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Gallium tetraphenyl porphyrin nanoparticles: An effective drug candidate against *Acinetobacter baumannii* in macrophages

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Acinetobacter baumannii (*A. baumannii*) is a gram-negative bacterium that has become increasingly resistant to antibiotic treatments and is an important cause of hospital acquired infection. Such infections have most commonly seen in military members and immune suppressed individuals, and can occur as a co-infection with other bacteria. *A. baumannii* has complex epidemiology and multiple strains, making specific species difficult to distinguish. Its resistance to antibiotics is conferred by several methods, including hydrolyzing antibiotic compounds, efflux pumps, the ability to receive resistance genes from other species, the ability to form biofilms and resistance to desiccation. *A. baumannii* are often resistant to multiple drugs and are becoming increasingly resistant to most available antibiotics. Hence, finding a novel drug candidate is much needed. Researchers have investigated the ability of gallium (Ga) compounds that interfere with microbial iron metabolism to inhibit the growth of *A. baumannii*. Ga limits the iron availability significantly and inhibits *A. baumannii* growth *in vitro*. In the pursuit of forms of Ga with prolonged activity and ability to reach intracellular sites, our team has found that gallium tetraphenyl porphyrin nanoparticle reduces *A. baumannii* ATCC 19606 growth at one day in infected THP-1 cells by more than 6 fold. Furthermore, folic acid and mannose tagging of the Ga nanoparticles enhanced drug delivery by engaging specific folic acid and mannose receptors of the macrophage. More importantly, the receptor targeted nanoparticles showed enhanced inhibition of *A. baumannii* growth relative to the standard Ga nanoparticle, confirming the value of receptor targeting. These data suggest that Ga nanoparticles could provide a novel and prolonged acting therapy for *A. baumannii* infections.

Biography

Dr. Prabagaran Narayanasamy is a faculty member in the Department of Pharmacology and Experimental Neurosciences at the University of Nebraska Medical Center. He received his Ph. D at IIT in Organic Chemistry and did his postdoctoral studies at North Dakota State University, Harvard University and University of Illinois Urbana-champaign. Later, he joined as a Research Scientist at Colorado State University to explore drug discovery. He has been a faculty at University of Nebraska Medical Center since 2012. Dr. Narayanasamy's research interests are on development, delivering and discovering drug for anti-mycobacterial medicine and antiretroviral therapy. For antibacterial drug discovery - glyoxalase, quorum sensing, MEP and menaquinone pathway are utilized. For antiviral drug discovery NRTI concept is used. Conventional (HIV and TB) drugs and new inhibitors are used in nanoformulation to generate active nanomedicine for sustained drug release through macrophages. *In vitro* and *In vivo* characterizations of drug like compounds were also carried out. In addition, metabolites are evaluated in the infected brain for characterizing neurodegenerative disorders. He has funding from NIH and also reviewer for proposals.

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