FORMULATION AND ANTIBACTERIAL ACTIVITY OF SILVER NANOPARTICLE HYDROGELS

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تفويض

أنّى الطالبة اماني عادل عمر الولود، كلية الصيدلة، افصِّل جامعة الإسراء بتزويد نسخ من رساليتي ورقياً وإلكترونياً للمكتبات أو المنظمات أو الهيئات والمؤسسات المعنية بالأبحاث والدراسات العلمية عند طلبي.

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DEDICATION

This thesis is dedicated to the soul of my father Brigadier General Adel Al-Aroud, to my beloved family, my mother and mother in law who have never failed to give reasons to be proud being their daughter, and also to my husband for his constant unconditional support, to my children Tareq and Joury whom I owe every bit of success I have ever achieved. My sisters and brothers, to my friend Suhad for her understanding and help all the way, to Fahmi, Mai and Nariman for the funny times we spent when we felt tired of working. I also dedicate this thesis to my friends all over the place for the happy and hard times we went through together during master’s journey.
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<th>Description</th>
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<tbody>
<tr>
<td>AgNPs</td>
<td>Silver Nanoparticles.</td>
</tr>
<tr>
<td>UV-vis</td>
<td>Ultra violet –visible spectroscopy</td>
</tr>
<tr>
<td>XRD</td>
<td>X-ray diffractometry</td>
</tr>
<tr>
<td>FTIR</td>
<td>Fourier transform infrared spectroscopy</td>
</tr>
<tr>
<td>XPS</td>
<td>spectroscopy of photoelectron emitted by X-ray</td>
</tr>
<tr>
<td>DLS</td>
<td>dynamic light scattering</td>
</tr>
<tr>
<td>SEM</td>
<td>scanning electron microscopy</td>
</tr>
<tr>
<td>TEM</td>
<td>transmission electron microscopy</td>
</tr>
<tr>
<td>AFM</td>
<td>atomic force microscopy</td>
</tr>
<tr>
<td>SPR</td>
<td>Surface Plasmon Resonance</td>
</tr>
<tr>
<td>LSPR</td>
<td>localized Surface Plasmon Resonance peaks</td>
</tr>
<tr>
<td>ATCC</td>
<td>American Type Culture Collection</td>
</tr>
<tr>
<td>TSA</td>
<td>Tryptic soy agar</td>
</tr>
<tr>
<td>TSB</td>
<td>Tryptic soy broth</td>
</tr>
<tr>
<td>HPMC</td>
<td>hydroxypropyl methyl cellulose</td>
</tr>
<tr>
<td>PDI</td>
<td>Polydispersity Index</td>
</tr>
<tr>
<td>Z-average</td>
<td>average hydrodynamic size</td>
</tr>
<tr>
<td>PVP</td>
<td>Polyvinylpyrrolidone</td>
</tr>
<tr>
<td>BSA</td>
<td>Bovine serum albumin</td>
</tr>
<tr>
<td>PH</td>
<td>Potency of hydrogen</td>
</tr>
<tr>
<td>HPMC</td>
<td>Hydroxyl propyl methyl cellulose polymer</td>
</tr>
<tr>
<td>SD</td>
<td>Standard deviation</td>
</tr>
<tr>
<td>NP</td>
<td>Nanoparticles</td>
</tr>
<tr>
<td>MDR</td>
<td>Multidrug resistant</td>
</tr>
<tr>
<td>E. coli</td>
<td>Escherichia coli</td>
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<tr>
<td>P. aeruginosa</td>
<td>Pseudomonas aeruginosa</td>
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<td>Staphylococcus aureus</td>
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<tr>
<td>S. epidermidis</td>
<td>Staphylococcus epidermidis</td>
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Formulation and Antibacterial Activity of Silver Nanoparticle Hydrogels

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ABSTRACT

The antibacterial activity of silver nanoparticles (AgNPs) is well documented. AgNPs have a broad spectrum activity against gram negative and gram positive bacteria. Most reports evaluated the antibacterial activity of AgNPs in suspensions and not in clinically relevant vehicles such as hydrogels. In this work we prepared a library of monodispersed AgNPs with various sizes and we described the successful incorporation of these nanoparticles into two type of hydrogels: Carbopol (represented anionic polymer) and Pluronic (represented nonionic polymer). AgNPs exhibit excellent colloidal stability in both hydrogels upon storage. However, aggregation occurred upon contact with Tryptic soy agar (bacterial growth media) for carbopol hydrogels but not for pluronic hydrogels.

AgNPs showed different antibacterial activity in both hydrogels, with a common trend supported higher activity for AgNPs with smaller size. This work highlighted the importance of considering nanoparticles size and the type of gelling agent when formulations AgNPs hydrogel which affect their colloidal stability and antibacterial activity.