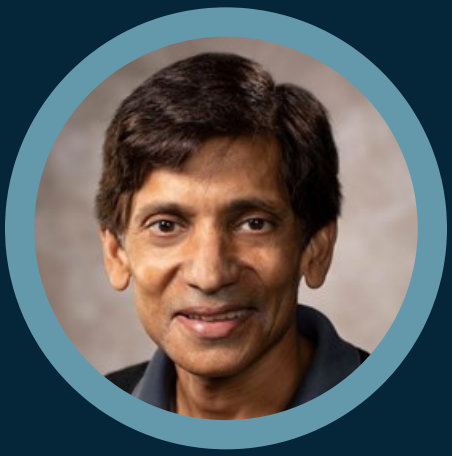

Membranes Are No Barrier to Market

Advancing Biotherapeutics and Water Treatment Technologies through Innovative Membrane Science

Dr. Ranil Wickramasinghe is a key leader in the field of membrane science and technology, guiding two barrier-busting research centers: the Membrane Science, Engineering, and Technology (MAST) Center and the Membranes for Virus Purifications (MVP) Center.

Ranil Wickramasinghe, PhD

The MAST Center, a global leader in membrane research for over 30 years, consists of four partner institutions: The University of Arkansas, The University of Colorado, The New Jersey Institute of Technology, and Pennsylvania State University. The Center focuses on a wide range of applications, while the MVP Center is dedicated to developing technologies for purifying viruses, which is crucial for modern medicine.

Membranes are selective barriers that allow certain molecules or particles to pass through while blocking others, making them crucial in processes like water purification and biotherapeutic production. Both centers, supported by the National Science Foundation (NSF), play vital roles in tackling major challenges in healthcare and environmental protection. They work closely with universities and industry partners to create innovative solutions and are also committed to training the next generation of scientists.

The Challenge

Dr. Wickramasinghe's research tackles problems in two critical areas: healthcare and water treatment, which significantly impact our well-being and the environment. In healthcare, particularly in developing medicines, one of the biggest challenges is purifying therapeutic proteins like monoclonal antibodies used to treat various diseases. While we've made great strides in producing these proteins in large quantities, the process of purifying them hasn't kept up, leading to delays and higher costs. Another challenge arises with the move towards continuous production, where medicines are made in a nonstop process rather than in batches. Continuous production reduces equipment downtime and improves efficiency, leading to more consistent product quality and lower costs, but it also introduces challenges in adapting membrane technologies to this new approach.

Arkansas Research Alliance

In water treatment, the challenge is finding better ways to clean and reuse water, particularly in dealing with wastewater from hydraulic fracturing (fracking) and removing stubborn pollutants like PFAs, which are harmful chemicals. As water scarcity and pollution become more pressing issues, there's an urgent need for new and sustainable membrane technologies to address these problems.

The Solution

At the MAST and MVP Centers, Dr. Wickramasinghe and his teams are working on creative solutions to challenging problems. At the MAST Center, they are improving membranes by changing their surfaces to make them better at their job. This includes creating “smart” membranes that can adjust to changes in their environment, making them more effective for both medicine and environmental cleanup.

The MVP Center focuses on creating advanced membranes specifically for purifying viruses, which is a crucial step in making vaccines, gene therapies, and other new medical treatments. The center leads in developing these technologies and trains future scientists to keep pushing the field forward.

For continuous manufacturing in the medical field, both centers are working on refining membrane systems to ensure they consistently remove viruses during production, which is essential for making safe and effective therapeutic proteins. Improving these processes and developing new membrane technologies are helping to make continuous production safer and more efficient.

Next Steps

Looking ahead, Dr. Wickramasinghe and the teams at the MAST and MVP Centers are seeking strong partnerships and support from both local and national businesses to drive their mission forward. The MAST Center is eager to deepen collaborations with the biotech industry in Northwest Arkansas, where its expertise can help local startups innovate. At the same time, they continue to build a skilled workforce through partnerships with educational institutions like Northwest Arkansas Community College.

The MVP Center, with its specialized focus on virus purification, is actively looking to partner with biopharmaceutical companies and research institutions to further develop and implement its membrane technologies. These collaborations have the potential to streamline industrial processes, reduce environmental impact, and contribute to regional economic growth. The continued success of the MAST and MVP Centers depends on sustained funding, dedicated support, and strong partnerships with industry. This support is essential to ensuring these groundbreaking technologies reach their full potential, creating lasting benefits for both business and society.

Contact

swickram@uark.edu