Poster No. 74

A break in the epithelial integrity of the skin with disruption of the structure and function of underlying normal tissue is referred as wound. Current healing therapy hinders the process of wound healing. Variety of wound dressings are available in market targeting different aspects of the healing process. Silver being the powerful antiseptic is available naturally and chitosan being biocompatible, biodegradable, hemostatic, anti-infectional wound healing accelerator provoke intensive research interest in this area. The current research is focused to augment the wound healing activity of chitosan and broad anti-bacterial activity of silver nanoparticles. In the present research, synthesis of Silver nano particle impregnated film (SNPF) was done in two steps. Firstly, silver oxide nanoparticles were prepared by chemical method using citrate reduction of silver nitrate. Nanoparticles were characterized using dynamic light scattering (DLS) method followed by incorporation of 2% chitosan solution into it. The developed Nano formulation was converted to film with chitosan as film forming agent. Antibacterial efficacy of these SNPF was assessed using Gram-negative (*E.coli)* bacterial studies. SNPF were evaluated for their mechanical properties like tensile strength, percentage elongation, swelling behaviour, water vapour transmission rate (WVTR). Developed SNPF will be further optimized for evaluating its antibacterial property. It can be concluded that SNPF is highly promising wound healing agent warranting further studies.

Development of Chitosan-Nano Silver Oxide Wound Healing Film

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Introduction

- Naturally derived materials are being widely used because of its similarities to the extracellular matrix. Typically good bio-characteristics, Inherent cellular interaction, Easily engineered and surface modified to provide an optimal microenvironment for better cell adhesion and tissue growth.
- Chitosan is being used as a wound-healing accelerator because It enhances the functions of inflammatory cells such as Polymorpho Nuclear leukocytes (PMN) (phagocytosis, production of osteopontin and leukotriene B4), Macrophages (phagocytosis, production of interleukin (IL-1), transforming growth factor ß1 and platelet derived growth factor), Fibroblasts (production of IL-8). As a result, chitosan promotes granulation and organization, therefore chitosan is beneficial for the large open wounds.
- Conventional dry gauze dressings soak up that vital fluid hence the wound will lack the growth factors and enzymes required for healing. The continuous oozing of exudates from the wounded region will prevent the proper and complete adherence of ointments, creams or powders in the wounded region. Further, removing the gauze during dressing changes causes continual reinjury that slows the process significantly.
- In modern-day 21st century, large part of wound care is wound treatment which include Promoting healing Preventing infections, Getting rid of an already existing infection. Newer Dosage Forms such as film, Gels preserve and protect a moist environment in the wound area. However, moist and occlusive dressings provide the best possible means to protect the vital fluid, maintain direct contact with the wound, improves patient compliance.

Properties of Ideal Wound Dressing

- It should create moist environment at the wound site.
- Enables gaseous exchange.
- Protects the wound from secondary infection.
- Allows ongoing assessment.
- Provides a barrier to pathogens.
- Comfortable and adaptable.
- Should be cost-effective.
- Should be removed without causing trauma.
- Must be effective and fast acting.

Experimental Protocol

Results

1T – NP(A01)

Particle Size Analysis	
Particle size (d.nm)	92.20 nm
PDI	0.273

Mechanical Property	
Thickness	0.039 mm
Tensile Strength	1108.15 N/cm^2

Swelling Study		
Time Duration	Weight (mg)	% Swelling
Initial Wt.	8.7 mg	-
After 2 Hr	16.90 mg	94.25%
After 3 Hr	20.80 g	139.08%
After 4 Hr	21.10 g	142.53%

Water Vapour Transmission Rate (WVTR)

Container type	HDPE bottle
Diameter	2.5 cm
Surface Area	0.000491 m^2
Wt. of empty bottle	11.59 g

Time Duration	Initial	After 24 Hrs.	After 21days
Temperature	29°C	30°C	30°C
% RH	43%	40%	40%
Final wt. of bottle	31.91 g	30.94 g	20.29 g
Wt. loss	--	0.97 g	11.62 g
WVTR	--	1979.59 gm.m^{-2} d^{-1}	1129.07 gm.m^{-2} d^{-1}

2T – NP(A01)

Particle Size Analysis	
Particle size (d.nm)	454.50 nm
PDI	0.705

Mechanical Property	
Thickness	0.041 mm
Tensile Strength	290.41 N/cm^2

Swelling Study		
Time Duration	Weight (mg)	% Swelling
Initial Wt.	8.3 mg	-
After 2 Hr	15.40 mg	85.54%
After 3 Hr	16.90 g	103.61%
After 4 Hr	17.1 g	106.02%

Water Vapour Transmission Rate (WVTR)

Container type	HDPE bottle
Diameter	2.5 cm
Surface Area	0.000491 m^2
Wt. of empty bottle	11.59 g

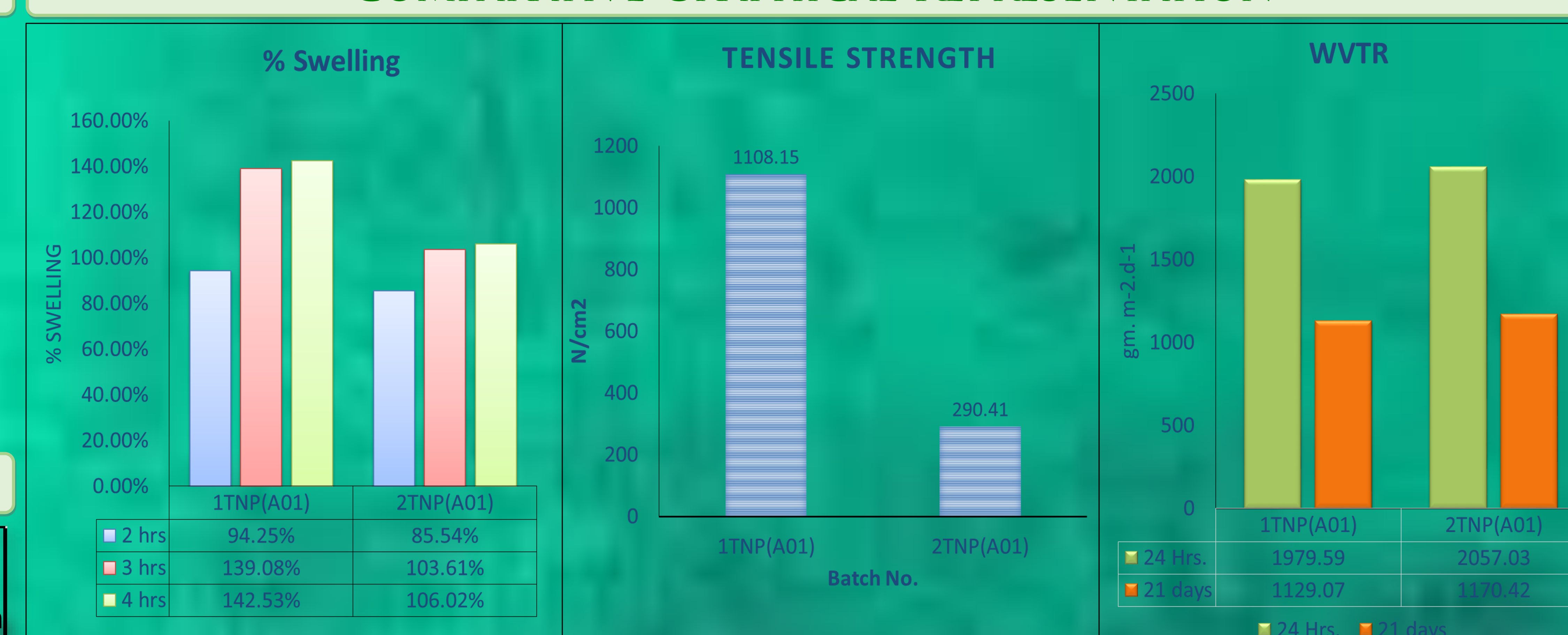
Time Duration	Initial	After 24 Hrs.	After 21days
Temperature	29°C	30°C	30°C
% RH	43%	40%	40%
Final wt. of bottle	31.91 g	30.93 g	19.87 g
Wt. loss	--	1.01 g	12.07 g
WVTR	--	2057.03 gm.m^{-2} d^{-1}	1170.42 gm.m^{-2} d^{-1}

Particle Size Analysis by DLS

In-vitro Antimicrobial Assay

Sample No.	Sample Name	Zone of Inhibition (cm)		Average zone of Inhibition (cm)	% inhibition
1	Chitosan Solution	2.6	2.7	2.65	29.44
2	Chitosan Film	1.5	1.5	1.5	16.67
3	AgNP Reaction Mixture	1.7	1.7	1.7	18.89
4	AgNP + Chitosan film	3.3	3.5	3.4	37.78
Blank	Control	0	0	0	0.00

Comparative Graphical Representation



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