Fiscal Year:	FY 2020	**Task Last Updated:**	FY 07/23/2020
PI Name:	McDonald, Karen Ph.D.		
Project Title:	A Plant-Based Platform for 'Just in Time' Medications		
Division Name:	Human Research		
Program/Discipline:			
Program/Discipline--Element/Subdiscipline:	TRISH--TRISH		
Joint Agency Name:		**TechPort:**	No
Human Research Program Elements:	None		
Human Research Program Risks:	None		
Space Biology Element:	None		
Space Biology Cross-Element Discipline:	None		
Space Biology Special Category:	None		
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Zip Code:	95616-5270	**Congressional District:**	3
Comments:			
Project Type:	GROUND	**Solicitation / Funding Source:**	2020 TRISH BRASH1901: Translational Research Institute for Space Health (TRISH) Biomedical Research Advances for Space Health
Start Date:	04/01/2020	**End Date:**	03/31/2022
No. of Post Docs:		**No. of PhD Degrees:**	
No. of PhD Candidates:		**No. of Master' Degrees:**	
No. of Master's Candidates:		**No. of Bachelor's Degrees:**	
No. of Bachelor's Candidates:		**Monitoring Center:**	TRISH
Contact Monitor:		**Contact Phone:**	
Contact Email:			
Flight Program:			
Flight Assignment:			
Key Personnel Changes/Previous PI:			
COI Name (Institution):	Lane, Nancy M.D. (University of California, Davis Health) Nandi, Somen Ph.D. (University of California, Davis) Paul, Debashis Ph.D. (University of California, Davis) Sudarshana, Mysore Ph.D. (United States Department of Agriculture)		
Grant/Contract No.:	NNX16AO69A-T0505		
Performance Goal No.:			
Performance Goal Text:			

Task Description:	The objectives of this proposal are to design, develop, and evaluate a plant-based bioproduction platform for rapid production of three NASA-relevant human therapeutic biologics, recombinant parathyroid hormone residues 1-34 (PTH) for osteoporosis, granulocyte colony stimulating factor (G-CSF) for acute radiation treatment, and Trypsin (TRP) in treatment of burns, skin abrasion or skin laceration in Lactuca sativa (lettuce). Plants offer many advantages as a biological host for production of medicines since they are safe, will already be available during deep space missions, require minimal external resources, can utilize in situ resources (light and carbon dioxide) for growth, and do not propagate mammalian viruses. Plants can be used for production of the therapeutics as well as purification reagents, and even offer a potential for oral delivery of the therapeutics in the future. To achieve production, purification, and delivery of just-in-time biologics made in lettuce within 24 hours we will develop novel plant viral expression systems, production and purification protocols, and viral immunosorbent nanoparticles. Our Specific Aims are: Specific Aim #1: Development and evaluation of transgene constructs and plant viral expression vectors for transient production of three therapeutic biologics, in Lactuca sativa (lettuce), for NASA-medically relevant conditions. Specific Aim #2: Development and testing of methods for delivery and utilization of plant viral expression cassettes in lettuce plants/tissues and evaluation of the production kinetics and levels (mg/kg fresh weight) of these biologics. Specific Aim #3: Development and testing of methods for rapid purification of the three biologics using plant-made plant viral immunosorbent nanoparticles (VINs) for affinity separation and evaluation of additional purification strategies to meet Topic 6 ("Just in time" medications") constraints. Specific Aim #4: Characterization of the purity, efficacy, and potency of the purified plant-made biologics. This proposal is innovative due to the development of novel recombinant protein expression technologies in plants as well as purification strategies that are fast and simple. The proposed approach minimizes mass, volume, power, and cold chain requirements.
Rationale for HRP Directed Research:	
Research Impact/Earth Benefits:	
Task Progress:	New project for FY2020.
Bibliography Type:	Description: (Last Updated:)