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## Novel methodology and drug to treat HIV-mycobacterium co-infection

Human immunodeficiency virus (HIV) infection and *Mycobacterium tuberculosis* (TB) are responsible for two of major global human infectious diseases. As a result co-infection is common. Thus, improvements in drug access and simplified treatment regimens are needed immediately. One of the key host cells infected by both HIV and TB is the mononuclear phagocyte (macrophage). Therefore, we hypothesized that one way this can be achieved is through nanoformulated drug that ideally would be active against both HIV and TB. We manufactured nano formulations of antibiotics, antiretroviral therapy and Gallium (Ga). The manufactured nanomedicine was used to study the drug uptake and release kinetics by monocytes (MDM) treated with macrophage colony stimulating factor (MCSF). Finally the efficacy study with nanomedicine was done against *Mycobacterium smegmatis*, HIV and co-infection in macrophages. The nanoparticle (NP) agent enhanced the drug uptake and maintained the drug release. It also 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 NP was also found in all compartments of macrophage in subcellular trafficking study. The multi targeted prolonged-acting NP was effective up to 15 days after single drug loading. The subcellular trafficking of NP was determined and the presence of NP in all the compartments confirmed the multi-targeting approach. These results provide a potential new approach to treat HIV-mycobacterial co-infection that could eventually lead to improved clinical outcomes.

### 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 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 in study sections.

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