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Nanoparticles with novel methodology to treat infectious diseases

Prabagaran Narayanasamy
University of Nebraska Medical Center, USA

The two major and important infectious diseases, *human immunodeficiency virus* (HIV) and *Mycobacterium tuberculosis* (TB) are responsible for maximum mortality. Therefore, improvements in drug and easy treatment regimens are needed immediately for treating both the infections. One of the important host cells infected by both HIV and TB is the mononuclear phagocyte (macrophage). We hypothesized and manufactured nanoformulations of antibiotics, antiretroviral therapy and gallium (Ga) targeting macrophage. The synthesized Ga nanoparticles inhibited growth of both HIV and mycobacterium in the macrophage separately and while co-infected for up to 15 days following single drug loading. The subcellular trafficking of Ga-NP was determined using known procedure and the presence of NP in all the compartments confirmed the multi-targeting approach. In addition, Gram-negative bacteria are the real cause of many potentially lethal infections, including pneumonia, wound or surgical site infections, sepsis, intra-abdominal infections, urinary tract infections, and meningitis. Novel Ceft-A and Cefep-A, drugs was synthesized, along with their respective nanoparticles. Ceft-A and Ceft-NP was observed to be better than Ceft against resistant Gram-negative bacteria. Also, Ceft-NP was able to reduce the bacterial growth of *K. pneumoniae* ATCC BAA-1705 and *E. coli* ATCC 35218 by 75% up to 10 days of infection. Thus, the novel antibiotic compounds, nanoparticles and macrophage routed drug delivery would be an excellent approach to target infectious diseases.

Biography

Prabagaran Narayanasamy is a faculty member in the Department of Pathology and Microbiology at the University of Nebraska Medical Center. He received his PhD 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 2011. His research interests are 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 in study sections.

p.narayanasamy@unmc.edu

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