Biosynthesis of silver nanoparticles using plant extracts as reducing/capping agents

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Background: Searching for and developing of non-toxic, clean and eco-friendly methods for synthesis of nanoparticles (NPs), intended for medical application, is a scientific topic permanently attracting attention due to the great impact of biomedical applications in tissue engineering, bioanalytical diagnostics, cancer therapy and new drug delivery systems. A variety of physical, chemical or hybrid methods for synthesis of metal NPs exist, but in general, they are toxic, expensive, with low yield and with limitations for use in medicine (e.g. contamination from precursors, etc.).

The aim of the presented study is to design "green" method for synthesis of AgNPs compatible for pharmaceutical formulation, by using capping agent(s) from natural source. Plant extracts are rich in enzymes and variety of phytochemicals that can reduce metal (silver) salts. Since many plant species are well-known, and have wide spread traditional use, there is a perspective for new, non-traditional uses because of the already reported antioxidative, antibacterial, antifungal activity, etc. Plant extracts with antioxidative properties are also suitable to be incorporated into or be deposited on the surface of AgNPs, while at the same time serving as a reagent for NPs synthesis.

Materials and methods: We used plant extracts for biosynthesis of AgNPs. Briefly, silver nitrate solution was mixed with previously prepared plant extract and incubated for one hour. During this time, silver was reduced by plant extract components, thus forming silver nanoparticles, resulting in change of colour of the silver nitrate solution (Fig.1). In the further examination, characterization of NPs will follow, including particle size distribution, zeta-potential measurement, Scanning Electron Microscopy, but also UV spectrophotometry and FTIR spectral investigation.

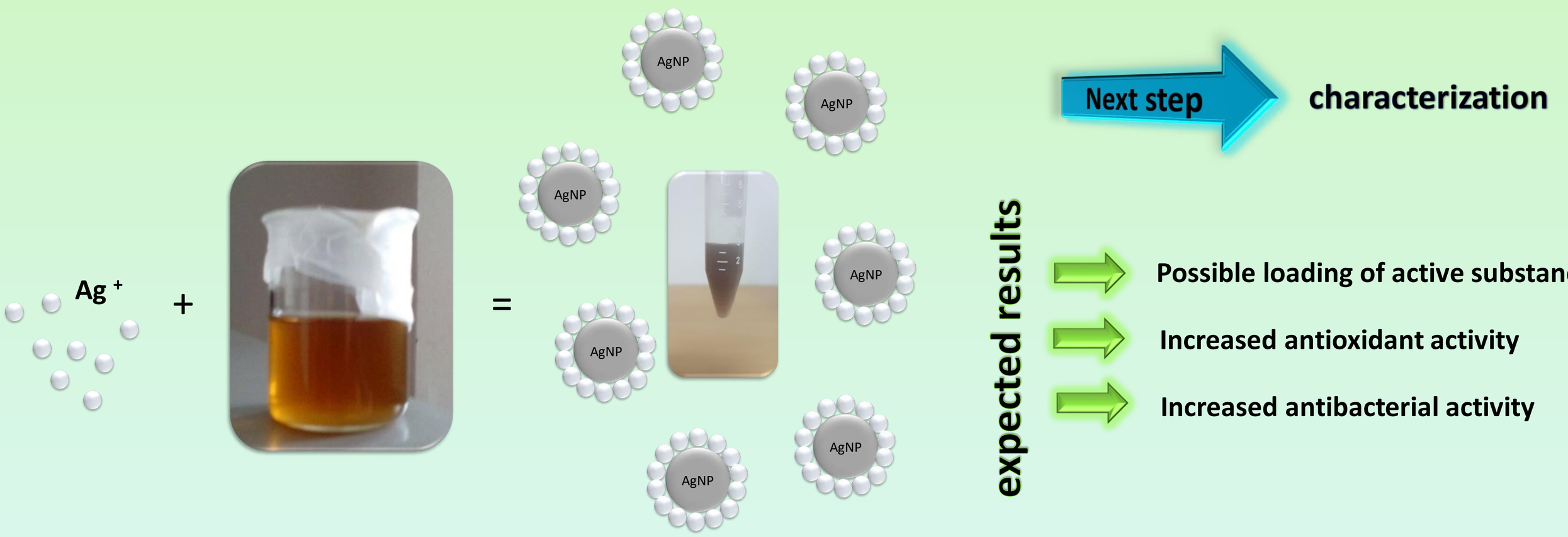

Fig. 1: Diagram of biosynthesis of AgNPs using plant extracts.

CONCLUSION

Considering the controversies that follow AgNPs and nanoparticles in general on one hand, and the possibilities that nanotechnology has to offer on the other, further investigations have to be undertaken in order to characterize the NPs synthesized in this manner. These, hopefully encouraging results have to be confirmed both *in vitro* and *in vivo* in order to assess the possible synergistic effects of AgNPs and antioxidative compounds with plant origin.