

Antibacterial activity of Cellulose-Chitosan Composite incorporated with Silver nanoparticles

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Abstract: A novel biocomposite material was prepared using cellulose-chitosan by employing regenerative technique. Silver nanoparticles also incorporated in this composite. The antibacterial activity of cellulose-chitosan composite incorporated with silver nanoparticles (C-Ch-Ag) was evaluated against some Gram-positive and Gram-negative bacteria.

Keywords: Cellulose:Chitosan:Silver nanoparticles: Antimicrobial activity.

1. Introduction:

A novel biocomposite material was prepared using cellulose-chitosan by employing regenerative technique. Silver nanoparticles also incorporated in this composite, its antibacterial activity was evaluated against some Gram-positive organisms include *Staphylococcus aureus*, the gram negative organisms include *Escherichia coli* and *Pseudomonas aeruginosa*. Chitosan¹ and silver nanoparticles² posses potent antimicrobial activity against various pathogens individually. The present study has been undertaken to ascertain the antibacterial activity of this biocomposite.

2. Materials and Methods.

2.1 Preparation of biocomposite material.

Cellulose was dissolved in NaOH- Thiourea solution according to a novel method and 2% chitosan solution was poured to this dissolving agent. Finally add 10µg/ml silver nanoparticle to this composite. Then the dried samples were cut like as antibiotic disc.

2.2 Antimicrobial activity

Antimicrobial activity was tested using various microorganisms with Gentamycin (10 µg/ml) as standard (Table-1) by cup plate agar diffusion method^[3-5]. The organisms selected for antimicrobial activity were *Staphylococcus aureus*, *Escherichia coli* and *Pseudomonas aeruginosa*. The plates were incubated at 37°C for 24 hr. and the diameter of zone of inhibition was measured.

Table. 1. Antimicrobial activity of C-Ch-Ag Biocomposite

S. N.	Name of the microorganism	Gentamycin (mm)	C-Ch-Ag Biocomposite (mm)
1.	<i>Staphylococcus aureus</i> ,	18	20
2.	<i>Escherichia coli</i>	15	17
3.	<i>Pseudomonas aeruginosa</i>	22	25

*Values are means of three replications.

Results and Discussions

The C-Ch-Ag biocomposite exhibited strong activity against various bacteria studied (Table. 1) and the zone of inhibition was comparable with the standard drug. Chitosan¹ and silver nanoparticles² have been reported to possess potent antimicrobial activity individually. Since the C-Ch-Ag biocomposite also possesses the antibacterial activity. The different mechanisms proposed to explain C-Ch-Ag biocomposite's antimicrobial activity include inhibition of extracellular microbial enzymes, deprivation of the substrates required for microbial growth or direct action on microbial metabolism through inhibition of oxidative phosphorylation. A further mechanism involving iron deprivation is

proposed. But further studies are required to assay the exact mechanism of action.

Conclusions:

Based on these results it is possible to conclude that C-Ch-Ag biocomposite has promising antimicrobial activity. In future this biocomposite can be used as a wound dressing material on experimental animals.

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