



Electrical Manipulation of Biological Cells: Models and Applications

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Electric waveforms, including electric pulses (EPs) and alternating current (AC) fields, such as radiofrequency and high-power microwaves, can induce deleterious or beneficial effects that require additional characterization. We combine thermal models with the Smoluchowski equation to assess the interactions of EP and AC waveforms with biological cells. We further develop a computationally efficient model based on the asymptotic Smoluchowski to screen biological response over seven orders of magnitude of pulse duration with excellent agreement between simulated electroporation and experimental observations. Applications in microorganism inactivation, natural products for cancer therapy, platelet activation, and stem cell stimulation will be discussed.



ABOUT the SPEAKER

Prof. Allen L. Garner received the BS degree (with high honors) in nuclear engineering from the University of Illinois in 1996, MSE in nuclear engineering from the University of Michigan in 1997, MS in electrical engineering from Old Dominion University in 2003, and PhD in nuclear engineering from the University of Michigan in 2006. He was an active duty Naval officer from 1997 to 2003 and is currently a Captain in the United States Navy Reserves. From 2006 to 2012, he was an electromagnetic physicist at GE Global Research Center. He joined Purdue University in 2012, where he is currently a Professor and Graduate Program Chair of Nuclear Engineering.

He has been awarded two Meritorious Service Medals, the Navy and Marine Corps Commendation Medal, and five Navy and Marine Corps Achievement Medal. He also received the 2021 Purdue School of Nuclear Engineering Outstanding Research Award, 2019 Outstanding Faculty Mentor of Engineering Graduate Students, and 2016 IEEE NPSS Early Achievement Award.

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1003 Engineering Centers (Tong Auditorium)

