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### ***A Chemical Engineer's Perspective on health and disease: From low-level targets to engaging systemic mechanisms***

#### **Abstract:**

Quantitative systems pharmacology aims at systematizing, in a model-based manner, the integration of systems biology and pharmacology in an effort to rationalize the potential of a drug to enhance well-being. Systems engineering, on the other hand, has enabled us to develop principles and methodologies for designing and operating complex, engineered networks of structures exploring the integration of the underlying governing (design) laws. The computational tools which have resulted in major advances in the design, analysis and operation of complex engineered systems have had tremendous success in the analysis of systems pharmacology models. However, we will argue in this talk that exploring the underlying conceptual foundations of complex systems engineering will enable us to move towards integrated systems pharmacology models. Exploring synergies between low-level drug targets and higher level, systemic, defense mechanisms will result in integrated frameworks for considering drugs in their broader context, beyond their local site of action. This is an approach which would require refocusing of key activities; however, it is likely the most promising approach as we enter the new era of personalized and precision medicine. We present these ideas in the context of our work on inflammation, inflammatory diseases and anti-inflammatory therapies.

#### **Biography:**

Dr. Androulakis is a Professor in the Department of Biomedical Engineering, the Department of Chemical & Biochemical Engineering at Rutgers University and holds an Adjunct faculty position in the Department of Surgery at the Rutgers-RWJ Medical School. His research focuses on systems biology and pharmacology of inflammation and inflammatory conditions with special emphasis on the interactions between the circadian, metabolic and immune systems. His research has been funded by the NIH, NSF, EPA and ONR. Dr. Androulakis was recently elected Fellow of the American Institute for Medical and Biological Engineering. He holds a BS degree from the National Technical University of Athens, Greece and MS/PhD degrees from Purdue University, all in Chemical Engineering. He was a Research Associate at Princeton University and prior to joining Rutgers he was with ExxonMobil's Corporate Strategic Research Laboratories.

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