

Fiscal Year:	FY 2010	Task Last Updated:	FY 07/02/2010
PI Name:	McQuillen, John		
Project Title:	IntraVenous Fluid GENeration for Exploration Missions (IVGEN)		
Division Name:	Human Research		
Program/Discipline:	HUMAN RESEARCH		
Program/Discipline-- Element/Subdiscipline:	HUMAN RESEARCH--Operational and clinical research		
Joint Agency Name:		TechPort:	Yes
Human Research Program Elements:	(1) ExMC :Exploration Medical Capabilities		
Human Research Program Risks:	(1) Medical Conditions :Risk of Adverse Health Outcomes and Decrements in Performance Due to Medical Conditions that occur in Mission, as well as Long Term Health Outcomes Due to Mission Exposures		
Space Biology Element:	None		
Space Biology Cross-Element Discipline:	None		
Space Biology Special Category:	None		
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City:	Cleveland	State:	OH
Zip Code:	44135	Congressional District:	10
Comments:			
Project Type:	FLIGHT	Solicitation / Funding Source:	Directed Research
Start Date:	04/01/2006	End Date:	08/31/2011
No. of Post Docs:	0	No. of PhD Degrees:	0
No. of PhD Candidates:	0	No. of Master' Degrees:	0
No. of Master's Candidates:	1	No. of Bachelor's Degrees:	0
No. of Bachelor's Candidates:	0	Monitoring Center:	NASA JSC
Contact Monitor:	Watkins, Sharmila	Contact Phone:	281.483.0395
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Flight Program:	Shuttle/ISS		
Flight Assignment:	ISS ; STS-131		
Key Personnel Changes/Previous PI:			
COI Name (Institution):			
Grant/Contract No.:			
Performance Goal No.:			
Performance Goal Text:			

Task Description:	<p>The ability to generate intravenous (IV) fluids for medical care from available spacecraft potable or technical water supplies will greatly reduce launch mass for NASA's future exploration class missions. In spite of designing and testing several systems, NASA has not yet met that goal. As a result, NASA's Human Research program initiated a detailed effort examining several different technologies for first purifying water and then mixing effectively with appropriate solutes.</p> <p>IntraVenous Fluid GENeration for Exploration Missions (IVGEN) will demonstrate a microgravity compatible water purification to the standards required for intravenous administration, and a pharmaceutical mixing system. This hardware is a prototype that will allow flight surgeons more options to treat ill or injured crewmembers during future long-duration exploration missions.</p> <p>Trade studies were used to down-select different technologies based on minimizing mass, volume, and power requirements. Experiments were conducted in normal and short duration reduced gravity facilities to verify actual performance of the selected technologies.</p> <p>Pressure driven systems with a gas-liquid separator and a DI cartridge have been shown to generate Sterile Water for Injection per the USP standards. Furthermore, by pre-positioning a sterile magnetic stir bar and salt within an IV bag, the desired medical solution can be quickly and effectively generated.</p> <p>Given the limitations with both the normal gravity and ground-based reduced gravity testing, these results need to be verified on orbit using a prototype. Further, an appropriate system level test should be conducted prior to deployment. Accordingly, the objectives of this experiment include the following: • Produce an acceptable IV solution that meets USP requirements • Verify on orbit, using available microgravity-compatible technology and techniques, the acceptability of that solution, and • Obtain sufficient engineering data to permit scaling of the system per actual mission needs. • Demonstrate end-to-end system level performance</p> <p>See also http://spaceflightssystems.grc.nasa.gov/</p>
Rationale for HRP Directed Research:	
Research Impact/Earth Benefits:	IVGEN technology could be used on Earth to generate purified water and IV fluid in Third World countries where medical resources are limited.
Task Progress:	<p>During the past year, the project initiated studies with a different deionizing resin because of concerns regarding the shelf life of the stored resin. In addition, an additional level of hermetic sealing was added, namely, a thermally sealed packet around the DI cartridge.</p> <p>Studies were initiated to examine the effect of water temperature on both the hydrodynamic and purification ability of the DI cartridge.</p> <p>A consultant, who specializes in USP certified water purification techniques review the IV-Gen process and found that for potable water from the ISS Water Processing Assembly (WPA), the IV-Gen process was acceptable; however, he also recommended that an activated carbon filter be incorporated into the design of any future exploration system that did not include such a feature.</p> <p>Finally, the project underwent a system acceptance review and hardware was delivered to NASA KSC. The experiment was launched aboard STS-131 and operations were conducted in May 2010 during Increment 23/24.</p>
Bibliography Type:	Description: (Last Updated: 09/07/2020)
Abstracts for Journals and Proceedings	McQuillen JB, McKay TL, Brown DF, Zoldak JT, Griffin DW. "The IntraVenous Fluid Generation Experiment (IV-Gen)." NASA Human Research Program Investigators' Workshop, Houston, TX, February 2010. NASA Human Research Program Investigators' Workshop, February 2010. , Feb-2010
Abstracts for Journals and Proceedings	McQuillen JB, McKay TL. "The IntraVenous Fluid Generation (IV-Gen) Experiment." Aerospace Medical Association 81st Annual Scientific Meeting, Phoenix, AZ, May 2010. Aviation, Space, and Environmental Medicine 2010 Mar;81(3):264. , Mar-2010
Abstracts for Journals and Proceedings	McQuillen JB, Weaver AS. "The fluidic challenges for emergency medical injections during extravehicular activity." Aerospace Medical Association 81st Annual Scientific Meeting, Phoenix, AZ, May 2010. Aviation, Space, and Environmental Medicine 2010 Mar;81(3):263-4. , Mar-2010