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Preparation, Characterization and In Vivo Evaluation of Novel Nano- sildenafil Formulae as Potential Wound Healing Promoters

Nazik Elgindy*, Wael Samy
Department of Industrial Pharmacy, Faculty of Pharmacy,
1 Khartoom sq., Azarita, Alexandria University, Alexandria, Egypt.
d_nazik4@yahoo.com, wsamy73@yahoo.com

Asser Ghoneim
Department of Pharmacology, Toxicology & Clinical Pharmacy, Faculty of Pharmacy,
Damanhour University, Damanhour, Egypt.
Department of Pharmacology & Therapeutics, Faculty of Pharmacy,
Beirut Arab University, Beirut, Lebanon.
asser1970@yahoo.com

Extended Abstract

Healing of wounds is a challenging problem involving a dynamic well-ordered biological process. Novel biodegradable nano polymeric powdered formulations of sildenafil citrate (SC) were prepared by the spray drying technique using chitosan (drug/polymer ratio 1/2) or chitosan/gum arabic polymers (drug/polymer ratio 1/4). The spray dried powder was evaluated for its possible wound healing properties. The prepared powders were characterized physically by DSC, SEM, particle size analysis, flow properties and swelling behavior. DSC showed no interaction between SC and the used polymers while the particle size analysis revealed a reduction in chitosan particle size from 290 μm to about 3.5 μm for the prepared powders. The powders showed a relatively poor flow with an angle of repose ranging from 41 to 48^{o}. They also exhibited a high moisture uptake capacity reaching 107% for formulation prepared from CS which can be due to the reduction in particle size, increased surface area and the hollow nature of such particles as seen in the SEM pictures. Powder porosity was also increased to reach 48 and 41for formula P_1 and P_2, respectively. The inclusion of Gum Arabic in the formula caused a retardation of SC release, where after three hours only 12.3% of SC was released.

Biomedical testing of powders' wound healing acceleration was done by measuring wound area contraction of excision wounds and post-healing tensile strength (TS) measurement for incision wounds. Histological examination was performed at day 12 after the surgical procedure. Biomedical testing revealed good wound healing properties with P_1 formulation giving rise to 98.4% reduction in the wound area after 12 days compared with 83% for the control group. Incision wounds were also improved as seen from the post-surgery tensile strength tests. Both P_1 and P_2 formulations showed TS values of 5.6 and 5.4 $kg.cm^{-2}$, respectively, compared with 3.8 $kg.cm^{-2}$ for the control group. Histological examinations supported the conclusion that the combination of chitosan and sildenafil could be a promising wound healing promoter with good epithelialization and collagen remodeling.