



Ajit Kumar Bishoyi

*School of Pharmaceutical Sciences
Siksha 'O' Anusandhan Deemed to be
University, Bhubaneswar*

Project Title

Bio-synthesis of silver nanoparticles with the brackish water blue-green alga *Oscillatoria princeps* and antibacterial assessment.

Objective

The assessment of In-vitro antibacterial activity of synthesized AgNPs using cyanobacterial extract against multidrug-resistant (MDR) and Methicillin-resistant staphylococcus aureus (MRSA) bacteria.

Method

Field water samples were collected from the Bhabakundaleswar sea mouth, an aquatic biodiversity-rich area in Puri district, East coast of Odisha state (Latitude 19.6851°N, Longitude 85.5165° E). The collection sample were isolation for unialgal culture and submit the sequence data to the National Center for Biotechnology Information (NCBI) for confirmation the particular species. The axenic culture was inoculated CHU#10 medium for a production of a requisite amount of algal biomass. The growth of cyanobacterium *Oscillatoria princeps* was filtered in Whatman No.1 filter paper and grounding in to mortar and pestle. The Cyanobacterium extract powder were synthesized 1mM silver nitrate (AgNO₃) solution. For the green synthesis confirmation, the solution colour changes from pale green to deep brown. After biosynthesis of OP-AgNPs was done by different characterization for the confirmation, such as Uv-vis spectroscopy, scanning electron microscopy-Energy dispersive X-ray (SEM-EDX), dynamic light scattering analysis (DLS), X-ray diffraction (XRD) and Fourier transform infrared spectroscopy (FTIR). The antibacterial activity followed by the agar well diffusion methods. In these methods prepared the Muller-hinton agar (MHA) and broth (MHB) media for bacterial growth. The MHA medium was prepared and poured the petri plate, after few minutes solidify the agar medium.

Uniformly, the cultures were spreading on culture media with the help of sterile swab sticks. Approximately 7mm diameter agar well was made on the agar plate help of sterilized cork borer. After that the synthesized samples were poured and incubated 37° C for 18-24 hrs. Then the zone of inhibition (ZOI) was measured on the measuring scale and the values were expressed in millimeters (mm). For the minimum inhibition concentration (MIC) study, the using of the 96 microplates. These processes defined as the inhibits the growth of the particular microorganism. The microplate was using the bacterial culture with MHB media, the synthesized products and incubated in the BOD incubator at 37° C for 18-24 hrs. Triphenyl tetrazolium chloride (TTC) was using as the color pigment dye.

Outcome

1. The cyanobacteria have rich sources of the bioactive compounds against antimicrobial activity and therapeutic approaches.
2. Antibacterial activities of the synthesized AgNPs had remarkable control against MRSA and MDR bacteria.
3. The green synthesized OP-AgNPs could be utilized as druggable antibacterial agents in the future.

Conclusion

From a local brackish water, a sea mouth, *Oscillatoria* sp. was isolated in a field sample and this species was ascertained as *O. princeps* being confirmed by the molecular technique. The morphometry was confirmed by SEM and the synthesis and characterization of O.p-AgNPs were confirmed as XRD spectral pattern with an excessive Θ value of AgNPs. From the SEM micrograph and the SEM-EDX picture obtained from the synthesized product the size range was 3.30-17.97 nm. The FT-IR range was 3272.61 cm^{-1} as (O-H str.), which corroborates sizes of AgNPs, study the literature. A remarkable inhibitory activity of O.p-AgNPs were recorded with MDR strains of pathogenic bacteria like MRSA, *S. pyogenes* and *E. coli*, isolated from clinical samples. Thus, it could be stated that O.p-AgNPs had controlling capacity in-vitro on the isolated Gram-positive and -negative bacteria.

Implementation

1. The cyanobacteria are producing large amount of oxygen, which are benefit the environment and it is also cost effective and ecofriendly.
2. Some cyanobacteria are rich sources of protein like *Spirulina* species. It is used as a tablets/capsules.
3. The green synthesized product (OP-AgNPs) is used as antibacterial agent against human pathogenic bacteria (MRSA and MDR bacteria).