

<b>Fiscal Year:</b>	FY 2010	<b>Task Last Updated:</b>	FY 11/12/2010
<b>PI Name:</b>	Chan, Eugene M.D.		
<b>Project Title:</b>	Nanoscale Test Strips for Multiplexed Blood Analysis		
<b>Division Name:</b>	Human Research		
<b>Program/Discipline:</b>	HUMAN RESEARCH		
<b>Program/Discipline--Element/Subdiscipline:</b>	HUMAN RESEARCH--Operational and clinical research		
<b>Joint Agency Name:</b>	<b>TechPort:</b>	No	
<b>Human Research Program Elements:</b>	(1) <b>ExMC:</b> Exploration Medical Capabilities		
<b>Human Research Program Risks:</b>	(1) <b>Medical Conditions:</b> 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		
<b>Space Biology Element:</b>	None		
<b>Space Biology Cross-Element Discipline:</b>	None		
<b>Space Biology Special Category:</b>	None		
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<b>Zip Code:</b>	02139-3323	<b>Congressional District:</b>	8
<b>Comments:</b>			
<b>Project Type:</b>	GROUND	<b>Solicitation / Funding Source:</b>	SBIR Phase II
<b>Start Date:</b>	01/26/2010	<b>End Date:</b>	01/25/2012
<b>No. of Post Docs:</b>	<b>No. of PhD Degrees:</b>		
<b>No. of PhD Candidates:</b>	<b>No. of Master' Degrees:</b>		
<b>No. of Master's Candidates:</b>	<b>No. of Bachelor's Degrees:</b>		
<b>No. of Bachelor's Candidates:</b>	<b>Monitoring Center:</b> NASA JSC		
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<b>Flight Program:</b>			
<b>Flight Assignment:</b>			
<b>Key Personnel Changes/Previous PI:</b>			
<b>COI Name (Institution):</b>			
<b>Grant/Contract No.:</b>	NNX10CA97C		
<b>Performance Goal No.:</b>			
<b>Performance Goal Text:</b>	<p>The goal of our nanoscale test strips, or nanostrips, is to provide rapid, low-cost, powerful multiplexed analyses in a diminutive form so that whole body health checks can be performed on a single drop of blood. The approach is conceptually similar to pH or urinalysis test strips which allow multiplexed measurements in a linear format. The main difference is that we are proposing test strips at the nanoscale, shrunk in size over a billion-fold in volume, allowing multiple sensing elements to be included in a tiny area. In Phase I, we fabricated, tested, and demonstrated functional parathyroid hormone and vitamin D nanostrips for bone metabolism. Furthermore, we developed thrombin aptamer and immune IgG antibody nanostrips. For Phase II, we will develop a breadth of nanostrips designed to address key space-flight medical needs. These will be for assessment of bone metabolism, immune response, cardiac status, liver metabolism, and lipid profiles. We plan to enhance our technology capabilities by developing a Rapid Nanostrip Assay</p>		

<b>Task Description:</b>	<p>Capability, mix-and-run assay capability, in-house aptamer production, advanced lyophilization technology, and nanostrip accelerated stability tests. The nanostrips will be read out in a time-of-flight flow-based manner utilizing our rHEALTH sensor.</p> <p>POTENTIAL NASA COMMERCIAL APPLICATIONS : Routine assessment of bone biomarkers during space flight enables diagnosis of bone loss and remodeling. Rapid assessment of altered immune response biomarkers allows detection of infection, immunocompromised states, and hematological malignancies. The stresses of space flight put the heart at increased risk for coronary events; measurement of cardiac biomarkers is vital to cardiac health. Liver function assessment gives insight into drug side effects and nutritional status. Lipid measurements allow early diagnosis of elevated levels and can prevent coronary and vascular disease. The technology can be utilized in diagnose-to-treat scenarios, where rapid diagnosis leads to life-saving treatments.</p>
<b>Rationale for HRP Directed Research:</b>	
<b>Research Impact/Earth Benefits:</b>	<p>Nanostrips allow comprehensive monitoring of health status in real-time at the bedside or doctor's office. The technology can be utilized in diagnose-to-treat scenarios, where rapid diagnosis allows immediate life-saving treatments. Detection of acute myocardial damage rapidly allows prompt administration of therapy. Point-of-care monitoring of bisphosphonate therapy allows dosage optimization for patients with osteoporosis. Emergent diagnoses of acute cholecystitis correctly triage patients with acute abdominal pain. Point-of-care lipid nanostrips give immediate results to patients. rHEALTH and nanostrips facilitate home-based tests and measurements. Myocardial damage can be studied by measuring cardiac biomarkers in hypoxic situations. Immune function can be assessed daily for patients with autoimmune disorders. Bone remodeling in Paget's disease can be studied. The effects of drugs and diet on liver function can be assessed. The immune system can be studied after exposure to stress, toxins, allergens, and other agents.</p>
<b>Task Progress:</b>	New project for FY2010. Reporting not required for this SBIR Phase 2 project.
<b>Bibliography Type:</b>	Description: (Last Updated: 01/06/2015)
<b>Articles in Peer-reviewed Journals</b>	<p>Phipps WS, Yin Z, Bae C, Sharpe JZ, Bishara AM, Nelson ES, Weaver AS, Brown D, McKay TL, Griffin D, Chan EY. "Reduced-gravity environment hardware demonstrations of a prototype miniaturized flow cytometer and companion microfluidic mixing technology." J Vis Exp. 2014 Nov 13;(93):e51743. <a href="http://dx.doi.org/10.3791/51743">http://dx.doi.org/10.3791/51743</a> ; PubMed <a href="https://pubmed.ncbi.nlm.nih.gov/25490614/">PMID: 25490614</a> , Nov-2014</p>