Exhibit R-2, RDT&E Budget Item Justification: PB 2011 Chemical and Biological Defense Program										DATE: February 2010	
APPROPRIATION/BUDGET ACTIVITY 0400: *Research, Development, Test & Evaluation, Defense-Wide* BA 2: *Applied Research*				R-1 ITEM NOMENCLATURE PE 0602384BP: *CHEMICAL/BIOLOGICAL DEFENSE (APPLIED RESEARCH)*							
COST ($ in Millions)	**FY 2009 Actual**	**FY 2010 Estimate**	**FY 2011 Base Estimate**	**FY 2011 OCO Estimate**	**FY 2011 Total Estimate**	**FY 2012 Estimate**	**FY 2013 Estimate**	**FY 2014 Estimate**	**FY 2015 Estimate**	**Cost To Complete**	**Total Cost**
Total Program Element	231.331	224.830	169.287	0.000	169.287	189.340	188.411	181.125	183.566	Continuing	Continuing
CB2: *CHEMICAL BIOLOGICAL DEFENSE (APPLIED RESEARCH)*	102.599	110.955	88.897	0.000	88.897	100.243	97.979	90.686	91.554	Continuing	Continuing
CI2: *CONGRESSIONAL INTEREST ITEMS (APPLIED RESEARCH)*	42.714	16.630	0.000	0.000	0.000	0.000	0.000	0.000	0.000	Continuing	Continuing
TB2: *MEDICAL BIOLOGICAL DEFENSE (APPLIED RESEARCH)*	50.485	53.930	43.858	0.000	43.858	50.866	51.077	51.051	51.959	Continuing	Continuing
TC2: *MEDICAL CHEMICAL DEFENSE (APPLIED RESEARCH)*	35.008	40.418	33.648	0.000	33.648	36.327	36.500	37.475	38.150	Continuing	Continuing
TR2: *MEDICAL RADIOLOGICAL DEFENSE (APPLIED RESEARCH)*	0.525	2.897	2.884	0.000	2.884	1.904	2.855	1.913	1.903	Continuing	Continuing

A. Mission Description and Budget Item Justification

Funding under this program element (PE) sustains a robust defense program, which both reduces the danger of a chemical, biological, or radiological (CBR) attack and enables U.S. forces to survive, and continue operations in a CBR environment. The medical program focuses on development of antidotes, drug treatments, casualty diagnosis, patient decontamination and medical technologies management. In the physical sciences area, the emphasis is on continuing improvements in CB defense materiel, including contamination avoidance, decontamination, and protection technologies. Research efforts are planned to be initiated for CB defense technologies that will result from a strategic approach of converging nanotechnology, biotechnology, information technology and cognitive science. This PE also provides for applied research in the areas of real-time sensing and immediate biological countermeasures. 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 is placed in BA2, because it includes non-system specific development, directed toward military needs.

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B. Program Change Summary ($ in Millions)

	FY 2009	FY 2010	FY 2011 Base	FY 2011 OCO	FY 2011 Total
Previous President's Budget	239.297	209.072	0.000	0.000	0.000
Current President's Budget	231.331	224.830	169.287	0.000	169.287
Total Adjustments	-7.966	15.758	169.287	0.000	169.287
• Congressional General Reductions		-0.942			
• Congressional Directed Reductions		0.000			
• Congressional Rescissions	0.000	0.000			
• Congressional Adds		16.700			
• Congressional Directed Transfers		0.000			
• Reprogrammings	4.731	0.000			
• SBIR/STTR Transfer	-2.697	0.000			
• Other Adjustments	-10.000	0.000	169.287	0.000	169.287

Congressional Add Details ($ in Millions, and Includes General Reductions)	FY 2009	FY 2010
Project: CI2: *CONGRESSIONAL INTEREST ITEMS (APPLIED RESEARCH)*		
Congressional Add: *Rapid Forensic Evaluation of Microbes in Biodefense*	0.989	0.000
Congressional Add: *Chem/Bio IR Detection System*	1.186	1.892
Congressional Add: *Zumwalt National Program for Countermeasures to Bio Chem Threats*	1.187	0.000
Congressional Add: *HyperAcute Vaccine Development*	2.373	3.585
Congressional Add: *Antibody-based Therapeutic against Smallpox*	0.791	0.000
Congressional Add: *Novel Viral Biowarfare Agent Identification and Treatment (NOVBAIT)*	3.955	0.000
Congressional Add: *Mixed Oxidants for Chemical and Biological Decontamination*	2.769	0.000
Congressional Add: *Bio Surety Development and Management Program -*	1.186	0.000
Congressional Add: *Countermeasures to Chemical/Biological Control-Rapid Response -*	2.372	0.000
Congressional Add: *Multiple Applications for Light Activated, Reactive Materiels for Protection of Warfighter, First Responder, and Public Health -*	1.582	0.000

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Congressional Add Details ($ in Millions, and Includes General Reductions)	FY 2009	FY 2010
Congressional Add: *Chemical Biological Preparedness Center for Advanced Development of Mobile Rapid Response Prototype* -	3.955	0.000
Congressional Add: *Novel System for Developing Therapeutics against Botulism* -	3.955	0.000
Congressional Add: *Ultra-Rapid Next Generation Pathogen Identification* -	1.978	0.000
Congressional Add: *Preventing Long-Term Brain and Lung Damage Caused by Battlefield Trauma Project* -	2.868	0.000
Congressional Add: *Chemical Agent Fate Appropriate Response Tool* -	1.582	1.593
Congressional Add: *Multivalent Marburg/Ebola Vaccine* -	3.461	0.000
Congressional Add: *Botulinum Neurotoxin Research* -	1.582	1.992
Congressional Add: *Miniaturized Chemical Detector for Chemical Warfare Protection (ChemPen)* -	1.581	1.593
Congressional Add: *Continued Expansion of Prototypes for Destruction of Airborne Pathogen* -	0.791	0.000
Congressional Add: *Mismatch Repair Derived Antibody to Treat Staph Derived Bioweapon* -	1.582	0.000
Congressional Add: *Nano Porous Hollow Fiber Regenerative Chemical Filter* -	0.989	0.000
Congressional Add: *Chemical and Biological Resistant Clothing*	0.000	1.593
Congressional Add: *Botulinum Toxin Treatment Therapy*	0.000	0.797
Congressional Add: *Contaminated Human Remains Pouch*	0.000	1.593
Congressional Add: *PaintShield for Protecting People from Microbial Threats*	0.000	1.992
Congressional Add Subtotals for Project: CI2	42.714	16.630
Congressional Add Totals for all Projects	42.714	16.630

Change Summary Explanation

Funding: N/A - Adjustments less than 10% of total program.

Schedule: N/A

Technical: N/A

Exhibit R-2A, RDT&E Project Justification: PB 2011 Chemical and Biological Defense Program			DATE: February 2010
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COST ($ in Millions)	FY 2009 Actual	FY 2010 Estimate	FY 2011 Base Estimate	FY 2011 OCO Estimate	FY 2011 Total Estimate	FY 2012 Estimate	FY 2013 Estimate	FY 2014 Estimate	FY 2015 Estimate	Cost To Complete	Total Cost
CB2: *CHEMICAL BIOLOGICAL DEFENSE (APPLIED RESEARCH)*	102.599	110.955	88.897	0.000	88.897	100.243	97.979	90.686	91.554	Continuing	Continuing

A. Mission Description and Budget Item Justification

This project (CB2) provides physical applied research to develop future, multi-disciplinary, multi-functional capabilities in life sciences, physical sciences, environmental sciences, mathematics, cognitive sciences, and engineering. Efforts in this project support the seamless integration of state-of-the-art-technologies into a collection of systems across the spectrum of capabilities required to support chemical and biological defense missions, including specific research to develop defensive capabilities against non-traditional agents (NTAs). Starting in FY11, all NTA-dedicated research will be re-aligned into specific capability areas within this project in order to ensure a focused effort on this high priority area. Capability areas in this project include: detection; detection for NTAs; information systems technology; protection/hazard mitigation; protection/hazard mitigation for NTAs; threat agent science; and threat agent science for NTAs. Detection focuses on developing technologies for standoff and point detection and identification of chemical and biological agents. Information systems technology focuses on advanced warning and reporting, hazard prediction and assessment, simulation analysis and planning, and systems performance modeling. Protection and hazard mitigation focuses on providing technologies that protect and reduce the chemical/biological threat or hazard to the Warfighter, weapons platforms, and structures. Threat agent science is devoted to characterizing threat agents and the hazards they present in terms of agent fate in the environment, toxicology, pathogenicity and the development of simulants, especially with regard to NTAs. This project focuses on horizontal integration of CB defensive technologies in support of the Joint Services.

B. Accomplishments/Planned Program ($ in Millions)

	FY 2009	FY 2010	FY 2011 Base	FY 2011 OCO	FY 2011 Total
1) SBIR	0.000	1.467	0.000	0.000	0.000
FY 2010 Plans: Small Business Innovative Research.					
2) Protection	5.716	0.000	0.000	0.000	0.000

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B. Accomplishments/Planned Program ($ in Millions)

	FY 2009	FY 2010	FY 2011 Base	FY 2011 OCO	FY 2011 Total
Integrated Protective Fabric: Development of lightweight chemical and biological protective textiles that can be used as an integrated combat duty uniform. *FY 2009 Accomplishments:* Completed development of test methodologies. Completed assessment of elastic, conformable CB protective fabrics with selectively permeable properties. Continued development of interpenetrating polymer networks whose permeability properties can be electrically controlled. Continued work on fabric residual life indicators that can be automatically integrated. Continued development of novel sorbents leap-ahead improvements over activated carbon technologies. Continued development work on ultra light and tactile barrier materials for gloves and boots. Continued fabrication and testing of prototype integrated fabrics to determine protection, mechanical properties, and heat transfer characteristics. Continued use of computational methods for assessment and refinement of prototypes. Continued ensemble design conceptual work based on lessons gathered in the human performance project. Initiated fabrication of prototype ensembles for evaluation and demonstration. Resulting technologies/knowledge transition to an integrated fabric development project in support of advanced development programs such as the Future Force Warrior Demonstration of the Soldier-as-a-System Ground Program and Uniform Integrated Protective Ensemble (UIPE). *FY 2010 Plans:* This effort re-aligned to Protection and Hazard Mitigation.					
3) Protection Human Performance: Analysis and modeling of human performance in chemical and biological protective ensembles to determine design priorities and trade-offs. *FY 2009 Accomplishments:* Completed first segment of the comprehensive study to reduce physiological burden on the human performance parameters for various Warfighter subgroups in the performance of their mission when	3.586	0.000	0.000	0.000	0.000

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B. Accomplishments/Planned Program ($ in Millions)

	FY 2009	FY 2010	FY 2011 Base	FY 2011 OCO	FY 2011 Total
CB protective systems are employed. Published findings on trade space between physiological and psychological comfort with regards to Warfighter effectiveness. Continued work to develop an overall comfort and performance model for CB protective equipment. Completed human subject studies on the effects of breathing rates and resistance during high work rates. Transitioned results into the comfort and performance model. Developed a draft standard for Air Purifying Respirator (APR) qualification. *FY 2010 Plans:* This effort re-aligned to Protection and Hazard Mitigation.					
4) Protection Self-Decontaminating Processes: Development and analysis of self-decontaminating coatings and surfaces. *FY 2009 Accomplishments:* Continued efforts from FY08 Decontamination Alternative Processes and Solid Phase to develop general purpose formulations and self decontaminating processes using sense and react (smart) systems, gas, kinetic, energetic, and/or novel approaches. Supported concept development for decontamination systems of systems strategies and technologies. Decontamination process fundamental efforts continued, including the integration of innovative surface chemistry apparatus focusing on surface, decontaminant, and contaminant interactions using live chemical agents. *FY 2010 Plans:* This effort re-aligned to Protection and Hazard Mitigation.	6.092	0.000	0.000	0.000	0.000
5) Protection Respiratory Protection (Non Traditional Agent (NTA)/Toxic Industrial Chemical (TIC) Protection): Development and integration of novel filtration media into a lightweight, low-profile, and low-burden	5.743	0.000	0.000	0.000	0.000

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B. Accomplishments/Planned Program ($ in Millions)

	FY 2009	FY 2010	FY 2011 Base	FY 2011 OCO	FY 2011 Total
individual protective filter, which has enhanced performance against a broader range of challenges that includes toxic industrial chemicals. *FY 2009 Accomplishments:* Completed integration of the protective mask designs with developmental helmet systems to provide seamless compatibility of CB protection with ballistic protection and the integration of communication and optical systems. Incorporated integrated results into designs under BA3 efforts. Completed the investigation of intelligent seal enhancement materials and technologies that will provide improvements in the field protection factor performance and comfort of a respirator. Continued to define the key development parameters associated with respiratory protective systems and incorporate data and lessons from the human performance project. Continued work on the dual-cavity respirator with increased levels of respiratory protection that provide a real-time indication of mask fit and integrate concept into the final design. Continued project to develop the next generation filter for individual protection. Completed initial phase of development of metal-organic frameworks as tuneable sorbents for advance air purification technologies in protective masks. Completed the down-selection of ceramic and polymer nanofiber-based filters. Continued reactive hybrid approaches for individual protection filtration. Developed and fabricated initial prototypes and evaluate performance. *FY 2010 Plans:* This effort re-aligned to Protection and Hazard Mitigation.					
6) Protection Novel Air Purification Technologies: Development of chemical and biological air-purification alternative technologies that minimize or eliminate the need for expendable media within acceptable size, weight and power constraints.	3.795	0.000	0.000	0.000	0.000

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B. Accomplishments/Planned Program ($ in Millions)

	FY 2009	FY 2010	FY 2011 Base	FY 2011 OCO	FY 2011 Total
FY 2009 Accomplishments: Continued to develop energetic, reactive, media-less, air purification technologies that reduce size, weight, and lifecycle costs of removing chemical and biological agents and Toxic Industrial Chemicals (TICs) from recirculated air in buildings, shelters, or platforms. Continued development of an acoustic fractionator that removes particulates down to the submicron level using standing sound waves. Completed investigation of a hybrid plasma filter that provides both vapor particulate removal and destruction capabilities. Continued development of a new air purification technology based on selective ionization and contaminant extraction. Continued development of a novel, low pressure drop, High Efficiency Particulate Arrestance (HEPA) filter, which provides increased dust capacity and extended filter life through the use of irregularly shaped high surface area submicron fibers. Completed demonstration of a highly efficient media-less particulate filter that uses charged sub-micron water droplets and down-select among technological approaches for further development. *FY 2010 Plans:* This effort re-aligned to Protection and Hazard Mitigation.					
7) Protection Collective Protection (COLPRO) System Integration: Development and systems analysis of novel system concepts for chemical and biological protection of occupants of buildings and platforms that integrates emerging technologies. *FY 2009 Accomplishments:* Continued project to investigate alternate system solutions and technologies for COLPRO. Technologies include micro fine detoxifying aerosol fogs to facilitate entry and mitigate cross contamination into the COLPRO system, internal self-detoxifying surfaces for walls and ductwork, expedient retrofit kits, self-detoxifying and expedient strippable coatings, rapid isolation and purge schemes, and novel and innovative air flow and re-circulation schemes. Completed the study	3.535	0.000	0.000	0.000	0.000

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B. Accomplishments/Planned Program ($ in Millions)

	FY 2009	FY 2010	FY 2011 Base	FY 2011 OCO	FY 2011 Total
of system alternatives and initiate efforts addressing specific technological gaps for COLPRO development. *FY 2010 Plans:* This effort re-aligned to Protection and Hazard Mitigation.					
8) Protection & Hazard Mitigation Innovative Systems Concepts and Analysis: Development and systems analysis of novel system concepts for chemical and biological protection of occupants of buildings and platforms that integrates emerging technologies. *FY 2010 Plans:* Investigate alternate system solutions and technologies for Collective Protection (COLPRO). Technologies include micro fine detoxifying aerosol fogs to facilitate entry and mitigate cross contamination into the COLPRO system, internal self-detoxifying surfaces for walls and ductwork, expedient retrofit kits, self-detoxifying and expedient strippable coatings, rapid isolation and purge schemes, and novel and innovative air flow and re-circulation schemes.	0.000	1.131	0.000	0.000	0.000
9) Protection & Hazard Mitigation Lightweight Integrated Fabric: Development of lightweight chemical and biological protective textiles that can be used as an integrated combat duty uniform. *FY 2010 Plans:* Support assessment of integrated fabric concurrent with the Individual Protection Advanced Technology Demonstration (IP Demo - see Budget Activity 3, Project TT3, Experiment and Technology Demonstrations), which will support the Lightweight CB Ensemble (LCBE), and incorporate lessons into further development of integrated fabric. Continue work on fabric residual life indicators and agent indicators that can be network enabled. Continue development of polymer membranes with	0.000	6.614	1.546	0.000	1.546

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B. Accomplishments/Planned Program ($ in Millions)

	FY 2009	FY 2010	FY 2011 Base	FY 2011 OCO	FY 2011 Total
permeability properties electrically controlled. Continue development of novel sorbents leap-ahead improvements over activated carbon technologies. Continue development work on ultra light and tactile barrier materials for gloves and boots. Continue development and scaling of nanofiber/textile production technologies. Continue fabrication and testing of prototype integrated fabrics to determine protection, mechanical properties, and heat transfer characteristics. Continue use of computational methods for assessment and refinement of prototypes. Continue ensemble design conceptual work based on lessons gathered in the human performance project. Continue support of fabrication of prototype ensembles for evaluation and demonstration. *FY 2011 Base Plans:* Incorporate lessons learned from the Individual Protection Advanced Technology Demonstration (see TT3 E&TD), which will support the Lightweight CB Ensemble (LCBE), and incorporate lessons into further development of integrated fabric. Complete work on network-enabled fabric agent indicators. Continue development work on ultra light and tactile barrier materials for gloves and boots and continue fabrication and testing of prototype integrated fabrics to determine protection, mechanical properties, and heat transfer characteristics. Continue development and scaling of nanofiber/textile production technologies for transition to UIPE/JSLIST program. Continue use of computational methods for assessment and refinement of prototypes. Continue development of ensemble design conceptual work based on lessons gathered in the human performance project for transition to UIPE/ JSLIST.					
10) Protection & Hazard Mitigation Low-Resistance, Low-Profile Filtration: Development and integration of novel filtration media into a lightweight, low-profile, and low-burden individual protective filter, which has enhanced performance against a broader range of challenges that includes toxic industrial chemicals.	0.000	5.934	3.528	0.000	3.528

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B. Accomplishments/Planned Program ($ in Millions)

	FY 2009	FY 2010	FY 2011 Base	FY 2011 OCO	FY 2011 Total
FY 2010 Plans: Support assessment of integrated fabric concurrent with the Individual Protection Advanced Technology Demonstration, which will support the Uniform Integrated Protective Ensemble (UIPE), and incorporate lessons into further development of low resistance/profile filtration. Continue project to develop the next generation filter for individual protection from chemical and biological (CB) agents, Toxic Industrial Chemicals (TICs) and Non Traditional Agents (NTAs). Integrate metal-organic frameworks and other novel adsorbent into "breadboard" prototypes. Integrate nanofiber High Efficiency Particulate Air (HEPA) filters into "breadboard" prototypes. Continue reactive hybrid approaches for individual protection filtration. Develop and fabricate initial prototypes and evaluate performance. Initiate prototype work for collective protection filtration in support of advanced development programs such as the Joint Expeditionary Collective Protection (JECP) and support of collective protection in vehicular/platform systems in Major Defense Acquisition Programs (MDAP). *FY 2011 Base Plans:* Incorporate lessons learned from the Individual Protection Advanced Technology Demonstration, which will support the Uniform Integrated Protective Ensemble (UIPE), and incorporate lessons into further development of low resistance/profile filtration. Continue project to develop the next generation filter for individual protection from CB agents, TICs and NTAs. Integrate metal-organic frameworks and other novel adsorbent into "breadboard" prototypes. Integrate nanofiber HEPA filters into breadboard prototypes. Continue reactive hybrid approaches for individual protection filtration and evaluate performance. As a result of the IP Demo, refine prototype concept filters to advanced development programs such as the Joint Service General Purpose Mask (JSGPM), Joint Service Aircrew Mask (JSAM), UIPE programs, improved media for collective protection filters in Joint Expeditionary Collective Protection (JECP), and in support of collective protection in vehicular/platform systems in Major Defense Acquisition Programs (MDAP).					
11) Protection & Hazard Mitigation	0.000	1.979	0.711	0.000	0.711

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B. Accomplishments/Planned Program ($ in Millions)

	FY 2009	FY 2010	FY 2011 Base	FY 2011 OCO	FY 2011 Total
Human Performance Prediction and Assessment: Analysis and modeling of human performance in chemical and biological protective ensembles in order to determine design priorities and trade-offs. *FY 2010 Plans:* Support assessment of integrated fabric concurrent with the Individual Protection Advanced Technology Demonstration, which will support the Uniform Integrated Protective Ensemble (UIPE), and incorporate lessons into further development of human performance prediction and assessment. Continue refining human performance parameters for various Warfighter subgroups in the performance of their mission when CB protective systems are employed. Continue work to develop an overall comfort and performance model for CB protective equipment. Initiate anthropometric sizing study to support size tariff development. *FY 2011 Base Plans:* Incorporate lessons learned from the Individual Protection Advanced Technology Demonstration, which will support the Uniform Integrated Protective Ensemble (UIPE), and incorporate lessons into further development of human performance prediction and assessment. Complete human performance model for CB protective equipment. As a result of the IP Demo, transition model data and analysis to individual protection advanced development programs. Continue anthropometric sizing study to support size tariff development.					
12) Protection & Hazard Mitigation	0.000	1.976	2.590	0.000	2.590
Low-Burden Air Purifying Respirator: Development and analysis of design alternatives for chemical and biological air-purifying respirators to provide enhanced protection with lower physiological burden and improved interface with mission equipment. *FY 2010 Plans:* Support assessment of integrated fabric concurrent with the Individual Protection Advanced Technology Demonstration, which will support the Uniform Integrated Protective Ensemble (UIPE),					

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B. Accomplishments/Planned Program ($ in Millions)

	FY 2009	FY 2010	FY 2011 Base	FY 2011 OCO	FY 2011 Total
and incorporate lessons learned into further development of a low-burden air purifying respirator. Continue to define the key development parameters associated with respiratory protective systems and incorporate data and lessons from the human performance project. Continue integration analysis with ground Warfighter helmet systems. Complete integration work on the dual-cavity respirator into concepts for the final design. Continue to refine and fabricate prototypes and evaluate performance. *FY 2011 Base Plans:* Incorporate lessons learned from the Individual Protection Advanced Technology Demonstration, which will support the Uniform Integrated Protective Ensemble (UIPE), and incorporate lessons into further development of a low-burden air purifying respirator. Complete the assessment of the key development parameters associated with respiratory protective systems and incorporate data and lessons from the human performance project. Incorporate lessons learned from the IP Demonstration into protective mask prototypes. Complete integration analysis with ground Warfighter helmet systems. Continue to integrate work on the dual-cavity respirator into concepts into the final design.					
13) Protection & Hazard Mitigation Logistically Sustainable Air Purification for Collective Protection: Development of chemical and biological air-purification alternative technologies that minimize or eliminate the need for expendable media within acceptable size, weight and power constraints. *FY 2010 Plans:* Complete development and analysis of prototypes of energetic, reactive, media-less, air purification technologies that reduce size, weight, and lifecycle costs of removing chemical and biological agents and toxic industrial chemicals (TICs) from both make-up and re-circulation air in buildings, shelters, or platforms. Complete development of an acoustic fractionator that removes particulates down to the submicron level using standing sound waves. Continue development of a new air purification technology based on selective ionization and contaminant extraction. Complete development of a	0.000	2.259	1.937	0.000	1.937

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B. Accomplishments/Planned Program ($ in Millions)

	FY 2009	FY 2010	FY 2011 Base	FY 2011 OCO	FY 2011 Total
novel, low pressure drop, HEPA filter, which provides increased dust capacity and extended filter life through the use of irregularly shaped high surface area submicron fibers. *FY 2011 Base Plans:* Continue development of reactive membrane and regenerative post treatment media technologies for applications in building protection and vehicular/platform systems for Major Defense Acquisition Programs (MDAP).					
14) Protection & Hazard Mitigation General Purpose Formulations for Decontamination: Development and improvement of chemical and biological decontamination formulations that are compatible with the current family of decontamination systems. *FY 2010 Plans:* Continue solid oxidant and green surfactant efforts resulting from alternative process research that emphasize dual-use technologies. Initiate focused enzymatic decontamination approaches. *FY 2011 Base Plans:* Complete development, testing and transition of solid oxidant and green surfactant to support advanced development programs such as the Hazard Mitigation for Material and Equipment Restoration (HaMMER) Advanced Technology Demonstration (see Budget Activity 3, Project TT3, Experiment & Technology Demonstrations), also known as the Decontamination Family of Systems Demonstration. Continue focused enzymatic decontamination development.	0.000	1.866	2.830	0.000	2.830
15) Protection & Hazard Mitigation Decontamination System-of-Systems: Development and analysis of non-traditional decontamination technologies and approaches which gain significantly improved effectiveness by complementary application.	0.000	2.553	4.348	0.000	4.348

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B. Accomplishments/Planned Program ($ in Millions)

	FY 2009	FY 2010	FY 2011 Base	FY 2011 OCO	FY 2011 Total
FY 2010 Plans: Complete development of self-detoxifying coatings, agent disclosure spray efforts, and strippable coating efforts and transition products in advanced development programs such as the Hazard Mitigation for Material and Equipment Restoration (HaMMER) Advanced Technology Demonstration. Continue investigation of microwave interaction with coating embedded particles and functionalities for directed energy decontamination. Complete work on functionalized photocatalytic materials. Initiate formulation development of a Decontamination Family of Systems that allow optimized formulation adjustment at point-of-use. *FY 2011 Base Plans:* Develop data to define performance envelop of system components and transition to HaMMER. Initiate a study on impact of application methods of decontaminants to complex surfaces.					
16) Protection & Hazard Mitigation Smart Hazard Mitigation: Development of decontamination technologies that sense, respond (decontaminate) and signal in the presence of chemical and biological contamination. *FY 2010 Plans:* Complete feasibility studies on the use of surface-modified nanoporous beads as encapsulation delivery devices for decontaminants. Continue development of molecular switches that respond and react to the presence of CB agents and signal results. Initiate development of rotaxane chemistry as artificial tunable G and V receptors that sense and react to chemical agents. *FY 2011 Base Plans:* Continue development of molecular switches that respond and react to the presence of CB agents and signal results. Continue development of rotaxane chemistry as artificial tunable G and V receptors that sense and react to chemical and biological agents.	0.000	1.787	1.388	0.000	1.388

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B. Accomplishments/Planned Program ($ in Millions)

	FY 2009	FY 2010	FY 2011 Base	FY 2011 OCO	FY 2011 Total
17) Protection and Hazard Mitigation	0.000	3.143	0.000	0.000	0.000
Novel Threat Agent Assessment and Methods: Focuses on Non-Traditional Agent hazard, permeation, and quantification of the hazard as it pertains to developing protective and hazard mitigation technologies. *FY 2010 Plans:* Initiate methodology development for assessment and quantification of percutaneous hazards from permeation of liquid NTAs. Initiate methodology development for assessment and quantification of decontamination contact hazard residuals of NTAs. Baseline methodologies for current filtration, barrier materials, and textile effectiveness against NTAs. Continue efforts to assess and predict NTA performance on military chemical warfare agent (CWA) adsorbents. *FY 2011 Base Plans:* All NTA efforts are re-aligned to Protection and Hazard Mitigation NTA capability area within this Budget Activity.					
18) Protection and Haz Mitigation NTA	0.000	0.000	2.280	0.000	2.280
NTA Air Purification: Study and assessment of filter technologies. *FY 2011 Base Plans:* Complete assessment of military carbon against NTAs, including performance when exposed to battlefield contaminants such as petroleum, oil, lubricants, and sweat. Develop and test novel materials to improve performance against NTAs. Provide results for upgrades into developmental programs such as the Joint Service General Purpose Mask (JSGPM).					
19) Protect & Haz Mit NTA	0.000	0.000	2.996	0.000	2.996
NTA Percutaneous Protection: Study and assessment of protective technologies.					

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B. Accomplishments/Planned Program ($ in Millions)

	FY 2009	FY 2010	FY 2011 Base	FY 2011 OCO	FY 2011 Total
FY 2011 Base Plans: Develop technologies to improve overall protective clothing performance against NTAs. Develop and assess improved ensemble closures and evaluate current individual protective (IP) barrier materials. Develop component aerosol test methods for performance standards of IP ensembles. Modify and verify material swatch test methods for liquid and aerosol for performance standards of IP materials. Develop breathable aerosol barrier materials and self-detoxifying fabrics. Develop and evaluate improved barrier materials for protective gloves and boots. Complete assessment of expedient approaches and skin barrier treatments. Develop and test performance enhancements that improve material agent resistance and garment closure performance.					
20) Protect & Haz Mit NTA NTA Decontamination: Study and assessment of decontamination technologies. *FY 2011 Base Plans:* Assess performance of current and developmental decontamination technologies against NTAs. Develop decontamination technologies and formulations that are optimized against NTAs. Modify and verify test procedures for NTAs. Develop and test decontamination formulations and system-of-systems approaches that improve performance against NTAs and manage process residuals.	0.000	0.000	3.124	0.000	3.124
21) Threat Agent Science Physiological Response: Delivers the scientific understanding and relevant standards for hazards posed to humans from a chemical or biological agent exposure. *FY 2009 Accomplishments:* Completed development of technically demanding exposure and analytic methods for selected very low volatile chemical threat agents such as NTAs. Continued studies on human health risk assessment exposure standard for medical applications associated with contact hazards of	5.210	14.469	0.085	0.000	0.085

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B. Accomplishments/Planned Program ($ in Millions)

	FY 2009	FY 2010	FY 2011 Base	FY 2011 OCO	FY 2011 Total
low volatility Chemical Warfare Agents (CWAs). Completed development of toxicokinetic and toxicodynamic models initiated in FY08. *FY 2010 Plans:* Refine and standardize exposure and analytical methods for evaluation of percutaneous exposure to selected low volatility CWAs and high priority NTAs. Assess established contact and inhalation hazard methodologies for applicability to next-generation chemical warfare agents and refine as evaluation indicates. Set milestones and begin research on hazard assessment for more chemical agents. Complete development of exposure and analytic methods for selected very low volatile chemical threat agents. Complete studies and publish report on human health risk assessment exposure standard for medical applications associated with contact hazards of low volatility CWAs. Expand previous toxicokinetic and toxicodynamic efforts on a representative spore-forming Biological Weapons Agents (BWA) to include other BWAs, both spore-forming and non spore-forming. Assess the validity of expanding the viral agents model. Investigate human toxicity operational contact hazard assessment, and the effects of alternate toxicological pathways on the overall physiological impacts of high priority NTAs. *FY 2011 Base Plans:* Continue research efforts on BWA toxicokinetic and toxicodynamic modeling. All NTA-related efforts re-aligned to Threat Agent Science NTA within this Budget Activity.					
22) Threat Agent Science Agent Fate: Characterizes fate of chemical and biological material on operationally relevant surfaces; information obtained from the study of particular agents will be used in core programs to assist detection, information systems, and protection and hazard mitigation activities.	4.990	8.847	0.079	0.000	0.079

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B. Accomplishments/Planned Program ($ in Millions)

	FY 2009	FY 2010	FY 2011 Base	FY 2011 OCO	FY 2011 Total
FY 2009 Accomplishments: Completed data collection for evaporation studies on thickened CWAs and low volatility chemicals for relevant substrates and nanotechnology developments. Continued kinetic studies of the fate of thickened CWAs on operationally relevant surfaces. Integrated and completed characterization of new phenomena into models that will be transitioned to advanced development programs such as the JEM. Continued research to develop data sets of persistence and residual NTA concentration on operationally relevant surfaces (concrete, asphalt, painted surfaces, sand, soil, etc.) and expanded studies to include newly prioritized agents. Continued characterization of reactivity of the NTAs with surfaces as well as surface penetration and the fate of NTAs over time. *FY 2010 Plans:* Leverage prior agent fate studies to better bound substrate characteristics, and begin to relate to agent-substrate interactions for highly variable substrates, such as, concrete, sand/soil, and asphalt, and transfer data to predictive models. Characterize effects of substrate composition and structure on persistence and degradation of high priority CWAs and NTAs. Accelerate Agent Fate work on operationally relevant surfaces for highest priority NTAs. Relate CWA and NTA adsorption/absorption to chemical properties of both agent and substrate. Characterize vapor and liquid phase transport of high priority CWAs and NTAs through porous and non-porous operationally relevant substrates. Continue studies to determine effects of environmental factors (such as wind, humidity, substrate hydration and temperature) on transport through and off of substrates. Transfer data to predictive models. Refine Droplet Reaction and Evaporation of Agents Model (DREAM), which helps predict evaporation rates of agents from various surfaces, to address variation in program output. Transition DREAM modules to defense acquisition programs. Develop NTA hazard models and estimate hazard with extended skin-surface contact. Transition the data to JEM. *FY 2011 Base Plans:* Utilize empirical data to inform prediction of persistence and degradation of select CWAs and BWAs; transition data to JEM. Characterize interaction between biological agents and environmental					

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B. Accomplishments/Planned Program ($ in Millions)

	FY 2009	FY 2010	FY 2011 Base	FY 2011 OCO	FY 2011 Total
surfaces, including the impact of ambient conditions (e.g., temperature, relative humidity) and mechanical disturbances. All NTA-related efforts re-aligned to Threat Agent Science NTA within this Budget Activity.					
23) Threat Agent Science	4.482	3.861	0.000	0.000	0.000
Accelerating Agent Sciences: Accelerates CB defense research and development by coupling computational methods and experimental approaches. *FY 2009 Accomplishments:* Continued CWA Quantum-Chemical Modeling (QCM) simulant design and selection methodology; simulant design and selection methodology efforts will be re-aligned to Agent Characterization and Simulant Development in FY10. Completed QCM dataset implementation to establish Quantitative Structure Activity Relationship (QSAR) between NTAs and surfaces/materials of operational interest. Utilized expertise and baseline against well-characterized substrates and move toward human toxicology QSAR toolsets. Integrated computational chemistry capabilities into experimental planning and data utilization work. *FY 2010 Plans:* Integrate research in computational techniques with existing computational toxicology, such as, shape signatures, and existing molecular dynamics capabilities to enhance agent fate, physiological response, simulant experiments and predictive modeling. Initiate work providing near term benefits, such as, computational toxicology. Complete CWA QCM development and maturation capability baseline for CWA interactions. Apply Quantum Chemical Modeling to develop and accelerate computationally obtained datasets and QSARS derived from the QCM data to highest priority NTA interactions and toxicology. *FY 2011 Base Plans:* All NTA-related efforts re-aligned to Threat Agent Science NTA within this Budget Activity.					

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B. Accomplishments/Planned Program ($ in Millions)

	FY 2009	FY 2010	FY 2011 Base	FY 2011 OCO	FY 2011 Total
24) Threat Agent Science	4.652	6.026	0.095	0.000	0.095

Agent Characterization and Simulant Development: Characterizes chemical and biological agents based on structure, physiochemical properties, and molecular interactions. Simulants and selection processes are developed to support test and evaluation applications.

FY 2009 Accomplishments:

Continued research into NTA chemistry, characterizing synthetic pathways and NTA products, and developing NTA simulants. Incorporated newly prioritized agents as identified by the intelligence community and operational users. Completed simulant and methodology development for protective equipment testing in collaboration with the Test and Evaluation (T&E) community. Continued simulant correlation studies to define operational envelopes in which simulants may be used for development testing/operational testing (DT/OT). Incorporated computational chemistry research into simulant design, selection, and methodologies for use in DT/OT. Continued development of NTA simulants matching material interaction properties and simulants for novel applications of traditional agents. Characterized masked agents.

FY 2010 Plans:

Capitalize on previous research to characterize highest priority CWA and NTA chemistry based on structure, physiochemical properties, and molecular interactions. Leverage prior work to better understand BWA genomic variation as related to preparation methodologies and environmental stresses. Improve sampling methods and agent simulant correlation studies by leveraging established BWA standard characterization and preparation techniques. Continue development and transition CWA, BWA and NTA simulant selection process and test protocols to support T&E applications and work to define the operational envelopes of simulants through the acquisition life cycle. Expand the scope of simulant development to accelerate delivery of characteristics and simulants for highest priority NTAs. Address critical characterization work on highest priority NTAs.

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B. Accomplishments/Planned Program ($ in Millions)

	FY 2009	FY 2010	FY 2011 Base	FY 2011 OCO	FY 2011 Total
FY 2011 Base Plans: Continue BWA research to improve understanding of the relationship of genotype variations on organism virulence, infectivity, and persistence. Sustain efforts to support T&E applications by continued development of CWA and BWA simulants and refine simulant application by expanding agent-simulant correlation studies. All NTA-related efforts re-aligned to Threat Agent Science NTA within this Budget Activity.					
25) Threat Agent Science NTA Threat Agent Science NTA: Provides enabling science and technology which informs development and testing of NTA defense technology such as detection, decontamination, protection, hazard assessment, and more. *FY 2011 Base Plans:* Establish human NTA operational toxicity estimates and interim human health risk assessments. Characterize the effects of alternate toxicological pathways. Expand agent fate studies to additional agent-substrate interactions. Correlate agent adsorption/absorption coefficients to chemical properties. Expand research on NTA liquid and solid phase transport to include re-suspension of particulates. Apply computational tools to identify data requirements and accelerate QSAR application to NTA interactions with operational substrates and toxicology issues. Correlate human effects to contact with operationally-relevant surfaces. Further research on NTA chemistry. Continue development of NTA simulants and simulant correlation studies.	0.000	0.000	17.200	0.000	17.200
26) Information Systems Technology Sensor Data Fusion: Emphasis on developing scientific techniques for fusing disparate information from multiple sources for insertion into the Joint Effects Model (JEM), Joint Warning and Reporting Network (JWARN), and Joint Operational Effects Federation (JOEF).	4.980	0.000	0.000	0.000	0.000

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B. Accomplishments/Planned Program ($ in Millions)

	FY 2009	FY 2010	FY 2011 Base	FY 2011 OCO	FY 2011 Total
FY 2009 Accomplishments: Completed testing and validation and verification (V&V) of first-generation outdoor Source Term Estimation (STE), Hazard Refinement (HR) and Sensor Placement Tool (SPT) algorithms. Completed development, testing and V&V of building interior STE and HR algorithms. Initiated development of advanced STE, HR and SPT tools for use in complex environments (e.g., variable terrain, urban, water.) Completed biological background model development to reduce sensor false alarms and incorporate a first generation model into virtual environment software. Initiated development of a tool that continuously refines and updates the contamination footprint through rapid assimilation of limited and disparate information into meteorological, transport and dispersion, and virtual environment models. *FY 2010 Plans:* Sensor Data Fusion efforts re-aligned to Advanced Warning and Reporting.					
27) Information Systems Technology Battle Space Management: Emphasis on development of collaborative information management technologies for insertion into the Joint Warning and Reporting Network (JWARN) and Joint Operational Effects Federation (JOEF) acquisition programs. *FY 2009 Accomplishments:* Integrated Sensor Data Fusion (SDF) and source term location technologies into JEM and JOEF programs. Investigated and began development of next generation technologies and net-centric enterprise integration capabilities. Explored nano, bio, information technology and cognitive science solutions. *FY 2010 Plans:* Battle Space Management efforts re-aligned to Advanced Warning and Reporting.	2.990	0.000	0.000	0.000	0.000

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B. Accomplishments/Planned Program ($ in Millions)

	FY 2009	FY 2010	FY 2011 Base	FY 2011 OCO	FY 2011 Total
28) Information Systems Technology	0.000	6.020	3.844	0.000	3.844

Advanced Warning and Reporting: Emphasis on developing science and technologies for collaborative information management, fusion of disparate information from multiple sources, environmental databases and modeling, fusion of syndromic/diseases surveillance data, and synthetic environments for model performance evaluation and acquisition decisions.

FY 2010 Plans:

Utilize newly released field test data to conduct validation and verification (V&V) of outdoor Source Term Estimation (STE) algorithms. Initiate development of a networked chemical and biological (CB) detector false alarm reduction capability for an advanced development program (Joint Warning and Reporting Network (JWARN). Initiate development of rapid STE tool for JWARN. Expand virtual test environment model to include fielded sensors and enhanced geospatial information. Expand and improve data assimilation techniques for linking chemical, environmental and medical surveillance sensor data with computer based applications. Continue development of advanced STE, Hazard Refinement (HR) and Sensor Placement Tool (SPT) algorithms for use in complex environments (e.g., variable terrain, urban, water). Extend coupling between environmental parameters and advanced development programs. Continue development of a tool that continuously refines and updates the contamination footprint through rapid assimilation of limited and disparate information into meteorological, transport and dispersion, and virtual environment models.

FY 2011 Base Plans:

Refine advanced STE and HR algorithms for use in complex environments (e.g., variable terrain, urban, water), based on results of field trial-based V&V effort. Complete testing and V&V of first-generation networked CB detector false alarm reduction capability for an advanced development program (JWARN). Expand and improve data assimilation techniques for linking chemical, environmental, medical surveillance, and other disparate sensor data with computer based applications. Complete development of STE, HR, and SPT for use in complex environments. Continue to enhance coupling between environmental parameters and advanced development

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B. Accomplishments/Planned Program ($ in Millions)

	FY 2009	FY 2010	FY 2011 Base	FY 2011 OCO	FY 2011 Total
programs. Finalize development of a tool that continuously refines and updates the contamination footprint through rapid assimilation of limited and disparate information into meteorological, transport and dispersion, and virtual environment models. Initiate development of route planning and evacuation/shelter-in-place decision aids.					
29) Information Systems Technology	2.257	4.942	3.030	0.000	3.030
Hazard Prediction and Assessment: Improve battlespace awareness by accurately predicting hazardous material releases, atmospheric transport and dispersion, and resulting human effects. Develop predictive capability for the source term of releases of CB and industrial materials to include counterproliferation, CB weapons, accidents and ground effects from ballistic missiles. *FY 2009 Accomplishments:* Expanded and improved data assimilation techniques to develop a multi-scale, four-dimensional model. Continued development of advanced numerical weather prediction capabilities. Initiated optimization of methods to significantly improve performance of transport and dispersion hazard models for JEM. Developed advanced modeling capability for chemical, biological, and industrial source models (IFAC, ITRANS, and CBFAC). *FY 2010 Plans:* Initiate development of a missile intercept module for integration with JEM. Continue optimization of methods to significantly improve performance of transport and dispersion hazard models for JEM in both open air and urban environments using Second Order Closure Puff Atmospheric Transport and Dispersion (SCIPUFF AT&D) and Micro-Stationary Wind Fit with Turbulence (Micro-SWIFT). Continue advancing modeling techniques for chemical, biological, and industrial source models IFAC, ITRANS, and CBFAC. Continue experimental verification of models by way of small scale tests initiated in FY09.					

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FY 2011 Base Plans: Continue to develop a missile intercept module for chemical, biological, and nuclear dispersion and integrate with advanced development programs. Continue to improve and optimize transport and dispersion models in open and urban environments. Implement source backtracking in advanced urban models. Implement methods for foreign regions as well as dynamic climatology.					
30) Information Systems Technology	11.316	0.000	0.000	0.000	0.000
Chemical Biological Defense Program Decision Capability: Develop tools for decision making for consequence management, human knowledge management, and health/human effects modeling including casualty estimation. *FY 2009 Accomplishments:* Completed validation and verification and transition the Nuclear, Biological, and Chemical Casualty Resource Estimation Support Tool (NBC CREST) to the Joint Operational Effects Federation (JOEF). Completed the implementation of the respiratory tract model and development of the prototype PSD health effects model. Continued development of secondary infection models for disease spread based on small-world networks and an extension of the Susceptible-Exposed-Infectious-Removed (SEIR) epidemiological model to account for heterogeneous mixing among sub-populations in order to provide a well-founded model for casualty estimates in the JEM involving infectious/contagious diseases, both bioagent-induced and naturally occurring. Continued building the analytical framework and identifying gaps in capability to conduct rapid program analysis and conducted feasibility assessments for tools development and re-align efforts to the Systems Performance Modeling area in FY10. Continued development of representative prototype models for each of the capability areas and re-aligned efforts to the Systems Performance Modeling area in FY10. Initiated development of a web-based system for storage and access of CB Modeling and Simulation (M&S) and Information Technology (IT) development data and knowledge and re-aligned efforts to the Systems Performance Modeling					

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area in FY10. Closed out decision support data inscription technology to support change in advanced development program office priority. Continued distributed modeling research. *FY 2010 Plans:* CBDP Decision Capability efforts re-aligned to Simulation Analysis and Planning.					
31) Information Systems Technology Chemical and Biological Warfare Effects on Operations: Develop the science behind the modeling and simulation of operations at the strategic, operational and tactical level in a CBRN environment for mobile forces, tactical aircraft, naval operations and fixed sites. *FY 2009 Accomplishments:* Delivered methodology for CB effects on mobile and shipboard forces models to JOEF. Refined design and expanded prototype system for consequence management and incident management inclusions in consequence systems. Refined and expanded methodology for CBRN decision support tools. *FY 2010 Plans:* Chemical and Biological Warfare Effects on Operations efforts re-aligned to Simulation Analysis and Planning.	3.986	0.000	0.000	0.000	0.000
32) Information Systems Technology Simulation Analysis and Planning: Develop decision support tools and information management capabilities for planning and real-time analysis to determine and assess operational effects, risks, and impacts of CBRN incidents on decision making. Focus areas include consequence management, human knowledge management, health/human effects modeling including casualty estimation, and fusion of diseases surveillance data.	0.000	6.300	7.395	0.000	7.395

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FY 2010 Plans: Refine and update secondary infection models and NBC Casualty Resource Estimation Support Tool (NBC CREST) human effects models to reflect revision of NATO's Allied Medical Publication 8 (AMedP-8). Initiate development of casualty estimation methodology for CBRN agents including Non-Traditional Agents. Develop methodologies to improve the calculation of medical countermeasures effects in casualty estimation models. Improve CBRN medical resource planning tools. Continue development of contagious and infectious disease models. Continue development of particle size distribution health effects based on basic and applied threat agent science research efforts. Continue development and improvement of methodologies to apply CB operational effects in tactical, operational and strategic level models for mobile forces, shipboard modeling, fixed sites and tactical aircraft. Continue development of Incident Management/Consequence Management (IM/CM) tools and capabilities. Initiate studies to identify and investigate existing syndromic/disease surveillance systems and early detection capabilities. Continue validation and verification (V&V) effort for medical modeling efforts aimed at transitioning to advanced development efforts. Continue refinement and expansion of decision support tools for advanced development efforts. Complete distributed modeling research. *FY 2011 Base Plans:* Complete development of refined versions of secondary infection models and human effects models to reflect revision of NATO's AMedP-8. Initiate development of additional casualty estimation modules for agents not in NATO's AMedP-8, including Non-Traditional Agents. Continue development of contagious/infectious disease models. Continue developing efforts aimed at integrating CB operational effects in tactical and operational level models for mobile forces, shipboard modeling, fixed sites and tactical aircraft. Further develop IM/CM tools and capabilities. Initiate development of capabilities that leverage and integrate existing early detection and disease surveillance data for inclusion into advanced development efforts.					
33) Information Systems Technology	0.000	3.073	3.502	0.000	3.502

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	FY 2009	FY 2010	FY 2011 Base	FY 2011 OCO	FY 2011 Total
Systems Performance Modeling: Develop Chemical, Biological, Radiological and Nuclear (CBRN) data sharing capabilities and simulation tools. *FY 2010 Plans:* Develop data collection and exchange methodologies for implementation in the Chemical, Biological, Radiological and Nuclear (CBRN) Data Backbone. Design CB Warfare Effects Manual. *FY 2011 Base Plans:* Continue to investigate CBRN data backbone secure data management capabilities. Investigate and evaluate virtualization technology platforms to efficiently host data and applications to enable the CBRN data backbone. Explore feasibility of creating a comprehensive simulation tool for test and evaluation of CBRN defense systems. Enhance ability to evaluate decontaminants and decontamination systems by continuing to develop simulation capabilities for decontamination processes.					
34) Detection Chemical and Biological Point Detection Technology: Emphasis on the detection and identification of chemical and biological threats. Objectives include the development of nanoscale detector for sensing of chemical and biological agents, design for prototype whole pathogen genome sequencing system, and development of a portable point detector for chemical warfare (CW) detection in potable water. *FY 2009 Accomplishments:* Completed feasibility studies on assays for biological materials based on multiphoton, multi-wavelength processes. Completed development of novel use of laser technology to separate biological materials for enhanced detection of biological warfare agents in water. Completed development of novel laser sources and evaluation of discrimination capability and optical design aspects for BW aerosol detection with these sources. Completed feasibility studies on the use of novel nanowire-array sensors for enhanced sensitivity and selectivity in the detection of biological	15.923	11.039	5.289	0.000	5.289

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B. Accomplishments/Planned Program ($ in Millions)

	FY 2009	FY 2010	FY 2011 Base	FY 2011 OCO	FY 2011 Total
warfare materials. Continued development of breadboard microelectronic machine-sized (MEMS) sized solid state FTIR point sensor system. Continued feasibility study of nanoscale detection systems. Continued development of technology to sequence entire pathogen genomes. Initiated expansion of sample preparation concepts to address genomic sequencing of biological pathogens. Initiate new concepts based on nano-scale biological agent identification and sensing technologies. Began transition of Defense Advanced Research Projects Agency (DARPA) Micro Cryogenic Cooler (MCC) technology to enhance detection sensitivity for MEMS FTIR infrared sensor system. Continued studies to increase understanding of critical biological antigen variability. Initiated assessment of chemical fate in potable water. Initiated a scientific analysis on the technical impacts of the presence of agents on surfaces. Initiated feasibility of bio synthetic concept to re-engineer plants (Plant Sentinel) to behave as a NTA detector.					
FY 2010 Plans: Continue concept development of nano-scale biological agent identification and sensing technologies. Continue development of technology to completely sequence entire pathogen genomes with automated sample preparation. Continue feasibility studies of nanoscale detection systems. Complete transition of MCC technology from DARPA and demonstrate integration into a MEMS FTIR sensor system as next generation chemical warfare agent detector. Continue studies to increase understanding of critical biological antigen variability. Continue a scientific analysis on the technical impacts of the presence of agents on surfaces and expand to include aerosol and operational scenarios due to the presense of NTAs. Continue assessment of chemical fate of chemicals in potable water. Continue feasibility development of plant sentinel concept. Initiate development of MEMS version of a gas chromatograph-mass spectrometer (GC-Mass Spec) technology in collaboration with DARPA.					
FY 2011 Base Plans: Continue concept development of nano-scale biological agent identification and sensing technologies. Continue feasibility studies of nanoscale detection systems. Demonstrate MEMS FTIR sensor system.					

Exhibit R-2A, RDT&E Project Justification: PB 2011 Chemical and Biological Defense Program		DATE: February 2010
APPROPRIATION/BUDGET ACTIVITY 0400: *Research, Development, Test & Evaluation, Defense-Wide* BA 2: *Applied Research*	R-1 ITEM NOMENCLATURE PE 0602384BP: *CHEMICAL/BIOLOGICAL DEFENSE (APPLIED RESEARCH)*	PROJECT CB2: *CHEMICAL BIOLOGICAL DEFENSE (APPLIED RESEARCH)*

B. Accomplishments/Planned Program ($ in Millions)

	FY 2009	FY 2010	FY 2011 Base	FY 2011 OCO	FY 2011 Total
Demonstrate technology to completely sequence entire pathogen genomes with automated sample preparation. Complete studies to increase understanding of critical biological antigen variability. All NTA-related efforts re-aligned to Detection NTA within this Budget Activity.					
35) Detection	13.346	15.669	9.100	0.000	9.100
Chemical and Biological Stand-off Detection Technology: Emphasis on the detection and identification of chemical and biological threats to include NTAs in near real time at a distance from the detector. Future programs focus on the improvement of algorithms, excitation sources, and detector elements to increase range, reduce false positives, increase sensitivity, and reduce cost.					
FY 2009 Accomplishments:					
Initiated improved algorithm development for increased range capabilities and to reduce false positives. Completed the study on the detection modalities to detect sentinel species from biological warfare materials and processes. Initiated first generation active infrared standoff biological classification capabilities. Initiated design of first generation chemical standoff detection and identification capabilities. Continued models of technology to meet the needs to detect contamination on surfaces in a post decontamination application. Evaluated and assessed technology for scattering optical techniques, non-scattering optical standoff techniques, and off-gassing (trace vapor production) techniques for down-selection of breadboard design.					
FY 2010 Plans:					
Continue algorithm development to increase range capabilities and reduce false positives. Continue first generation active infrared standoff biological classification capabilities development. Continue design of first generation chemical standoff detection and identification capabilities. Complete models of technology to meet the needs to detect contamination on surfaces in a post decontamination application. Continue to evaluate and assess technology for scattering optical techniques, non-scattering optical standoff techniques, and off-gassing techniques for down-selection of breadboard design.					

Exhibit R-2A, RDT&E Project Justification: PB 2011 Chemical and Biological Defense Program		DATE: February 2010
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B. Accomplishments/Planned Program ($ in Millions)

	FY 2009	FY 2010	FY 2011 Base	FY 2011 OCO	FY 2011 Total
FY 2011 Base Plans: Complete algorithm development to increase range capabilities and reduce false positives. Complete work on first generation active infrared (IR) standoff biological classification capabilities. Complete evaluation and assessment of technology for scattering optical techniques, non-scattering optical standoff techniques, and off-gassing for down-selection of breadboard design. All NTA-related efforts re-aligned to Detection NTA within this Budget Activity.					
36) Detection NTA Primary focus is to assess the potential of optical technologies to meet the needs to detect the presence of NTAs. *FY 2011 Base Plans:* Complete a scientific analysis on the technical impacts of the presence of agents on surfaces due to the presence of NTAs. Complete assessment of chemical fate of chemicals in potable water. Continue feasibility development of plant sentinel concept. Complete design of first generation chemical standoff detection and identification capabilities. Initiate development from technology models to meet the needs to detect contamination on surfaces in a post decontamination application.	0.000	0.000	12.000	0.000	12.000
Accomplishments/Planned Programs Subtotals	102.599	110.955	88.897	0.000	88.897

C. Other Program Funding Summary ($ in Millions)

Line Item	FY 2009	FY 2010	FY 2011 Base	FY 2011 OCO	FY 2011 Total	FY 2012	FY 2013	FY 2014	FY 2015	Cost To Complete	Total Cost
• CB1: *CHEMICAL/BIOLOGICAL DEFENSE (BASIC RESEARCH)*	23.871	35.475	31.041		31.041	32.670	36.744	37.688	38.458	Continuing	Continuing
• CB3: *CHEMICAL BIOLOGICAL DEFENSE (ATD)*	19.567	25.297	15.410		15.410	21.450	26.120	36.775	37.148	Continuing	Continuing
	25.761	13.307	11.875		11.875	11.267	11.160	0.000	0.000	Continuing	Continuing

Exhibit R-2A, RDT&E Project Justification: PB 2011 Chemical and Biological Defense Program			DATE: February 2010
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C. Other Program Funding Summary ($ in Millions)

Line Item	FY 2009	FY 2010	FY 2011 Base	FY 2011 OCO	FY 2011 Total	FY 2012	FY 2013	FY 2014	FY 2015	Cost To Complete	Total Cost
• TE3: *TEST & EVALUATION (ATD)*											
• TT3: *TECHBASE TECHNOLOGY TRANSITION*	8.127	7.357	4.504		4.504	8.117	8.169	8.390	8.528	Continuing	Continuing

D. Acquisition Strategy

N/A

E. Performance Metrics

N/A

Exhibit R-2A, RDT&E Project Justification: PB 2011 Chemical and Biological Defense Program			DATE: February 2010
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COST ($ in Millions)	FY 2009 Actual	FY 2010 Estimate	FY 2011 Base Estimate	FY 2011 OCO Estimate	FY 2011 Total Estimate	FY 2012 Estimate	FY 2013 Estimate	FY 2014 Estimate	FY 2015 Estimate	Cost To Complete	Total Cost
CI2: *CONGRESSIONAL INTEREST ITEMS (APPLIED RESEARCH)*	42.714	16.630	0.000	0.000	0.000	0.000	0.000	0.000	0.000	Continuing	Continuing

A. Mission Description and Budget Item Justification

The efforts this project include congressional interest programs for FY09 and FY10.

B. Accomplishments/Planned Program ($ in Millions)

	FY 2009	FY 2010
Congressional Add: Rapid Forensic Evaluation of Microbes in Biodefense *FY 2009 Accomplishments:* Continued research program to develop an ultra-sensitive single application detection method that can be used for a range of Bioterrorism agents.	0.989	0.000
Congressional Add: Chem/Bio IR Detection System *FY 2009 Accomplishments:* Continued research to investigate an electric-field focusing approach, combined with optically transparent filters, to be used for spore capture and identification. *FY 2010 Plans:* Develop an advanced chemical and biological detection system using a common platform to include detection of emerging novel agents and toxic industrial chemicals	1.186	1.892
Congressional Add: Zumwalt National Program for Countermeasures to Bio Chem Threats	1.187	0.000

Exhibit R-2A, RDT&E Project Justification: PB 2011 Chemical and Biological Defense Program		DATE: February 2010
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B. Accomplishments/Planned Program ($ in Millions)

	FY 2009	FY 2010
FY 2009 Accomplishments: Continued research to improve model development related to atmospheric sciences and environmental modeling.		
Congressional Add: HyperAcute Vaccine Development *FY 2009 Accomplishments:* Continued research by testing vaccine efficacy in a mouse model for correlates of immunity and protection from live virus challenge. *FY 2010 Plans:* Continuation of research from FY09.	2.373	3.585
Congressional Add: Antibody-based Therapeutic against Smallpox *FY 2009 Accomplishments:* Continued testing with the goal of generating a combinational therapeutic of human mAbs to several neutralizing VACV proteins, that confer the highest degree of protection against vaccinia, smallpox, monkeypox, and other orthopoxvirus infections.	0.791	0.000
Congressional Add: Novel Viral Biowarfare Agent Identification and Treatment (NOVBAIT) *FY 2009 Accomplishments:* Continued research to find small molecules that inhibit the assembly of capsids by viruses of high biowarfare potential, thereby inhibiting their replication and neutralizing infection.	3.955	0.000
Congressional Add: Mixed Oxidants for Chemical and Biological Decontamination	2.769	0.000

Exhibit R-2A, RDT&E Project Justification: PB 2011 Chemical and Biological Defense Program		DATE: February 2010
APPROPRIATION/BUDGET ACTIVITY 0400: *Research, Development, Test & Evaluation, Defense-Wide* BA 2: *Applied Research*	**R-1 ITEM NOMENCLATURE** PE 0602384BP: *CHEMICAL/BIOLOGICAL DEFENSE (APPLIED RESEARCH)*	**PROJECT** CI2: *CONGRESSIONAL INTEREST ITEMS (APPLIED RESEARCH)*

B. Accomplishments/Planned Program ($ in Millions)

	FY 2009	FY 2010
FY 2009 Accomplishments: Continued research begun in FY08.		
Congressional Add: Bio Surety Development and Management Program - *FY 2009 Accomplishments:* Continued the research and analysis from FY08.	1.186	0.000
Congressional Add: Countermeasures to Chemical/Biological Control-Rapid Response - *FY 2009 Accomplishments:* Continued research from FY08.	2.372	0.000
Congressional Add: Multiple Applications for Light Activated, Reactive Materiels for Protection of Warfighter, First Responder, and Public Health - *FY 2009 Accomplishments:* Developed protective applications for first responders of all types.	1.582	0.000
Congressional Add: Chemical Biological Preparedness Center for Advanced Development of Mobile Rapid Response Prototype - *FY 2009 Accomplishments:* Developed a mobile, forward deployable, medical capacity that would respond to bio-terrorist incidents and other mass casualty incidents resulting from WMD, natural and technological disasters.	3.955	0.000
Congressional Add: Novel System for Developing Therapeutics against Botulism -	3.955	0.000

Exhibit R-2A, RDT&E Project Justification: PB 2011 Chemical and Biological Defense Program		DATE: February 2010
APPROPRIATION/BUDGET ACTIVITY 0400: *Research, Development, Test & Evaluation, Defense-Wide* BA 2: *Applied Research*	R-1 ITEM NOMENCLATURE PE 0602384BP: *CHEMICAL/BIOLOGICAL DEFENSE (APPLIED RESEARCH)*	PROJECT CI2: *CONGRESSIONAL INTEREST ITEMS (APPLIED RESEARCH)*

B. Accomplishments/Planned Program ($ in Millions)

	FY 2009	FY 2010
FY 2009 Accomplishments: Conducted research to discover new therapeutics against Botulism.		
Congressional Add: Ultra-Rapid Next Generation Pathogen Identification - *FY 2009 Accomplishments:* Developed pathogen identification capabilities.	1.978	0.000
Congressional Add: Preventing Long-Term Brain and Lung Damage Caused by Battlefield Trauma Project - *FY 2009 Accomplishments:* Conducted research to determine new techniques to prevent brain and lung damage.	2.868	0.000
Congressional Add: Chemical Agent Fate Appropriate Response Tool - *FY 2009 Accomplishments:* Conducted research to create a systematic approach for to the development of a comprehensive operational agent fate model/tool that provides recommendations on the appropriate response to contamination events. *FY 2010 Plans:* Continue research from FY09.	1.582	1.593
Congressional Add: Multivalent Marburg/Ebola Vaccine - *FY 2009 Accomplishments:* Conducted research in the development of a multivalent Marburg/Ebola vaccine.	3.461	0.000

Exhibit R-2A, RDT&E Project Justification: PB 2011 Chemical and Biological Defense Program		DATE: February 2010
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B. Accomplishments/Planned Program ($ in Millions)

	FY 2009	FY 2010
Congressional Add: Botulinum Neurotoxin Research - *FY 2009 Accomplishments:* Conducted research in the development of a new assay which is designed to detect Botulinum (A-G) in the environment and on exposed animals, humans, and culture cells. *FY 2010 Plans:* Continue research from FY09.	1.582	1.992
Congressional Add: Miniaturized Chemical Detector for Chemical Warfare Protection (ChemPen) - *FY 2009 Accomplishments:* Developed a ready for production MEMs FTIR absorption spectrometer to detect in seconds a wide range of nerve agents/TICs. *FY 2010 Plans:* Continuation of research from FY09.	1.581	1.593
Congressional Add: Continued Expansion of Prototypes for Destruction of Airborne Pathogen - *FY 2009 Accomplishments:* Continued development of methodologies for the destruction of aerosolized agents.	0.791	0.000
Congressional Add: Mismatch Repair Derived Antibody to Treat Staph Derived Bioweapon - *FY 2009 Accomplishments:* Continued research begun in FY07 to develop fully human anti-Staphylococcus enterotoxin B (SEB) monoclonal antibodies (mAbs) that can neutralize >1000 times the human LD50 of the toxin.	1.582	0.000

Exhibit R-2A, RDT&E Project Justification: PB 2011 Chemical and Biological Defense Program		DATE: February 2010
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B. Accomplishments/Planned Program ($ in Millions)

	FY 2009	FY 2010
Congressional Add: Nano Porous Hollow Fiber Regenerative Chemical Filter - *FY 2009 Accomplishments:* Conducted research in the application of nanotechnology to chemical filter design.	0.989	0.000
Congressional Add: Chemical and Biological Resistant Clothing *FY 2010 Plans:* Develop a material capable of simultaneously being lightweight, robust, breathable, and resistant to chemical and biological agents.	0.000	1.593
Congressional Add: Botulinum Toxin Treatment Therapy *FY 2010 Plans:* Develop new therapies for botulinum toxin poisoning and other bioterrorism threats.	0.000	0.797
Congressional Add: Contaminated Human Remains Pouch *FY 2010 Plans:* Conduct development activities for a contaminated human remains transportable container.	0.000	1.593
Congressional Add: PaintShield for Protecting People from Microbial Threats *FY 2010 Plans:* Develop a paint coating technology, a cost-effective, interior paint platform that will render microbiological threats harmless upon contact.	0.000	1.992
Congressional Adds Subtotals	42.714	16.630

Exhibit R-2A, RDT&E Project Justification: PB 2011 Chemical and Biological Defense Program		DATE: February 2010
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C. Other Program Funding Summary ($ in Millions)

Line Item	FY 2009	FY 2010	FY 2011 Base	FY 2011 OCO	FY 2011 Total	FY 2012	FY 2013	FY 2014	FY 2015	Cost To Complete	Total Cost
• CI1: *CONGRESSIONAL INTEREST ITEMS (BASIC RESEARCH)*	8.090	20.036	0.000		0.000	0.000	0.000	0.000	0.000	Continuing	Continuing
• CI3: *CONGRESSIONAL INTEREST ITEMS (ATD)*	46.971	18.622	0.000		0.000	0.000	0.000	0.000	0.000	Continuing	Continuing

D. Acquisition Strategy

N/A

E. Performance Metrics

N/A

Exhibit R-2A, RDT&E Project Justification: PB 2011 Chemical and Biological Defense Program			DATE: February 2010
APPROPRIATION/BUDGET ACTIVITY 0400: *Research, Development, Test & Evaluation, Defense-Wide* BA 2: *Applied Research*	R-1 ITEM NOMENCLATURE PE 0602384BP: *CHEMICAL/BIOLOGICAL DEFENSE (APPLIED RESEARCH)*	PROJECT TB2: *MEDICAL BIOLOGICAL DEFENSE (APPLIED RESEARCH)*	

COST ($ in Millions)	FY 2009 Actual	FY 2010 Estimate	FY 2011 Base Estimate	FY 2011 OCO Estimate	FY 2011 Total Estimate	FY 2012 Estimate	FY 2013 Estimate	FY 2014 Estimate	FY 2015 Estimate	Cost To Complete	Total Cost
TB2: *MEDICAL BIOLOGICAL DEFENSE (APPLIED RESEARCH)*	50.485	53.930	43.858	0.000	43.858	50.866	51.077	51.051	51.959	Continuing	Continuing

A. Mission Description and Budget Item Justification

This project (TB2) funds applied research of vaccines, therapeutic drugs, and diagnostic capabilities to provide effective medical defense against validated biological threat agents including bacteria, toxins, and viruses. Innovative biotechnology approaches will be incorporated to advance medical systems designed to rapidly identify, diagnose, prevent, and treat disease due to exposure to biological threat agents will be advanced. Categories of this project include core science efforts in biological defense capability areas, such as Pretreatments, Diagnostics, and Therapeutics. Medical Science and Technology (S&T) efforts in this Budget Activity refine promising medical initiatives identified in Budget Activity 1, resulting in the development of countermeasures to protect against and treat the effects of exposure to chemical, biological, and radiological (CBR) agents.

This project also includes efforts such as the Transformational Medical Technologies Initiative (TMTI). The Transformational Medical Technologies Initiative (TMTI) was launched to respond to the threat of emerging or intentionally bioengineered biological threats. TMTI's mission is to protect the Warfighter from genetically engineered biological threats by providing a rapid response capability from identification of pathogens to the delivery of medical countermeasures. This mission is accomplished through two main efforts: 1) developing broad spectrum (multi-agent) therapeutics against biological warfare (BW) agents (e.g, one drug that treats multiple agents); and 2) developing platform technologies to assist in the rapid development of medical countermeasures (MCMs) in response to BW agents (e.g, developing new and innovative ways to mass produce drugs in the event of a biological incident).

B. Accomplishments/Planned Program ($ in Millions)

	FY 2009	FY 2010	FY 2011 Base	FY 2011 OCO	FY 2011 Total
1) SBIR	0.000	0.733	0.000	0.000	0.000
FY 2010 Plans: Small Business Innovative Research.					
2) Diagnostics	6.594	7.197	6.994	0.000	6.994

Exhibit R-2A, RDT&E Project Justification: PB 2011 Chemical and Biological Defense Program		DATE: February 2010
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B. Accomplishments/Planned Program ($ in Millions)

	FY 2009	FY 2010	FY 2011 Base	FY 2011 OCO	FY 2011 Total
Diagnostic Technologies: Development and verification of rapid, sensitive, and specific tests for the identification of Biological Warfare Agents (BWAs) and their expressed toxins in biological fluids of Warfighters for the diagnosis of exposure/infection. Discovery of biomarkers of response to exposure. Evaluation of next generation diagnostic technologies including portable instrument platforms, highly parallel and informative testing formats, and nanotechnology applications. *FY 2009 Accomplishments:* Continued to apply decision matrix to developmental testing on next generation diagnostic devices with emphasis on technologies capable of integrating sample processing, nucleic acid and immunodiagnostic testing. Based on results, assessed/expanded study using animal models exposed to biothreat agents in order to identify the optimal matrices/tissues for biological pathogen identification and test windows of diagnostic opportunity using Service developed assays. Promoted use of recombinant DNA reagent production and incorporate onto existing systems. Developed improved test assays utilizing new technologies and approaches that enhance diagnosis of early exposure/ infection. Completed a study of laboratory based research targeting the diagnostic implications of toxins in the body. *FY 2010 Plans:* Implement restructured intra- and inter-agency strategy for Next Generation Diagnostic System (NGDS) candidate technology assessment and maturation. Continue development of panel of potential pre-symptomatic indicators of exposure/infection. Develop affinity reagent production and characterization pipeline and apply materials and data coordination with technology maturation efforts. Develop affinity-based amplification prototype assays for application on PCR-based fluorometric system. Apply nano-diagnostic technology to demonstrate BWA viability and analytic application. Develop target enrichment methods for rapid diagnostic de novo sequencing of BWA directly from clinical matrices. Develop micro-RNA library and study diagnostic utility.					

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B. Accomplishments/Planned Program ($ in Millions)

	FY 2009	FY 2010	FY 2011 Base	FY 2011 OCO	FY 2011 Total
FY 2011 Base Plans: Develop high-throughput technologies for identification, evaluation, and validation of agent-specific genetic and immunological assay targets using sequencers and microarrays. Complete development and assess performance of affinity-based protein expression amplification methods. Continue to discover and develop pre-symptomatic diagnostic signatures for additional agents and investigate diagnostic utility as early indicators of exposure/infection in animal models. Evaluate nano diagnostic technologies for ease-of-use, sensitivity, specificity and cost. Continue development and application of rapid sequencing technology and target enrichment for deployable field environment. Investigate advancement of technologies and procedures for broad multiplex detection of agent gene expression, proteomic and antibiotic resistance profiles. Develop a geographically representative strain collection and assay(s) capable of detecting an emerging threat agent of high genetic variability.					
3) Pretreatments	3.872	0.000	0.000	0.000	0.000
Multi-agent DNA Vaccines for Bio-Warfare Agents (Former DTO CB65): Molecular (i.e., naked DNA) vaccine platforms will be developed so that a single vaccine formulation provides protection against multiple bacterial and viral biothreat agents. *FY 2009 Accomplishments:* Optimized DNA multiagent vaccines that include anthrax and plague components in animal models. Characterized the underlying protective response and evaluate for possible interference between vaccine components and the immune response. Optimized alternative genetic vaccine delivery strategies and unique immune stimulation formulations for the development of vaccines against intracellular bacterial pathogens. Finalized efficacy testing of native and genetically modified vaccine candidates. Completed testing of native and genetically modified vaccine candidates, particularly single formulation DNA vaccine constructs expressing multiple biothreat antigens. Tested spore-based vaccines in animal models. Completed DTO CB65 in FY09.					

Exhibit R-2A, RDT&E Project Justification: PB 2011 Chemical and Biological Defense Program		DATE: February 2010
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B. Accomplishments/Planned Program ($ in Millions)

	FY 2009	FY 2010	FY 2011 Base	FY 2011 OCO	FY 2011 Total
FY 2010 Plans: This effort re-aligned to Vaccine Platforms and Research Tools.					
4) Pretreatments Multiagent Vaccine Platforms: Construct multi-agent vaccine platforms and formulations capable of expressing multiple protein antigens from multiple pathogens, and evaluate in animal models. *FY 2009 Accomplishments:* Further assessed candidate multi-agent vaccines in animal models, and considered the inclusion of alternative agents. Explored novel platforms and vaccine formulations. Evaluated effectiveness in animal models. *FY 2010 Plans:* Effort re-aligned to Vaccine Platforms and Research Tools.	1.364	0.000	0.000	0.000	0.000
5) Pretreatments Vaccine Research Support: Identify the elements of a vaccine formulation that are necessary for an effective host immune response that confers protection against biothreat agents. *FY 2009 Accomplishments:* Further characterized immune correlates of protection elicited by alphavirus (WEE/VEE/EEE) and filovirus vaccines in animal models. Optimized alphavirus and filovirus antibody-based assays and evaluated their ability to predict protection. Explored additional intracellular pathogen antigens using animal model systems including the use of alternative vaccine delivery platforms for protection. Further evaluated the protective efficacy of BoNT components in small animal models. Extended the characterization of non-protective antigen vaccine candidates to additional small animal models. Pursued the use of immune stimulating protein fragments (peptides) or immune cell targeting peptides to enhance vaccine efficacy in animal models.	6.463	0.000	0.000	0.000	0.000

Exhibit R-2A, RDT&E Project Justification: PB 2011 Chemical and Biological Defense Program		DATE: February 2010
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B. Accomplishments/Planned Program ($ in Millions)

	FY 2009	FY 2010	FY 2011 Base	FY 2011 OCO	FY 2011 Total
FY 2010 Plans: Efforts re-aligned to Viral Vaccines and Bacterial/Toxin Vaccines.					
6) Pretreatments Bacterial/Toxins Vaccines: Generate novel or improved vaccines against bacterial and toxin biothreat agents, and demonstrate preliminary efficacy in small animal models. Identify correlates of protective immunity in animals models. *FY 2010 Plans:* Test the efficacy of Burkholderia vaccine candidates against aerosol challenge in small animal models. Begin to determine the therapeutic regimen needed in conjunction with a vaccine to eliminate residual Burkholderia organisms and begin evaluation of the immune response elicited by the vaccine. Use comparative animal studies to test the efficacy of disease inactivated, but metabolically active vaccine candidates against Brucella species. Begin to compare the ability of the disease inactivated, but metabolically active vaccine candidates to protect mice against aerosol challenge with distinct strains of Brucella following oral immunization. Continue to test the immune stimulation and effectiveness of novel anthrax vaccines (e.g., multi-component genetically altered vaccines composed of spore antigens, etc.) to combat emerging and genetically engineered strains. Initiate studies aimed at generating a second-generation vaccine that protects against aerosolized Type A Francisella tularensis. *FY 2011 Base Plans:* Continue aerosol efficacy studies in mice for Brucella and Burkholderia vaccine candidates. Work to improve the efficacy of the most promising vaccine candidates against Burkholderia and Brucella by initiating studies that vary the route of immunization, dose and vaccination schedule. Begin investigating whether the efficacy of the Brucella and Burkholderia vaccine candidates can be approved by co-administering the vaccines with nonspecific stimulators of the immune response (i.e., adjuvants). Test the ability of antibiotics to remove residual Burkholderia from vaccinated animals to	0.000	2.948	5.254	0.000	5.254

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B. Accomplishments/Planned Program ($ in Millions)

	FY 2009	FY 2010	FY 2011 Base	FY 2011 OCO	FY 2011 Total
prevent reactivation of disease. Identify measures of immunity elicited by vaccine candidates against Brucella and Burkholderia. Test the efficacy of novel next-generation, multi-valent anthrax vaccines in small animal models against aerosol challenge. Determine the immune stimulation capability of novel subunit vaccines comprised of proteins involved in a common virulence pathway shared by most gram negative bacteria, including Yersinia pestis. Investigate the potential of outer membrane proteins isolated from Type A Francisella tularensis to serve as vaccine candidates against aerosol challenge with the pathogen in small animal models.					
7) Pretreatments Viral Vaccines: Design vaccines against the Filoviruses (Ebola and Marburg strains) and Alphaviruses (VEE, EEE, WEE) using distinct vaccine platforms, and demonstrate preliminary efficacy in animal models. Identify correlates of protective immunity in animal models. *FY 2010 Plans:* Identify correlates of immunity for alphavirus (VEE, EEE, WEE) vaccine candidates. Define immune correlates of protection for mature Marburg and Ebola virus vaccine candidates. Develop vaccine candidates for emerging filovirus strains (e.g. Ebola Uganda strain). *FY 2011 Base Plans:* Further define immune correlates of protection for alphavirus (i.e., EEE and WEE) vaccine candidates. Continue to characterize the immune response to Ebola and Marburg viruses in order to identify correlates of protection in animal models, and establish assays to measure these immune correlates. Assess the immune stimulation and effectiveness of vaccine candidates against a new strain of the Ebola virus, Ebola Bundibugyo, in animal challenge models.	0.000	2.948	0.525	0.000	0.525
8) Pretreatments Vaccine Platforms and Research Tools: Design novel multi-agent vaccine platforms capable of expressing multiple antigens, investigate the ability of non-specific stimulators of immunity to enhance	0.000	4.279	4.729	0.000	4.729

Exhibit R-2A, RDT&E Project Justification: PB 2011 Chemical and Biological Defense Program		DATE: February 2010
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B. Accomplishments/Planned Program ($ in Millions)

	FY 2009	FY 2010	FY 2011 Base	FY 2011 OCO	FY 2011 Total
the effectiveness of newly generated vaccines, characterize alternative vaccine delivery (needle-free) methods and novel vaccine stabilization methodologies, and conduct studies to further advance a laboratory based, human artificial immune system to render it capable of predicting the human immune response to biodefense vaccines under development. *FY 2010 Plans:* Research multiagent vaccines, immune interference, immune stimulation formulations, vaccine delivery/stabilization, and efforts to predict the human immune response to vaccine candidates. Develop and test new platform technologies that support the expression of multiple antigens. Explore new multi-agent vaccine formulations for immune stimulation in animal models. Further examine devices for efficient administration of DNA vaccines. Begin evaluating alternate, needle-free immunization strategies (i.e., intranasal, oral, and transdermal administration) with current vaccine candidates (non-DNA) against biological threats. Conduct studies to advance the laboratory based artificial human immune system to optimize antibody production. If available, obtain samples from individuals in the Former Soviet Union that have either been vaccinated against or infected with endemic pathogens considered to be threat organisms in order to evaluate the human immunologic response to these agents and/or vaccines. Evaluate new immune stimulating formulations for their ability to enhance vaccine effectiveness in animal models by examining the antibody and cell-based immune responses. *FY 2011 Base Plans:* Continue to construct new multi-agent vaccine formulations utilizing platform technologies that support the expression of multiple antigens, and test these multi-agent vaccines for immune stimulation in small animal models. Compare an intra-dermal versus intra-muscular electric field device for delivery of DNA vaccines against bio-threat agents in small animals. Continue studies to advance the laboratory based, surrogate human immune system termed the Modular Immune In vitro Construct (MIMIC), which provides a three-dimensional peripheral tissue model intended to reliably reproduce the human immune response. Complete optimization of the production of high affinity antibodies by					

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B. Accomplishments/Planned Program ($ in Millions)

	FY 2009	FY 2010	FY 2011 Base	FY 2011 OCO	FY 2011 Total
the MIMIC in response to biodefense vaccines, and develop a sensitive fluorescent-based assay to assess the functionality of the antibodies generated. Adapt the MIMIC to function as an infectious disease model for alphaviruses and filoviruses. Use these MIMIC in infectious disease models to begin to define human correlates of protective immunity against alphaviruses and filoviruses. Initiate studies to develop methodologies that render different types of vaccine platforms (i.e., viral vector, inactivated virus, virus like particles, and attenuated bacteria, etc.) stable in variable and extreme temperatures.					
9) Therapeutics Therapy for Ebola and Marburg Virus Infections: Identify, optimize and evaluate lead candidate therapeutics for efficacy against Filovirus infections, specifically Ebola and Marburg Viruses. *FY 2009 Accomplishments:* Completed proof-of-concept studies for lead candidate technologies.	0.811	0.000	0.000	0.000	0.000
10) Therapeutics Viral Therapeutics: Identify, optimize and evaluate lead candidate therapeutics for efficacy against viral pathogens. *FY 2009 Accomplishments:* Determined the ability of heavy metal nanoparticle-based therapeutics to inhibit viral infection in a laboratory model system. Conducted proof-of-concept studies aimed at identifying therapeutic candidates for poorly characterized threats. Continued supporting therapeutics effective against well characterized threat agents towards advanced development. Screened multiple compound libraries for small molecule inhibitors of designated viral pathogens.	0.430	2.067	1.600	0.000	1.600

Exhibit R-2A, RDT&E Project Justification: PB 2011 Chemical and Biological Defense Program		DATE: February 2010
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B. Accomplishments/Planned Program ($ in Millions)

	FY 2009	FY 2010	FY 2011 Base	FY 2011 OCO	FY 2011 Total
FY 2010 Plans: Initiate drug discovery for a second novel orthopox drug with a mechanism distinct from ST-246, a low-molecular-weight compound that is active against multiple orthopoxviruses. Expand drug discovery efforts for alphaviruses (VEE, EEE, and WEE). Establish clinical protocols to obtain human clinical samples from filovirus outbreaks in the Democratic Republic of the Congo. Test and evaluate lead candidate therapeutic compounds in relevant animal challenge models. Continue testing of heavy metal nanoparticle-based therapeutics for the ability to prevent viral infection in animal models. Identify lead compounds from small molecule library screening and optimize their action through medicinal chemistry. Test and evaluate small protein fragments to determine if their ability to prevent a virus from binding to cells represents a viable therapeutic interdiction point for designated viral pathogens. *FY 2011 Base Plans:* Identify FDA-approved drug combinations with efficacy against alphavirus infection. Identify and develop small molecule inhibitors to specific host factors required for alphavirus pathogenesis. Conduct structure-based screening of chemical libraries to identify inhibitors of alphavirus proteins. Utilize medicinal chemistry to optimize antiviral activity of lead compounds. Identify therapeutic inhibitors of orthopoxvirus infection by targeting required host and viral tyrosine phosphatases.					
11) Therapeutics Bacterial Therapeutics: Identify, optimize and evaluate lead therapeutic candidates effective against designated bacterial threat agents. *FY 2009 Accomplishments:* Completed initial evaluation of a single domain antibody that is smaller than conventional antibodies against plague, and extend the application to other related bacteria if successful. Screened small molecules that can prevent plague bacteria from injecting virulence factors into cells in the laboratory, and extend application of assay to other related bacteria. Balanced efforts to evaluate potential single	5.418	4.110	4.100	0.000	4.100

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B. Accomplishments/Planned Program ($ in Millions)

	FY 2009	FY 2010	FY 2011 Base	FY 2011 OCO	FY 2011 Total
agent bacterial therapeutics with those having broad-spectrum activity. Identified and screened inhibitors of bacterial phosphatases for protective effects in cellular and animal models. *FY 2010 Plans:* Complete evaluation of bacterial phosphatase inhibitors in a mouse model of plague infection. Test and evaluate lead candidate small molecules to determine their antimicrobial activity. Screen commercially available antimicrobial in advanced clinical development for their activity in the laboratory against bacterial threat agents. *FY 2011 Base Plans:* Continue the identification of commercially available antimicrobials in advanced clinical development with laboratory assayed activity against bacterial threat agents. Assess compounds identified in high content imaging assays for their antimicrobial activity in relevant animal challenge models.					
12) Therapeutics Toxin Therapeutics: Identify, optimize and evaluate therapeutic candidates that are effective against biological toxin agents. *FY 2009 Accomplishments:* Evaluated next generation monoclonal antibodies for laboratory and animal effectiveness against Botulinum Neurotoxin (BoNT). Characterized lead compounds for potency and specificity in laboratory models and animal models. Initiated development of inactive versions of BoNT substrates as therapeutics with the potential to restore nerve activity following neuroparalysis. Developed a cell-based high-throughput screening system for BoNT therapeutics derived from mouse cells and embryonic stem cells. Evaluated immune-modifying compounds for pre- and post-exposure therapy for Staphylococcal Enterotoxin B (SEB) intoxication in laboratory and animal models.	10.528	9.065	9.171	0.000	9.171

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B. Accomplishments/Planned Program ($ in Millions)

	FY 2009	FY 2010	FY 2011 Base	FY 2011 OCO	FY 2011 Total
FY 2010 Plans: Screen compound libraries utilizing a high-throughput screening system for BoNT therapeutics derived from mouse cells and embryonic stem cells. Test and evaluate lead candidate inhibitors in relevant laboratory and animal model systems of BoNT intoxication. Perform experimental analysis to clarify the contribution of protein modification of BoNT to its structure and biochemical activity as it relates to drug development. Conduct high-throughput screening of drug libraries to identify inhibitors of ricin toxicity. *FY 2011 Base Plans:* Develop transgenic mice expressing genetically-encoded reporters of BoNT activity in neurons for use in high-throughput screening of BoNT therapeutics. Validate neurite outgrowth analysis for the identification of BoNT inhibitors. Identify host proteins responsible for BoNT light chain stabilization. Conduct co-crystallization studies of BoNT-inhibitor complexes. Perform experiments to determine toxicity and pharmacokinetics of selected ricin inhibitors. Identify host proteins involved in ricin dislocation as potential host-directed drug targets. Determine efficacy of identified ricin inhibitors in mice.					
13) Transformational Medical Technologies Initiative Multiagent (Broad Spectrum) Medical Countermeasures (MCM): Builds upon basic research performed by existing performers and supports the efforts of new performers who are in the mid-drug discovery phase of drug development. Applied research efforts also include the investigation of existing drugs to explore their efficacy against BW agents. Assesses toxicity and efficacy in accordance with the product's intended use. Initiation of experiments to identify markers, correlates of protection, assays, and endpoints for further non-clinical and clinical studies. Develop a scalable and reproducible manufacturing process amenable to Food and Drug Administration (FDA) good manufacturing processes.	15.005	4.186	8.037	0.000	8.037

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B. Accomplishments/Planned Program ($ in Millions)

	FY 2009	FY 2010	FY 2011 Base	FY 2011 OCO	FY 2011 Total
FY 2009 Accomplishments: Continued efforts to evaluate novel drugs to treat against Hemorrhagic Fever Viruses (HFVs) and Intracellular Bacteria Pathogen (IBP) infections. Completed validation studies of antisense RNA therapeutic candidate drugs against HFV pathogens to prepare for Investigational New Drug (IND) studies. Continued to evaluate novel drugs for anti-bacterial effects. Continued to evaluate and develop genetic methods for identifying broad spectrum host pathway therapeutic target. Evaluated promising therapeutics in combination with lead therapeutic candidates. Continued to expand the evaluation of drug compounds targeting key pathogen and/or host molecules. Conducted a validation of the computer model and a bioinformatics structure for the examination of protein interactions. *FY 2010 Plans:* Continue efforts to evaluate novel drugs to treat HFV and ICB pathogen infections. Mature promising compounds in combination with lead therapeutic candidates. *FY 2011 Base Plans:* Continue to support new MCM discovery efforts entering the product pipeline. Continue to evaluate and mature navel drugs as post-exposure prophylaxis and treatment for HFVs and IBP infections. Identify and initiate the development of intervention strategies targeting host pathogen response, inclusive of enhancing the immune system and addressing symptoms to reduce the severity of disease.					
14) Transformational Medical Technologies Initiative Development of Platform Technologies: Mature the components necessary to develop an integrated capability from pathogen identification and characterization to countermeasure delivery. Off-the-shelf technologies will be identified, evaluated, and where applicable, refined to demonstrate the ability to provide drug development capabilities. Drug evaluation needs will continue to advance the maturity of animal models specific for each BW agent therapeutic.	0.000	16.397	3.448	0.000	3.448

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B. Accomplishments/Planned Program ($ in Millions)

	FY 2009	FY 2010	FY 2011 Base	FY 2011 OCO	FY 2011 Total
FY 2010 Plans: Identified enabling and critical technologies, formulated appropriate technology plans and acquisition strategies, and determined their performance objectives. Initiated development of an information network to serve as the backbone for a rapid drug discovery and development capability. Supported development of platform technologies to higher levels of maturity. Genetic sequencing studies model the types and quantity of data needed for the identification of unknown pathogen ID, including a genomic survey for countermeasure targets and genetically engineering. Evaluated the information network to serve as the backbone for a rapid drug discovery and development capability. Pursued informatics to support analytical activities, event response, and science discovery. Initiated work on advanced manufacturing to enhance the rapid production of therapeutics. *FY 2011 Base Plans:* Continue the development of host and pathogen based platforms to higher levels of maturity. Continue to explore pathogen identification and characterization capabilities, including genetic sequencing, integrate existing capabilities. Continue to assess future sequence and analysis needs to characterize advanced threats. Continue to integrate leading edge technologies with existing technologies to enhance pathogen characterization, target identification, countermeasure discovery and countermeasure evaluation platform areas.					
Accomplishments/Planned Programs Subtotals	50.485	53.930	43.858	0.000	43.858

C. Other Program Funding Summary ($ in Millions)

Line Item	FY 2009	FY 2010	FY 2011 Base	FY 2011 OCO	FY 2011 Total	FY 2012	FY 2013	FY 2014	FY 2015	Cost To Complete	Total Cost
• TB1: *MEDICAL BIOLOGICAL DEFENSE (BASIC RESEARCH)*	15.086	16.782	14.352		14.352	15.499	14.845	14.402	14.672	Continuing	Continuing
	180.425	203.723	115.233		115.233	125.666	109.737	115.049	117.289	Continuing	Continuing

Exhibit R-2A, RDT&E Project Justification: PB 2011 Chemical and Biological Defense Program		DATE: February 2010
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C. Other Program Funding Summary ($ in Millions)

Line Item	FY 2009	FY 2010	FY 2011 Base	FY 2011 OCO	FY 2011 Total	FY 2012	FY 2013	FY 2014	FY 2015	Cost To Complete	Total Cost
• TB3: *MEDICAL BIOLOGICAL DEFENSE (ATD)*											

D. Acquisition Strategy

N/A

E. Performance Metrics

N/A

Exhibit R-2A, RDT&E Project Justification: PB 2011 Chemical and Biological Defense Program			DATE: February 2010
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COST ($ in Millions)	FY 2009 Actual	FY 2010 Estimate	FY 2011 Base Estimate	FY 2011 OCO Estimate	FY 2011 Total Estimate	FY 2012 Estimate	FY 2013 Estimate	FY 2014 Estimate	FY 2015 Estimate	Cost To Complete	Total Cost
TC2: *MEDICAL CHEMICAL DEFENSE (APPLIED RESEARCH)*	35.008	40.418	33.648	0.000	33.648	36.327	36.500	37.475	38.150	Continuing	Continuing

A. Mission Description and Budget Item Justification

This project (TC2) funds applied research for the investigation of new medical countermeasures to include prophylaxes, pretreatments, antidotes, skin decontaminants and therapeutic drugs against identified and emerging chemical warfare threat agents to include a class of agents called Non Traditional Agents (NTAs). Starting in FY11, all NTA-dedicated research will be re-aligned into specific capability areas within this project in order to ensure a focused effort on this high priority area. Capability areas include: Pretreatments; pretreatments for NTAs; diagnostics; diagnostics for NTAs; therapeutics; and therapeutics for NTAs. Pretreatments includes researching prophylaxes to protect against chemical agents and NTAs. Diagnostics focuses on researching diagnostic tools that help identify exposure to chemical agents and NTAs. Therapeutics focuses on researching post-exposure countermeasures to protect against chemical agents and NTAs. Research and development efforts in this project focus on formulation and scale-up of candidate compounds.

B. Accomplishments/Planned Program ($ in Millions)

	FY 2009	FY 2010	FY 2011 Base	FY 2011 OCO	FY 2011 Total
1) SBIR *FY 2010 Plans:* Small Business Innovative Research.	0.000	0.507	0.000	0.000	0.000
2) Diagnostics Diagnostic Technologies: Focuses on developing state-of-the-art laboratory/fieldable methods that detect exposure to chemical warfare agents (CWA) (e.g., nerve agents and vesicants) in clinical samples. Identifies biomolecular targets that can be leveraged as analytical methodologies, as well as, laboratory and animal studies characterizing time-course and longevity of a particular analyte/ biomarker.	1.013	1.207	0.865	0.000	0.865

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B. Accomplishments/Planned Program ($ in Millions)

	FY 2009	FY 2010	FY 2011 Base	FY 2011 OCO	FY 2011 Total
FY 2009 Accomplishments: Completed alternative sample collection/extraction technologies, such as, solvent free extraction as part of a rapid screening method to verify exposure to CWAs. Evaluated the combined sample extraction and analysis procedure for pre- and post-CWA exposure to assess the feasibility of detecting chemical warfare analytes in hair samples from animals. Incorporated promising antibody diagnostics and molecular technologies for hand-held CWA diagnostic platforms developed under the Small Business Innovative Research (SBIR) program into the core program for further development. *FY 2010 Plans:* Continue development of definitive diagnostic biomarkers for early detection of CWA exposure using several different analytical approaches. Develop pre-symptomatic diagnostic technologies for eventual incorporation into handheld devices in order to detect CWA exposures. *FY 2011 Base Plans:* Continue to determine whether existing CWA biomarkers are appropriate for early detection and validation of CWA exposure in clinical samples. Determine if biomarkers that appear after exposure to sulfur mustard can be used to identify an appropriate treatment option prior to the onset of symptoms. Continue investigation of a novel surface plasmon resonance based sensor array and a phage library display to develop binding molecules as biomarkers of nerve agent exposure. All NTA-related efforts are re-aligned to Chemical Diagnostics NTA within this Budget Activity.					
3) Chem Diagnostics NTA *FY 2011 Base Plans:* Continue studies to identify biomarkers to create an enhanced capability to pre-symptomatically diagnose NTA exposure. Continue method development for identification and validation of NTAs in clinical samples.	0.000	0.000	0.400	0.000	0.400
4) Pretreatments	10.685	9.883	5.980	0.000	5.980

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B. Accomplishments/Planned Program ($ in Millions)

	FY 2009	FY 2010	FY 2011 Base	FY 2011 OCO	FY 2011 Total
Nerve Agent, Bioscavengers: Develops pretreatments that provide protection against all organophosphorous nerve agents. Bioscavengers should have the ability to rapidly bind and detoxify nerve agents, and have broad binding specificity and high catalytic efficiency for the destruction of agents. *FY 2009 Accomplishments:* Refined gene-splicing methods and expression systems for large scale production and purification of genetically altered and catalytic bioscavengers. Continued investigating catalytic bioscavengers in mice that have various genes turned off. Optimized dose and route of administration of short amino acid based drugs as potential catalytic bioscavengers. Assessed efficacy of novel catalytic bioscavengers. Evaluated catalytic bioscavengers with increased destruction efficiency. Tested new, more efficient delivery formulations in animal models. *FY 2010 Plans:* Develop formulations for improved and reduced immune system stimulation of catalytic/stoichiometric bioscavengers, with a particular focus on providing protection against Non-Traditional Agents (NTAs). Investigate improved drug-delivery systems for 1st generation catalytic/stoichiometric bioscavengers. Conduct supportive studies toward licensure of catalytic stoichiometric bioscavengers. *FY 2011 Base Plans:* Further refine methods and expression systems for screening, production and purification of designed catalytic bioscavengers. Initiate development of animal expression systems for delivery of newly designed improved catalytic bioscavengers. Initiate efficacy studies of small molecule approaches towards AChE protection. All NTA-related efforts are re-aligned to Chemical Pretreatments NTA within this Budget Activity.					
5) Chem Pretreatments NTA	0.000	0.000	1.500	0.000	1.500

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B. Accomplishments/Planned Program ($ in Millions)

	FY 2009	FY 2010	FY 2011 Base	FY 2011 OCO	FY 2011 Total
FY 2011 Base Plans: Continue efforts to investigate ways to decrease the development time to deliver a bioscavenger (stoichiometric/catalytic) to protect the Warfighter. Continue studies to determine efficacy of bioscavenger for NTA exposure.					
6) Therapeutics Respiratory and Systemic: Supports investigation of the systemic host response to chemical warfare agent (CWA) injury via all routes of exposure, with emphasis on the respiratory system and chronic effects of exposure. This involves the development of effective practical field and clinic management strategies and physical and pharmacological interventions to treat the injury processes. This work is designed to support eventual Food and Drug Administration (FDA) licensure of new compounds or new indications for licensed products for use in the treatment of chemical warfare casualties. *FY 2009 Accomplishments:* Continued research on broad-based therapeutics effective against multiple agents and routes of exposures. *FY 2010 Plans:* Evaluate safety, efficacy, dosing and relevant effects on the body, and the body's effects on the drug, of candidate countermeasures against lung injury. Investigate down-selected potential candidate countermeasures based on molecular biology approaches to CWA lung injury. Continue to study long-term health effects due to CWA exposure. *FY 2011 Base Plans:* Continue to evaluate safety, efficacy, dosing and relevant effects on the body, and the body's effects on the drug, of candidate countermeasures against lung injury. Continue to investigate down-selected potential candidate countermeasures based on molecular biology approaches to CWA lung injury. Continue to study long-term health effects due to CWA exposure.	3.130	2.994	2.788	0.000	2.788

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B. Accomplishments/Planned Program ($ in Millions)

	FY 2009	FY 2010	FY 2011 Base	FY 2011 OCO	FY 2011 Total
7) Therapeutics	1.525	1.263	1.275	0.000	1.275

Cutaneous and Ocular: Focuses on therapeutic strategies to effectively minimize injuries to dermal and ocular tissues resulting from exposure to chemical warfare agents (CWAs). Involves the development of effective practical field and clinic management strategies and physical and pharmacological interventions to treat the injury processes. This work is designed to support eventual FDA licensure of new non-licensed compounds or new indications for licensed products for use in the treatment of chemical warfare casualties.

FY 2009 Accomplishments:

Evaluated safety, efficacy, dosing and relevant effects on the body, and the body's effects on the drug, of candidate countermeasures against sulphur mustard injury. Evaluated cell-based therapeutic technologies. Tested the protective effects of an FDA approved antibiotic against acute sulfur mustard injury. Evaluated the efficacy of drug modifiers of stem cells for blister injury. Assessed effectiveness of anti-inflammatory drugs in the laboratory against sulphur mustard damage to the eye.

FY 2010 Plans:

Continue to determine the efficacy of bioengineering and molecular biology approaches to treat sulfur mustard ocular injury. Continue testing of cell-based approaches to facilitate blister agent wound healing. Continue development of a decontaminant for penetrating wounds containing CWAs. Maintain effort to determine the chronic consequences of blister agent exposure. Begin novel efforts to increase drug delivery of candidate countermeasures. Enhance current anti-inflammatory approaches to treating blister agent injury. Evaluate the commonality in mechanisms of blister-induced injury across tissues and routes of exposure.

FY 2011 Base Plans:

Continue development of novel drug delivery approaches for candidate countermeasures. Continue to determine the effectiveness of multiple anti-inflammatory approaches in vitro against blister agent

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B. Accomplishments/Planned Program ($ in Millions)

	FY 2009	FY 2010	FY 2011 Base	FY 2011 OCO	FY 2011 Total
exposure. Continue investigation of potential therapeutic approaches to mitigate the chronic effects of blister agent exposure.					
8) Therapeutics	8.054	8.652	7.840	0.000	7.840
Neurologic: Focuses on therapeutic strategies to effectively minimize neurologic injuries resulting from exposure to CWAs. This effort involves the development of neuroprotectants, anticonvulsants, and improved neurotransmitter restorers. Supports eventual FDA licensure of new compounds or new indications for licensed products for use in the treatment of chemical warfare casualties. *FY 2009 Accomplishments:* Identified and developed broad-spectrum improved reactivators based on the mechanism of action of reactivation. Initiated testing of centrally acting neurotransmitter degrading enzyme restorers for efficacy using laboratory and animal models. Down-selected novel and FDA approved anticonvulsants, neuroprotectants, anti-epileptics, and receptor competitors and neutralizing agents for neuroprotective activity against nerve agents. Defined and optimized the utility of therapeutic agent-binding proteins. *FY 2010 Plans:* Identify and develop drug-delivery systems to improve the restoration of nerve transmitters following exposure to chemical agents. Utilize structure-activity relationships to identify anticholinergic drugs with reduced side effects and novel neuroprotectants and anti-epileptics to protect against nerve agents. *FY 2011 Base Plans:* Continue to investigate the mechanism of reactivation of nerve-agent inhibited acetylcholinesterase in order to identify or design compounds that allow for a longer time frame between exposure and the administration of the therapeutic without decreasing its effectiveness. Continue to explore approaches					

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B. Accomplishments/Planned Program ($ in Millions)

	FY 2009	FY 2010	FY 2011 Base	FY 2011 OCO	FY 2011 Total
for neuroprotection against nerve agent exposure. Develop therapeutic strategies to effectively minimize neurologic injuries resulting from exposure to CWAs by testing in silico and in vitro.					
9) Therapeutics Medical Toxicology (Non Traditional Agents (NTAs) and Other Agents): Investigates common mechanisms of agent injury. Determines the toxic effects of agents by probable routes of field exposure, as well as standard experimental routes. Physiological parameters and pathological assessment will be used to establish the general mode and mechanism(s) of toxicity. *FY 2009 Accomplishments:* Quantified the nature, scope, and time course of exposure/effects using biochemical, toxicological, physiological, and modeling methods as required for therapeutic and clinical strategy design. *FY 2010 Plans:* Investigate and study receptor effects of common and agent-specific mechanisms of NTA injury for therapeutic intervention. *FY 2011 Base Plans:* All NTA-related efforts are re-aligned to Chemical Therapeutics NTA within this Budget Activity.	1.783	2.756	0.000	0.000	0.000
10) Therapeutics Therapeutics for Non Traditional Agents (NTAs): Develops, assesses, evaluates, and validates therapeutics for treatment resulting from exposure to NTAs. *FY 2009 Accomplishments:* Evaluated pre-existing and new commercially-available compounds for respiratory and neurological injury in small animal models and began transition to large animal models (e.g. non-human primate).	8.818	13.156	0.000	0.000	0.000

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B. Accomplishments/Planned Program ($ in Millions)

	FY 2009	FY 2010	FY 2011 Base	FY 2011 OCO	FY 2011 Total
Initiated testing of novel compounds as therapies in small animal models. Defined and optimized the utility of therapeutic agent-binding proteins against NTAs. *FY 2010 Plans:* Further development and validation of animal models for testing clinical efficacy of therapeutics against NTAs. Identify binding characteristics of NTAs, as well as mitigate NTA toxicity by researching and developing novel therapeutics. *FY 2011 Base Plans:* All NTA-related efforts are re-aligned to Chemical Therapeutics NTA within this Budget Activity.					
11) Chem Therapeutics NTA Develops, assesses, evaluates, and validates therapeutics for treatment resulting from exposure to NTAs. *FY 2011 Base Plans:* Continue binding studies to support the design and synthesis of an improved reactivator. Continue evaluation of improved products to treat NTA exposure. Continue investigation of pathophysiological effects to identify debilitating syndromes caused by exposure to NTAs. Continue development of animal models for various routes of exposure to NTA. These models will be utilized to evaluate toxic effects of NTAs, behavioral changes, efficacy, and FDA animal rule approvals.	0.000	0.000	13.000	0.000	13.000
Accomplishments/Planned Programs Subtotals	35.008	40.418	33.648	0.000	33.648

C. Other Program Funding Summary ($ in Millions)

Line Item	FY 2009	FY 2010	FY 2011 Base	FY 2011 OCO	FY 2011 Total	FY 2012	FY 2013	FY 2014	FY 2015	Cost To Complete	Total Cost
• TC1: *MEDICAL CHEMICAL DEFENSE (BASIC RESEARCH)*	13.308	5.496	3.144		3.144	2.889	2.954	2.928	2.977	Continuing	Continuing

Exhibit R-2A, RDT&E Project Justification: PB 2011 Chemical and Biological Defense Program			DATE: February 2010
APPROPRIATION/BUDGET ACTIVITY 0400: *Research, Development, Test & Evaluation, Defense-Wide* BA 2: *Applied Research*	R-1 ITEM NOMENCLATURE PE 0602384BP: *CHEMICAL/BIOLOGICAL DEFENSE (APPLIED RESEARCH)*	PROJECT TC2: *MEDICAL CHEMICAL DEFENSE (APPLIED RESEARCH)*	

C. Other Program Funding Summary ($ in Millions)

Line Item	FY 2009	FY 2010	FY 2011 Base	FY 2011 OCO	FY 2011 Total	FY 2012	FY 2013	FY 2014	FY 2015	Cost To Complete	Total Cost
• TC3: *MEDICAL CHEMICAL DEFENSE (ATD)*	21.641	28.971	29.134		29.134	30.401	30.546	31.356	31.877	Continuing	Continuing

D. Acquisition Strategy

N/A

E. Performance Metrics

N/A

Exhibit R-2A, RDT&E Project Justification: PB 2011 Chemical and Biological Defense Program			DATE: February 2010
APPROPRIATION/BUDGET ACTIVITY 0400: *Research, Development, Test & Evaluation, Defense-Wide* BA 2: *Applied Research*	R-1 ITEM NOMENCLATURE PE 0602384BP: *CHEMICAL/BIOLOGICAL DEFENSE (APPLIED RESEARCH)*	PROJECT TR2: *MEDICAL RADIOLOGICAL DEFENSE (APPLIED RESEARCH)*	

COST ($ in Millions)	FY 2009 Actual	FY 2010 Estimate	FY 2011 Base Estimate	FY 2011 OCO Estimate	FY 2011 Total Estimate	FY 2012 Estimate	FY 2013 Estimate	FY 2014 Estimate	FY 2015 Estimate	Cost To Complete	Total Cost
TR2: *MEDICAL RADIOLOGICAL DEFENSE (APPLIED RESEARCH)*	0.525	2.897	2.884	0.000	2.884	1.904	2.855	1.913	1.903	Continuing	Continuing

A. Mission Description and Budget Item Justification

This project (TR2) funds applied research to develop medical countermeasures to protect the Warfighter against radiological exposure. Specifically, innovative technical approaches will be used to develop products to mitigate health consequences resulting from Acute Radiation Exposure (ARS) and Delayed Effects of Acute Radiation Exposure (DEARE). The research and development of medical countermeasures for radiation exposure will ultimately enhance the survivability of Warfighters and will serve to significantly minimize the development of acute radiation syndromes and subsequent health problems. Results of efforts funded under this project are collaboratively shared with other government agencies, while the Department of Defense maintains an emphasis on the development of pretreatments to protect military personnel who could be involved in responding to a radiological incident.

B. Accomplishments/Planned Program ($ in Millions)

	FY 2009	FY 2010	FY 2011 Base	FY 2011 OCO	FY 2011 Total
1) SBIR *FY 2010 Plans:* Small Business Innovative Research.	0.000	0.042	0.000	0.000	0.000
2) Radiological Medical Countermeasures Radiation Medical Countermeasures: Develop medical countermeasures to protect the Warfighter against radiological/nuclear exposure, to include developing both pretreatments (prophylaxis) and post-irradiation therapeutics against radiological/nuclear exposure. DoD is the only governmental agency currently developing medical prophylaxis to protect Warfighters and/or other responders in the event of a radiological incident.	0.525	2.855	2.884	0.000	2.884

Exhibit R-2A, RDT&E Project Justification: PB 2011 Chemical and Biological Defense Program		DATE: February 2010
APPROPRIATION/BUDGET ACTIVITY 0400: *Research, Development, Test & Evaluation, Defense-Wide* BA 2: *Applied Research*	R-1 ITEM NOMENCLATURE PE 0602384BP: *CHEMICAL/BIOLOGICAL DEFENSE (APPLIED RESEARCH)*	PROJECT TR2: *MEDICAL RADIOLOGICAL DEFENSE (APPLIED RESEARCH)*

B. Accomplishments/Planned Program ($ in Millions)

	FY 2009	FY 2010	FY 2011 Base	FY 2011 OCO	FY 2011 Total
FY 2009 Accomplishments: Down-select at least one promising drug candidate that has the ability to provide protection from the harmful effects of radiation exposure. Determine the pre-clinical efficacy of combined agents that confer protection or supportive medical care against the harmful effects of radiation exposure with minimal toxic side effects. Explore current Good Laboratory Practice (cGLP) test capability for selected candidate drugs against acute radiation syndrome (ARS) based on Food and Drug Administration's (FDA) animal testing requirements. *FY 2010 Plans:* Evaluate mature and promising drug candidates for respiratory and gastrointestinal damage and repair, demonstrating efficacy, safety, and animal (rodents) survival exposed to lethal radiation for a future non-human primate (NHP) efficacy study. Identify common biochemical/physiological mechanisms for hematological, respiratory and gastrointestinal damage and repair, as well as, biology of cellular damage. *FY 2011 Base Plans:* Continue to evaluate novel and FDA-approved drugs for efficacy against radiation exposure maintaining a focus on potential mechanisms of action. These studies will help identify biochemical/ physiological mechanisms that could be exploited for expanding the scope of potential therapeutic approaches. Continue to focus approaches on the GI and lung injury related to radiation exposure. Continue evaluation and identification of unique, novel and promising biomarkers useful for biodosimetry and potential pathways for therapeutic approaches.					
Accomplishments/Planned Programs Subtotals	0.525	2.897	2.884	0.000	2.884

Exhibit R-2A, RDT&E Project Justification: PB 2011 Chemical and Biological Defense Program		DATE: February 2010
APPROPRIATION/BUDGET ACTIVITY 0400: *Research, Development, Test & Evaluation, Defense-Wide* BA 2: *Applied Research*	R-1 ITEM NOMENCLATURE PE 0602384BP: *CHEMICAL/BIOLOGICAL DEFENSE (APPLIED RESEARCH)*	PROJECT TR2: *MEDICAL RADIOLOGICAL DEFENSE (APPLIED RESEARCH)*

C. Other Program Funding Summary ($ in Millions)

Line Item	FY 2009	FY 2010	FY 2011 Base	FY 2011 OCO	FY 2011 Total	FY 2012	FY 2013	FY 2014	FY 2015	Cost To Complete	Total Cost
• TR1: *MEDICAL RADIOLOGICAL DEFENSE (BASIC RESEARCH)*	0.000	0.975	0.971		0.971	0.966	0.000	0.000	0.000	Continuing	Continuing
• TR3: *MEDICAL RADIOLOGICAL DEFENSE (ATD)*	4.859	2.403	0.957		0.957	0.966	1.922	2.901	2.927	Continuing	Continuing

D. Acquisition Strategy

N/A

E. Performance Metrics

N/A