

Nanocomposites for Targeting Intracellular Pathogens

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Intracellular pathogens pose a challenge for therapy because antibiotics must diffuse into the cytoplasm to reach them. The situation is more complicated in the family Mycobacteriaceae because pathogenic members infect and multiply within macrophages, the cells responsible for clearing microorganisms from the body. In addition, mycobacterial members are enclosed within pathogen-containing vesicles, or phagosomes. The treatment of these pathogens is complicated when they develop resistance to antibiotics. As a result, new antimicrobial alternatives are needed. Niosomes are vesicles composed of cholesterol and nonionic surfactants that can be used for antibiotic encapsulation and delivery. We develop niosome formulations to identify the optimal niosome functionalization for precise delivery to intracellular pathogens. Silver nanoparticles (AgNPs) are synthesized as antibacterial agents. Then, niosomes are prepared and characterized after encapsulating AgNPs functionalized with single-chain antibodies screened against cell wall components of mycobacteria. Examples of intracellular delivery of AgNPs in various Mycobacterium-infected macrophages will be presented.