

Date: 10/19/2022 Wednesday 12-1 pm

Location: In-Person

**Title: Disruptive Innovation to Reduce Health Care Costs**

**Speaker:** Dr. Govind Rao

Professor, Department of Chemical, Biochemical and Environmental Engineering,  
UMBC and Director, Center for Advanced Sensor Technology, UMBC

**Abstract:**

Health care costs are an enormous burden on the economy. In addition, this lack of affordability is creating social fractures with increasing health-care access divisions in society. We will describe emerging technologies that are designed to empower people to take charge of their own health. We will present several critical technology platform examples including i) Physiological monitoring of metabolic status and ii) Portable manufacturing capability for protein therapeutics. iii) Next generation bioreactor sensors iv) Low-cost cardboard incubator for reducing neonatal mortality and v) Innovations for rapid SARS-CoV-2 detection.

A simple approach to non-invasive transdermal monitoring of O<sub>2</sub>, CO<sub>2</sub> and glucose from human subjects will be described. The sensing principle is based on the rate of analyte diffusion across a fixed surface on the body and is shown to be a reliable measurement of blood analyte levels. Continuous monitoring of these critical metabolic parameters provide real time health status. These non-invasive approaches have been used to achieve bioreactor monitoring as well and have enabled single-use and high throughput bioreactor technologies.

We will discuss the ability to manufacture therapeutics on demand using lyophilized cell extracts using a compact suitcase size system. This system is extremely flexible as different therapeutic proteins can be produced quickly by varying the starting DNA; very robust, because the whole process is based on cell-free expression of the desired protein, thus making it independent of the usual conditions needed for cell culture; and extremely adaptable, as pure therapeutic proteins can be consistently produced within hours and without need for a cold chain. We demonstrate the ability to make G-CSF (approved for radiation sickness mitigation), EPO, vaccine candidates etc. within a few hours. These proteins have been shown to be made consistently and with purity and potency acceptable to regulatory authorities.

Finally, we demonstrate how simple innovations can potentially make life-saving interventions available at very low cost. We will share data from a clinical trial that compares a cardboard incubator to a conventional hospital incubator for housing newborns. The data suggest that such low-cost interventions can serve large numbers of people who currently do not have healthcare access to basic life-saving devices. In another instance, we will share how sampling condensate from a dehumidifier can be a simple means of atmospheric sampling to detect SARS-CoV-2. In all the above case studies, converting data to information is a key requirement and we are eager to collaborate.

**Biography:**

Govind Rao is Professor of Chemical & Biochemical Engineering at the University of Maryland, Baltimore County. He obtained his Bachelor of Technology degree in Chemical Engineering from the Indian Institute of Technology, Madras in 1984. His Ph.D. degree was obtained from Drexel University in Chemical Engineering in 1987. He has been a faculty member at UMBC since 1987 and has served as Department Chair from 2000-2006. In 2006, he founded the Center for Advanced Sensor Technology (CAST) and has been serving as its Director since its inception.

Dr. Rao's research is targeted towards disruptive innovation, where the goal is to create paradigm shifts in the state-of-the-art. A major effort is the application of sensor technology to reduce healthcare costs and close disparity gaps by making innovative low-cost devices for use in low-resource settings. Another emerging area is point-of-care biomanufacturing. He has published nearly 200 papers in professional journals. His funding has come from several diverse sources including NSF, NIH, JDRF, DARPA, FDA, ONR, Bill and Melinda Gates Foundation and from several companies. Dr. Rao has given several invited Keynote and Plenary Lectures at various International Conferences and Corporations. He has served on various government and industry advisory panels.

He has received several awards. These include the Presidential Young Investigator Award from the National Science Foundation, Outstanding Teaching and Research Awards from UMBC, the Van Lanen Award from the American Chemical Society, the Gaden Award from Biotechnology & Bioengineering, the University System of Maryland Regents Award for Excellence in Research, and he has been named a 2003 Innovator of the Year by the Maryland Daily Record. Dr. Rao has several issued patents, many of which have been licensed. Dr. Rao has served as the Chair of the Biotechnology Division of the American Chemical Society and on the Editorial Board of several prominent journals. In 2007, he was elected as a Fellow of the American Association for the Advancement of Science. In 2009, he was appointed as Editor of the PDA Journal of Pharmaceutical Science and Technology. In 2015, he was named an Eminent Engineer by Tau Beta Pi. In 2019 he received a "75 bright ideas" award from UMBC for the number of inventions filed. He received the 2017 Pioneer Award from Connected World Magazine. The cardboard incubator won the 2019 Academic Pediatric Association Global Health Research Award. He has just been named 2019 Presidential Research Professor at UMBC.