

# Antibacterial Activity of Green Synthesized Silver Nanoparticles and their Synergistic Effect with Carbapenems against Carbapenem-resistant *Klebsiella pneumoniae* (CRKP)

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**ABSTRACT:** The emergence of carbapenem-resistance among Enterobacteriaceae has been increasingly reported worldwide. In Songklanagarind hospital, carbapenem-resistant *Klebsiella pneumoniae* (CRKP) are the highest prevalence among other CRE species. In this study, we aimed to investigate the incorporation of nanotechnology with the existing therapeutics to combat antimicrobial resistance. Herein, silver nanoparticles (AgNPs) was synthesized using durian peel extract as the reducing agents. The transmission electron microscope (TEM) and dynamic light scattering (DLS) measurement revealed small grains of AgNPs in spherical shapes with sizes of ~20-30 nm. The antibacterial activities of the green-synthesized AgNPs alone and in combination with carbapenems have been evaluated against *K. pneumoniae* ATCC®700603TM and CRKP clinical strains by broth microdilution assay, time-kill assay and checkerboard assay. The

AgNPs showed in vitro concentration-dependent antibacterial activities against the standard strain and CRKP clinical isolates. Moreover, the time-kill assay showed that green-synthesized AgNPs completely eradicated both of the standard strain and the CRKP isolates within a few hours. From the combination study, it was found that AgNPs enhanced the antibacterial efficacy of carbapenems against the CRKP isolates. The minimum inhibitory concentration (MIC) of the combinations were far below the MIC of each AgNPs or carbapenems in the checkerboard assay. The time of killing also decreased when CRKP exposed to the mixture when compared with AgNPs or carbapenems alone. These results confirmed the synergistic effect of carbapenem antibiotics and AgNPs against CRKP. Therefore, the combination of green-synthesized AgNPs and carbapenems antibiotics could be a promising tool to fight against the CRKP infection.

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## Biography

Aunnada Musikaphan is studying for a master's degree at Department of Biomedical Sciences, Faculty of Medicine, Prince of Songkla University, Thailand. In 2016, she graduated from Prince of Songkla University with a bachelor's degree in Medical Technology. Currently, she is working on her thesis to investigate the synergistic antimicrobial effect of carbapenems and silver nanoparticles against carbapenems-resistant Enterobacteriaceae (CRE)

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