Lactoperoxidase immobilization on silver nanoparticles enhances its antimicrobial activity

Ishfaq Ahmad Sheikh[1,*], Muhammad Yasir[1], Imran Khan[1], Sher Bahadur Khan[2], Naveed Azum[2], Essam Hussain Jiffri[3], Mohammad Amjad Kamal[1], Ghulam MD. Ashraf[1], Mohd Amin Beg[1]

[1] King Fahd Medical Research Center, King Abdulaziz University, Jeddah, Kingdom of Saudi Arabia.

[2] Department of Chemistry, Faculty of Science, and [‡]Center of Excellence for Advanced Materials Research, King Abdulaziz University, Jeddah, Kingdom of Saudi Arabia

[3] Faculty of Applied Medical Sciences, King Abdulaziz University, Jeddah, Kingdom of Saudi Arabia.

Short Title: Lactoperoxidase immobilization on silver nanoparticles

*Corresponding author: Ishfaq Ahmad Sheikh
King Fahd Medical Research Center, King Abdulaziz University, Jeddah, Kingdom of Saudi Arabia. Tel: +966-532972254
E-mail: iasheikh@kau.edu.sa

ABSTRACT

Lactoperoxidase (LPO) is an antimicrobial protein present in milk that plays an important role in natural defence mechanisms during the neonatal and adult life. The antimicrobial activity of LPO has been commercially adapted for increasing the shelf life of dairy products. Immobilization of LPO on silver nanoparticles (AgNPs) is a promising way to enhance the antimicrobial activity of LPO. In the current study, LPO was immobilized on AgNPs to form LPO/AgNP conjugate. The immobilized LPO/AgNP conjugate was characterized by various biophysical techniques. The enhanced antibacterial activity of the conjugated was tested against *E. coli* in culture at 2 hr intervals for 10 hrs. The results showed successful synthesis of spherical AgNPs. LPO was immobilized on AgNPs with agglomerate sizes averaging approximately 50 nm. The immobilized conjugate exhibited stronger antibacterial activity against *E. coli* in comparison to free LPO. This study may help in increasing the efficiency of lactoperoxidase system.

Practical application

This study will be helpful in identifying novel avenues to enhance the stability and antimicrobial function of LPO system in dairy and other industries.