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Preparation and characterization of silver sulfadiazine loaded polyvinyl alcohol hydrogels as an antibacterial wound dressing

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Abstract: In this study, we prepared a series of silver sulfadiazine (AgSD) loaded polyvinyl alcohol (PVA) hydrogels via electron beam (e-beam) irradiation. Our objective was to explore the influence of e-beam irradiation on the chemical structure and crystallinity of AgSD and the antibacterial properties of AgSD/PVA hydrogels. Prior to irradiation, we mixed AgSD in PVA solution in two forms, either suspended in water (WS) or dissolved in ammonia solution (AS). We noted that nano silver was released from AgSD/PVA-AS hydrogels immersed in deionized water, while it would not happen in AgSD/PVA-WS hydrogels. Both kinds of AgSD/PVA hydrogels exhibited good antibacterial activities against Gram-negative *Escherichia coli* (*E. coli*) and Gram-positive *Staphylococcus aureus* (*S. aureus*). And their antibacterial activity was not obviously affected by different dosages of e-beam irradiation. Moreover, the antibacterial activity of the AgSD/PVA-WS hydrogels was stronger than that of AgSD/PVA-AS. Accordingly, the cell cytotoxicity of the AgSD/PVA-WS hydrogels was higher than that of AgSD/PVA-AS. Our study results reveal that e-beam irradiation of PVA solution with dispersed AgSD is a simple and efficient way to prepare AgSD/PVA hydrogels, which might be an ideal antibacterial wound dressing.

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