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Abstract

Biosynthesis and Physicochemical Characterization of Protein Nanoparticles Containing Silver Using *Bifidobacterium breve*

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Abstract

Background and Aim: Biological and microbial synthesis processes offer a safe, cost-effective, and environmentally friendly alternative to physical and chemical methods, especially for silver nanoparticles. Probiotics, such as *Bifidobacterium breve*, prevent inflammatory bowel disease. Albumin, a key water-soluble protein, has medical applications, and albumin nanoparticles synthesized in this study show potential for minimizing drug side effects and improving drug stability in therapy.

Materials and methods: Probiotic bacterium *Bifidobacterium breve* was cultured in MRS Broth culture medium, and after obtaining a single colony, the bacterium was cultured in MRS Broth liquid culture medium, then, centrifuged, the supernatant was filtered and silver nitrate was added. Silver nanoparticles are then synthesized. Albumin protein was used to synthesize protein nanoparticles. A solution of albumin protein and distilled water was prepared and synthesized silver nanoparticles were added, 25% glutaraldehyde was added, acetone and ethanol were added, then albumin protein nanoparticles were synthesized, placed in an oven for XRD and FTIR, TEM, SEM and DLS are prepared.

Results: Albumin and silver protein nanoparticles have spherical, crystalline, semi-crystalline and cubic morphology and structure. Silver albumin protein nanoparticles have O-H, N-H and C-H bonds, C = C bonds in aromatic rings and C-N bonds in amino compounds. Silver nanoparticles have OH bonds, CH bonds in CH₂ and CH₃ groups, NH bonds, CO bonds in the structure of COc and C-OH functional groups.

Conclusion: The synthesis involves creating albumin protein nanoparticles incorporating silver nanoparticles with a suitable structure and properties. These protein nanoparticles can also be utilized for treatment.

Keywords: *Biosynthesis, Protein nanoparticles, Silver, Bifidobacterium breve*

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