BCA#28 - Complete and demonstrate first generation breadboard based on millimeter wave spectroscopy for bio detection. Complete Raman spectroscopy for the detection/identification of biological materials.
- 4000 Detection of CB Contamination on Surfaces - Continue the development of technology to meet the needs to detect contamination on surfaces in a post decontamination application.
- 4000 Biological Identification - Continue the development of proteomics to identify biomarkers for the identification of biological agents in complex biological backgrounds.
- 5000 Chemical Point Detection - Continue the development of a micro gas analyzer with technology from DARPA. Focus is on real-time (less than 5 sec) detection/ identification of sub miosis sensitivity levels (parts per trillion) and the expansion of the number of detectable materials to include the high priority Toxic Industrial Chemicals (TICs).
- 2197 Chemical Stand-off Technology - Continue the development of new signatures using non-linear technologies (i.e. femtosecond spectroscopy) to reduce the false alarm rate at least an order of magnitude and increase the detection range out beyond 10 km.

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| **RDT&E DEFENSE-WIDE/ BA2 - Applied Research** | **0602384BP CHEMICAL/BIOLOGICAL DEFENSE (APPLIED RESEARCH)** | **CB2** |

**FY 2007 Planned Program (Cont):**

- 2196 Biological Stand-off Technology BCA #1 - Continue the development of new signatures in nontraditional regions of the electromagnetic spectrum that reduces the false alarm rate by at least an order of magnitude.

**Total** 23393

| | FY 2004 | FY 2005 | FY 2006 | FY 2007 |
|---|---|---|---|---|
| Modeling and Simulation Battlespace Management | 7990 | 7715 | 31161 | 26749 |

**FY 2004 Accomplishments:**

- 2507 Battle Space Management - Continued efforts to optimize data fusion and decision-making across networks and to provide visualization of network sensor responses under the auspices of Joint Warning and Reporting Network (JWARN) program requirements in concert with the Command, Control, Communications, Computers, Intelligence, Surveillance, and Reconnaissance (C4ISR) architecture.
- 1800 Chemical and Biological Hazard Environment Prediction (DTO CB55) BCA#5/6 - Investigated availability of high altitude dispersion model in support of the Joint Effects Model (JEM) Program. Transitioned advanced predictive capabilities Multi-community Environmental Storm Observatory (MESO) to JEM program. Enhanced the complex terrain and flow around structures modeling capability to address effects of vegetation and surface scavenging.

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| **RDT&E DEFENSE-WIDE/ BA2 - Applied Research** | **0602384BP CHEMICAL/BIOLOGICAL DEFENSE (APPLIED RESEARCH)** | **CB2** |

**FY 2004 Accomplishments (Cont):**

- 1437 Simulation Based Acquisition - Developed support tools for future acquisition decisions that would emerge from a study of CBDP requirements. Identified user base from within the Chemical Biological Defense Program. Initiated prototype tool design efforts.
- 2246 Chemical and Biological Warfare Effects on Operations (DTO CB43) BCA#8/9 - Tested and finalized Aerial Port of Debarkation (APOD) and Sea Port of Debarkation (SPOD) representation. Populated SPOD representation. Completed Joint Operational Effects Federation (JOEF) demonstration. Completed independent validation and verification on core model.

**Total** 7990

**FY 2005 Planned Program:**

- 1154 Chemical and Biological Hazard Environment Prediction (DTO CB55) and Hazard Prediction with Nowcasting (DTO CB62) BCA#5/6/8 - Continue refinement of Multi-community Environmental Storm Observatory (MESO) code for transition to Joint Effects Model (JEM). Perform independent validation and verification of a computation fluid dynamics - based tools set. Continue DTO CB62 to enhance near-surface environmental characterization and demonstrate improvements using the Joint Effects Model (JEM).
- 2795 CBDP Decision Capability (formerly Simulation Based Acquisition) BCA#1-39 - Complete tool design and begin prototype construction and testing. Consolidate analytic library and analysis methodology for use by program for rapid decision making. Use iterative user-focused design techniques to enhance tool/capability usability and acceptance.

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**FY 2005 Planned Program (Cont):**

- 1477 Battlespace Management BCA#2/3/9 - Continue efforts to optimize data fusion and decision-making across networks and to provide visualization of network sensor responses within the current and planned Command, Control, Communications, Computers, Intelligence, Surveillance, and Reconnaissance (C4ISR) architecture frame work. Integrate existing models into the Global Information Grid (GIG) and Net-Centric Enterprise System (NCES).
- 2289 Chemical and Biological Warfare Effects on Operations (DTO CB43) BCA#5/6/8 - Test and transition to Joint Operational Effects Federation (JOEF) transition. Develop mobile forces module. Conduct internal Verification and Validation (V&V). Complete DTO.

**Total** 7715

**FY 2006 Planned Program:**

- 9000 Chemical and Biological Warfare Effects on Operations (non-DTO) BCA#5/6/8/9 - Complete development of mobile forces modules. Identify new applications for Joint Operational Effects Federation (JOEF). Begin development activities for the integration of JOEF components with theater-level models such as the Joint Integrated Campaign Model (JICM). Begin development of consequence management tools for deployed forces.

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|---|---|---|
| **RDT&E DEFENSE-WIDE/ BA2 - Applied Research** | **0602384BP CHEMICAL/BIOLOGICAL DEFENSE (APPLIED RESEARCH)** | **CB2** |

**FY 2006 Planned Program (Cont):**

- 9700 Chemical and Biological Hazard Environment Prediction (DTO CB55) and Hazard Prediction with Nowcasting (DTO CB62) BCA#5/6 - Complete DTO CB55. Continue DTO CB62 to enhance near-surface environmental characterization and demonstrate improvements using the Joint Effects Model (JEM). Continue high altitude intercept effects characterization. Initiate littoral and maritime effects model for JEM. Expand sensor data fusion algorithm develop efforts. Consolidate source term determination module development. Conduct study of NTA transport and dispersion module requirements for JEM. Conduct study to assess military utility of computational fluid dynamics models for JEM. Begin applied research on epidemiological module for JEM. Assess and select appropriate methods for integrating near real-time weather data into transport and dispersion models. Continue development of urban dispersion models. Begin development of integrated indoor modeling capability. Leverage off other activities' waterborne transport modeling efforts. Begin developing a test-bed for transport and dispersion modeling.
- 7000 Battlespace Management BCA#2/3/9 - Design Net-Centric Enterprise Systems (NCES) modules for migration to test environment. Continue sensor-data fusion and source term location technologies in conjunction with chemical and biological hazard prediction thrust area. Develop an end-to-end laboratory facility to test the requirements for integrating CBRN sensors onto existing and planned Command, Control, Communications, Computers, Intelligence, Surveillance, and Reconnaissance (C4ISR) networks. Conduct study of user interface requirement for future indications and warning for CBRN hazards in both deployed force and homeland defense scenarios. Develop integration strategy to link consequence management capability into JWARN. Begin development of appropriate bridging capability to link and extend JWARN capabilities to homeland defense architectures. Begin development of a modeling/exercise rehearsal capability for JWARN.

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|---|---|---|
| **RDT&E DEFENSE-WIDE/ BA2 - Applied Research** | **0602384BP CHEMICAL/BIOLOGICAL DEFENSE (APPLIED RESEARCH)** | **CB2** |

**FY 2006 Planned Program (Cont):**

- 5461 CBDP Decision Capability BCA#1-39 - Continue building the analytical framework. Begin development of representative prototypes for each of the other capability areas. Continue to identify gaps in capability to conduct rapid program analysis and conduct feasibility assessments for tool(s) development. Begin development of selected model and database linkages between analytic framework and decision support personnel.

**Total** 31161

**FY 2007 Planned Program:**

- 10000 Chemical and Biological Warfare Effects on Operations (non-DTO) BCA#5/6/8/9 - Integrate mobile forces modules. Identify new applications for Joint Operational Effects Federation (JOEF). Continue developing integration with theater-level models and begin initial testing with Joint Forces Command (JFCOM) and other selected Combatant Commands (COCOMs). Build plan for developing a complete virtual environment training capability.
- 5300 Chemical and Biological Hazard Environment Prediction (non-DTO) and Hazard Prediction with Nowcasting (DTO CB62) BCA#3/5/6/8 - Complete development of data assimilation techniques to improve forecasts of near-surface characteristics important for hazard prediction. Complete development of modules for Joint Effects Model (JEM) for high altitude, urban, littoral and coastal environments, and indoor scenarios. Integrate and field test sensor data fusion efforts with JEM. Conduct validation and verification (V&V) of high altitude intercept module. Continue the development of a test-bed for transport and dispersion modeling.

# CBDP BUDGET ITEM JUSTIFICATION SHEET (R-2a Exhibit)

DATE: **February 2005**

| BUDGET ACTIVITY | PE NUMBER AND TITLE | PROJECT |
|---|---|---|
| **RDT&E DEFENSE-WIDE/ BA2 - Applied Research** | **0602384BP CHEMICAL/BIOLOGICAL DEFENSE (APPLIED RESEARCH)** | **CB2** |

**FY 2007 Planned Program (Cont):**

- 7000 Battlespace Management BCA#2/3/4/8/9 - Build Net-Centric Enterprise Systems (NCES) modules for migration to test environment. Develop the CB-sensor network test facility. Develop certification lab capability for Joint Warning And Reporting Network (JWARN) related sensors and nodes. Begin test of CBRN interfaces to assess impact on JWARN and other Command, Control, Communications, Computers, Intelligence, Surveillance, and Reconnaissance (C4ISR) entities. Begin preliminary research on alternative technology CBRN display technologies. Continue sensor-data fusion and source term location technologies - integrate with Joint Effects Model (JEM) and Joint Operational Effects Federation (JOEF).
- 4449 CBDP Decision Capability BCA#1-39 - Continue building the analytical framework. Continue to identify gaps in capability to conduct rapid program analysis and conduct feasibility assessments for tool(s) development. Continue development of representative prototype models for each of the capability areas.

**Total** 26749

| | FY 2004 | FY 2005 | FY 2006 | FY 2007 |
|---|---|---|---|---|
| Protection | 6227 | 7646 | 10962 | 10476 |

# CBDP BUDGET ITEM JUSTIFICATION SHEET (R-2a Exhibit)

DATE: **February 2005**

| BUDGET ACTIVITY | PE NUMBER AND TITLE | PROJECT |
|---|---|---|
| **RDT&E DEFENSE-WIDE/ BA2 - Applied Research** | **0602384BP CHEMICAL/BIOLOGICAL DEFENSE (APPLIED RESEARCH)** | **CB2** |

**FY 2004 Accomplishments:**

- 1500 Self-Detoxifying Materials for Chemical/Biological Protective Clothing (DTO CB45) BCA#11 - Demonstrated ability to produce materials employing self detoxification chemistries for G-nerve agents, VX, and blister (HD) by commercial electrospinning. Demonstrated improved reaction rates for hyperbranched surface migrating compounds. Demonstrated agent deactivation chemistry of fiber bound catalysts through solution and vapor challenge testing for a target reactivity level of 1 mg agent/cm2/day. Demonstrated effectiveness of scaled up N-halamine treated materials against significant biological challenges. Demonstrated nanoparticle reaction rates in excess of 2 mg agent/cm2/day in both fiber and coating form. Down-selected most reactive, cost effective nanoparticle compositions and optimized those materials for reactivity rates and range of materials they detoxify. This DTO supported Joint Expeditionary Collective Protection (JECP) program . The DTO also supported the current Joint Service Lightweight Integrated Suit Technology (JSLIST) program.
- 1218 Collective Protection, Shelters - Continued development and testing of advanced CB shelter materials and prototype shelter system components (shell, liner, support, airlocks, seams and seals). Continued to identify and test chemistries for self decontaminating shelter materials and applications. Continued airflow modeling of airlock configurations to optimize designs to reduce dwell time, increase entry/exit rate, and facilitate dual entry and exit of personnel, patients and supplies.
- 900 End-of-Service-Life Indicators (ESLI) for NBC Mask Filters (DTO CB36) BCA#19 - Continued fabrication and demonstration testing of ESLI filter concept models to verify ESLI is a reliable indicator of gas life depletion for key target agents (i.e., GB, HD, CK, AC and CG). Continued efforts to determine the effects of common environmental factors (i.e., heat and humidity) that may impact ESLI performance and evaluated the effects of long term storage. This DTO supported several protective equipment (mask) programs.

# CBDP BUDGET ITEM JUSTIFICATION SHEET (R-2a Exhibit)

DATE: **February 2005**

| BUDGET ACTIVITY | PE NUMBER AND TITLE | PROJECT |
|---|---|---|
| **RDT&E DEFENSE-WIDE/ BA2 - Applied Research** | **0602384BP CHEMICAL/BIOLOGICAL DEFENSE (APPLIED RESEARCH)** | **CB2** |

**FY 2004 Accomplishments (Cont):**

- 748 Individual Protection, Masks - Refined advanced mask system concepts. Optimized candidate mask sealing options and assessed anti-fogging and moisture control technologies. Prepared human use bio-aerosol protection factor assessment protocol, established and validated test procedures, and conducted human Protection Factor study with monodisperse inert aerosols.
- 861 Collective Protection, Air Purification - Characterized constraints of mature candidate adsorbent compositions against a wide range of TIC and CW agents including aging, chemical reaction regeneration cycles, relative humidity, temperature, and material compatibility. Optimized regenerative process for temperature, pressure and cycle time to verify candidate adsorbent materials. Developed regenerative technology demonstrator and obtaining performance data. Initiated database development of unit processes for developing advance air purification systems. Tested anti-microbial aerosol/ particulate filter media and developed enhanced prototype. Transitioned effort to Advanced Technology Development.
- 1000 Advanced Adsorbents for Protection Applications (DTO CB08) - Completed fundamental single-pass and regenerative filtration adsorption models. Completed performance verification of new adsorbent formulations for use in NBC filtration systems. Evaluations considered adsorbent bed performance under a wide range of agent challenge concentration scenarios and environmental conditions. Selected best adsorbent bed compositions. Completed DTO and transitioned efforts into the Joint Service General Purpose Mask (JSGPM) and Joint Collective Equipment Program (JCEP) programs.

**Total** 6227

# CBDP BUDGET ITEM JUSTIFICATION SHEET (R-2a Exhibit)

DATE: **February 2005**

| BUDGET ACTIVITY | PE NUMBER AND TITLE | PROJECT |
|---|---|---|
| **RDT&E DEFENSE-WIDE/ BA2 - Applied Research** | **0602384BP CHEMICAL/BIOLOGICAL DEFENSE (APPLIED RESEARCH)** | **CB2** |

**FY 2005 Planned Program:**

- 772 End-of-Service-Life Indicators (ESLI) for NBC Mask Filters (DTO CB36) BCA#19 - Assess the effects of common battlespace interferents on ESLI performance. Optimize ESLI design and complete demonstration testing on ESLI filter prototype(s). Investigate new indicators (or optimize existing indicators as required) to detect sorbent depleting battlefield contaminants. This DTO will transition to the Joint Service General Purpose Mask (JSGPM) program.
- 1155 Advanced Air Purification System Model (DTO CB61) BCA#11 - Identify high priority model applications, compile user and operational requirements and initiate population of databases using data in literature, existing system performance and module models. Initiate configuration of a lab scale system to measure required design data. This DTO supports the Joint Expeditionary Collective Protection (JECP) program.
- 1151 Individual Protection, Clothing BCA#26/27 - Prepare and evaluate carbon-loaded fabric with nanofiber and/or membrane backing in wide widths suitable for fabrication into prototype garments, incorporating novel closure systems for aerosol NTA protection. Develop and evaluate the performance of a prototype intermittent Micro Climate Cooling System (MCS) vapor compression component. Develop advanced closure concepts, develop and assess conceptual models, and fabricate prototypes of best candidates. Develop swatch test technology for assessing role of wind speed in challenge penetration of Individual Protective Equipment (IPE).

# CBDP BUDGET ITEM JUSTIFICATION SHEET (R-2a Exhibit)

DATE: **February 2005**

| BUDGET ACTIVITY | PE NUMBER AND TITLE | PROJECT |
|---|---|---|
| **RDT&E DEFENSE-WIDE/ BA2 - Applied Research** | **0602384BP CHEMICAL/BIOLOGICAL DEFENSE (APPLIED RESEARCH)** | **CB2** |

**FY 2005 Planned Program (Cont):**

- 1098 Collective Protection, Shelters BCA# 11 - Explore next generation airlock concepts focusing on improved airflow properties and ease of use features using computer modeling as well as test-bed purge testing of multiple configurations. Novel CB closures will be fabricated, tested and down-selected to the best performing concept. Initiate development of new impermeable CB resistant barrier material, starting with a front-end analysis and identification of conceptual configurations. Complete a study on the currently fielded equipment and procedures used in entry/exit of collective protection systems. Create a model of entry/exit process and run simulations documenting the effects of key variables. Perform simulant and agent testing on cloth swatches treated with self-decontaminating chemistries. Demonstrate performance of expedient coating formulations and determine permeability.
- 1344 Self-Detoxifying Materials for Chemical/Biological Protective Clothing (DTO CB45) BCA#11/26/27 - Demonstrate scaled-up electrospun self-detoxifying membranes. Optimize materials and processing conditions for reactive fibers/films/membranes. Select materials from DTO and related projects. Measure chemical/aerosol breakthrough of candidate fabrics. Measure durability of candidate fabrics from all sources. Conduct toxicology and live agent testing of manufactured fabrics. Select fabric design from agent and durability testing. Select overall garment design from field-testing and report findings. This DTO supports the Joint Expeditionary Collective Protection (JECP) program. This DTO also supports the current Joint Service Lightweight Integrated Suit Technology program.

# CBDP BUDGET ITEM JUSTIFICATION SHEET (R-2a Exhibit)

DATE: **February 2005**

| BUDGET ACTIVITY | PE NUMBER AND TITLE | PROJECT |
|---|---|---|
| **RDT&E DEFENSE-WIDE/ BA2 - Applied Research** | **0602384BP CHEMICAL/BIOLOGICAL DEFENSE (APPLIED RESEARCH)** | **CB2** |

**FY 2005 Planned Program (Cont):**

- 977 Individual Protection, Masks BCA#19 - Initiate and validate bio protection factor (PF) test procedures, conduct human bio-Protection Factor study, analyze data and prepare final report. Assess performance of dual sided filter concept model, develop and evaluate integration options, conduct testing to update baseline performance for concepts, and demonstrate technology and concepts for the next generation advanced mask system. Develop final technology concepts for active and passive pressurization, conduct additional unmanned and manned protection factor evaluations of all technology concepts, and develop final technology option recommendations for future mask concept development.
- 1149 Collective Protection, Air Purification BCA# 11 - Characterize and optimize performance of advance aerosol/particulate removal processes providing enhanced protection. Minimize the deleterious effects of adsorbents possessing volatile and non-volatile reactive chemicals. Develop filtration advanced air purification technology demonstrators based upon temperature swing adsorption and electrical swing adsorption approaches and integration with environmental control units. Leverage developed residual life indicator hardware and initiate chemical pulsing concepts to probe filter reactive chemistry capacity.

**Total** 7646

**FY 2006 Planned Program:**

- 500 Advanced Air Purification System Model (DTO CB61) BCA# 11- Continue identification of high priority model applications, user and operational requirements and population of databases using data in literature, existing system performance and module models. Continue configuration of lab scale system to measure required design data. This DTO supports the Joint Expeditionary Collective Protection (JECP) program.

| CBDP BUDGET ITEM JUSTIFICATION SHEET (R-2a Exhibit) | DATE February 2005 |
|---|---|

| BUDGET ACTIVITY | PE NUMBER AND TITLE | PROJECT |
|---|---|---|
| **RDT&E DEFENSE-WIDE/ BA2 - Applied Research** | **0602384BP CHEMICAL/BIOLOGICAL DEFENSE (APPLIED RESEARCH)** | **CB2** |

**FY 2006 Planned Program (Cont):**

- 3000 Individual Protection, Clothing BCA# 26/27- Pursue technologies to reduce aerosol penetration of garments (e.g. nanofiber mats, high moisture vapor transport membranes, novel closures, etc.). Identify materials for glove applications that enhance tactility, durability, and protection. Evaluate the impact of Non Traditional Agents on clothing materials, components, and systems. Develop test and evaluation methodology, protocol, and/or apparatus for evaluation of fully integrated clothing systems, as well as individual components.
- 3000 Collective Protection, Shelters BCA# 11- Complete airlock concepts investigations. Identify advanced textiles, seaming technology, materials and closures for use in protective enclosures for use in mobile, transportable and fixed site shelter platforms, and protective clothing. Develop shelter concepts using easily transported, erected molds and widely available indigenous materials. Initiate the development of non-toxic strippable or permanent coatings for on-demand application. Evaluate the impact of NTAs on shelters materials, components, and systems. Develop test and evaluation methodology, protocol, and/or apparatus for evaluation of fully integrated shelter systems, as well as individual components.
- 1350 Individual Protection, Masks BCA# 19- Develop updated system level design goals for advanced masks, complete updated technology assessment, complete preliminary market survey and updated trade-off analysis, and initiate development of prototype models. Initiate efforts to identify advance seal technologies to enhance performance and comfort of future masks. Results will be used to transition efforts to Advanced Technology Development.

# CBDP BUDGET ITEM JUSTIFICATION SHEET (R-2a Exhibit)

DATE: **February 2005**

| BUDGET ACTIVITY | PE NUMBER AND TITLE | PROJECT |
|---|---|---|
| **RDT&E DEFENSE-WIDE/ BA2 - Applied Research** | **0602384BP CHEMICAL/BIOLOGICAL DEFENSE (APPLIED RESEARCH)** | **CB2** |

**FY 2006 Planned Program (Cont):**

- 3112 Collective Protection, Air Purification BCA# 11- Identify broad spectrum sorbents for application in both single pass and regenerative filtration systems and pursue technologies for CO, SOx, and NOx. Evaluate the impact of NTAs on air purification materials, components, and systems. Continue to investigate chemical pulsing for filter capacity determination. Develop test and evaluation methodology, protocol, and/or apparatus for evaluation of fully integrated air purification systems, as well as individual components.

**Total** 10962

**FY 2007 Planned Program:**

- 500 Advanced Air Purification System Model (DTO CB61) BCA#11 - Complete high priority model applications and population of databases using data in literature, existing system performance and module models. Complete configuration of lab scale system to measure required design data. This DTO supports the Joint Expeditionary Collective Protection (JECP) program.

# CBDP BUDGET ITEM JUSTIFICATION SHEET (R-2a Exhibit)

DATE: **February 2005**

| BUDGET ACTIVITY | PE NUMBER AND TITLE | PROJECT |
|---|---|---|
| **RDT&E DEFENSE-WIDE/ BA2 - Applied Research** | **0602384BP CHEMICAL/BIOLOGICAL DEFENSE (APPLIED RESEARCH)** | **CB2** |

**FY 2007 Planned Program (Cont):**

- 2350 Individual Protection, Clothing BCA#26/27 - Conduct system level testing of garments employing best candidate closures, and validate the performance of seals against Chemical Warfare (CW) agent . Characterize wind speed effects on entire Individual Protective Equipment (IPE) systems (including adsorbent carbon technology (JSLIST, JPACE) and advanced materials (membranes, nanofiber mats, etc.). Identify technologies to indicate the residual life, or end of life of protective garments. Fabricate test samples and evaluate candidate technologies to reduce aerosol penetration of garments (e.g. nanofiber mats, high moisture vapor transport membranes, novel closures, etc.) Initiate evaluation of materials for glove applications that enhance tactility, durability, and protection. Develop technologies to mediate the impact of NTAs on clothing materials, components, and systems. Conduct validation of test and evaluation methodology, protocol, and/or apparatus for evaluation of fully integrated clothing systems, as well as individual components.
- 2876 Collective Protection, Shelters BCA#11 - Fabricate and evaluate candidate advanced textiles, seaming technology, materials and closures. Evaluate candidate shelter concepts using easily transported and erected molds and widely available indigenous materials. Assess candidate non-toxic strippable or permanent coatings for on-demand application to structures. Develop technologies to mediate the impact of NTAs on shelter materials, components, and systems. Conduct validation of test and evaluation methodology, protocol, and/or apparatus for evaluation of fully integrated shelter systems, as well as individual components.
- 1250 Individual Protection, Masks BCA#19 - Complete development of advanced mask prototypes and conduct performance testing. Down-select advance seal technologies, develop proof-of-concept models and initiate evaluations.

# CBDP BUDGET ITEM JUSTIFICATION SHEET (R-2a Exhibit)

DATE: **February 2005**

| BUDGET ACTIVITY | PE NUMBER AND TITLE | PROJECT |
|---|---|---|
| **RDT&E DEFENSE-WIDE/ BA2 - Applied Research** | **0602384BP CHEMICAL/BIOLOGICAL DEFENSE (APPLIED RESEARCH)** | **CB2** |

**FY 2007 Planned Program (Cont):**

- 3500 Collective Protection, Air Purification BCA#11 - Initiate the evaluation of broad spectrum sorbents for application in both single pass and regenerative filtration systems. Evaluate characteristics of technologies for CO, SOx, and NOx removal technologies. Develop technologies to mediate the impact of NTAs on air purification materials, components, and systems. Conduct validation of test and evaluation methodology, protocol, and/or apparatus for evaluation of fully integrated air purification systems, as well as individual components.

**Total** 10476

| | FY 2004 | FY 2005 | FY 2006 | FY 2007 |
|---|---|---|---|---|
| Threat Agent Sciences | 24002 | 31040 | 32810 | 38021 |

# CBDP BUDGET ITEM JUSTIFICATION SHEET (R-2a Exhibit)

DATE: **February 2005**

| BUDGET ACTIVITY | PE NUMBER AND TITLE | PROJECT |
|---|---|---|
| **RDT&E DEFENSE-WIDE/ BA2 - Applied Research** | **0602384BP CHEMICAL/BIOLOGICAL DEFENSE (APPLIED RESEARCH)** | **CB2** |

**FY 2004 Accomplishments:**

- 2003 Threat Agents - Continued to synthesize small quantities for defensive RDT&E, toxicologically screened, and characterized new threat materials and fill data gaps for established chemical and biological threat agents. Continued to characterize fundamental properties of Y. pestis. Continued characterization of fundamental properties of a viral family and initiated characterization on a second viral family selected by biodefense priorities. Completed validation studies on simulant BG spores and continued improvement of Erwinia herbicola antigenicity, exploration of novel peptide-based biological simulants, and research on a new viral simulant. Continued development of an agent simulant knowledge base technical information system with emphasis on completion of environmental database and initiated the collection and quality assessment of classified and incapacitating agent data. Loaded bioinformatics database with fundamental physical sciences properties.
- 3614 Aerosol Technology - Initiated investigations of inlets to facilitate aerosol collection in high air speed conditions. Continued experimental studies of micro high efficiency particulate air filtration (HEPA), electrostatic collector, mini-slit and other low power aerosol collection devices. Fabricated and tested breadboard aerosol collector capable of low temperature operation. Initiated and evaluated emerging collectors and collection technology. Developed new aerosol generation and analysis techniques including methodology development to generate suitable chemical simulant aerosol challenges. Completed enhanced Laser Imaging Detection and Ranging (LIDAR) aerosol test cell to support stand-off detection tests. Continued development of new methodology for quantifying biological aerosols captured in collector/concentrator characterization experiments.

# CBDP BUDGET ITEM JUSTIFICATION SHEET (R-2a Exhibit)

DATE: **February 2005**

| BUDGET ACTIVITY | PE NUMBER AND TITLE | PROJECT |
|---|---|---|
| **RDT&E DEFENSE-WIDE/ BA2 - Applied Research** | **0602384BP CHEMICAL/BIOLOGICAL DEFENSE (APPLIED RESEARCH)** | **CB2** |

**FY 2004 Accomplishments (Cont):**

- 5500 Low Level Chemical Warfare Agent Exposure Effects and Countermeasures (DTO CB51) - Low Level Operational Toxicology Studies - Completed initial inhalation studies for the nerve agents GF and VX. Delivered a refined operational human health risk assessment for those agents suitable for integration into Operational Risk Management processes used by commanders in military settings. Evaluated the utility of diverse non-human data for extrapolation to human conditions based on a common dosimetric.
- 1690 Environmental Fate of Agent (DTO CB42) - Predictive Modeling - Developed evaporation and liquid contact models and integrated into the Joint Effects Model (JEM). Expanded surface evaporation database to include all agent/simulant data from large area surfaces and continually added data generated from the Agent Fate program. Expanded the features and accuracy of Chemical Hazard Estimation Method and Risk Assessment Tool (CHEMRAT) by including current data from the Agent Fate program to support Operation Iraqi Freedom and future military operations. Calibrated Vapor Liquid Solid Tracking (VLSTRACK) model by adjusting parameters relevant to secondary evaporation to provide better vapor hazard and liquid persistence estimates. Enhanced SRFSIM and SURFIT assessment tools by including secondary evaporation methodology from the Hazard Prediction Assessment Capability (HPAC) model. Performed sensitivity analysis of HPAC 4.0.3 secondary evaporation methodology.

| CBDP BUDGET ITEM JUSTIFICATION SHEET (R-2a Exhibit) | DATE February 2005 |
|---|---|

| BUDGET ACTIVITY | PE NUMBER AND TITLE | PROJECT |
|---|---|---|
| **RDT&E DEFENSE-WIDE/ BA2 - Applied Research** | **0602384BP CHEMICAL/BIOLOGICAL DEFENSE (APPLIED RESEARCH)** | **CB2** |

**FY 2004 Accomplishments (Cont):**

- 3365 Threat Agents and Simulants - Continued efforts to determine and validate new synthesis targets. Continued to fill data gaps relative to classical and novel threat agents, toxic industrial chemicals, and CW agent simulants. Completed investigations of physical and decontamination properties of B. anthracis. Investigated physical properties and decontamination properties of Erwinia herbicola and baculovirus. Continued update of classified Agent Simulant Knowledge (ASK) databases and provided to Chemical and Biological Information Analysis Center (CBIAC) when completed. Continued effort to identify and validate non-pathogenic antigen mimics. Completed methodology development for assessing inhalation toxicity of non-traditional agents (NTAs).
- 4330 Environmental Fate of Agents (DTO CB42) - Large-Scale and Lab-Scale Wind Tunnel Studies - Initiated investigations of nerve agent (VX) and NTAs on asphalt. Initiated surface evaporation of thickened nerve agents (GD, VX) and blister agent (HD) on concrete and asphalt. Completed fabrication and certification of large scale wind tunnel in the UK.
- 2440 Biological Agent Fate - Initiated an accelerated all-source compilation and analysis of existing literature data that addresses the persistence of biological warfare agents released into the operational environment. Conducted a state of current research expert workshop in conjunction with NATO/allied investigators to document research efforts in the fate of biological agents. Delivered a documented assessment of identified data gaps and produced a targeted Defense Technology Objective (DTO) research program.

# CBDP BUDGET ITEM JUSTIFICATION SHEET (R-2a Exhibit)

DATE: **February 2005**

| BUDGET ACTIVITY | PE NUMBER AND TITLE | PROJECT |
|---|---|---|
| **RDT&E DEFENSE-WIDE/ BA2 - Applied Research** | **0602384BP CHEMICAL/BIOLOGICAL DEFENSE (APPLIED RESEARCH)** | **CB2** |

**FY 2004 Accomplishments (Cont):**

- 1060 Environmental Fate of Agents (DTO CB42) - Methodology Development - Determined degradation products of agents on surfaces of interest such as concrete. Using high speed solid phase microextraction (HS-SPME), measured and correlated nerve agents (VX, GD) and blister agent (HD) on Czech concrete vs. NIST standard concrete. Using HS-SPME, measured VX, GD, and HD on asphalt, soil and metal/glass at three humidity levels and compared single vs. multiple droplets surface contamination. Initiated HS-SPME measurements of NTAs. Initiated soil methodology development and determined sorption and fate of GD on dry sand and its response to simulated rainfall. Determined the fate of RVX, NTA, and HD on concrete by Nuclear Magnetic Resonance (NMR).

**Total** 24002

**FY 2005 Planned Program:**

- 3932 Threat Agents and Simulants - Continue and expand efforts to determine and validate new synthesis targets. Continue to fill data gaps relative to classical and novel threat agents, toxic industrial chemicals, and CW agent simulants. Continue to catalog agent properties in searchable database. Continue investigations of inhalation toxicity of NTAs.

# CBDP BUDGET ITEM JUSTIFICATION SHEET (R-2a Exhibit)

DATE: **February 2005**

| BUDGET ACTIVITY | PE NUMBER AND TITLE | PROJECT |
|---|---|---|
| **RDT&E DEFENSE-WIDE/ BA2 - Applied Research** | **0602384BP CHEMICAL/BIOLOGICAL DEFENSE (APPLIED RESEARCH)** | **CB2** |

**FY 2005 Planned Program (Cont):**

- 2918 Biological-Threat Agents - Continue to synthesize small quantities for defensive RDT&E, toxicologically screen, and characterize identified new threat materials and fill identified data gaps for established biological threat agents. Continue to characterize fundamental properties of Y. pestis and initiate work on B. mallei. Complete characterization of fundamental properties of a viral family and continue characterization of a second viral family selected by biodefense priorities. Complete improvement of Erwinia herbicola antigenicity, and continue exploration of novel peptide-based bio simulants and research on a new viral simulant. Continue upgrading the data in the agent/simulant knowledge base technical information system and initiate the collection and quality assessment of toxicology data. Investigate physical properties and decontamination properties of B. mallei and baculovirus.
- 2041 Aerosol Technology - Continue investigations of approaches to advanced inlets for aerosol collection in high air speed conditions. Continue experimental studies of novel collectors, electrostatic collector, impeller, mini-slit, and other low power aerosol collection devices. Continue characterization of emerging collectors and collection technology. Upgrade existing chambers and wind tunnels. Continue evaluations of new and prototype chemical detectors using chemical simulant aerosols. Continue computational fluid dynamics (CFD) modeling for the windbreak approach of sampling from high speed flows.

# CBDP BUDGET ITEM JUSTIFICATION SHEET (R-2a Exhibit)

DATE: **February 2005**

| BUDGET ACTIVITY | PE NUMBER AND TITLE | PROJECT |
|---|---|---|
| **RDT&E DEFENSE-WIDE/ BA2 - Applied Research** | **0602384BP CHEMICAL/BIOLOGICAL DEFENSE (APPLIED RESEARCH)** | **CB2** |

**FY 2005 Planned Program (Cont):**

- 3598 Environmental Fate of Agents (DTO CB42) BCA#5/6/23/28/39 - Predictive Modeling - Evaluate Agent Fate secondary evaporation model versus the Vapor Liquid Solid Tracking (VLSTRACK) module and evaluate each with agent lab trials to determine accuracy of downwind vapor predictions. Tune model/module and integrate into Joint Effects Model (JEM). Complete agent/inert substrate prediction model from lab-scaled wind tunnel data. Continue to work the scaling of agent vapor concentrations from laboratory to outdoor test conditions. Continue chemical hazard estimation method and risk assessment tool (CHEMRAT) update with new agent fate test data. Continue to update secondary evaporation model with new agent fate test data and incorporate into JEM.
- 2800 Environmental Fate of Agents (DTO CB42) BCA#5/6/23/28/39 - Methodology Development - Determine degradation products of agents on surfaces of interest such as concrete. Examine the fate of nerve agents (VX, GD) and non-traditional agents (NTAs) on asphalt by nuclear magnetic resonance (NMR). Examine the fate of V analogs, NTAs and thickened agents on surfaces under different temperature and humidity conditions by HS-SPME. Determine sorption and fate of nerve agent (VX) on sand and clay soil. Determine sorption and fate of nerve agents (GD, VX) on assembled test soil.
- 8551 Environmental Fate of Agents (DTO CB42) BCA#5/6/23/28/39 - Lab/Large-Scale Wind Tunnel Studies - Continue surface residual agent testing to determine contamination levels. Complete surface evaporation tests of nerve agents (VX, GD) and blister agent (HD) on a non-porous substrate. Start surface evaporation testing of thickened CW agents on soil, asphalt and concrete.
- 500 Modeling and Simulation - Complete and transition agent/inert substrate prediction module to Joint Operational Effects Federation (JOEF) and JEM.

# CBDP BUDGET ITEM JUSTIFICATION SHEET (R-2a Exhibit)

DATE: **February 2005**

| BUDGET ACTIVITY | PE NUMBER AND TITLE | PROJECT |
|---|---|---|
| **RDT&E DEFENSE-WIDE/ BA2 - Applied Research** | **0602384BP CHEMICAL/BIOLOGICAL DEFENSE (APPLIED RESEARCH)** | **CB2** |

**FY 2005 Planned Program (Cont):**

- 5500 Low Level Chemical Warfare Agent Exposure Effects and Countermeasures (DTO CB51) - Low Level Operational Toxicology Studies - Conduct cross-validation studies, based on a validated dosimetric for exposure route comparison that refine operational human health risk assessments for exposure to the nerve agents. Extend the useful range of prediction for inhalation exposures to nerve agent (GF) expected in various military response settings. Initiate nerve agent (VX) studies that extend time-effect predictive capability.
- 1200 Biological Agent Fate - Continue assessments of the persistence of biological warfare agents if released into operational environments.

**Total** 31040

**FY 2006 Planned Program:**

- 1650 Threat Agents and Simulants - Continue to synthesize small quantities for defensive RDT&E, toxicologically screen, and characterize new threat agents and fill data gaps for established chemical and biological threat agents. Complete characterization of the fundamental properties of Y. pestis and continue work on B. mallei. Initiate new efforts to identify CB simulants and catalog data.
- 3400 Aerosol Technology - Continue investigations of approaches to advanced inlets for aerosol collection in high air speed conditions. Continue experimental studies of novel collectors.
- 1240 Biological Agent Fate - Continue assessments of the persistence of biological warfare agents if released into operational environments.
- 2520 Agent Chemistry - Initiate efforts to characterize the chemical and physical properties of emerging threat agents.

| CBDP BUDGET ITEM JUSTIFICATION SHEET (R-2a Exhibit) | DATE February 2005 |
|---|---|
| BUDGET ACTIVITY<br>**RDT&E DEFENSE-WIDE/**<br>**BA2 - Applied Research** | PE NUMBER AND TITLE<br>**0602384BP CHEMICAL/BIOLOGICAL DEFENSE (APPLIED RESEARCH)** |
| | PROJECT<br>**CB2** |

**FY 2006 Planned Program (Cont):**

- 8865 Environmental Fate of Agents (DTO CB42) BCA#5/6/23/28/39 - Lab/Large-Scale Wind Tunnel Studies - Complete measurements of large scale and outdoor test data for original test matrix. Complete validation tests of surface evaporation model for agents on surfaces. Complete and document surface residual agent testing. Complete surface evaporation tests of nerve agents (VX, GD) and blister agent (HD) on concrete, asphalt, grass, and soil. Complete measurement of surface evaporation of thickened HD, GD and VX on asphalt and concrete.
- 3735 Environmental Fate of Agents (DTO CB42) BCA#5/6/23/28/39 - Predictive Modeling - Complete secondary evaporation models and conduct predictions of field trials. Transition updates into Joint Effects Model (JEM) and Joint Operational Effects Federation (JOEF).
- 2900 Environmental Fate of Agents (DTO CB42) BCA#5/6/23/28/39 - Methodology Development - Complete studies to determine degradation products of agents on surfaces of interest such as concrete, asphalt, grass, and soil.
- 6500 Low Level Chemical Warfare Agent Exposure: Effects and Countermeasures (DTO CB51) - Low Level Operational Toxicology Studies - Complete nerve agents (VX) studies that define longer-time, lower-level operational effects. Initiate studies for nerve agent (GD) that lead to a refined operational human health risk assessment. Continue and expand evaluations of inhalation toxicology for traditional agents to deliver science-based exposure standards for operational risk management decision tools.
- 800 Inhalation Exposure Study - Implement development of technically challenging inhalation exposure studies for selected very low volatile chemical threat agents, such as non-traditional threat agents (NTAs).
- 1200 Percutaneous Hazard Study - Conduct studies that characterize the threat of percutaneous hazards from operational exposure to selected chemical warfare agents and non-traditional threat agents. (NTAs)

# CBDP BUDGET ITEM JUSTIFICATION SHEET (R-2a Exhibit)

DATE: **February 2005**

| BUDGET ACTIVITY | PE NUMBER AND TITLE | PROJECT |
|---|---|---|
| **RDT&E DEFENSE-WIDE/ BA2 - Applied Research** | **0602384BP CHEMICAL/BIOLOGICAL DEFENSE (APPLIED RESEARCH)** | **CB2** |

**FY 2006 Planned Program (Cont):**
**Total** 32810

**FY 2007 Planned Program:**

- 12143 Threat Agents and Simulants - Continue to synthesize small quantities for defensive RDT&E, toxicologically screen, and characterize identified new threat materials and fill identified data gaps for established chemical and biological threat agents. Complete characterization of the fundamental properties of Y. pestis and continue work on B. mallei. Initiate new efforts to identify CB simulants and catalog data.
- 2100 Aerosol Technology - Continue investigations of approaches to advanced inlets for aerosol collection in high air speed conditions. Continue experimental studies of novel collectors.
- 5640 Biological Agent Fate - Continue assessments of the persistence of biological warfare agents if released into operational environments.
- 5000 Chemical Agent Fate - Initiate effort to gather agent fate data for emerging threat agents and surfaces of interest.
- 5500 Low Level Chemical Warfare Agent Exposure: Effects and Countermeasures (DTO CB51) - Low Level Operational Toxicology Studies - Initiate and complete inhalation studies that characterize the extended time, low level respiratory exposures to blister agent (HD). Deliver refined human health risk assessment for blister agent (HD) inhalation exposures suitable for incorporation into Operational Risk Management processes.
- 2438 Inhalation Hazard - Continue development of technically demanding inhalation exposure methods for selected very low volatile chemical threat agents, such as non-traditional threat agents (NTA).

# CBDP BUDGET ITEM JUSTIFICATION SHEET (R-2a Exhibit)

DATE: **February 2005**

| BUDGET ACTIVITY | PE NUMBER AND TITLE | PROJECT |
|---|---|---|
| **RDT&E DEFENSE-WIDE/ BA2 - Applied Research** | **0602384BP CHEMICAL/BIOLOGICAL DEFENSE (APPLIED RESEARCH)** | **CB2** |

**FY 2007 Planned Program (Cont):**

- 5200 Agent Hazards - Initiate Defense Technology Research program to address the operational risk to military personnel when exposed to selected traditional chemical warfare agents as well as non-traditional threat agents by contact and inhalation routes.

**Total** 38021

| | FY 2004 | FY 2005 | FY 2006 | FY 2007 |
|---|---|---|---|---|
| Congressional Increases | 0 | 38558 | 0 | 0 |

**FY 2005 Planned Program:**

- 992 Agent Detection and Neutralization System (AFSOC) - Evaluate the capability of DNA Capture Elements (DCEs) provided by Conceptual MindWorks, Inc. as biological warfare agent sensor(s) for live anthrax spores, as well as other existing antibody-based sensors, to perform under battlefield conditions and determine the sensitivity, responsiveness and robustness of these biological sensors.

| CBDP BUDGET ITEM JUSTIFICATION SHEET (R-2a Exhibit) | DATE February 2005 |
|---|---|

| BUDGET ACTIVITY | PE NUMBER AND TITLE | PROJECT |
|---|---|---|
| **RDT&E DEFENSE-WIDE/ BA2 - Applied Research** | **0602384BP CHEMICAL/BIOLOGICAL DEFENSE (APPLIED RESEARCH)** | **CB2** |

**FY 2005 Planned Program (Cont):**

- 2479 CBRN Countermeasures - Conduct research that focuses on human exposures to bacterial/viral/toxin agents, chemical warfare agents or toxic industrial chemicals, or radioisotopes from aerosol releases associated with terrorist incidents in urban and near-urban environments. Concentrate efforts that expand the knowledge, tools, models, and strategies necessary to protect against WMD. Conduct laboratory studies of cell type-specific, cytotoxic effects and mechanism of lethality for biomedical applications; conduct dispersion modeling, exposure estimation, and risk assessment of aerosol releases for in-door and ambient environments for threat characterization; develop model emergency medical systems for responsiveness to terrorist incidents as part of consequence management; and assess social psychological/psychiatric dimensions of behavioral dynamics to prevent or respond to terrorism.
- 2157 Chemical Agent Persistence Models - Conduct independent Verification and Validation (IV&V) of CB models, simulations, and battlespace management tools for environmental fate of agents, Chemical Hazard Estimation Risk Assessment Tool (CHEMRAT) version 1.5 and other models as applicable to chemical-biological defense.
- 992 IMS Sample Concentration and Bioagent Detection - Develop a front-end to allow the sample collection and process to increase the performance of existing detection technologies.
- 992 Integrated Biodefense Research
- 1488 Low-cost Automated Gas Chromatograph/Flame Photometric Detector System - Develop an inexpensive chemical agent detector based on gas chromatograph and atomic emission spectroscopy from chemical agents.
- 1488 Systems for Sampling and Detecting Bioaerosols - Develop a low cost, front-end for sample collection and processing of biological materials for the next generation of light weight biological detectors.
- 992 Agent Fate Program

# CBDP BUDGET ITEM JUSTIFICATION SHEET (R-2a Exhibit)

DATE: **February 2005**

| BUDGET ACTIVITY | PE NUMBER AND TITLE | PROJECT |
|---|---|---|
| **RDT&E DEFENSE-WIDE/ BA2 - Applied Research** | **0602384BP CHEMICAL/BIOLOGICAL DEFENSE (APPLIED RESEARCH)** | **CB2** |

**FY 2005 Planned Program (Cont):**

- 992 Air Contamination Monitoring System - South Coast Air Quality Management District (SCAQMD) - Develop and validate concepts of operation for the protection of high value/visible domestic facilities, i.e. sports arena. Provide sufficient equipment to support and demonstrate the concepts of operation.
- 1488 Biological-Chemical Vaporous Hydrogen Peroxide Decontamination for Military Aircraft and Equipment - Validate the adaptation of biological-chemical vaporous hydrogen peroxide in performing fast and effective decontamination of military aircraft.
- 3719 Chemical-Biological Protective Suit Membrane Research - Continue optimization of membrane materials to increase moisture vapor transport and durability and to reduce chemical warfare agent permeation. Fabricate optimized membrane into candidate fabric systems for further evaluation. Conduct laboratory evaluations of candidate fabric systems.
- 3471 Chemical Imaging for Food and Water Safety - Develop an imaging capability based on Raman spectroscopy to detect biological contaminants in food and water.
- 992 Early Warning and Detection Program - Develop new point sensors based on surface enhanced Raman using semi-metallic oxides materials to detect the biological materials.
- 1289 Future Force Warrior-Nano Wire Mesh Fabrics for Chemical-Biological Agent Defense - Fabricate barrier materials employing wire mesh technology and assess their efficacy against chemical warfare agent simulants. Down-select best candidate material configurations and optimize to improve protective barrier characteristics. Conduct assessment of optimized materials against simulants and chemical warfare agents.

# CBDP BUDGET ITEM JUSTIFICATION SHEET (R-2a Exhibit)

DATE: **February 2005**

| BUDGET ACTIVITY | PE NUMBER AND TITLE | PROJECT |
|---|---|---|
| **RDT&E DEFENSE-WIDE/ BA2 - Applied Research** | **0602384BP CHEMICAL/BIOLOGICAL DEFENSE (APPLIED RESEARCH)** | **CB2** |

**FY 2005 Planned Program (Cont):**

- 3719 Low Cost Chemical-Biological Protective Shelter Development - Conduct an extensive survey of candidate technologies for shelter applications that are low cost, and that provide the opportunity for reducing the size, weight, and power requirements of shelter systems. Down-select candidates to most promising technologies and initiate evaluation of those technologies for target applications.
- 4166 Love Shear Horizontal Surface Acoustic Wave (LSH-SAW) Hand-held Biosensor - Develop a light-weight handheld biological sensor based on the use of antibodies supported on quartz resonators.
- 992 Remote Optical Sensing Program - Develop new optical components base on semi-metallic oxide materials to replace conventional mechanic components currently used in detector systems.
- 992 Research on a Molecular Approach to Hazardous Materials Decontamination - Conduct research into the use of multi-phase systems for decontamination. Evaluate the combinations of agent/surfactant/water and agent/solid/surfactant/water.
- 1190 Technology for the Protection of Air and Water Systems - Develop technology to detect the presence of chemical and biological contaminants in water.
- 1984 Zumwalt Program for Countermeasures to Biological and Chemical Threats - Develop new models and sensor systems for the detection and identification of chemical and biological hazardous materials.
- 1984 Real Time Non-Specific Viral Agent Detection - Develop and publish the operating protocols for at least four non-enveloped viruses from naturally occurring sources using the VDSC-1 virus detection technology.

**Total** 38558

# CBDP BUDGET ITEM JUSTIFICATION SHEET (R-2a Exhibit)

DATE: **February 2005**

BUDGET ACTIVITY: **RDT&E DEFENSE-WIDE/ BA2 - Applied Research**

PE NUMBER AND TITLE: **0602384BP CHEMICAL/BIOLOGICAL DEFENSE (APPLIED RESEARCH)**

PROJECT: **CB2**

| | FY 2004 | FY 2005 | FY 2006 | FY 2007 |
|---|---|---|---|---|
| SBIR/STTR | 0 | 847 | 0 | 0 |

**FY 2005 Planned Program:**

- 847 SBIR

**Total** 847

**C. Other Program Funding Summary:**

| | FY 2004 | FY 2005 | FY 2006 | FY 2007 | FY 2008 | FY 2009 | FY 2010 | FY 2011 | To Compl | Total Cost |
|---|---|---|---|---|---|---|---|---|---|---|
| CB3 CHEMICAL BIOLOGICAL DEFENSE (ATD) | 88011 | 92075 | 60787 | 76897 | 70670 | 73260 | 66155 | 54853 | Cont | Cont |
| CP3 COUNTERPROLIFERATION SUPPORT (ATD) | 4077 | 5116 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 9193 |
| TT3 TECHBASE TECHNOLOGY TRANSITION | 0 | 0 | 16207 | 13978 | 10783 | 11077 | 11523 | 11857 | Cont | Cont |

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# CBDP BUDGET ITEM JUSTIFICATION SHEET (R-2a Exhibit)

DATE: **February 2005**

BUDGET ACTIVITY: **RDT&E DEFENSE-WIDE/ BA2 - Applied Research**

PE NUMBER AND TITLE: **0602384BP CHEMICAL/BIOLOGICAL DEFENSE (APPLIED RESEARCH)**

PROJECT: **TB2**

| COST (In Thousands) | | FY 2004 Actual | FY 2005 Estimate | FY 2006 Estimate | FY 2007 Estimate | FY 2008 Estimate | FY 2009 Estimate | FY 2010 Estimate | FY 2011 Estimate | Cost to Complete | Total Cost |
|---|---|---|---|---|---|---|---|---|---|---|---|
| TB2 | MEDICAL BIOLOGICAL DEFENSE (APPLIED RESEARCH) | 44784 | 43678 | 61654 | 42401 | 35344 | 29153 | 31017 | 31606 | Continuing | Continuing |

## A. Mission Description and Budget Item Justification:

**Project TB2 MEDICAL BIOLOGICAL DEFENSE (APPLIED RESEARCH):** This project funds applied research on the development of vaccines, therapeutic drugs, and diagnostic capabilities to provide an effective medical defense against validated biological threat agents including bacteria, toxins, and viruses. Innovative biotechnological approaches and advances will be incorporated to obtain medical systems designed to rapidly identify, diagnose, prevent, and treat disease due to exposure to biological threat agents. Categories for this project include Defense Technology Objectives (DTOs); science and technology programs in medical biological defense capability areas (Pretreatments, Diagnostics, Therapeutics and Emerging Threats); and directed research efforts, including the Chemical and Biological Defense Initiative (CBDI) fund. Categories under this project address the Joint Requirements Office (JRO) critical capability gaps identified in the baseline capability assessment performed in FY03. The specific critical capability gaps addressed are Gap #14 (Medical Prophylaxes - Lack of multi-valent vaccines), Gap #15 (Medical Prophylaxes - Lack of prophylaxes for chem warfare agents), Gap #16 (Medical Prophylaxes - FDA Approval for radiological prophylaxes), Gap #22 (Medical Therapeutics - Limited anti-viral/ toxin development), Gap #24 (Medical Therapeutics - Lack of FDA Approval for CBRN), Gap #35 (Diagnostics - Lack of portability), Gap #36 (Diagnostics - FDA Approval) and Gap #38 (Diagnostics - Reagent Verification).

# CBDP BUDGET ITEM JUSTIFICATION SHEET (R-2a Exhibit)

DATE: **February 2005**

| BUDGET ACTIVITY | PE NUMBER AND TITLE | PROJECT |
|---|---|---|
| **RDT&E DEFENSE-WIDE/ BA2 - Applied Research** | **0602384BP CHEMICAL/BIOLOGICAL DEFENSE (APPLIED RESEARCH)** | **TB2** |

## B. Accomplishments/Planned Program

| | FY 2004 | FY 2005 | FY 2006 | FY 2007 |
|---|---|---|---|---|
| Diagnostics | 4068 | 4087 | 11425 | 10171 |

**FY 2004 Accomplishments:**

- 2468 Diagnostic Technologies - Continued to apply new diagnostic approaches directed toward early recognition of infection, selecting technologies that can be adapted to current and future comprehensive integrated diagnostic systems. Continued laboratory and field studies using relevant clinical samples to apply new technological approaches for diagnosis of potential biological warfare threat agents. Continued to apply new technological approaches for concentrating and processing clinical samples to support rapid agent identification and to apply research reagents and associated assays for the detection of appropriate biological markers using relevant clinical samples.
- 1600 Diagnostic Technologies, Methodology to Facilitate Development of Biological Warfare Threat Agent Detection and Medical Diagnostic Systems (DTO CB56) - Developed laboratory-based test and evaluation standards for comparing similar diagnostic/detection assays and reagents. Elevated assays, previously handed off to advanced development, to consistent test and evaluation standards and prepared technical data packages for these assays/reagents.

**Total** 4068

# CBDP BUDGET ITEM JUSTIFICATION SHEET (R-2a Exhibit)

DATE: **February 2005**

| BUDGET ACTIVITY | PE NUMBER AND TITLE | PROJECT |
|---|---|---|
| **RDT&E DEFENSE-WIDE/ BA2 - Applied Research** | **0602384BP CHEMICAL/BIOLOGICAL DEFENSE (APPLIED RESEARCH)** | **TB2** |

**FY 2005 Planned Program:**

- 2487 Diagnostic Technologies - Focus on multiplexing nucleic acid and immunoassays for the detection of identified threat agents in clinical samples. Invest in improving and multiplexing existing assays, as new genomic data and techniques become available. Investigate recombinant DNA technologies for immunodiagnostic reagent production. Pursue toxin diagnostics. Coordinate pursuit of diagnostic approaches to the early recognition of infections and the evaluation of systems compatible with future comprehensive integrated diagnostics. Test developed assays, reagents and sample preparation techniques and platforms in field studies. Investigate the use of proteomics to develop immunologic assays for pathogen detection. Investigate novel pathogen detection systems. Analyze clinical samples obtained from human vaccines receiving biodefense vaccines to evaluate host responses to the immunizations
- 1600 Diagnostic Technologies, Methodology to Facilitate Development of Biological Warfare Threat Agent Detection and Medical Diagnostic Systems (DTO CB56) - Continue to elevate previously transitioned assays to test and evaluation standards established during FY04.

**Total** 4087

| CBDP BUDGET ITEM JUSTIFICATION SHEET (R-2a Exhibit) | DATE February 2005 |
|---|---|

| BUDGET ACTIVITY | PE NUMBER AND TITLE | PROJECT |
|---|---|---|
| **RDT&E DEFENSE-WIDE/ BA2 - Applied Research** | **0602384BP CHEMICAL/BIOLOGICAL DEFENSE (APPLIED RESEARCH)** | **TB2** |

**FY 2006 Planned Program:**

- 6925 Diagnostic Technologies - Continue to develop/multiplex nucleic acid and immunoassays for the detection of identified threat agents in clinical samples. Invest in improving and multiplexing existing assays, as new genomic data and techniques become available. Pursue using recombinant DNA technologies for immunodiagnostic reagent production. Develop gene sets correlating host immune response with exposure to endemic pathogens/threat agents. Test on existing molecular diagnostic platforms. Evaluate systems compatible with future comprehensive integrated diagnostics. Continue to test developed assays, reagents and sample preparation techniques and platforms in field studies. Complete evaluation of new chemistries for identifying biological warfare agents. Apply proteomics finding to the development of immunologic assays for pathogen detection. Accelerate development of alternate sampling/extraction techniques (e.g., address Joint Biological Agent Identification and Diagnostic System (JBAIDS) Block I gap in sample processing and RNA extraction). Address gaps in assay development; assess novel technologies suitable for complete threat characterization; use results to develop more specific diagnostic assays adaptable to existing/future hand held and reference lab systems. Continue to assess components of future comprehensive integrated diagnostic system suitable to both hand held and reference laboratory confirmatory testing. Conduct a market survey to determine the present state of commercial development of systems compatible with future comprehensive integrated hand held diagnostic system; determine capability area investment strategy with tri-service partners; choose those technologies suitable for further development. Perform multi-center trial of automated sample processing technologies
- 1500 Diagnostic Technologies, Methodology to Facilitate Development of Biological Warfare Threat Agent Detection and Medical Diagnostic Systems (DTO CB56) - Continue to elevate previously transitioned assays to test and evaluation.

# CBDP BUDGET ITEM JUSTIFICATION SHEET (R-2a Exhibit)

DATE: **February 2005**

| BUDGET ACTIVITY | PE NUMBER AND TITLE | PROJECT |
|---|---|---|
| **RDT&E DEFENSE-WIDE/ BA2 - Applied Research** | **0602384BP CHEMICAL/BIOLOGICAL DEFENSE (APPLIED RESEARCH)** | **TB2** |

**FY 2006 Planned Program (Cont):**

- 3000 Multiagent (Broad Spectrum) Medical Countermeasures - Develop massively parallel microfluidics techniques for analyzing protein signatures at submicromolar levels in physiological fluids using nanotechnology advances (nanowires coated with antibody or aptamer conjugates) to monitor pathogen / host pathogenesis pathway expression products.

**Total** 11425

# CBDP BUDGET ITEM JUSTIFICATION SHEET (R-2a Exhibit)

DATE: **February 2005**

| BUDGET ACTIVITY | PE NUMBER AND TITLE | PROJECT |
|---|---|---|
| **RDT&E DEFENSE-WIDE/ BA2 - Applied Research** | **0602384BP CHEMICAL/BIOLOGICAL DEFENSE (APPLIED RESEARCH)** | **TB2** |

**FY 2007 Planned Program:**

- 8571 Diagnostic Technologies - Continue to develop/multiplex nucleic acid and immunoassays for the detection of identified threat agents in clinical samples. Invest in improving and multiplexing existing assays, as new genomic data and techniques become available. Pursue using recombinant DNA technologies for immunodiagnostic reagent production. Continue to develop gene sets for different organisms and types of infections, as they become available, that characterize early recognition of infections. Test these gene sets on new and existing molecular diagnostic platforms. Identify and test systems compatible with future comprehensive integrated diagnostics. Continue to test developed assays, reagents and sample preparation techniques and platforms in field studies. Test systems utilizing new chemistries for the identification of biological warfare agents. Utilize proteomics data to develop and test assays for pathogen detection. Analyze findings and collate data from clinical samples obtained from human vaccines receiving biodefense vaccines to evaluate host responses to the immunizations. Invest in further development of technologies compatible with a comprehensive integrated hand held diagnostic system; direct efforts at adapting to military use. Continue to assess components of future comprehensive integrated diagnostic system suitable to both hand held and reference laboratory confirmatory testing. Complete assessment of technologies suitable for complete threat characterization; apply results to develop more specific diagnostic assays adaptable to hand held and reference lab systems.
- 1600 Diagnostic Technologies, Methodology to Facilitate Development of Biological Warfare Threat Agent Detection and Medical Diagnostic Systems (DTO CB56) - Continue to elevate previously transitioned assays to test and evaluation.

**Total** 10171

# CBDP BUDGET ITEM JUSTIFICATION SHEET (R-2a Exhibit)

DATE: February 2005

BUDGET ACTIVITY: RDT&E DEFENSE-WIDE/ BA2 - Applied Research

PE NUMBER AND TITLE: 0602384BP CHEMICAL/BIOLOGICAL DEFENSE (APPLIED RESEARCH)

PROJECT: TB2

| | FY 2004 | FY 2005 | FY 2006 | FY 2007 |
|---|---|---|---|---|
| Emerging Threats | 0 | 0 | 1726 | 5759 |

**FY 2006 Planned Program:**

- 526 Genetically Engineered Threats - Conduct determination of spore germination inhibitors and their effectiveness.
- 1200 Rapid Detection, Threat Assessment and Attribution of Genetically Engineered Biothreat Organisms Using Microarray-Based Resequencing Technologies (DTO CB64) - Provide for rapid, inexpensive, high-throughput, microarray-based DNA resequencing of biothreat agent genomes, whether they are naturally occurring, newly arising, or genetic engineered strains. Develop the capability to perform whole-genome sequencing in single laboratories with minimal space and personnel requirements at less than 1% of the current cost of existing, non-DOD industrial genome sequencing centers. Enable immediate definitive identification of the organism and provides specific data on the presence of any engineered elements. Develop and implement collection procedures and expand biothreat agent strain collection, focusing on Bacillus anthracis and Yersinia pestis. Sequence 6 B. anthracis group genomes; release data to other relevant DOD projects. Demonstrate and evaluate two high-density microarray systems. Develop, implement data analysis pipeline.

**Total** 1726

**FY 2007 Planned Program:**

- 4359 Genetically Engineered Threats - Initiate broad array of studies on discovery and characterization of genetic elements of pathogenicity and virulence. Divide these studies into three broad areas: toxin virulence factors, broad spectrum anti-viral compounds and common pathways of virulence.

# CBDP BUDGET ITEM JUSTIFICATION SHEET (R-2a Exhibit)

DATE: **February 2005**

| BUDGET ACTIVITY | PE NUMBER AND TITLE | PROJECT |
|---|---|---|
| **RDT&E DEFENSE-WIDE/ BA2 - Applied Research** | **0602384BP CHEMICAL/BIOLOGICAL DEFENSE (APPLIED RESEARCH)** | **TB2** |

**FY 2007 Planned Program (Cont):**

- 1400 Rapid Detection, Threat Assessment and Attribution of Genetically Engineered Biothreat Organisms Using Microarray-Based Resequencing Technologies (DTO CB64) - Demonstrate greater than 3-fold scale up of high-throughput experimental protocols and systems for rapid high-throughput microarray-based resequencing. Resequence 10 B. anthracis and 10 Y. pestis group genomes; release data to other relevant DOD projects. Expand biothreat agent collection. Evaluate microarray feature size reduction/increased density on two platforms.

**Total** 5759

| | FY 2004 | FY 2005 | FY 2006 | FY 2007 |
|---|---|---|---|---|
| Medical Biological Warfare Defense | 5370 | 0 | 0 | 0 |

**FY 2004 Accomplishments:**

- 2426 Medical Biological Warfare Defense, Vaccines and Therapeutics to Counter Biothreats - Conducted applied research to develop vaccines and therapeutics to counter BW threat agents.
- 2039 Medical Biological Warfare Defense, Advanced Emergency Medical Response - Conducted applied research toward development of advanced emergency medical response capabilities.
- 905 Medical Biological Warfare Defense, Advanced - Conducted research on the treatment of late stage biological weapon and battle wound related sepsis by removal of extracorporeal mediators.

**Total** 5370

# CBDP BUDGET ITEM JUSTIFICATION SHEET (R-2a Exhibit)

DATE: **February 2005**

| BUDGET ACTIVITY | PE NUMBER AND TITLE | PROJECT |
|---|---|---|
| **RDT&E DEFENSE-WIDE/ BA2 - Applied Research** | **0602384BP CHEMICAL/BIOLOGICAL DEFENSE (APPLIED RESEARCH)** | **TB2** |

| | FY 2004 | FY 2005 | FY 2006 | FY 2007 |
|---|---|---|---|---|
| Pretreatments | 19668 | 7140 | 18044 | 14064 |

**FY 2004 Accomplishments:**

- 3664 Vaccines, Bacterial - Completed the evaluation of potential subunit and live-attenuated glanders vaccine candidates in small animal models and prepared a technical data package summarizing the glanders vaccine research program. Performed preliminary studies toward development of an acellular brucella vaccine candidate. Continued to perform in vitro (inside a test tube) and in vivo (inside the organism) studies to support advanced development of the rPA vaccine candidate.
- 1533 Vaccines, Toxin - Initiated studies on the ability of intact catalytic and translocation domains of botulinum neurotoxins (BoNT) to elicit protective immunity in animal models. Initiated studies to increase immunogenicity of recombinant BoNT heavy chain (Hc) subunit vaccine candidates by varying adjuvant and/or method of delivery. Continued developing in-process and release assays for recombinant BoNT Hc vaccine candidates. Qualified in vivo and in vitro concept model systems for assessment of recombinant ricin vaccine candidate efficacy and surrogate endpoints of human clinical efficacy.
- 473 Vaccines, Viral - Investigated the use of the oligonucleotide CpG as an adjuvant with live attenuated alphavirus vaccine candidates to determine their effect on immunity conferred by the vaccines.
- 500 Vaccines, Viral, Western and Eastern Equine Encephalitis (WEE/EEE) Vaccine Constructs for a Combined Equine Encephalitis Vaccine (DTO CB58 ) - Initiated applied research to define correlates of immunity that protect against disease from alphaviruses (EEE and WEE viruses). Developed DNA and replicon-based vaccine constructs/platforms as western and eastern equine encephalitis (WEE/EEE) vaccine candidates.

| CBDP BUDGET ITEM JUSTIFICATION SHEET (R-2a Exhibit) | DATE February 2005 |
|---|---|
| BUDGET ACTIVITY<br>**RDT&E DEFENSE-WIDE/**<br>**BA2 - Applied Research** | PE NUMBER AND TITLE<br>**0602384BP CHEMICAL/BIOLOGICAL DEFENSE (APPLIED RESEARCH)** |
| | PROJECT<br>**TB2** |

**FY 2004 Accomplishments (Cont):**

- 1100 Vaccines, Viral, Vaccine Technologies for Protection Against Filovirus (Marburg and Ebola Viruses) Exposure (DTO CB60) - Initiated development of animal models of aerosol infection with filoviruses. Initiated applied research to define correlates of immunity that protect against disease from filoviruses. Developed animal models for Ebola-Sudan virus. Conducted preliminary characterization of leading vaccine candidates.
- 1941 Vaccines, Needle-less Delivery Methods for Vaccines - Examined the potential for intradermal (ID) delivery to provide antigen dose-sparing benefits, faster seroconversion, and reduction or elimination of alum. Examined the safety and immunogenicity of the ID delivery of the anthrax rPA with or without alum adjuvant. Compared intramuscular (IM) injection with standard needles. Pursued further development of formulation technologies for rPA and rSEB providing improved shelf-life stability. Developed and test rapidly reconstituting rPA powders and systems for ID delivery in mouse challenge studies. Identified rapidly reconstituting formulations and delivery systems for the rSEB vaccine candidate.
- 8272 Vaccines, Viral, Multivalent Ebola, Marburg Filovirus Program - Developed a multivalent vaccine platform capable of inducing potent humoral and cellular immune responses against two strains of Ebola viruses (bivalent) and three strains of Marburg viruses (trivalent) for biodefense.
- 971 Vaccines, Bacterial, Oral Anthrax and Plague Vaccine - Developed an oral combination vaccine against anthrax and plague using proprietary technology for attenuated live bacterial vaccines. Supported preclinical animal testing of vaccine constructs developed for the oral combination vaccine against anthrax and plague.
- 1214 Vaccines, Bacterial, Novel Pharmaceuticals for Anthrax - Developed the Helinz-treated vaccine platform, with application in both cancer and infectious disease, including those agents that pose threats to bioterrorism.

**Total** 19668

# CBDP BUDGET ITEM JUSTIFICATION SHEET (R-2a Exhibit)

DATE: **February 2005**

| BUDGET ACTIVITY | PE NUMBER AND TITLE | PROJECT |
|---|---|---|
| **RDT&E DEFENSE-WIDE/ BA2 - Applied Research** | **0602384BP CHEMICAL/BIOLOGICAL DEFENSE (APPLIED RESEARCH)** | **TB2** |

**FY 2005 Planned Program:**

- 500 Multiagent Vaccines, Western and Eastern Equine Encephalitis (WEE/EEE) Vaccine Constructs for a Combined Equine Encephalitis Vaccine (DTO CB58) - Continue to analyze mutants with various engineered attenuating mutations to determine their suitability for use as vaccine platforms. Enhance studies to establish an eastern equine encephalitis (EEE) virus non-human primate efficacy model.
- 700 Multiagent Vaccines, Vaccine Technologies for Protection Against Filovirus (Marburg and Ebola Viruses) Exposure (DTO CB60) - Incorporate antigen targets from earlier studies to improve vaccine candidates as determined from characterization studies and concurrent testing.
- 5940 Vaccine Research Support - Continue to develop lead vaccine candidates against plague (F1-V fusion antigen vaccine) and ricin. Evaluate the role of capsule in the development of a generation-after-next anthrax vaccine. Investigate anthrax spore interactions with host cells and characterization of diverse B. anthracis strains for vaccine resistance. Continue studies on the ability of functional domains of botulinum neurotoxins (BoNT) to elicit protective immunity in animal models. Accelerate studies to increase immunogenicity of existing recombinant BoNT heavy chains (Hc) subunit vaccine candidates via adjuvants and/or method of delivery. Develop in-process and release assays for recombinant BoNT Hc vaccine candidates. Test recombinant ricin vaccine (rRTA) candidate stability. Develop surrogate endpoints of clinical efficacy for higher animal species in ricin vaccine adjuvant studies. Test novel adjuvants with lead ricin vaccine candidate. Determine stability of Staphylococcal Enterotoxin (SE) vaccine candidates. Test oligonucleotide CpG as an adjuvant with live attenuated alphavirus vaccine candidates. Complete studies on correlates of immunity that protect against disease from filoviruses and alphaviruses. Evaluate the use of Virus-Like Particles (VLP) as antigen for vaccines for filoviruses. Begin evaluation of a VEE replicon-based Marburg virus vaccine candidate.

**Total** 7140

# CBDP BUDGET ITEM JUSTIFICATION SHEET (R-2a Exhibit)

DATE: **February 2005**

| BUDGET ACTIVITY | PE NUMBER AND TITLE | PROJECT |
|---|---|---|
| **RDT&E DEFENSE-WIDE/ BA2 - Applied Research** | **0602384BP CHEMICAL/BIOLOGICAL DEFENSE (APPLIED RESEARCH)** | **TB2** |

**FY 2006 Planned Program:**

- 500 Multiagent Vaccines, Western and Eastern Equine Encephalitis (WEE/EEE) Vaccine Constructs for a Combined Equine Encephalitis Vaccine (DTO CB58) - Evaluate new EEE vaccine approaches in animal models in combination with WEE vaccine construct(s) and already transitioned VEE vaccine candidate V3526 or alternate VEE vaccine candidates made in the DNA- or replicon-based vaccine platforms.
- 2500 Multiagent Vaccines, Multi-agent (molecular) Vaccines for Bio-Warfare Agents (DTO CB65) - Develop a trivalent vaccine based on a prototype anthrax/plague vaccine. Explore both molecular and protein-based trivalent vaccine platforms. Develop the optimal backbone in combination with adjuvant formulation. Identify third pathogen to be targeted as the third component of the trivalent vaccine and initiate candidate antigen incorporation into a candidate vaccine.
- 3600 Animal Models - Develop definitive non-human primate model to evaluate the efficacy of separate and a combined VEE/WEE/EEE vaccine candidates (Venezuelan, Eastern and Western equine encephalitis virus, respectively). Develop final technology data package for the F1/V-fusion protein vaccine for Milestone B decision in FY06.
- 3000 Resuscitative Intervention - Accelerate the construction and evaluation of VEE/WEE/EEE vaccine candidate constructs in various delivery platforms. Start down-selection phase of filoviral vaccine candidate constructs and evaluate alternative forms of delivery for comparative evaluation of vaccine efficacy. Evaluate a recombinant protein multiagent (trivalent) vaccine that combines protection against anthrax, plague, and one additional target biothreat agent (e.g. ricin, Botulinum neurotoxin or poxvirus) using currently identified protective antigens for each pathogen. Test novel adjuvants designed to enhance the efficacy of genetic vaccines in non-human primates (e.g. toll-like receptor response, cationic antimicrobial peptides, etc.). Accelerate the development and design of generic gene-based vaccines targeting common target sequences in pathogens.

# CBDP BUDGET ITEM JUSTIFICATION SHEET (R-2a Exhibit)

DATE: **February 2005**

| BUDGET ACTIVITY | PE NUMBER AND TITLE | PROJECT |
|---|---|---|
| **RDT&E DEFENSE-WIDE/ BA2 - Applied Research** | **0602384BP CHEMICAL/BIOLOGICAL DEFENSE (APPLIED RESEARCH)** | **TB2** |

**FY 2006 Planned Program (Cont):**

- 2000 Multiagent (Broad Spectrum) Medical Countermeasures - Develop multiagent vaccines with the attendant adjuvant and delivery systems that ensure rapid host immunity development.
- 6444 Vaccine Research Support - Initiate the evaluation of intracellular pathogen candidate antigens using animal model systems including the use of alternative delivery platforms. Continue support studies for F1-V and rPA candidate vaccines in phase 1 studies. Begin immunogenicity studies for generic Bacillus vaccine target antigens. Evaluate B and T cell epitope mapping of lead protective antigen candidates. Continue to evaluate novel antigen targets for anthrax and plague vaccine development. Examine in vivo antigen expression/recognition in non-human primates (NHPs). Evaluate the immunogenicity of intact catalytic and translocation domains of botulinum neurotoxins (BoNT). Continue developing in-process and release assays for recombinant BoNT Hc vaccine candidates. Continue recombinant ricin vaccine candidate stability testing. Continue to develop surrogate endpoints of clinical efficacy for higher animal species in ricin vaccine adjuvant studies. Clone, express proposed Staphylococcal Enterotoxin A (SEA)/Staphylococcal Enterotoxin B (SEB) structural determinants; determine stability of immunogens; raise neutralizing antibodies against immunogens and test for cross-reactivity among SE serotypes using in vitro systems. Analyze WEE/EEE mutants with various engineered attenuating mutations. Evaluate target antigens for Ebola virus vaccine development. Explore additional use of VLP as antigen delivery platform for filovirus vaccine development. Continue the evaluation of a VEE replicon-based Marburg virus vaccine platform.

**Total** 18044

# CBDP BUDGET ITEM JUSTIFICATION SHEET (R-2a Exhibit)

DATE: **February 2005**

| BUDGET ACTIVITY | PE NUMBER AND TITLE | PROJECT |
|---|---|---|
| **RDT&E DEFENSE-WIDE/ BA2 - Applied Research** | **0602384BP CHEMICAL/BIOLOGICAL DEFENSE (APPLIED RESEARCH)** | **TB2** |

**FY 2007 Planned Program:**

- 500 Multiagent Vaccines, Western and Eastern Equine Encephalitis (WEE/EEE) Vaccine Constructs for a Combined Equine Encephalitis Vaccine (DTO CB58) - Complete evaluation of live site-directed mutagenized, attenuated viral vaccine. Perform final dose ranging studies in NHP efficacy of multiagent viral vaccine candidates. Develop a FDA-licensed combined Venezuelan, Eastern, and Western Equine Encephalitis (VEE, EEE, and WEE, respectively) vaccine by identifying and characterizing WEE and EEE vaccine constructs that would be appropriate to combine into a single vaccine with the already transitioned VEE vaccine candidate V3526, or with alternative VEE vaccine candidates made in the DNA- or replicon-based vaccine platforms.
- 2500 Multiagent Vaccines, Multi-agent (molecular) Vaccines for Bio-Warfare Agents (DTO CB65) - Evaluate selected target antigens in various vaccine platform systems for immunogenicity and protective efficacy. Characterize the underlying protective response and evaluate for possible interference phenomena. Begin scale-up process development evaluation. Conduct a comparative analysis of genomic and recombinant vaccine candidates.
- 300 Multiagent Vaccines - Continue assessment of candidate anthrax/plague multi-agent vaccines in animal models. Continue development and refinement of in vitro correlates of immunity. Determine efficacy/immunogenicity and optimization studies of new antigen vaccine formulations considering alternative adjuvants, routes of administration, and dosage schedules.
- 3600 Animal Models - Conduct dose and antigen interference studies for the combined VEE/WEE/EEE vaccine in the definitive animal model. Evaluate incorporation of recombinant lethal factor from B. anthracis into an anthrax vaccine candidate for a multiagent vaccine approach.

# CBDP BUDGET ITEM JUSTIFICATION SHEET (R-2a Exhibit)

DATE: **February 2005**

| BUDGET ACTIVITY | PE NUMBER AND TITLE | PROJECT |
|---|---|---|
| **RDT&E DEFENSE-WIDE/ BA2 - Applied Research** | **0602384BP CHEMICAL/BIOLOGICAL DEFENSE (APPLIED RESEARCH)** | **TB2** |

**FY 2007 Planned Program (Cont):**

- 2500 Resuscitative Intervention - Evaluate novel delivery systems for enhanced vaccine delivery and efficacy in support of the rapid development of multiagent vaccines. Accelerate the development and design of generic DNA gene-based vaccines targeting common target virulence sequences in pathogens.
- 3664 Vaccine Research Support - Initiate efficacy studies through animal challenge models. Explore additional intracellular pathogen target antigens using animal model systems including the use of alternative delivery platforms. Expand support studies for F1-V candidate vaccine in phase 1 studies. Accelerate B and T cell epitope mapping of lead protective antigen candidates. Select novel antigen targets for next generation anthrax and plague vaccine development. Test next generation SEA/SEB immunogens as vaccine candidates to protect against multiple SE serotypes in vivo. Complete stability and immunogenicity of SEB toxin vaccine in support of clinical trial. Continue studies on the immunogenicity of intact functional domains of botulinum neurotoxins (BoNT). Complete developing the in-process and release assays for recombinant BoNT Hc vaccine candidates. Refine applied research to define correlates of immunity that protect against disease from filoviruses and alphaviruses. Continue to conduct studies of recombinant Ebola vaccine candidates. Expand evaluation of alphavirus candidate vaccines for efficacy. Evaluate vaccine performance requirements (vaccine dose, route, number of immunizations, etc.) in animal models. Apply the use of VLP as antigen carriers for vaccines against filoviruses. Finalize the evaluation of a VEE replicon-based Marburg virus vaccine candidate.
- 1000 Vaccine Technology Development - Develop genetic immunization platforms as a multiagent anthrax-plague vaccine strategy and their animal efficacy studies. Begin evaluation of Bacillus generic molecular vaccine efficacy in animal models. Expand alternative immunization platforms such as VLP, VEE replicons and adenoviral constructs for efficacy against selected biothreat pathogens and/or toxins.

**Total** 14064

# CBDP BUDGET ITEM JUSTIFICATION SHEET (R-2a Exhibit)

DATE: **February 2005**

BUDGET ACTIVITY: **RDT&E DEFENSE-WIDE/ BA2 - Applied Research**

PE NUMBER AND TITLE: **0602384BP CHEMICAL/BIOLOGICAL DEFENSE (APPLIED RESEARCH)**

PROJECT: **TB2**

| | FY 2004 | FY 2005 | FY 2006 | FY 2007 |
|---|---|---|---|---|
| Therapeutics | 15678 | 10594 | 30459 | 12407 |

**FY 2004 Accomplishments:**

- 559 Therapeutics, Bacterial - Performed additional in vivo studies on efficacy of selected antimicrobial compounds against various bacterial threat agents in small animal models. Initiated studies of selected Food and Drug Administration (FDA)-licensed antibiotics to support consideration for changing label indications against biological warfare (BW) threat agents.
- 1456 Therapeutics, Toxin - Initiated testing of lead inhibitors of SE using in vivo model systems for assessment of therapeutic efficacy. Standardized in vivo model systems for assessment of therapeutic efficacy and surrogate endpoints of human clinical efficacy.
- 596 Therapeutics, Viral - Developed fluorescent-based methods for high-throughput screening for antiviral efficacy and cellular toxicity. Continued research to identify pharmacological compounds provided by industry that may intervene in filovirus-induced shock. Continued the assessment of the therapeutic action of compounds in mouse models of filovirus infection. Completed research for development of a variola animal model at CDC.

| CBDP BUDGET ITEM JUSTIFICATION SHEET (R-2a Exhibit) | DATE February 2005 |
|---|---|

| BUDGET ACTIVITY | PE NUMBER AND TITLE | PROJECT |
|---|---|---|
| **RDT&E DEFENSE-WIDE/ BA2 - Applied Research** | **0602384BP CHEMICAL/BIOLOGICAL DEFENSE (APPLIED RESEARCH)** | **TB2** |

**FY 2004 Accomplishments (Cont):**

- 2500 Therapeutics, Viral, Therapy for Smallpox and Other Pathogenic Orthopox Viruses (DTO CB54) - Continued preclinical virology studies (including animal efficacy studies) required for a supplemental New Drug Application for cidofovir and provided technical data and support to the drug license holder. Compared the variola animal model to the monkeypox animal model and human monkeypox to qualify models to be proposed under the FDA animal efficacy rule. Initiated development of an oral prodrug of cidofovir.
- 3900 Therapeutics, Toxin, Therapeutic Strategies for Botulinum Neurotoxins (DTO CB59) - Investigated recombinant human antibodies as passive immunotherapeutics. Synthesized structural analogs of active-site inhibitors identified by high-throughput screening. Identified candidate botulinum neurotoxin (BoNT) receptor antagonists as therapeutic candidates. Established a central database and compound repository.
- 1900 Therapeutics, Viral, Therapeutic Strategies for Treating Filovirus (Marburg and Ebola Viruses) Infection (DTO CB63) - Developed assays, methodologies, and drug formulations or prodrugs for analysis. Evaluated monoclonal antibodies to viral specific proteins for their ability to neutralize virus. Identified critical host-cell proteins integral to viral replication, viral budding, or viral entry. Generated Ebola virus VP40 and GP mutant constructs as well as a tetra cysteine-fusion of VP40 in mammalian and bacterial expression vectors.
- 971 Therapeutics, Heteropolymer Monoclonal Antibody-Based Technology - Produced and purified milligram quantities of H25 antibody for a 4-liter scale spinner production. Determined functional and biophysical properties of the purified antibody. Confirmed the utility and acceptability of the antibody produced from the cell lines for further product development. Developed analytical transfer methods and assays for monoclonal antibodies (MAbs) and heteropolymers (HPs) and conducted animal studies.

# CBDP BUDGET ITEM JUSTIFICATION SHEET (R-2a Exhibit)

DATE: **February 2005**

| BUDGET ACTIVITY | PE NUMBER AND TITLE | PROJECT |
|---|---|---|
| **RDT&E DEFENSE-WIDE/ BA2 - Applied Research** | **0602384BP CHEMICAL/BIOLOGICAL DEFENSE (APPLIED RESEARCH)** | **TB2** |

**FY 2004 Accomplishments (Cont):**

- 971 Therapeutics, Bacterial, Heteropolymer Technologies for Anthrax Immunity - Evaluated protective efficacy in rabbits exposed to lethal doses of aerosolized anthrax using the proprietary anthrax antibody, ETI-204. Assessed the level of bacteremia in treated versus untreated animals.
- 2825 Therapeutics, Bacterial, Rapid Antibody-Based Biological Countermeasures - Developed diagnostic and therapeutic antibodies against anthrax and identified new targets associated with anthrax and plague pathology. Identified additional targets associated with anthrax and plague virulence and screen for novel antibodies to detect and protect against related bioweapons. Discovered novel, validated protein targets. Developed diagnostic antibodies optimized for affinity and selectivity to biowarfare agents. Created a collection of human therapeutic antibodies for passive immunity protection against bioweapons and more effective treatment against pathogens and toxins.

**Total** 15678

**FY 2005 Planned Program:**

- 1383 Therapeutics, Bacterial - Perform therapeutic efficacy studies in non-human primate models. Continue studies on selected FDA-licensed antimicrobial compounds to support consideration for changing label indications for use against Biological Warfare (BW) threat agents.
- 2735 Therapeutics, Toxin - Develop surrogate endpoints of human clinical efficacy for Staphylococcal Enterotoxin (SE) therapeutics.
- 576 Therapeutics, Viral - Assess therapeutic action of pharmacological compounds provided by industry in mouse and non-human primate models of filovirus infection.

# CBDP BUDGET ITEM JUSTIFICATION SHEET (R-2a Exhibit)

DATE: **February 2005**

| BUDGET ACTIVITY | PE NUMBER AND TITLE | PROJECT |
|---|---|---|
| **RDT&E DEFENSE-WIDE/ BA2 - Applied Research** | **0602384BP CHEMICAL/BIOLOGICAL DEFENSE (APPLIED RESEARCH)** | **TB2** |

**FY 2005 Planned Program (Cont):**

- 2400 Therapeutics, Therapy for Smallpox and Other Pathogenic Orthopox Viruses (DTO CB54) - Complete studies to evaluate drug efficacy of IV cidofovir in primate models that support the Food and Drug Administration (FDA) Animal Efficacy Rule. Evaluate activity in monkeypox primate animal model. Continue evaluation of oral prodrug of cidofovir to determine if it is a replacement for IV cidofovir. Identify new molecular targets and develop assays specific for those targets. Evaluate antiviral activity of collections of compounds to identify lead structures for development into antiviral drugs with emphasis on compounds acting through a different mechanism than inhibition of vial DNA polymerase. Identify and test leading antivirals in appropriate animal models. Identify potential mediators of shock or toxemia and determine the basis for the pathogenesis of shock or toxemia in animal models.
- 2500 Therapeutics, Toxin, Therapeutic Strategies for Botulinum Neurotoxins (DTO CB59) - Investigate recombinant human antibodies as passive immunotherapeutics. Synthesize structural analogs of active-site inhibitors identified by high-throughput screening. Identify candidate BoNT receptor antagonists as therapeutic candidates. Establish a central database and compound repository. Initiate ex vivo evaluation of lead compounds in model systems for therapeutic efficacy. Standardize in vivo concept model systems for assessment of therapeutic efficacy and surrogate endpoints of human clinical efficacy for botulinum intoxication.
- 1000 Therapeutics, Viral, Therapeutic Strategies for Treating Filovirus (Marburg and Ebola Viruses) Infection (DTO CB63) - Generate mutant Marburg virus proteins and evaluate their ability to interact with other Marburg virus proteins. Develop information on characteristics distinguishing protective and nonprotective monoclonal antibodies.

**Total** 10594

| CBDP BUDGET ITEM JUSTIFICATION SHEET (R-2a Exhibit) | DATE February 2005 |
|---|---|

| BUDGET ACTIVITY | PE NUMBER AND TITLE | PROJECT |
|---|---|---|
| **RDT&E DEFENSE-WIDE/ BA2 - Applied Research** | **0602384BP CHEMICAL/BIOLOGICAL DEFENSE (APPLIED RESEARCH)** | **TB2** |

**FY 2006 Planned Program:**

- 2220 Therapeutics, Bacterial - Test Antibacterial cytokine-based therapeutic candidates. Test CpG motifs (stimulators of immune response) in conjunction with antibiotics for plaque therapy in an animal model. Continue to advance the assessment of selected compounds for safety and efficacy against multiple bacterial threat agents in non-human primates. Enhance aerobiology capabilities and animal model development to facilitate bacterial therapeutics research.
- 4220 Therapeutics, Toxin - Develop formulations or prodrugs to overcome problems with metabolism, bioavalibility or pharmacokinetics of compounds with otherwise acceptable antiviral profiles of new compounds. Test efficacy of combinations of monoclonal antibodies against multiple toxin serotypes in cell-based systems. Continue ongoing proof-of-concept studies with lead toxin therapeutics in vivo using qualified surrogate endpoints of human clinical efficacy.
- 2219 Therapeutics, Viral - Therapeutics, Viral - Standardize leading antivirals in appropriate animal models. Develop and execute initial steps in plan for licensure and manufacturing with lead compounds, leading up to milestone approval and transition. Develop additional resuscitative technologies that integrate established and emerging viral therapeutic modalities into suitable candidate therapies in humans.
- 1800 Therapeutics, Therapy for Smallpox and Other Pathogenic Orthopox Viruses (DTO CB54) - Conduct initial evaluation in pock lesion variola primate model at the Centers for Disease Control and Prevention. Evaluate oral cidofovir prodrug against monkeypox in primate model. Conduct initial studies to determine drug efficacy. Evaluate minimal and sufficient viral therapeutic requirements such as dose, route, and area under the curve. Perform appropriate testing in nonhuman primates for FDA licensure consideration under the FDA Animal Efficacy Rule.

| CBDP BUDGET ITEM JUSTIFICATION SHEET (R-2a Exhibit) | DATE February 2005 |
|---|---|

| BUDGET ACTIVITY | PE NUMBER AND TITLE | PROJECT |
|---|---|---|
| **RDT&E DEFENSE-WIDE/ BA2 - Applied Research** | **0602384BP CHEMICAL/BIOLOGICAL DEFENSE (APPLIED RESEARCH)** | **TB2** |

**FY 2006 Planned Program (Cont):**

- 1000 Therapeutics, Toxin, Therapeutic Strategies for Botulinum Neurotoxins (DTO CB59) - Develop lead mixtures of human antibodies against BoNT as passive immunotherapeutics in vivo. Complete in vitro testing of combinations of monoclonal antibodies against multiple Botulinum Neurotoxin (BoNT) serotypes and proof-of-concept studies with lead BoNT active-site inhibitors and/or receptor antagonists in vivo using qualified surrogate endpoints of human clinical efficacy. Generate information from research and use to develop a strategy, in concert with the advanced developer, for development of BoNT therapeutic candidates. Generate information from research and use to prepare a technology development plan for non-clinical studies of optimum therapeutic candidates/treatment modalities.
- 500 Therapeutics, Viral, Therapeutic Strategies for Treating Filovirus (Marburg and Ebola Viruses) Infection (DTO CB63) - Identify the structural requirements of the filoviral proteins that are essential for their function. Identify structure/function relationships that are essential for the virion formation and host cell interactions. Determine previously unsolved 3D structures of filoviral proteins and filoviral proteins in complex with host cell proteins. Refine (energetic and hydropathic) crystallographic coordinates, and or the generate sequence based homology models of identified targets. Apply bioinformatics, chemoinformatics and molecular modeling tools to further optimize lead therapeutic compounds.

# CBDP BUDGET ITEM JUSTIFICATION SHEET (R-2a Exhibit)

DATE: **February 2005**

| BUDGET ACTIVITY | PE NUMBER AND TITLE | PROJECT |
|---|---|---|
| **RDT&E DEFENSE-WIDE/ BA2 - Applied Research** | **0602384BP CHEMICAL/BIOLOGICAL DEFENSE (APPLIED RESEARCH)** | **TB2** |

**FY 2006 Planned Program (Cont):**

- 5500 Resuscitative Intervention - Develop combined injury animal model (trauma and Biological Warfare (BW)/Chemical Warfare (CW) agent) for a vapor nerve agent, a low-volatility nerve agent, and a particulate chemical agent threat. Develop combined injury animal model (trauma and BW/CW agent) for a vesicating agent. Identify early markers via genomic or proteomic analysis, and physiologic status of interactive effects of combined injury in appropriate animal model. Initiate studies with Defense Advanced Research Projects Agency (DARPA) funded collaborators on ex vivo and in silico methods to model immune system function. Conduct initial evaluation of the pock lesion/variola primate model at the Centers for Disease Control and evaluate the oral prodrug Cidofovir for efficacy. Expand characterization of the monkeypox vs. primate-small pox model to prepare data packages for oral prodrug licensure.
- 13000 Multiagent (Broad Spectrum) Medical Countermeasures - Develop computer-based technologies that enable the development of small molecule medical countermeasure candidates based upon structure/function analysis of either BW agent or host response pathway target. Develop ex vivo cell-based model systems to replace animal models in the study of medical countermeasure bioactivity, efficacy and safety. Develop artificial cell/artificial tissue models for the testing of medical countermeasure bioactivity, efficacy and safety.

**Total** 30459

# CBDP BUDGET ITEM JUSTIFICATION SHEET (R-2a Exhibit)

DATE: **February 2005**

| BUDGET ACTIVITY | PE NUMBER AND TITLE | PROJECT |
|---|---|---|
| **RDT&E DEFENSE-WIDE/ BA2 - Applied Research** | **0602384BP CHEMICAL/BIOLOGICAL DEFENSE (APPLIED RESEARCH)** | **TB2** |

**FY 2007 Planned Program:**

- 1250 Therapeutics, Bacterial - Refine conceptual development and execute in vivo testing of innate immunity modulator therapeutic approaches, focusing on CpG-based countermeasures against plague/anthrax. Develop and refine resuscitative technologies that integrate established and emerging bacterial therapeutic modalities into suitable candidate therapies in humans.
- 4000 Therapeutics, Toxin - Complete ongoing proof-of-concept studies with lead toxin therapeutics in vivo using qualified surrogate endpoints of human clinical efficacy. Develop and execute initial steps in plan for licensure and manufacturing with lead compounds, leading up to milestone approval and transition. Develop and refine additional resuscitative technologies that integrate established and emerging toxin therapeutic modalities into suitable candidate therapies in humans.
- 2857 Therapeutics, Viral - Optimize leading antivirals in appropriate animal models. Evaluate minimal and sufficient viral therapeutic requirements such as dose, route, and area under the curve. Perform appropriate testing in nonhuman primates for FDA licensure consideration under the animal efficacy rule. Develop and refine additional resuscitative technologies that integrate established and emerging viral therapeutic modalities into suitable candidate therapies in humans.
- 1800 Therapeutics, Therapy for Smallpox and Other Pathogenic Orthopox Viruses (DTO CB54) - Complete studies to evaluate drug efficacy in primate models that support the FDA Animal Efficacy Rule. Compile technical data to provide to the commercial partner to support consideration of the drug candidate for licensure for use as an oral smallpox therapeutic.

# CBDP BUDGET ITEM JUSTIFICATION SHEET (R-2a Exhibit)

DATE: February 2005

| BUDGET ACTIVITY | PE NUMBER AND TITLE | PROJECT |
|---|---|---|
| RDT&E DEFENSE-WIDE/ BA2 - Applied Research | 0602384BP CHEMICAL/BIOLOGICAL DEFENSE (APPLIED RESEARCH) | TB2 |

**FY 2007 Planned Program (Cont):**

- 2500 Resuscitative Intervention - Complete combined injury animal model (trauma and BW/CW agent) for a vapor nerve agent, a low-volatility nerve agent, and a particulate chemical agent threat. Evaluate Commercial off the Shelf (COTS)/Government off the Shelf (GOTS) medical status monitors against BW/CW agent exposure in combined injury model and complete early markers via genomic or proteomic analysis, and physiologic status of interactive effects of combined injury in appropriate animal model. Continue collaboration with DARPA-funded collaborators on ex vivo and in silico methods to model immune system function. Evaluate anti-sense molecules against multiple pox virus threats to determine potential for broad protection against engineered pox vector.

**Total** 12407

| | FY 2004 | FY 2005 | FY 2006 | FY 2007 |
|---|---|---|---|---|
| Congressional Increases | 0 | 21523 | 0 | 0 |

**FY 2005 Planned Program:**

- 3868 Alternative Delivery Methods for Recombinant Protein Vaccines -
- 1389 Biological Counter-measures (RABB-C) -
- 992 BioTerNet Networking and Strain Tracking - Create a networked system allowing identification and tracking of biological agents and quickly disseminated information about strains.
- 992 Genetic Reassortment by Mismatched Repair-enhanced Acute Biowarfare Therapy Program -

# CBDP BUDGET ITEM JUSTIFICATION SHEET (R-2a Exhibit)

DATE: **February 2005**

| BUDGET ACTIVITY | PE NUMBER AND TITLE | PROJECT |
|---|---|---|
| **RDT&E DEFENSE-WIDE/ BA2 - Applied Research** | **0602384BP CHEMICAL/BIOLOGICAL DEFENSE (APPLIED RESEARCH)** | **TB2** |

**FY 2005 Planned Program (Cont):**

- 1785 Heat Shock Protein Rapid Vaccine -
- 992 Heteropolymar Anthrax Monoclonal Antibody - Conduct proof-of-principle studies of novel heteroduplex antibody molecule against anthrax virulence molecules to determine efficacy and develop data packages for product licensure.
- 1091 Multi-purpose Biodefense Immunoarray - Develop a tool for flexible, rapid characterization of new and novel pathogens and expedited development of countermeasures.
- 992 Neurotoxin Mitigation Research -
- 2777 Novel Viral Biowarfare Agent ID and Treatment - Develop a radically novel approach to anti-viral therapeutics based an a revolutionary new discovery they have made about the molecular biology of viral capsid formation.
- 2777 Vaccines and Therapeutics to Counter Biological Threats - Continue to explore efficacy of mucosally-delivered vaccine candidates to bacterial and viral pathogens.
- 1389 Global Pathogen Portal - Populate a pathogen database and establish a pathogen portal, through genomic data gathering, pathogen background information curation and develpment and incorporation of new analysis tools for microarray and proteomics analysis
- 2479 Virginia Bioinformatic Institute -

**Total** 21523

# CBDP BUDGET ITEM JUSTIFICATION SHEET (R-2a Exhibit)

DATE: **February 2005**

| BUDGET ACTIVITY | PE NUMBER AND TITLE | PROJECT |
|---|---|---|
| **RDT&E DEFENSE-WIDE/ BA2 - Applied Research** | **0602384BP CHEMICAL/BIOLOGICAL DEFENSE (APPLIED RESEARCH)** | **TB2** |

| | FY 2004 | FY 2005 | FY 2006 | FY 2007 |
|---|---|---|---|---|
| SBIR/STTR | 0 | 334 | 0 | 0 |

**FY 2005 Planned Program:**

- 334 SBIR

**Total** 334

**C. Other Program Funding Summary:**

| | FY 2004 | FY 2005 | FY 2006 | FY 2007 | FY 2008 | FY 2009 | FY 2010 | FY 2011 | To Compl | Total Cost |
|---|---|---|---|---|---|---|---|---|---|---|
| TB3 MEDICAL BIOLOGICAL DEFENSE (ATD) | 44353 | 68272 | 63124 | 37131 | 31339 | 32232 | 41281 | 41147 | Cont | Cont |

# CBDP BUDGET ITEM JUSTIFICATION SHEET (R-2a Exhibit)

DATE: **February 2005**

| BUDGET ACTIVITY | PE NUMBER AND TITLE | PROJECT |
|---|---|---|
| **RDT&E DEFENSE-WIDE/ BA2 - Applied Research** | **0602384BP CHEMICAL/BIOLOGICAL DEFENSE (APPLIED RESEARCH)** | **TC2** |

| COST (In Thousands) | | FY 2004 Actual | FY 2005 Estimate | FY 2006 Estimate | FY 2007 Estimate | FY 2008 Estimate | FY 2009 Estimate | FY 2010 Estimate | FY 2011 Estimate | Cost to Complete | Total Cost |
|---|---|---|---|---|---|---|---|---|---|---|---|
| TC2 | MEDICAL CHEMICAL DEFENSE (APPLIED RESEARCH) | 21698 | 24518 | 21516 | 31172 | 39449 | 40969 | 40384 | 39952 | Continuing | Continuing |

## A. Mission Description and Budget Item Justification:

**Project TC2 MEDICAL CHEMICAL DEFENSE (APPLIED RESEARCH):** This project funds medical chemical defense applied research and emphasizes the prevention of chemical casualties. Categories under this project address the Joint Requirements Office (JRO) critical capability gaps identified in the baseline capability assessment performed in FY03. The specific critical capability gaps addressed are Gap #15 (Medical Prophylaxes - Lack of prophylaxes for chemical warfare agents), Gap #24 (Medical Therapeutics - Lack of FDA Approval for CBRN), Gap #35 (Diagnostics - Lack of portability), and Gap #38 (Diagnostics - Reagent Verification).

## B. Accomplishments/Planned Program

| | FY 2004 | FY 2005 | FY 2006 | FY 2007 |
|---|---|---|---|---|
| Diagnostics | 486 | 483 | 1808 | 1509 |

**FY 2004 Accomplishments:**

- 486 Chemical Warfare Agent Defense, Medical Diagnostics - Initiated development of diagnostic applications for miniaturized mass spectrometer. Developed diagnostics that can be used to diagnose exposure via respiratory route. Refined analytical methods to measure scopolamine levels in blood and tissue. Investigated applicability of ocular device for self-examination of pupillary response.

# CBDP BUDGET ITEM JUSTIFICATION SHEET (R-2a Exhibit)

DATE: **February 2005**

| BUDGET ACTIVITY | PE NUMBER AND TITLE | PROJECT |
|---|---|---|
| **RDT&E DEFENSE-WIDE/ BA2 - Applied Research** | **0602384BP CHEMICAL/BIOLOGICAL DEFENSE (APPLIED RESEARCH)** | **TC2** |

**FY 2004 Accomplishments (Cont):**

**Total** 486

**FY 2005 Planned Program:**

- 483 Diagnostic Technologies - Perform applied research experiments aimed at developing detection methods in clinical samples for metabolites, adducts and/or other relevant biomarkers resulting from CW agent exposure. Initiate additional experiments focusing on detecting sulfur mustard exposure. Validate Walter Reed Army Institute of Research (WRAIR) cholinesterase assay. Continue development of alternate sample collection/extraction technology.

**Total** 483

**FY 2006 Planned Program:**

- 608 Diagnostic Technologies - Continue applied research experiments aimed at developing detection methods in clinical samples for metabolites, adducts and/or other relevant biomarkers resulting from CW agent exposure. Pursue experiments focused on detecting sulfur mustard exposure. Develop an automation/high throughput strategy for WRAIR cholinesterase assay. Accelerate development of alternate sample collection/extraction technology for CW agent.
- 1200 Animal Models - Develop a diagnostic gene set to determine exposure to CW agent vesicant and the class of CW agent in a small animal model. Evaluate diagnostic gene set for exposure to non-human primate exposure to nerve agent. Accelerate automation/high throughput strategy for cholinesterase analysis bridging studies from animal models to potential human organophosphate exposure.

**Total** 1808

# CBDP BUDGET ITEM JUSTIFICATION SHEET (R-2a Exhibit)

DATE: **February 2005**

| BUDGET ACTIVITY | PE NUMBER AND TITLE | PROJECT |
|---|---|---|
| **RDT&E DEFENSE-WIDE/ BA2 - Applied Research** | **0602384BP CHEMICAL/BIOLOGICAL DEFENSE (APPLIED RESEARCH)** | **TC2** |

**FY 2007 Planned Program:**

- 509 Diagnostic Technologies - Accelerate research experiments aimed at developing detection methods in clinical samples for metabolites, adducts and/or other relevant biomarkers resulting from CW agent exposure. Finalize automation/high throughput experiments for cholinesterase assay. Validate alternate sample collection/extraction technology. Initiate lab based studies to assess the development of a genomics-based diagnostic screening test for chemical warfare agent exposure. Initiate feasibility studies for incorporation of WRAIR whole blood cholinesterase assay into a hand held platform. Conduct animal studies for detecting biomarkers of CW agent exposure in biological samples.
- 1000 Animal Models - Refine assay procedures for the diagnostic CW gene set markers and down-select predictive gene targets to refine a diagnostic test for low level nerve agent exposure. Complete data package and all validation studies for advanced development transition of an automation/high throughput strategy for serum cholinesterase levels.

**Total** 1509

| | FY 2004 | FY 2005 | FY 2006 | FY 2007 |
|---|---|---|---|---|
| Emerging Threats | 5458 | 6463 | 3045 | 7119 |

# CBDP BUDGET ITEM JUSTIFICATION SHEET (R-2a Exhibit)

DATE: **February 2005**

| BUDGET ACTIVITY | PE NUMBER AND TITLE | PROJECT |
|---|---|---|
| **RDT&E DEFENSE-WIDE/ BA2 - Applied Research** | **0602384BP CHEMICAL/BIOLOGICAL DEFENSE (APPLIED RESEARCH)** | **TC2** |

**FY 2004 Accomplishments:**

- 2700 Chemical Warfare Agent Defense, Low Level CW Agent Exposure: Effects and Countermeasures (DTO CB51) - Assessed short-term behavioral, physiological, and neuropathological effects of VX nerve agent in rodents following low-dose exposures for varying durations and their potential impact on human operational readiness. Initiated studies on the effects of current prophylactic and therapeutic treatments on the maximum tolerated dose for repeated CW agent exposures and on other indices of chemical agent toxicity.
- 2758 Nerve Agent Defense, Non-Traditional Nerve Agent Medical Countermeasures (DTO CB57) - Determined the effects of NTAs on energy metabolism of cardiac cells and the effectiveness of decontamination on percutaneous NTAs. Conducted electrophysiological evaluation of cardiovascular, respiratory, muscular and cortical dysfunction.

**Total** 5458

**FY 2005 Planned Program:**

- 2605 Chemical Warfare Agent Defense, Low Level CW agents Exposure: Effects and Countermeasures (DTO CB51) - Complete assessments of the short-term effects of VX nerve agent on higher order behavioral tasks in non-human primates following a range of low-dose exposures for varying durations to improve estimates of impact on human operational readiness. Complete initial species and route integration studies that provide a basis for more accurate extension of results to human military operator risk assessment.
- 3858 Nerve Agent Defense, Non-Traditional Nerve Agent Medical Countermeasures (DTO CB57) - Evaluate the effectiveness of anticonvulsants against seizures produced by NTAs, in vivo (inside the organism) persistence of NTAs, and current medical countermeasures against NTAs. Conduct evaluation of respiratory dynamics and lung biochemistry.

**Total** 6463

# CBDP BUDGET ITEM JUSTIFICATION SHEET (R-2a Exhibit)

DATE: **February 2005**

| BUDGET ACTIVITY | PE NUMBER AND TITLE | PROJECT |
|---|---|---|
| **RDT&E DEFENSE-WIDE/ BA2 - Applied Research** | **0602384BP CHEMICAL/BIOLOGICAL DEFENSE (APPLIED RESEARCH)** | **TC2** |

**FY 2006 Planned Program:**

- 3045 Non-Traditional Agent Medical Countermeasures - Compare non-traditional and conventional nerve agents for induction of neurochemical changes. Evaluate countermeasures against non traditional cytokine agents (e.g. effect on inflammation reaction and bronchoconstriction). Identify target molecules for intervention against peptide NTAs and additional convulsant agents. Initiate development of animal model for peptide NTAs.

**Total** 3045

**FY 2007 Planned Program:**

- 7119 Non-Traditional Agent Medical Countermeasures - Expand studies of the medical effects of additional classes of NTAs including ion channel blockers and convulsive agents. Work performed will center on understanding the mechanisms of activity and discovering targets for intervention. Perform efficacy studies of identified target molecules for intervention against peptide NTAs and additional convulsant agents. Conduct studies to identify genomic and proteomic expression profiles in animal models and ex vivo animal or human tissue models against peptide and other neurotropic emerging chemical threat agents.

**Total** 7119

| | FY 2004 | FY 2005 | FY 2006 | FY 2007 |
|---|---|---|---|---|
| Pretreatments | 3857 | 3705 | 5075 | 9076 |

# CBDP BUDGET ITEM JUSTIFICATION SHEET (R-2a Exhibit)

DATE: **February 2005**

| BUDGET ACTIVITY | PE NUMBER AND TITLE | PROJECT |
|---|---|---|
| **RDT&E DEFENSE-WIDE/ BA2 - Applied Research** | **0602384BP CHEMICAL/BIOLOGICAL DEFENSE (APPLIED RESEARCH)** | **TC2** |

**FY 2004 Accomplishments:**

- 3361 Nerve Agent Defense, Biological Scavenger - Determined pharmacokinetics of CW agents and the impact of pretreatment in guinea pigs. Determined x-ray crystallographic structure of catalytic scavengers. Continued pretreatment intervention studies of vectors to deliver bioscavenger genes. Characterized animal models to test efficacy of nerve agent bioscavengers. Tested physiologic pharmacokinetic model of CW agents.
- 496 Chemical Warfare Agent Defense, Cyanide Medical Countermeasures - Evaluated cyanide toxicity using an inhalation model. Investigated efficacy of sulfur donors and methemoglobin formers as cyanide pretreatment.

**Total** 3857

**FY 2005 Planned Program:**

- 482 Chemical Warfare Agent Defense, Cyanide Medical Countermeasures - Screen anti-cyanide compounds for efficacy.
- 3223 Nerve Agent, Bioscavengers - Complete development of transgenic animal models that can produce sufficient amounts of recombinant enzyme scavengers for clinical trials. Complete feasibility testing of vector/gene combinations to validate the concept of gene therapy for bioscavengers. Continue pretreatment intervention studies of vectors to deliver bioscavenger genes.

**Total** 3705

# CBDP BUDGET ITEM JUSTIFICATION SHEET (R-2a Exhibit)

DATE: **February 2005**

| BUDGET ACTIVITY | PE NUMBER AND TITLE | PROJECT |
|---|---|---|
| **RDT&E DEFENSE-WIDE/ BA2 - Applied Research** | **0602384BP CHEMICAL/BIOLOGICAL DEFENSE (APPLIED RESEARCH)** | **TC2** |

**FY 2006 Planned Program:**

- 5075 Nerve Agent, Bioscavengers - Continue pretreatment intervention studies of vectors to deliver bioscavenger genes. Develop genetic knock-out murine animal models for catalytic bioscavenger studies (Block II). Evaluate different delivery systems for administration of recombinant and/or catalytic bioscavengers in vivo (Block II). Purify sufficient hBuChE (Block I) for animal safety and efficacy proof-of-concept studies. Develop procedures and systems for large scale purification of recombinant bioscavengers (Block II). Produce hBuChE bioscavenger (Block I) under current Good Manufacturing Practice (cGMP) conditions in sufficient quantity for future phase I safety trials in human subjects. Develop transgenic animal model to evaluate therapeutic approaches for human plasma-derived butylcholinesterase. Expand the evaluation of human protein catalytic bioscavengers.

**Total** 5075

**FY 2007 Planned Program:**

- 9076 Nerve Agent, Bioscavengers - Evaluate recombinant methods and expression systems for larger scale production and purification of recombinant and catalytic bioscavenger proteins (Block II). Perform initial evaluation studies of catalytic bioscavenger in genetic knock-out mice. Continue to develop knock-out murine models for evaluation of recombinant and catalytic bioscavenger evaluation. Extend efficacy studies to NHP models. Accelerate the determination of 3-D structure of human bioscavenger proteins.

**Total** 9076

# CBDP BUDGET ITEM JUSTIFICATION SHEET (R-2a Exhibit)

DATE: **February 2005**

| BUDGET ACTIVITY | PE NUMBER AND TITLE | PROJECT |
|---|---|---|
| **RDT&E DEFENSE-WIDE/ BA2 - Applied Research** | **0602384BP CHEMICAL/BIOLOGICAL DEFENSE (APPLIED RESEARCH)** | **TC2** |

| | FY 2004 | FY 2005 | FY 2006 | FY 2007 |
|---|---|---|---|---|
| Therapeutics | 11897 | 6971 | 11588 | 13468 |

**FY 2004 Accomplishments:**

- 634 Nerve Agent Defense, Nerve Agent Anticonvulsants - Determined efficacy of midazolam and anticholinergic drug combinations against seizures and lethality caused by nerve agents. Determined minimal amount of atropine needed to sustain survival in non-human primates exposed to nerve agent.
- 729 Nerve Agent Defense, Neuroprotection - Tested Food and Drug Administration (FDA) approved drugs shown to be neuroprotective in both anatomic and behavioral studies.
- 1000 Nerve Agent Defense, Improved Oxime (DTO CB48) - Continued assay development, stability studies, and studies to identify and characterize a surrogate marker for efficacy of candidate oxime(s) for use against traditional nerve agents and NTAs.
- 1662 Vesicant Agent Defense, Vesicant Medical Countermeasures - Conducted screening of candidate antivesicant compounds. Developed in vitro (inside the test tube) and in vivo (inside the organism) models to support efficacy studies of new antivesicant countermeasures.
- 2127 Vesicant Agent Defense, Cutaneous Therapeutics - Identified candidate treatment strategies and collate findings in concert with medical experts and relevant research teams. Defined in vitro/in vivo models, establish pathophysiological endpoints, and define cellular and tissue consequences of exposure.

# CBDP BUDGET ITEM JUSTIFICATION SHEET (R-2a Exhibit)

DATE: **February 2005**

| BUDGET ACTIVITY | PE NUMBER AND TITLE | PROJECT |
|---|---|---|
| **RDT&E DEFENSE-WIDE/ BA2 - Applied Research** | **0602384BP CHEMICAL/BIOLOGICAL DEFENSE (APPLIED RESEARCH)** | **TC2** |

**FY 2004 Accomplishments (Cont):**

- 4777 Vesicant Agent Defense, Mustard Gas Antidote - Enhanced the effectiveness of Signal Transduction Inhibition Methodology Antioxidant Liposomes (STIMAL), also known as the Redox Regulating Liposome (RRL), by further product development. Elucidated the pathophysiology of mustard agents in previously developed in vitro and in vivo models. Explored additional modalities such as pharmacogenomically-based drugs and complement blockade. Completed initial efficacy studies of STIMAL against HD. Conducted detailed studies on the inhalation of mustards (bis-2-CEES) to determine if oxidative stress is a significant part of the pathophysiology.
- 731 Chemical Warfare Agent Defense, Inhalation Therapeutics - Screened clinically available drugs for potential efficacy against HD using the mouse model.
- 237 Chemical Warfare Agent Defense, Skin and Wound Decontamination - Pursued development of screening procedures for the evaluation of decontaminants using analytical techniques and animal models. Determined the extent that HD forms a reservoir in skin using pig and hairless guinea pig skin models.

**Total** 11897

**FY 2005 Planned Program:**

- 964 Nerve Agent Defense, Improved Oxime (DTO CB48) - Complete assay development and stability studies. Complete the identification and characterization of a surrogate marker for efficacy of candidate oxime(s) for use against traditional nerve agents and NTAs.

| CBDP BUDGET ITEM JUSTIFICATION SHEET (R-2a Exhibit) | DATE February 2005 |
|---|---|
| BUDGET ACTIVITY<br>**RDT&E DEFENSE-WIDE/**<br>**BA2 - Applied Research** | PE NUMBER AND TITLE<br>**0602384BP CHEMICAL/BIOLOGICAL DEFENSE (APPLIED RESEARCH)** |
| | PROJECT<br>**TC2** |

**FY 2005 Planned Program (Cont):**

- 579 Nerve Agent Defense, Nerve Agent Anticonvulsants - Evaluate efficacy of combinations of midazolam with selected anticholinergic compounds against nerve agent seizures in rodent (guinea pig) and, if relevant, non-human primate models. Develop analytical method to detect therapeutic levels of scopolamine in blood and tissue. Continue to develop a method to directly assay atropine levels in blood.
- 434 Nerve Agent Defense, Neuroprotection - Test putative neuroprotectants in at least one and possibly more than one animal species. Investigate potential markers for neuroprotectant effects, e.g.., EEG power spectrum, Pulse oximetry, Neuroimaging. Develop and validate a neurobehavioral model for change in ability to carry out complex behavior after recovery from nerve agent toxicity.
- 1929 Vesicant Agent Defense, Vesicant Medical Countermeasures - Collate available industrial documentation. Strengthen technology transfer mechanisms. Develop in vivo/in vitro models. Procure compounds for screening modules. Initiate screening procedures. Prioritize screened compounds. Select compounds for further safety and efficacy evaluation.
- 1929 Vesicant Agent Defense, Cutaneous Therapeutics - Complete development of a superficial dermal vesicant injury model in weanling pigs. Begin development of a sulfur mustard cutaneous wound healing model using African green monkeys. Complete development of an in vitro wound healing model to screen pharmacological interventions for the effective treatment of cutaneous sulfur mustard injuries.
- 482 Chemical Warfare Agent Defense, Inhalational Therapeutics - Identify and solicit for scientifically plausible animal and non-animal exposure models to investigate mechanisms of toxicity on pulmonary related function and to establish in-house and collaborative research programs within the confines of the approach.

# CBDP BUDGET ITEM JUSTIFICATION SHEET (R-2a Exhibit)

DATE: **February 2005**

| BUDGET ACTIVITY | PE NUMBER AND TITLE | PROJECT |
|---|---|---|
| **RDT&E DEFENSE-WIDE/ BA2 - Applied Research** | **0602384BP CHEMICAL/BIOLOGICAL DEFENSE (APPLIED RESEARCH)** | **TC2** |

**FY 2005 Planned Program (Cont):**

- 654 Chemical Warfare Agent Defense, Skin and Wound Decontamination - Evaluate the ability of Sandia foam combined with wetting solutions to extract agent from under the skin and extend the time delay for effective decontamination against nerve agents, blister agents, and non-traditional agents (NTAs). Compare efficacy of reactive skin decontamination lotion (RSDL) with other leading skin decontamination products on skin challenge with HD, VX, and non-traditional agents (NTAs). Demonstrate the proof-of-concept for developing a decontaminating skin product that can be applied before or after exposure. Evaluate the effectiveness of RSDL and other leading decontamination products on skin that active Topical Skin Protectant (aTSP) was applied prior to CW agents. Begin developing a skin decontamination formulation that can be use in and around the eyes and wounds.

**Total** 6971

**FY 2006 Planned Program:**

- 1188 Nerve Agent Defense, Improved Oxime - Expand screening of novel compounds for evaluation against next generation of chemical threats.
- 2000 Nerve Agent Defense, Nerve Agent Anticonvulsants - Maintain a tech-watch of new anticonvulsant compounds and evaluate their efficacy against nerve agent-induced seizures using in vivo screening models. Determine efficacy of midazolam, and/or anticholinergic drug combinations, against seizures and lethality produced by all current threat agents in rodent (guinea pig) model.

# CBDP BUDGET ITEM JUSTIFICATION SHEET (R-2a Exhibit)

DATE: **February 2005**

| BUDGET ACTIVITY | PE NUMBER AND TITLE | PROJECT |
|---|---|---|
| **RDT&E DEFENSE-WIDE/ BA2 - Applied Research** | **0602384BP CHEMICAL/BIOLOGICAL DEFENSE (APPLIED RESEARCH)** | **TC2** |

**FY 2006 Planned Program (Cont):**

- 2400 Nerve Agent Defense, Neuroprotection - Investigate long-term neuroprotective strategies against the neurotoxic effects of acetylcholinesterase inhibitors. Evaluate putative neuroprotectants that have demonstrated effectiveness in neuronal rescue. Assess compounds in other pharmaceutical classes (alpha-amino-3-hydroxy-5-methyl-4-isoxazolepriopionic acid antagonists and cannabinoid analogs). Initiate research on a second large animal model (e.g., rabbit, pig, nonhuman primate). Develop and validate a guinea pig neurobehavioral test battery and validate the large animal neurobehavioral test battery.
- 1600 Vesicant Agent Defense, Vesicant Medical Countermeasures - Determine in rodents the safety and efficacy of selected compounds. Complete efforts to develop biological tissue assays for selected compounds and further animal model development, if needed, for ocular and pulmonary exposures.
- 2000 Vesicant Agent Defense, Cutaneous Therapeutics - Complete development of a sulfur mustard cutaneous wound healing model using African green monkeys. Develop a hybrid sulfur mustard-thermal burn model using weanling pigs. Utilize an in vitro wound healing model to screen pharmacological interventions for the effective treatment of cutaneous sulfur mustard injuries. Demonstrate clinical correlates for targeted endpoints that have been developed for in vivo models. Investigate and develop additional resuscitative technologies that integrate established and emerging anti-vesicant therapeutic modalities into suitable candidate therapies in humans.
- 500 Chemical Warfare Agent Defense, Inhalation Therapeutics - Initiate experimentation to establish exposure/effects models from in vitro to in vivo systems by addressing a commonality of response/effects, i.e., identify a common response effect regardless of inhaled toxicant.

# CBDP BUDGET ITEM JUSTIFICATION SHEET (R-2a Exhibit)

DATE: **February 2005**

| BUDGET ACTIVITY | PE NUMBER AND TITLE | PROJECT |
|---|---|---|
| **RDT&E DEFENSE-WIDE/ BA2 - Applied Research** | **0602384BP CHEMICAL/BIOLOGICAL DEFENSE (APPLIED RESEARCH)** | **TC2** |

**FY 2006 Planned Program (Cont):**

- 700 Chemical Warfare Agent Defense, Skin and Wound Decontamination - Select a replacement for the M291 Skin Decontamination Kit (SDK). Evaluate the ability of new commercial skin decontamination formulations to remain effective even after long time delays. Continue development of a decontaminating wound product that can be applied before or after exposure. Continue development of a decontaminating skin product that can be used in and around the eyes and wounds. Begin development of an improved product for patient decontamination. Investigate and develop additional resuscitative technologies that integrate established and emerging anti-vesicant therapeutic modalities into suitable candidate therapies in humans.
- 1200 Animal Models - Develop a non-human primate percutaneous testing model for chemical warfare agent exposure. Initiate assessment of an alternate non-human primate model by determining basic immunological and physiological parameters and validating literature findings in order to demonstrate a mechanistic bridge to humans. Evaluate the African green monkey, and the Marmoset, as alternate non-human primate models by: determining the toxicity of sarin, tabun, cyclosarin, VX, VR, and selected non-traditional agents (NTAs); determining the efficacy of currently licensed medical countermeasures against this panel of chemical warfare agents.

**Total** 11588

# CBDP BUDGET ITEM JUSTIFICATION SHEET (R-2a Exhibit)

DATE: **February 2005**

| BUDGET ACTIVITY | PE NUMBER AND TITLE | PROJECT |
|---|---|---|
| **RDT&E DEFENSE-WIDE/ BA2 - Applied Research** | **0602384BP CHEMICAL/BIOLOGICAL DEFENSE (APPLIED RESEARCH)** | **TC2** |

**FY 2007 Planned Program:**

- 1925 Improved Oxime - Accelerate oxime candidate downselection by establishing in vivo models in higher mammalian non-rodent species to evaluate the efficacy of candidate medical countermeasures (rabbits and non-human primates). Determine broad-spectrum efficacy of selected oximes against multiple nerve agents (GB, GD, VX, and four Non-traditional agents).
- 2000 Nerve Agent Defense, Nerve Agent Anticonvulsants - Determine the minimum amount of atropine needed to sustain survival in non-human primates exposed to two LD-50s of nerve agent.
- 3000 Nerve Agent Defense, Neuroprotection - Identify neurobehavioral changes in rats and guinea pigs following soman-induced status epilepticus: Effects of pharmacological intervention. Expand evaluation of putative neuroprotectants that have demonstrated effectiveness in neuronal rescue (proteasome inhibitor MNL519, NAALADase inhibitor, riluzole, estradiol; initiate evaluations of other proteasome inhibitor, antioxidant nitrones, ifenprodil and/or tiagabine, NPY and/or neuroactive steroids, cyclosporine and AMPA antagonists). Finalize evaluation of best animal model system for earlier neuronal rescue studies (including neuropathologic evaluation of proposed mechanism of recovery for each compound) and prepare these compounds for advanced development evaluations.
- 1600 Vesicant Agent Defense, Vesicant Medical Countermeasures - Define pharmacological categories for points of intervention in vesicant injury process. Screen potential antivesicant compounds. Develop and execute initial steps in plan for licensure and manufacturing with lead compounds, leading up to milestone approval and transition. Refine and demonstrate additional resuscitative technologies that integrate established and emerging therapeutic modalities into suitable candidate therapies in humans.

# CBDP BUDGET ITEM JUSTIFICATION SHEET (R-2a Exhibit)

DATE: **February 2005**

| BUDGET ACTIVITY | PE NUMBER AND TITLE | PROJECT |
|---|---|---|
| **RDT&E DEFENSE-WIDE/ BA2 - Applied Research** | **0602384BP CHEMICAL/BIOLOGICAL DEFENSE (APPLIED RESEARCH)** | **TC2** |

**FY 2007 Planned Program (Cont):**

- 2000 Vesicant Agent Defense, Cutaneous Therapeutics - Utilize an in vitro wound healing model to screen pharmacological interventions for the effective treatment of cutaneous sulfur mustard injuries. Assess instrumentation to evaluate depth of cutaneous vesicant injury. Demonstrate clinical correlates for targeted endpoints that have been developed for in vivo models.
- 722 Chemical Warfare Agent Defense, Inhalation Therapeutics - Complete studies largely (in vivo when possible) based on data gathered to identify lead compounds as candidates for administration as a medical countermeasure(s) therapy(ies) against multiple agent exposures. Develop screening protocol to evaluate and down-select candidate compounds.
- 821 Chemical Warfare Agent Defense, Skin and Wound Decontamination - Continue development of a decontaminating skin product that can be applied before or after exposure. Continue development of a decontaminating skin product that can use in and around the eyes and wounds. Continue development of an improved product for patient decontamination. Begin development of improved product for the decontamination of remains. Continue investigation and development of additional resuscitative technologies that integrate established and emerging decontamination and detoxification therapeutic modalities into suitable candidate therapies in humans.
- 1400 Animal Models - Complete all pharmacodynamics and pharmacokinetics data, and toxicity data for selected oxime candidate. Develop transition data package for improved oxime candidate product to advanced developer.

**Total** 13468

| | FY 2004 | FY 2005 | FY 2006 | FY 2007 |
|---|---|---|---|---|
| Congressional Increases | 0 | 6695 | 0 | 0 |

# CBDP BUDGET ITEM JUSTIFICATION SHEET (R-2a Exhibit)

DATE: **February 2005**

| BUDGET ACTIVITY | PE NUMBER AND TITLE | PROJECT |
|---|---|---|
| **RDT&E DEFENSE-WIDE/ BA2 - Applied Research** | **0602384BP CHEMICAL/BIOLOGICAL DEFENSE (APPLIED RESEARCH)** | **TC2** |

**FY 2005 Planned Program:**

- 6695 Mustard Gas Antidote Research STIMAL - Continue studies on mustard inhalation models to evaluate efficacy of anti-oxidant liposomes in protection of the respiratory tree. Evaluate additional pharmacogenically-based drugs and complement blockade compounds for vesicant agent therapies.

**Total** 6695

| | FY 2004 | FY 2005 | FY 2006 | FY 2007 |
|---|---|---|---|---|
| SBIR/STTR | 0 | 201 | 0 | 0 |

**FY 2005 Planned Program:**

- 201 SBIR

**Total** 201

**C. Other Program Funding Summary:**

| | FY 2004 | FY 2005 | FY 2006 | FY 2007 | FY 2008 | FY 2009 | FY 2010 | FY 2011 | To Compl | Total Cost |
|---|---|---|---|---|---|---|---|---|---|---|
| TC3 MEDICAL CHEMICAL DEFENSE (ATD) | 10097 | 13129 | 24363 | 19222 | 32238 | 31302 | 32460 | 34454 | Cont | Cont |

# CBDP BUDGET ITEM JUSTIFICATION SHEET (R-2a Exhibit)

DATE: **February 2005**

BUDGET ACTIVITY: **RDT&E DEFENSE-WIDE/ BA2 - Applied Research**

PE NUMBER AND TITLE: **0602384BP CHEMICAL/BIOLOGICAL DEFENSE (APPLIED RESEARCH)**

PROJECT: **TR2**

| COST (In Thousands) | | FY 2004 Actual | FY 2005 Estimate | FY 2006 Estimate | FY 2007 Estimate | FY 2008 Estimate | FY 2009 Estimate | FY 2010 Estimate | FY 2011 Estimate | Cost to Complete | Total Cost |
|---|---|---|---|---|---|---|---|---|---|---|---|
| TR2 | MEDICAL RADIOLOGICAL DEFENSE (APPLIED RESEARCH) | 0 | 0 | 300 | 1600 | 3000 | 4500 | 4900 | 5500 | Continuing | Continuing |

## A. Mission Description and Budget Item Justification:

**Project TR2 MEDICAL RADIOLOGICAL DEFENSE (APPLIED RESEARCH):** This project funds applied research on the development of pretreatments to provide an effective medical defense against validated radiological threats. Innovative technical approaches and advances will be incorporated to obtain medical systems designed to provide enhanced protection against exposure to radiological threats. Program objectives focus on mitigating the health consequences from exposures to ionizing radiation that represent the highest probable threat to US forces under current tactical, humanitarian, and counter terrorism mission environments. New protective and therapeutic strategies will broaden the military commander's options for operating within nuclear or radiological environments by minimizing both short- and long term risks of adverse health consequences. Accurate models to predict casualties will promote effective command decisions and force structure planning to ensure mission success.

## B. Accomplishments/Planned Program

| | FY 2004 | FY 2005 | FY 2006 | FY 2007 |
|---|---|---|---|---|
| Radioprotectants | 0 | 0 | 300 | 1600 |

# CBDP BUDGET ITEM JUSTIFICATION SHEET (R-2a Exhibit)

DATE: **February 2005**

| BUDGET ACTIVITY | PE NUMBER AND TITLE | PROJECT |
|---|---|---|
| **RDT&E DEFENSE-WIDE/ BA2 - Applied Research** | **0602384BP CHEMICAL/BIOLOGICAL DEFENSE (APPLIED RESEARCH)** | **TR2** |

**FY 2006 Planned Program:**

- 300 Radioprotectants - Identify and test, from a prioritized list of approximately 20 agents, two candidates for efficacy in a rodent model; the degree of protection at a radiation dose that normally causes approximately 90% lethality within 30 days (Lethal Dose (LD) 90/30).

**Total** 300

**FY 2007 Planned Program:**

- 1600 Radioprotectants - Evaluate three to four new compounds at the LD 90/30. Assess the more promising candidates to determine the dose-reduction factor (DRF) for radioprotection and develop protocols for evaluation in a non-human primate model system.

**Total** 1600

**C. Other Program Funding Summary:**

| | FY 2004 | FY 2005 | FY 2006 | FY 2007 | FY 2008 | FY 2009 | FY 2010 | FY 2011 | To Compl | Total Cost |
|---|---|---|---|---|---|---|---|---|---|---|
| TR3 MEDICAL RADIOLOGICAL DEFENSE (ATD) | 0 | 0 | 0 | 2200 | 4500 | 4156 | 4500 | 6865 | Cont | Cont |