Antibacterial Activity of Silver Nanoparticles (AgNPs) Synthesized from Polychaete Extract, *Marphysa moribidii*

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Abstract

According to WHO in 2020, there are approximately 7,000 signals of potential outbreaks every month throughout the world, indicating that infectious diseases are a significant health problem. In the meantime, the world is still struggling in combating Coronavirus disease (COVID-19). Besides the vaccine, antimicrobial agents from nanobiotechnology and natural resources may have the potential in facing current and upcoming microbial infections. In this study, the authors aim to discover the potential of polychaete, *Marphysa moribidii*, in synthesizing silver nanoparticles (AgNPs) and their antimicrobial activity. The synthesis process was initiated by adding the aqueous polychaete extract with silver nitrate. The color changes were observed visually and through surface Plasmon resonance (SPR) using UV-Vis spectroscopy to verify the formation of AgNP. The AgNP formation's validation was performed using Scanning and Transmission Electron Microscopy (SEM and TEM), Fourier Transforms Infrared (FTIR), and X-ray Diffraction (XRD). The antibacterial assessment was carried out using well dilution methods and time-kill assay on *Escherichia coli*, *Staphylococcus aureus*, *S. epidermidis*, and *Pseudomonas aeruginosa*. After 24 hours, the sample turned from pinkish red to brown color, and a single SPR peak was formed at 397 nm. The morphology of the AgNPs was spherical as depicted. The FTIR analysis showed that the synthesis involved several functional groups such as carboxylic acid (O-H), nitriles (HC≡N), alkenes (C-C), aromatic (C-O), amine (N-H), and alkyl halides (C-Br). Data from the XRD confirmed that the synthesis occurred from the polychaete extract and was not a contaminant from the environment. The antibacterial assessment demonstrated positive results by inhibiting the bacterial growth, compared with commercial AgNPs. At 6 hours, about 90% of the bacteria growth was inhibited by the AgNPs. This study shows that polychaete has the potential in developing AgNPs with antibacterial properties, in addition to its current application as fish baits.

Keywords*: *AgNPs, Antibacterial Activity, Nanobiotechnology, Polychaete, Silver Nanoparticles