Exhibit R-2, RDT&E Budget Item Justification: PB 2017 Defense Health Agency	Date: February 2016
Appropriation/Budget Activity 0130: *Defense Health Program I* BA 2: *RDT&E*	**R-1 Program Element (Number/Name)** PE 0603002DHA *I Medical Advanced Technology (AFRRI)*

COST ($ in Millions)	Prior Years	FY 2015	FY 2016	FY 2017 Base	FY 2017 OCO	FY 2017 Total	FY 2018	FY 2019	FY 2020	FY 2021	Cost To Complete	Total Cost
Total Program Element	1.273	0.286	0.305	0.310	-	0.310	0.332	0.338	0.345	0.352	Continuing	Continuing
030A: *CSI - Congressional Special Interests*	0.000	0.031	0.000	0.000	-	0.000	0.000	0.000	0.000	0.000	Continuing	Continuing
242A: *Biodosimetry (USUHS)*	0.765	0.153	0.183	0.186	-	0.186	0.199	0.202	0.206	0.210	Continuing	Continuing
242B: *Radiation Countermeasures (USUHS)*	0.508	0.102	0.122	0.124	-	0.124	0.133	0.136	0.139	0.142	Continuing	Continuing

A. Mission Description and Budget Item Justification

For the Uniformed Services University of the Health Sciences/ Armed Forces Radiobiology Research Institute (USUHS/AFRRI), this program supports applied research for advanced development of biomedical strategies to prevent, treat and assess health consequences from exposure to ionizing radiation. It capitalizes on findings under PE 0602787HP, Medical Technology, and from industry and academia to advance novel medical countermeasures into and through pre-clinical studies toward newly licensed products. Program objectives focus on mitigating the health consequences from exposures to ionizing radiation(alone or in combination with other injuries) that represent the highest probable threat to US forces in current tactical, humanitarian and counterterrorism mission environments. Findings from basic and developmental research are integrated into focused advanced technology development studies to produce the following: (1) protective and therapeutic strategies; (2) novel biological markers and delivery platforms for rapid, field-based individual medical assessment; and (3) experimental data needed to build accurate models for predicting casualties from complex injuries involving radiation and other battlefield insults. The AFRRI, because of its multidisciplinary staff and exceptional laboratory and radiation facilities, is uniquely positioned to execute the program as prescribed by its mission.

B. Program Change Summary ($ in Millions)	FY 2015	FY 2016	FY 2017 Base	FY 2017 OCO	FY 2017 Total
Previous President's Budget	0.279	0.305	0.310	-	0.310
Current President's Budget	0.286	0.305	0.310	-	0.310
Total Adjustments	0.007	0.000	0.000	-	0.000
• Congressional General Reductions	-	-			
• Congressional Directed Reductions	-	-			
• Congressional Rescissions	-	-			
• Congressional Adds	0.031	-			
• Congressional Directed Transfers	-	-			
• Reprogrammings	-	-			
• SBIR/STTR Transfer	-0.024	-			

Congressional Add Details ($ in Millions, and Includes General Reductions)	FY 2015	FY 2016
Project: 030A: *CSI - Congressional Special Interests*		
Congressional Add: *473A – Program Increase: Restore Core Research Funding Reduction (USUHS)*	0.031	0.000

Exhibit R-2, RDT&E Budget Item Justification: PB 2017 Defense Health Agency	Date: February 2016
Appropriation/Budget Activity 0130: *Defense Health Program I* BA 2: *RDT&E*	**R-1 Program Element (Number/Name)** PE 0603002DHA *I Medical Advanced Technology (AFRRI)*

Congressional Add Details ($ in Millions, and Includes General Reductions)	FY 2015	FY 2016
Congressional Add Subtotals for Project: 030A	0.031	0.000
Congressional Add Totals for all Projects	0.031	0.000

Change Summary Explanation

FY 2015: Realignment from Defense Health Program, Research, Development, Test and Evaluation (DHP RDT&E), PE 0603002-Advanced Technology (AFRRI) (-$0.024 million) to DHP RDT&E PE 0605502-Small Business Innovation Research (SBIR) / Small Business Technology Transfer (STTR) Program (+$0.024 million).

FY 2015: Restore core research funding to the DHP RDT&E, PE 0603002-Advanced Technology (AFRRI) (+$0.031 million).

FY 2016: No Change.

FY 2017: No Change.

Exhibit R-2A, RDT&E Project Justification: PB 2017 Defense Health Agency			Date: February 2016
Appropriation/Budget Activity 0130 / 2	R-1 Program Element (Number/Name) PE 0603002DHA / *Medical Advanced Technology (AFRRI)*	Project (Number/Name) 030A / *CSI - Congressional Special Interests*	

COST ($ in Millions)	Prior Years	FY 2015	FY 2016	FY 2017 Base	FY 2017 OCO	FY 2017 Total	FY 2018	FY 2019	FY 2020	FY 2021	Cost To Complete	Total Cost
030A: *CSI - Congressional Special Interests*	0.000	0.031	0.000	0.000	-	0.000	0.000	0.000	0.000	0.000	Continuing	Continuing

A. Mission Description and Budget Item Justification

The FY15 DHP Congressional Special Interest (CSI) funding is directed toward core research initiatives in Program Element (PE) 0603002 - Medical Advanced Technology (AFRRI). Because of the CSI annual structure, out-year funding is not programmed.

B. Accomplishments/Planned Programs ($ in Millions)	FY 2015	FY 2016
Congressional Add: 473A – Program Increase: Restore Core Research Funding Reduction (USUHS)	0.031	0.000
FY 2015 Accomplishments: FY 2015 DHP Congressional Special Interest (CSI) spending item directed toward the restoral of core research initiatives in PE 0603002. Funds supported University research in biodosimetry and radiation countermeasures (Projects 242A,B).		
FY 2016 Plans: No Funding Programmed.		
Congressional Adds Subtotals	0.031	0.000

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

D. Acquisition Strategy

N/A

E. Performance Metrics

N/A

Exhibit R-2A, RDT&E Project Justification: PB 2017 Defense Health Agency			Date: February 2016
Appropriation/Budget Activity 0130 / 2	R-1 Program Element (Number/Name) PE 0603002DHA / *Medical Advanced Technology (AFRRI)*	Project (Number/Name) 242A / *Biodosimetry (USUHS)*	

COST ($ in Millions)	Prior Years	FY 2015	FY 2016	FY 2017 Base	FY 2017 OCO	FY 2017 Total	FY 2018	FY 2019	FY 2020	FY 2021	Cost To Complete	Total Cost
242A: *Biodosimetry (USUHS)*	0.765	0.153	0.183	0.186	-	0.186	0.199	0.202	0.206	0.210	Continuing	Continuing

A. Mission Description and Budget Item Justification

For the Uniformed Services University of the Health Sciences/Armed Forces Radiobiology Research Institute (USU/AFRRI), this program supports applied research for advanced development of biomedical strategies to prevent, treat and assess health consequences from exposure to ionizing radiation. It capitalizes on findings under PE 0602787HP, Medical Technology, and from industry and academia to advance novel medical countermeasures into and through pre-clinical studies toward newly licensed products. Program objectives focus on mitigating the health consequences from exposures to ionizing radiation (alone or in combination with other injuries) that represent the highest probable threat to US forces in current tactical, humanitarian and counterterrorism mission environments. Findings from basic and developmental research are integrated into focused advanced technology development studies to produce the following: (1) protective and therapeutic strategies; (2) novel biological markers and delivery platforms for rapid, field-based individual medical assessment; and (3) experimental data needed to build accurate models for predicting casualties from complex injuries involving radiation and other battlefield insults. The AFRRI, because of its multidisciplinary staff and exceptional laboratory and radiation facilities, is uniquely positioned to execute the program as prescribed by its mission.

B. Accomplishments/Planned Programs ($ in Millions)	FY 2015	FY 2016	FY 2017
Title: Biodosimetry (USUHS)	0.153	0.183	0.186
Description: Biodosimetry (USUHS): For the Uniformed Services University of the Health Sciences (USUHS), this program supports applied research for advanced development of biomedical and biophysical strategies to assess health consequences from exposure to ionizing radiation. It capitalizes on findings under PE 0602787HP, Medical Technology, and from industry and academia to advance novel biological markers and delivery platforms for rapid, field-based individual dose assessment and experimental data needed to build accurate models for predicting casualties from complex injuries involving radiation and other battlefield insults. ***FY 2015 Accomplishments:*** - Contributed to the further evaluation of discovered new radiation-responsive biomarkers in higher order animal and human models for diagnostic bio-dosimetry applications. - Completed NHP-specific ARS category score system based on multiple bio-dosimetric endpoints (i.e., clinical signs, peripheral blood cell counts, and radiation-responsive protein expression profile). - Began pilot study using samples from the NHP total-body irradiation model, to permit testing of measurement of novel organ-specific biomarkers in isolated peripheral blood using commercially available antibodies and assays developed at AFRRI. - Created multiparametric (hematological and selected protein biomarkers) full dose-response algorithm dose assessment study in NHP total-body irradiation model.			

Exhibit R-2A, RDT&E Project Justification: PB 2017 Defense Health Agency		Date: February 2016
Appropriation/Budget Activity 0130 / 2	**R-1 Program Element (Number/Name)** PE 0603002DHA / *Medical Advanced Technology (AFRRI)*	**Project (Number/Name)** 242A / *Biodosimetry (USUHS)*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2015	FY 2016	FY 2017
- Contributed in preparation of summary report for FDA use on diagnostic utility of combined hematological and proteomic approach for triage biodosimetry applications based on combination of hematological and proteomic biomarkers results using minipigs and nonhuman primate models. - Sustained efforts to provide necessary proof-of-concept dose-response data to transition combined proteomic and hematological concept for further development of diagnostic devices (i.e., hand-held, field deployable) and obtain necessary FDA approval. - Continued to create a human baseline data base for evaluated biomarkers for use in human radiation accident cases. - Began comparing results from NHP dose-response TBI (photon/low-LET) studies with data collected from radiation accident victims and radiation therapy patients. - Enhanced cytogenetic biodosimetry protocols for radiation dose assessment by expanding database of baseline chromosome aberration frequency, adopting use of karyotyping software utility to screen for potential clonal aberrations, extending dose-response calibration curve to low doses (i.e., 10cGy), and successfully participating in several blind exercises using the lymphocyte metaphase spread dicentric chromosome aberration (DCA) assay. - Initiated studies to establish premature chromosome condensation (PCC) assay to permit assessment of partial-body exposures at high doses (i.e., 20-30 Gy). - Used multiple blood cell types (i.e., lymphocyte, neutrophils, and platelets) in development of algorithm for radiation dose assessment for extended times after radiation exposure. - Transitioned Windows-based software application (i.e., First-responder Radiological Assessment Triage or FRAT) for use on mobile Android cell phone. - Developed radiation risk categorization (RRIC) algorithm using hematology and serum chemistry parameters for triaging minipigs exposed to TBI lethal and nonlethal radiation doses between days 0-30 days. - Determined feasibility of discerning early (≤7 days) and/or late (>7 days) radiation-responsive urinary metabolite and protein biomarkers in nonhuman primates for the development of a radiation risk categorization (RRIC) algorithm for TBI doses between 1 to 8 Gy.			
FY 2016 Plans: - Sustain efforts to establish clinical laboratory quality control and assurance system for radiation dose assessment by cytogenetic biodosimetry. Expand upon baseline measurements for DCA and PCC assays, continue scoring to establish a robust dose-response calibration curve, and participate in exercises. - Continue to provide improved radiation diagnostic tools for use by DOD end-users. Extend transition of mobile FRAT software application for use on iPhone OS devices. Sustain AFRRI's Biodosimetry Tools website for access to diagnostic worksheets and software applications. - Contribute to further evaluation of discovered new radiation-responsive biomarkers in higher order animal and human models for diagnostic biodosimetry applications.			

Exhibit R-2A, RDT&E Project Justification: PB 2017 Defense Health Agency		Date: February 2016
Appropriation/Budget Activity 0130 / 2	**R-1 Program Element (Number/Name)** PE 0603002DHA / *Medical Advanced Technology (AFRRI)*	**Project (Number/Name)** 242A / *Biodosimetry (USUHS)*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2015	FY 2016	FY 2017
- Continue evaluating new predictive radiation-responsive biomarkers in NHP models for ARS outcome and their applicability in humans. - Complete NHP-specific ARS category score system based on multiple biodosimetric endpoints (i.e., clinical signs, peripheral blood cell counts and chemistry, pathology reports, and radiation-responsive protein expression profile). - Sustain efforts to provide necessary proof-of-concept dose-response data to transition combined proteomic and hematological concept for further development of diagnostic devices (i.e., hand-held, field deployable) and obtain necessary FDA approval. - Sustain efforts in comparing results/data from the NHP dose-response TBI (photon/low-LET) studies with data collected from radiation accident victims and radiation therapy patients. - Continue efforts in developing protocol for evaluating newly discovered protein biomarkers for use in human radiation accident cases. ***FY 2017 Plans:*** - Report on use of PCC assay for assessment of partial-body exposure including use of protein nucleic acid (PNA) centrometic probes for identification of di-centric aberrations in PCC assay. Expand upon radiation calibration curves using PCC assay. - Sustain participation in exercises and establishment of a clinical laboratory certification. - Establish NHP partial-body animal radiation model involving low-LET exposure with AFRRI LINAC to identify organ-specific radiation injury biomarkers evaluated earlier in low-LET TBI studies. - Continue evaluating new predictive radiation-responsive biomarkers in NHP models for ARS outcome and their applicability in humans. - Sustain efforts in comparing results from NHP dose-response TBI (photon/low-LET) studies with data collected from radiation accident victims and radiation therapy patients. - Continue to create human baseline data base for evaluated biomarkers for use in human radiation accident cases.			
Accomplishments/Planned Programs Subtotals	0.153	0.183	0.186

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

D. Acquisition Strategy

N/A

E. Performance Metrics

By FY 2015

- Report on use of changes in multiple human blood cell counts on assessment of radiation dose.

Exhibit R-2A, RDT&E Project Justification: PB 2017 Defense Health Agency		Date: February 2016
Appropriation/Budget Activity 0130 / 2	**R-1 Program Element (Number/Name)** PE 0603002DHA / *Medical Advanced Technology (AFRRI)*	**Project (Number/Name)** 242A / *Biodosimetry (USUHS)*

- Establish Institute's IRB regulatory approvals to permit evaluation of newly developed proteomic biomarkers for use in radiation accident cases by commercial partner.
- Provide necessary proof-of-concept dose-response data to transition combined proteomic and hematological concept for further development of diagnostic devices (i.e., hand-held, field deployable) and obtain necessary FDA approval.
- Continue evaluation and validation of discovered new radiation-responsive biomarkers in higher order animals and human models for biodosimetric diagnostic applications.
- Begin to develop protocol on evaluated and newly developed protein biomarkers for use in human radiation accident cases.
- Continue to create a human baseline data base for evaluated biomarkers for use in human radiation accident cases.
- Begin to compare results from NHP dose-response TBI (photon/low-LET) studies with data collected from radiation accident victims and radiation therapy patients.

By FY 2016
- Report on the current status of AFRRI's capability and capacity to perform dose assessment by cytogenetics.
- Participate in annual performance evaluations to demonstrate accuracy in dose assessment by cytogenetics.
- Continue studies evaluating new radiation-responsive biomarkers in animal models for early-phase and organ-specific damage and their applicability in humans.
- Continue evaluating new predictive radiation-responsive biomarkers in animal models for ARS outcome and their applicability in humans.
- Continue to compare results from NHP dose-response TBI (photon/low LET) studies with data collected from radiation accident victims and radiation therapy patients.

By FY 2017
- Report on development and use of AFRRI's mobile FRAT application for use in triage diagnostics of suspected radiation casualties.
- Characterize robustness of PCC assay for assessment of high-dose partial-body exposures.
- Establish NHP partial-body animal radiation model involving low-LET exposure with AFRRI LINAC to identify organ-specific radiation injury biomarkers evaluated earlier in low-LET TBI studies.
- Continue evaluating new predictive radiation-responsive biomarkers in NHP models for ARS outcome and their applicability in humans.
- Sustain efforts in comparing results/data from NHP dose-response TBI (photon/low-LET) studies with data collected from radiation accident victims and radiation therapy patients.
- Continue to create a human baseline data base for evaluated biomarkers for use in human radiation accident cases.

Exhibit R-2A, RDT&E Project Justification: PB 2017 Defense Health Agency			Date: February 2016
Appropriation/Budget Activity 0130 / 2	R-1 Program Element (Number/Name) PE 0603002DHA / *Medical Advanced Technology (AFRRI)*	Project (Number/Name) 242B / *Radiation Countermeasures (USUHS)*	

COST ($ in Millions)	Prior Years	FY 2015	FY 2016	FY 2017 Base	FY 2017 OCO	FY 2017 Total	FY 2018	FY 2019	FY 2020	FY 2021	Cost To Complete	Total Cost
242B: *Radiation Countermeasures (USUHS)*	0.508	0.102	0.122	0.124	-	0.124	0.133	0.136	0.139	0.142	Continuing	Continuing

A. Mission Description and Budget Item Justification

Radiation Countermeasures (USU): For the Uniformed Services University of the Health Sciences (USU), this program supports applied research for advanced development of biomedical strategies to prevent and treat health consequences from exposure to ionizing radiation. It capitalizes on findings under PE 0602787HP, Medical Technology, and from industry and academia to advance novel medical countermeasures into and through pre-clinical studies toward newly licensed products. Program objectives focus on preventing or mitigating the health consequences from exposures to ionizing radiation alone or in combination with other injuries, in the context of probable threats to US forces in current tactical, humanitarian and counterterrorism mission environments. Findings from basic and developmental research are integrated into highly focused advanced technology development studies yielding protective and therapeutic strategies.

B. Accomplishments/Planned Programs ($ in Millions)	FY 2015	FY 2016	FY 2017
Title: Radiation Countermeasures (USUHS)	0.102	0.122	0.124
Description: Radiation Countermeasures (USU): For the Uniformed Services University of the Health Sciences (USU), this program supports applied research for advanced development of biomedical strategies to prevent and treat health consequences from exposure to ionizing radiation. It capitalizes on findings under PE 0602787HP, Medical Technology, and from industry and academia to advance novel medical countermeasures into and through pre-clinical studies toward newly licensed products. Program objectives focus on preventing or mitigating the health consequences from exposures to ionizing radiation alone or in combination with other injuries, in the context of probable threats to US forces in current tactical, humanitarian and counterterrorism mission environments. Findings from basic and developmental research are integrated into highly focused advanced technology development studies yielding protective and therapeutic strategies.			
FY 2015 Accomplishments: - Continued evaluating minipig and nonhuman primate as suitable models for assessing effects of radiation countermeasures on survival and biodosimetry markers after radiation injury.			
FY 2016 Plans: - Continue evaluating minipig and nonhuman primate as suitable models for assessing effects of radiation countermeasures on survival and biodosimetry markers after radiation injury.			
FY 2017 Plans:			

Exhibit R-2A, RDT&E Project Justification: PB 2017 Defense Health Agency		Date: February 2016
Appropriation/Budget Activity 0130 / 2	**R-1 Program Element (Number/Name)** PE 0603002DHA / *Medical Advanced Technology (AFRRI)*	**Project (Number/Name)** 242B / *Radiation Countermeasures (USUHS)*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2015	FY 2016	FY 2017
- Continue evaluating minipig and nonhuman primate as suitable models for assessing effects of radiation countermeasures on survival and biodosimetry markers after radiation injury			
Accomplishments/Planned Programs Subtotals	0.102	0.122	0.124

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

D. Acquisition Strategy

N/A

E. Performance Metrics

By FY 2015
- Assess biomarkers in context of radiation injury and radiation countermeasure effects.

By FY 2016
- Assess biomarkers in context of radiation injury and radiation countermeasure effects.

By FY 2017
- Assess biomarkers in context of radiation injury and radiation countermeasure effects.

THIS PAGE INTENTIONALLY LEFT BLANK