

# Lasers in Medicine

Official Journal of Iranian Center for Medical Laser (ICML)  
Academic Center for Education, Culture and Research (ACECR)

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Laser in Medicine is a peer-reviewed open access medical journal. It was established the leading national pulication in the expanding field of the Medical application of Lasers and Lights. It provides a forum of papers on technical, experimental and clinical aspects of the medical Lasers applications. Furthermore, the journal publishes the articles on Lasers, Light delivery systems, sensor to monitor Laser effects, basic Laser-tissue interactions and modeling of Laser-tissue interactions. All other authors are cordially invited to submit their relevant studies on Lasers or any other light tissue interactions to the journals of the Lasers in Medicine. The journal of Lasers in Medicine provides an online platform for the high quality academic manuscripts, making the JLM an important academic journal in the field of Lasers and Light therapies.

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3<sup>rd</sup> International and 5<sup>th</sup> National Congress of  
**Wound and Tissue Repair**

Held by Medical Laser Research Center, ACECR

سومین کنفرانس بین المللی و پنجمین کنفرانس ملی  
زخم و ترمیم بافت

۴ تا ۶ مهرماه ۱۳۹۷  
تهران مرکز همایش های رازی  
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محو رهای کنگره:

پوست ، طب داخلی ، جراحی  
تکنولوژی های نوین در تشخیص ،  
پیشگیری ، درمان  
مهندسی بافت ، طب بازساختی ،  
نانوتکنولوژی  
علوم پایه ، سلولی - ملکولی  
توانبخشی و پرستاری

Sept, 26-28<sup>th</sup> 2018

Razi Hall, Iran University of Medical Sciences,  
Tehran, Iran

Scientific Secretariat: +98 21 66494649  
Executive Secretariat: +98 21 44412437

The Contents:

Dermatology, Internal  
Medicine, Surgery

New Technologies,  
(Diagnosis, Prevention,  
Treatment)

Tissue Engineering,  
Regenerative Medicine,  
NanoTechnology

Basic Sciences,  
Cellular - Molecular Sciences

Rehabilitation and Nursing



دبیرخانه علمی: ۰۲۱ ۴۴۴۹۴۴۴۹  
دبیرخانه اجرایی: ۰۲۱ ۴۴۴۱۲۴۳۷

پژوهشکده فن آوری های زخم  
و ترمیم بافت بهاد دانشکده



مرکز تحقیقات لیزر در پزشکی  
جهاد دانشگاهی واحد علوم پزشکی تهران



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# Lasers in Medicine

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## Contents

<b>Message of Congress President</b> .....	<b>1</b>
Seyed Mehdi Tabaie	
<b>Message of Scientific Chair in Clinical Sciences</b> .....	<b>2</b>
Parvin Mansouri	
<b>Message of Scientific Chair in Basic Sciences</b> .....	<b>3</b>
Mansour Jamali Zavareh	
<b>Message of Executive Chair</b> .....	<b>4</b>
Mohsen Fateh	
<b>Congress Scientific Policy Council</b> .....	<b>5</b>
<b>Congress Scientific Committee</b> .....	<b>6</b>
<b>Congress Executive Committee</b> .....	<b>8</b>
<b>Congress Scientific Program</b> .....	<b>9</b>
<b>Oral Presentation</b> .....	<b>15</b>
<b>Poster Presentation</b> .....	<b>45</b>



**Dr. Seyed Mehdi Tabaie**

President of 3<sup>rd</sup> International and 5<sup>th</sup>  
National Congress of Wound and Tissue Repair

**In the name of God**

**With the greeting to the professors, colleagues and students in the wound and tissue repair field**

**I am proud to invite you to the 3<sup>rd</sup> international congress and the 5<sup>th</sup> national congress of wound healing and tissue repair.**

**This congress will be held by the aim of enhancing the therapeutic services in the wound healing and tissue repair. It will be for 3 days from 26 - 28<sup>th</sup> of the September 2018 in Razi Conference Hall.**

**This congress seems to be a great opportunity to exchange knowledge and experience in all areas of wound healing and tissue repair, especially in clinical and basic sciences fields that are currently facing lots of challenges.**

**It is hoped that, with the participation of clinicians and active scientists, the exchange of ideas and thoughts practical solutions to the challenges and problems would be provided and achievements would be brought to the public health.**

**My colleagues in the scientific and executive committees of the congress and I hope that the participation of national and international lecturers and experts, holding workshops and the organizing of the exhibition, provide the basic knowledge for the interested learners. We are looking forward to your active participation in the upcoming congress.**



**Dr. Parvin Mansouri**

Scientific Chair in Clinical Sciences of 3<sup>rd</sup> International and 5<sup>th</sup> National Congress of Wound and Tissue Repair

**Dear Colleagues;**

**It's my deep pleasure to invite you participate in the 3<sup>rd</sup> international and 5<sup>th</sup> National congress of Wound and Tissue Repair, organized by Academic Center for Education, Culture and Research the branch of Tehran University of Medical Sciences (ACECR\_TUMS).**

**Three days interactive, stimulating discussion and scientific presentations on main highlighted categories are scheduled at the congress as: "Dermatology, internal medicine, surgery", "New technologies for diagnosis, prevention and treatment", "Tissue engineering, regenerative medicine and Nano technology", "Basic sciences, cellular - molecular sciences", "Rehabilitation and nursing".**

**Sharing latest research findings and clinical information on wound and repair related issues can be a unique chance for healthcare professionals and scientists and a help to establish different learning approach using evidence based practice for better results.**

**I am really honored and humbled to welcome you in such an important scientific event. The 3<sup>rd</sup> international and 5<sup>th</sup> National congress of Wound and Tissue Repair held in Tehran at .... 2018, Razi Conference Hall, Tehran, Iran.**

**We do our best to hold a scientific platform to enhance everyday skin and wound practice for healthcare professionals influencing patient care.**



**Dr. Mansour Jamali Zavareh**

Scientific Chair in Basic Sciences of 3<sup>rd</sup> International and 5<sup>th</sup> National Congress of Wound and Tissue Repair

**It is my great pleasure to invite you to the 3<sup>th</sup> international congress in wound healing and tissue repair (WTRC) here in Tehran, IRAN on September 26-28<sup>th</sup>, 2018.**

**Our unique congress is led by a group of experienced scientists and clinicians interested in communicating new approaches to the wound healing and repair of tissues throughout the human body.**

**As you all know, the evolution of medicine and medical technology in wound healing and tissue repair hinges on the successful translation of basic science research from the bench to clinical implementation at the bedside. Therefore, this congress will focus on moving basic science discovery into patient care, from our presentations that extend from molecular and cellular biology to clinical development.**

**I would like to cordially invite you all to this international research festival and also I hope that this upcoming 2018 WTRC congress will be a memorable event to your research career.**

**Sincerely,**



### **Dr. Mohsen Fateh**

Executive Chair of 3<sup>rd</sup> International and 5<sup>th</sup> National Congress of Wound and Tissue Repair

**Wound healing and tissue repair are one of the serious issues in the health and therapeutic fields. Delay in a wound or tissue damage healing, impose lots of cost for the healthcare community and people economy.**

**This heavy burden, affects not only on the patients, but also on their family, community and organizations responsible in providing health services.**

**Due to the changing lifestyle of community, population increased rate and changing the pattern of diseases, problems related to chronic ulcers shows a growing trend. Accordingly, YARA institute as a leading institution in the field of planning and developing strategies on promoting health of community and ACECR's Medical Laser Research Center have held the annual congresses of WTR (Wound and Tissue Repair) with the goal of creating a good opportunity for cooperation of active people in the wound healing and tissue repair field and also to present the latest achievements in this field. The upcoming congress is 5<sup>th</sup> national and 3<sup>rd</sup> international congress will be held at 26-28 September 2018 in Razi international conference hall, Tehran, Iran.**

**The target groups of the congress are clinical and basic science specialists, students of medical, paramedical, Nursing and Basic Sciences who are interested in the field of treatment of tissue damage.**

**Beside the scientific lectures, it will be established various scientific and commercial sections including poster presentation, some workshops, pavilions of publishers, organizations, manufacturers and Medical Equipment exhibition.**

**We hope your participation enrich the congress.**

### WTR Congress Scientific Policy Council



Dr. Siamak Bashardoust Tajali



Dr. Kamran Ferdowsi



Dr. Reza Hosseinzadeh



Dr. Gholamreza Esmaeeli Djavid



Dr. Khatereh Khorsandi



Dr. Majid Pornour



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Zirak Saz

**3<sup>rd</sup> International and 5<sup>th</sup> National Congress of Wound Healing and Tissue Repair**

**Wednesday, September 26, 2018 (8:00 – 10:30)**

Recitation of the Holy Quran, Opening Session	8:00 – 8:30
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**Panel I: Dermatology and Internal Medicine in Wound Care 1**

Chairpersons	Seyed Mehdi Tabaie, Parvin Mansouri, Mansour Jamali Zavareh, Mohammad Ali Nilforoushzadeh	
Nasrin Zand	Evaluating the Effects of Non-Thermal CO2 Laser Therapy (NTCLT) on Promoting Wound Healing of Recurrent Oral Aphthous Ulcers: A Pilot Study	8:30 – 8:45
Farzad Pakdel	The use of Stromal Vascular Fraction in Oculo-Facial Regeneration and Reconstruction	8:45 – 9:00
Nooshafarin Kazemikhoo	Effect of Low Level Laser Therapy on the Healing Process of Donor Site in Patients with Grade 3 Burn Ulcer after Skin Graft Surgery (A Randomized Clinical Trial)	9:00 – 9:10
Afshin Fathi	The Role of Botulinum Toxin Type A in Treatment of Hypertrophic Scar Symptoms	9:10 – 9:20
Gholamreza Esmaeeli Djavid	Collagen Matrix Dressing on Neuropathic Diabetic Foot Ulcer	9:20 – 9:30

**Panel II: New Approaches in Wound Care**

Chairpersons	Gholamreza Esmaeeli Djavid, Majid Pornour, Mojgan Sheikhpour	
Soheila Kordestani	HealApp: A Powerful Application For Cognition And Continuous Wound Care	9:30 – 9:45
Maryam Esmaeili	Effects of Pressure Ulcer Classification System Education Program on Visual Differential Diagnostic Ability of Pressure Ulcer Classification in Critical Care Units	9:45 – 10:00
Mojgan Sheikhpour	Optimization of Cell proliferation and Repair with the Help of Microcarrier Based Cell Culture Technology	10:00 – 10:15
Hamed Alizadeh Ghazijahani	Wound Tissue Type Classification Using Deep Neural Network	10:15 – 10:30

Break and Poster Presentation	10:30 – 11:00
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**Wednesday, September 26, 2018 (11:00 – 13:00)**

**Panel III: Wound Management**

Chairpersons	Parvin Mansouri, Leila Ataie Fashtami, Aldo Morrone, Nazif Ullah	
Parvin Mansouri	Platelet Rich Plasma (PRP): New Insights in Dermatology	11:00 – 11:20
Aldo Morrone	Diabetic Wounds Management	11:20 – 11:40
Nazif Ullah	Anti-Leishmanial Potentials of Euphorbia Wallichii Root Extracts and Their Effects on Membrane Permeability and Apoptosis	11:40 – 12:00

Plenary Talks I: Diabetes and Wound Healing		
Moderator	Bagher Larijani <i>Professor of Endocrinology, Tehran University of Medical Sciences</i>	
Mohammad Reza Mohajeri Tehrani	<i>Professor of Endocrinology, Tehran University of Medical Sciences, Tehran, Iran</i>	12:00 – 13:00
Behnam Molavi	<i>Professor of Vascular Surgery, Tehran University of Medical Sciences, Tehran, Iran</i>	
Mahlsha Kazemi	<i>Assistant Professor of Orthopedic, Tehran University of Medical Sciences, Tehran, Iran</i>	
Parvin Mansouri	<i>Professor of Dermatology, Tehran University of Medical Sciences, Tehran, Iran</i>	
Mohammad Reza Amini	<i>PhD Candidate, Tehran University of Medical Sciences, Tehran, Iran</i>	
Mahnaz Sanjari	<i>Assistant Professor of Orthopedic, Tehran University of Medical Sciences, Tehran, Iran</i>	
Maryam Aalaa	<i>PhD Candidate of Medical Education, Iran University of Medical Sciences, Tehran, Iran</i>	

Pray & Lunch	13:00 – 14:00
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<b>Wednesday, September 26, 2018 (14:00 – 15:30)</b>
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Panel IV: Nursing and Complementary Medicine		
Chairpersons	Hesamodin Allameh, Kourosh Jafarian, Laila Shirbeigi	
Atefe Sadat Bandbon Balanga	Evaluation of Mechanical and Antibacterial Properties of Wound Dressing Based on Chitozan and Platanus Oriental Leaves	14:00 – 14:10
Fatemeh Kheiry	Prevalence of Diabetic Foot Ulcer and Comparison of Two Methods of Ozone Therapy with Simple Dressing and Dressing in Patients Referred to Wound Clinic in Bandar Abbas 2017-2018	14:10 – 14:20
Mansour Kalantar	Investigating Healing Effects of Aloe Vera Extract and Mesquite Pod Fruit Extract on Skin Lesions in Rats	14:20 – 14:30
Zahra Akbari	Investigation On The Effect of AFA Extract On Excisional Wound Healing in Adult Male Rats	14:30 – 14:40
Niloofer Farokhnia	Gallic Acid Wound Healing Effects in Rat Burn Model	14:40 – 14:50
Azam Malekian	Using Maggot Debridement Therapy to Remove Main Bacteria Species from Diabetic Foot Ulcers in Tehran, Northern Iran	14:50 – 15:00
Farahnaz Heshmat	Application of Complementary Medicine to Improve the Process of Postpartum Episiotomy Wound Healing	15:00 – 15:10
Questions and Answers		15:10 – 15:30

Workshop I: Maggot Debridement Therapy		
Instructors	Gholamreza Esmaceli Djauid, Azam Malekian	15:30 – 17:30

**3<sup>rd</sup> International and 5<sup>th</sup> National Congress of Wound Healing and Tissue Repair**

**Thursday, September 27, 2018 (8:30 – 10:30)**

**Panel V: Dermatology and Internal Medicine in Wound Care 2**

<b>Chairpersons</b>	Seyed Mehdi Tabaie, Zahra Azizian, Behzad Imani	
Zahra Azizian	New Approach to Prevent Hypertrophic Scar	8:30 – 8:45
Behzad Imani	To Compare Effect of Hydrocolloid Dressing and 1% Silver Sulfadiazine Dressing on Burn Improve Wounds in Patients with Second-Degree Burn	8:45 – 9:00
Shahram Teimourian	Treatment of 100 Chronic Thalassemic Leg Wounds by Plasma-Rich Platelets	9:00 – 9:10
Seyed Behzad Jalali	The study of Effectiveness of Pulsed Dye Laser (PDL) with Wavelength of 585 Nanometer in Decreasing Surgical Scars of Thyroidectomy	9:10 – 9:20
Elham Torkmaniha	Evaluation of Cord Blood Platelet Gel for the Treatment of Skin Lesions in Children with Dystrophic Epidermolysis Bullosa: Pilot Study	9:20 – 9:30

**Plenary Talks II: New Surgical Approaches in Wound Healing**

<b>Moderator</b>	<p align="center">Mohammad Javad Fatemi <i>Professor of Plastic and Reconstructive Surgery, Iran University of Medical Sciences, Tehran, Iran</i></p>	
Farhad Hafezi	<i>Professor of Plastic and Reconstructive Surgery, Iran University of Medical Science, Tehran, Iran</i>	9:30 – 10:30
Hossein Akbari	<i>Associate Professor of Plastic and Reconstructive Surgery, Iran University of Medical Sciences, Tehran, Iran</i>	
Kamran As-adi	<i>Associate Professor of Plastic and Reconstructive Surgery, Iran University of Medical Sciences, Tehran, Iran</i>	
Kamran Balighi	<i>Associate Professor of Dermatology, Tehran University of Medical Sciences, Tehran, Iran</i>	

**Break and Poster Presentation**

**10:30 – 11:00**

**Thursday, September 27, 2018 (11:00 – 13:00)**

**Panel VI: Tissue Engineering**

<b>Chairpersons</b>	Hamid Mirzadeh, Seyed Mostafa Fatemi, Mohammad Pezeshki Modarres	
Mohammad Pezeshki Modarres	Nano Fibers Application in Skin Tissue Engineering	11:00 – 11:15
Atefeh Shamosi	Endothelial Cells Adhesion and Proliferation on Collagen/Hyaluronic Acid/ Bio Glass Nanoparticles Scaffolds	11:15 – 11:30
Neda Khatami	Alginate / Gelatin / Nano-Silica Hydrogel Microcapsules for Bone Tissue Engineering Applications	11:30 – 11:45
Fatemeh Morshedloo	Effect of Gelatin on Characteristics of Enzymatically-Gellable Alginate Hydrogels for Cartilage Tissue Engineering Application	11:45 – 12:00

Panel VII: Special Guest Talk		
Chairpersons	Nasrin Zand, Hamideh Moravej, Aldo Morrone, Elyas Salimi	
Elyas Salimi	Management of Pressure Wounds on Kermanshah Imam Hospital	12:00 – 12:20
Aldo Morrone	Wound and Tissue Repair: Our Experience in Africa and Middle East	12:20 – 12:40
Simab Kanwal	GABA Production as a Potential Wound Healing Agent in <i>Synechocystis</i> sp. PCC6803 With Inactivated Glutamate and Ketoglutarate Decarboxylase Pathways	12:40 – 13:00

Pray and Lunch	13:00 – 14:00
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<b>Thursday, September 27, 2018 (14:00 – 15:30)</b>
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Panel VIII: Student Short Communication		
Chairpersons	Mohsen Fateh, Reza Hoseinzadeh, Khatereh Khorsandi	
Zynab Hormozi-Moghaddam	Effect of Adipose-derived Mesenchymal Stem Cells on Healing of Skin Radiation-Induced Injury in Guinea Pig Model	14:00 – 14:10
Ghazaal Shineh	Application of Black Carrot Anthocyanin for Wound Healing	14:10 – 14:20
Mohammad Seddigh Shahryari Noor	Effect of Intraperitoneal Administration of Silymarin on Cervical Linear Esophagotomy Wound Healing in Rats	14:20 – 14:30
Zahra Moghimi Dehkordi	Combination of Negative Pressure Wound Therapy with Non-Cultured Autologous Suspension of Cells, Isolated Using the ReCell for Reconstruction of an Extensive Burn Scar	14:30 – 14:40
Forough Fathi Arateh	Preparation and Evaluation of Chitosan-Carboxymethyl Cellulose Composite Film with <i>Mentha Longifolia</i> Extract for Wound Healing Activity	14:40 – 14:50
Hamid Yazdaninejad	Knowledge and Practice of Nurses Towards Prevention of Pressure Ulcer and Related Factors	14:50 – 15:00
Narjes Rastgoo	A Macroscopic and Histological Study of the Effect of Bovine Vitreous Humor on Accelerating Wound Healing in Healthy Wistar Rats	15:00 – 15:10
Negin Mohammad Rafieian	The Causes of The Formation of Bed Sores and Its Treatment	15:10 – 15:20
Seyed Mahdi Tabatabaei	The Combined Effects of Nano-Zinc, Nano-Albumin and Honey in Healing the Wounds Caused by Third-Degree Burn in Male Mice	15:20 – 15:30

Workshop II: New Methods to Prevent Scar		
Instructors	Zahra Azizian	15:30 – 16:30

Workshop III: Management of Chronic Pressure Ulcers and Providing Guidance for Prevention and Care of Pressure Ulcers at Imam Reza Hospital		
Instructors	Elyas Salimi, Masoud Fallahi	16:30 – 18:00

**3<sup>rd</sup> International and 5<sup>th</sup> National Congress of Wound Healing and Tissue Repair**

**Friday, September 28, 2018 (8:30 – 11:00)**

**Panel IX: Tissue Engineering & Regenerative Medicine**

<b>Chairpersons</b>	Mohamad Ali Bahar, Ali Samadi Kuchaksaraei, Soheila Ebrahimi	
Soheila Ebrahimi	Evaluation of Mummy on the Function of HUVEC Cells and Fibroblast in Skin Wound Healing	8:30 – 8:45
Ehsan Taghi Abadi	Exosomes for Repair, Regeneration and Wound Healing	8:45 – 9:00
Hayder Sudan Abbas Obaid	Chitosan / Modified Egg Shell Wound Healing Scaffold Containing Vitamin D and Herbal Remedy for Diabetic Wounds Medicine	9:00 – 9:15
Hamidreza Behboodi	Fabrication of a Novel PH-Sensitive PLLA / PVA / Hyaluronic Acid / Tragacanth 3D Printing Wound Healing Scaffold with Antagonistic Bacteria as the Antibacterial Agent	9:15 – 9:30

**Panel X: Basic Sciences**

<b>Chairpersons</b>	Jafar Ai, Nasim Kashef, Farzaneh Chehelcheraghi, Somayeh Ebrahimi Barough	
Somayeh Ebrahimi-Barough	The use of Naringin-Loaded PCL/Gelatin Nano Fiber Scaffold as a Wound Dressing	9:30 – 9:45
Farzaneh Chehelcheraghi	Effects of Acellular Amniotic Membrane Matrix and Bone Marrow-Derived Mesenchymal Stem Cells in Improving Random Skin Flap Survival in Rats	9:45 – 10:00
Abbas Parham	Differentiation of Adipose-derived Mesenchymal Stem Cells into the Tenocyte by Platelet-Derived Growth Factor-BB	10:00 – 10:10
Afshan Shirkavand	Alternative Light Sources of Daylight Photodynamic Therapy	10:10 – 10:20
Sepideh Sayadi	Anti-inflammatory Effect of Sulfated Polysaccharide Of Persian Gulf Sargassum Species In Vivo	10:20 – 10:30

**Break**

**10:30 – 11:00**

**Friday, September 28, 2018 (11:00 – 13:30)**

**Panel XI: Nanotechnology**

<b>Chairpersons</b>	Nasrin Takzaree, Mina Sadat Naderi, Elia Damavandi, Farnoosh Attar	
Nasrin Takzaree	Acceleration of Skin Wound Healing: Nano Emulsion Spray Analgesic and Immediate Dressing Skin Wound	11:00 – 11:15
Mina Sadat Naderi	Detection of Wound Site Bacteria Using Gold Nano Rods-Based Biosensor	11:15 – 11:30
Maryam Heidari - Kharaji	Effect of Paromomycin Loaded Solid Lipid Nanoparticle Formulation on Leishmanial Infection: In Vitro and In Vivo Study	11:30 – 11:45
Farnoosh Attar	Evaluation of Tau Protein Interaction with Titanium Oxide Nanoparticles Using Fluorescence Spectroscopy	11:45 – 12:00



Plenary Talks (III): Non-Invasive Approaches in Healing Process		
Moderator	Siamak Bashardoust Tajali <i>Associate Professor of Physiotherapy, Tehran University of Medical Sciences, Tehran, Iran</i>	
Gholamreza Esmaceli Djavid	<i>Assistant Professor of Biophysics, Department of Photo Healing and Regeneration, Medical Laser Research Center, ACECR, Tehran, Iran</i>	12:00 – 13:00
Behnoush Vassaghi	<i>Associate Professor of Physiotherapy, Iran University of Medical Sciences, Tehran, Iran</i>	
Amir Bajouri	<i>M.D, PhD student of Applied Cell Sciences, Tehran University of Medical Sciences, Royan Institute for Stem cell Biology and Technology, ACECR, Tehran, Iran</i>	
Morteza Izadi	<i>Deputy of Research, Health Research Center, Baqiatallaah University of Medical Sciences, Tehran, Iran</i>	
Marzieh Ebrahimi	<i>Associate Professor of Medical Immunology, Royan Institute for Stem cell Biology and Technology, ACECR, Tehran, Iran</i>	
Somayeh Kazem Nejad	<i>Associate Professor of Clinical Biochemistry, Avicenna Research Institute, ACECR, Tehran, Iran</i>	
Closing Ceremony and Presentation of Awards		13:00 – 13:30

# Oral Presentations

## **Evaluating the effects of Non-Thermal CO<sub>2</sub> Laser Therapy (NTCLT) on Promoting Wound Healing of Recurrent Oral Aphthous Ulcers: A pilot Study**

**Zand Nasrin\*, Fateh Mohsen, Ataie Fashtami Leila, Mansouri Parvin, Esmaeeli Djavid Gholamreza, Fatemi Seyed Mostafa, Arbabi Kalati Fateme, Alinaghizadeh Mohammad Reza, Shirkavand Afshan**

*Department of Medical Laser, Medical Laser Research Center (MLRC), Yara Institue, ACECR, Tehran, Iran*

**Background and Objective:** This randomized controlled clinical trial was designed to evaluate the effects of Non-Thermal CO<sub>2</sub> Laser Therapy (NTCLT) to promote wound healing in recurrent aphthous stomatitis (RAS).

**Material and Methods:** Fifteen patients with 30 aphthous ulcers completed the RCT. One of the ulcers was randomly allocated to be treated with NTCLT and the other one served as placebo. Before laser irradiation, both the laser and placebo lesions and their surroundings were covered with a thick layer of transparent, non-anesthetic gel with high water content. The CO<sub>2</sub> laser beam (power: 1 W, defocused continuous mode, scanning the lesions with rapid circular motion of the handpiece) was illuminated through the gel. The placebo lesion was irradiated with the same laser, but with an inactive probe. The healing times of the lesions were recorded by a blinded physician.

**Results:** The healing period was significantly shorter in ulcers treated by NTCLT than in those treated with placebo ( $p < 0.05$ ). The process was pain free and no kind of anesthesia was required. There were no visible thermal complications after NTCLT and during follow-up periods.

**Conclusion:** The results of this RCT suggest that single session of NTCLT could be used to promote wound healing in recurrent aphthous stomatitis without any visible side effects.

**Material and Methods:** A total of 32 punch wounds (6mm) were generated on the back of 8 mice (4 wounds/ mouse) and they were splinted to prevent contraction. Half of these wounds received nothing (Untreated control) and another half were filled up with MeshFill (MF). Mepitel was used as wound coverage to prevent adhesion and non-adhesive gauze was sutured over the Mepitel dressing. Wounds were daily monitored for healing, dressing and photographed on Day 7 and 14 post applications. On day 7 and 14, mice were terminated and wound areas were harvested and stained for infiltrated immune cells (CD45+ cells), tissue histology and cellularity.

**Results:** The results showed a significantly faster epithelialization and wound closure of splinted wounds received MeshFill as compared to those of control. The findings further showed an early appearance and clearance of infiltrated immune cells (CD45+ cells) in treated wounds as compared to control indicating that the inflammation phase was shifted to early time points of healing process.

**Conclusion:** The results demonstrated that the use of in situ forming scaffold accelerates wound closure and shifting the inflammation phase to an earlier time points in a delayed splinted wound model in mice.

**Keywords:** Aphthous Ulcers, Wound Healing, NTCLT, Non-Thermal CO<sub>2</sub> Laser Therapy, Photo Biomodulation, Low Level Laser Therapy

## **The Use of Stromal Vascular Fraction in Oculo-Facial Regeneration and Reconstruction**

**Farzad Pakdel**

*M.D Oculo - Facial Department, Farabi Hospital, Tehran University of Medical Sciences, Tehran, Iran*

Stromal vascular fraction (SVF) contain a variety of stem cells including adult mesenchymal stem

cells, endothelial precursor cells and a variety of cytokine growth factors. SVF has biologic properties of as anti-inflammatory, regenerative, and immunomodulatory. SVF is capable of promoting healing by directly replacing damaged cells or secreting cytokine Growth factors that affect cellular repair. SVF could be considered as an enhancer in facial volumization, adjuvant therapy in physical and chemical tissue damages and chronic poor-healing ulcers. I try to provide a holistic view on SVF and applications in the oculo-facial surgery.

## **Effect of Low Level Laser Therapy on the Healing Process of Donor Site in Patients with Grade 3 Burn Ulcer after Skin Graft Surgery (A Randomized Clinical Trial)**

**Kazemikhoo Nooshafarin\*, Vaghardoost Rrza, Momeni Mahnoush, Dahmardehei Mostafa**

*PHD, laser and Wound Healing, Tehran University of Medical Sciences, Tehran, Iran*

**Background:** Skin graft is standard therapeutic technique in patients with deep ulcers but managing donor site after grafting is very important. Although several modern dressings are available to enhance comfort of donor site, using techniques that accelerate wound healing may enhance patient's satisfaction.

Low Level Laser Therapy (LLLT) has been used in several medical fields, including healing of diabetic, surgical and pressure ulcers but there is not any report of using this method for healing of donor site in burn patients. In this study for the first time we evaluate the effects of LLLT on the healing of donor site in these patients.

**Material and Methods:** The protocols and informed consent were reviewed according to Iranian Registry of Clinical Trials (IRCT2016020226069N2). 18 donor sites in 11

patients with grade 3 burn ulcer were selected. Donor areas were divided into 2 parts, for laser irradiation and control randomly. Laser area was irradiated by red, 650 nm laser light, 150 mW, radiation area: 0.25 cm<sup>2</sup>, power density: 0.6 W/cm<sup>2</sup>, 2 J/cm<sup>2</sup>, continuous mode, 16-20 point, 10 sec each point, (Canadian Optic Laser Center, COL laser, Canada) direct in-contact probe. To avoid contamination a sterile, transparent cover was used. Output laser power after passing through the cover was calculated using dosimeter. Treatment was done on day 0 (immediately after surgery), 3, 5, 7 and 9 (5 sessions). Dressing and other therapeutic cares for both sites were the same. Patient and the person who analyzed the results were blinded.

**Results:** The size of donor site reduced in both groups during the 7 days study period (P<0.01) and this reduction was significantly greater in laser group (P=0.01).

**Discussion:** In the present study for the first time we evaluate the effects of LLLT on the healing process of donor site in burn patients. The results showed that local irradiation of red laser light can accelerate wound healing process significantly.

**Keywords:** Low Level laser Therapy, Skin Graft, Wound Healing

## **The Role of Botulinum Toxin Type A in Treatment of Hypertrophic Scar Symptoms**

**Fathi Afshin\*, Taheri Ahmad Reza**

*Assistant Professor of Plastic and Reconstructive Surgery, Tehran University of Medical Sciences, Tehran, Iran*

**Background:** Hypertrophic scar lesion is the result of an increase in the activity of fibroblasts in skin ulcers. They might be painful or itchy and has beauty and functional complications for patient which may influence their quality of life. Now a day, varieties of methods are used but

because of lesion recurrence, patients' problems last. This study examines the effect of BTX-A on the improvement of hypertrophic scar as a new auxiliary method.

**Methods:** In this double blind clinical trial, 45 patients with hypertrophic scar lesions were interfered from March 2016 to Jan 2018. Patient's lesion was randomly divided into two parts. In part one BTX-A with concentration of 200 units/ml and dose of 24 units/cm<sup>3</sup> was injected and in another, normal saline was injected with the same volume. The injections were repeated monthly up to three times, and the patients were evaluated for erythema, pruritus, pain and satisfaction 6 months after the last injection.

**Results:** A significant relationship exists in the reduction of erythema, pruritus (P = 0.000) and pain scores after the injection of BTX-A (P = 0.009).

**Conclusion:** It seems that injection of botulinum toxin A in hypertrophic scar lesions as a new method, improves some of the symptoms of these lesions.

**Keywords:** Hypertrophic Scar, Botulinum Toxin Type A, Pruritus, Erythema

## **Collagen Matrix Dressing in Treatment of Diabetic Foot Ulcer**

**Esmaeeli Djavid Gholamreza\*, Tabaie Seyed Mehdi, Totouchi Mehrangiz, Bashardoust Tajali Siamak, Fateh Mohsen, Ghafghazi Mahmoud, Kosha Mojtaba, Taghizadeh Solmaz**

*Department of Photo Healing and Regeneration, Medical Laser Research Center, Yara Institute, Academic Center for Education, Culture and Research (ACECR), Tehran, Iran*

Diabetic foot Ulcer (DFU) is one of most complicated life and limb-threatening may happen

following diabetes mellitus. These ulcers often delayed to heal despite of all standard care methods and the healing outcomes are mostly unacceptable. In such complicated healing process, any advanced wound care to promote complete healing is recommended. The collagen matrix dressings have potential to promote regenerative process. In this study, the efficacy of collagen matrix dressings were compared with standard dressing for wound healing in patients with DFU. After standard care including debridement, infection control and off-loading, the patients were randomly received either a collagen matrix dressing or saline-moistened gauze dressing for wound care. Our results showed that these advanced dressing could considerably improve healing rate of chronic diabetic foot. Frequency of complete healing rate in a period of 24-weeks follow-up will be significantly better in collagen matrix dressing group.

## **HealApp: A Powerful Application for Cognition and Continuous Wound Care**

**Fayyazbakhsh Fateme, S. Kordestani Soheila\***

*PHD, Assistant Professor of Biomaterials, Amirkabir University of Technology, Tehran, Iran*

**Background:** ChitoTech Inc., has developed a mobile application for android and iOS platforms, and desktop PCs, that provides continuous assessment of wound size and wound healing progress. HealApp can provide continuous monitoring at hospitals, wound care centers, and even at patients' homes allowing clinicians to do follow-up care remotely with accurate information provided by HealApp.

**Methods:** HealApp takes pictures by mobile camera then, evaluate the size, shape and color of the wound using artificial intelligence (AI) and tracks the changes taking place in the patient's wound. The wound image and results are reported to medical team and they recommend appropriate

medication to the patient, based on the received information.

Results: The image is showing the topology, shape, color, and size of the wound then analyzed by HealApp to report the wound healing progress. HealApp combines these results with the patient's clinical information which entered to the software before, then assists the clinicians to diagnose the wound faster and more accurately.

Conclusion: HealApp is a powerful cognitive tool that help clinicians and nurses in wound care field, can save patients' lives and reduce hospital costs immensely.

Keywords: Wound Healing, Wound Area, Wound Healing Progress, Application, Advanced Wound Care

## **Effects of Pressure Ulcer Classification System Education Programme on Visual Differential Diagnostic Ability of Pressure Ulcer Classification in Critical Care Units**

**Esmaeili Maryam\*, Okhovati Shahrbanoo, Shariat Esmaeil**

*Ph.D, Assistant Professor of Nursing, Tehran University of Medical Sciences, Tehran, Iran*

Background: Pressure ulcer is a common complication in patients admitted to critical care units. Detection of different grades of Pressure ulcer is one of the important aspects of nursing care in critical care units. Therefore, nurses' empowerment to care for Pressure ulcer is important. Considering the importance of nurses in preventing and timely identification of Pressure ulcer and the choice of appropriate care and treatment, as well as the increasing trend in the number of affected patients, especially in critical care units, this study aimed to investigate the effect of nurses' empowerment program on the

differential diagnostic ability of Pressure ulcer in critical care units.

Methods: This is a non-randomized clinical trial with two groups of control and intervention. The research population included all nurses working in the critical care units of selected hospitals of Shahid Beheshti University of Medical Sciences. The sample consisted of 80 nurses (40 nurses Control and 40 nurses in the intervention group) who were selected based on inclusion criteria and available methods. In order to investigate the ability of differential diagnosis of nurses in both groups, a set of photographs (20 photos of quality and standard considering the appropriate distribution of different grades of bed sore) was used and according to the correct or incorrect answer, each person received a certain score (Correct answer for one point and incorrect answer to zero score). The scores of the two groups were compared before and after the implementation of the empowerment program and analyzed using SPSS 20 and Chi-square, Fisher's exact test, independent t-test and dependent t-test.

Results: The results of this study showed that there was a significant difference in the ability of differential diagnosis of nurses except the third grade of pressure ulcer in the control and intervention groups before intervention. The t-test showed that there was a significant difference between the mean scores of differential diagnostic ability after intervention in the two groups ( $P = 0.001$ ). By comparing the mean of the two groups, the mean score of the differential diagnosis of nurses in the intervention group after intervention was significantly higher than the mean scores of differential diagnostic ability of nurses in the control group.

Conclusion: Implementation of empowerment program could increase the ability of nurses to detect pressure ulcer degrees and differentiate pressure ulcer with other wounds. However, the empowerment program in this study failed to provide significant assistance to nurses in identifying third grade pressure ulcer and it shows that there is a need for continuous and consistent

interventions to increase the diagnostic power and differentiation of nurses.

Keywords: Empowerment, Visual Differential Diagnosis, Nurse, Critical Care, Pressure Ulcer

## **Optimization of Cell Proliferation and Repair with the Help of Microcarrier - based Cell Culture Technology**

**Sheikhpour Mojgan\*, Amoabediny Ghassem, Derakhti Sorour, Safiabadi-Tali Seyed Hamid**

*Department of Mycobacteriology and Pulmonary Research, Pasteur Institute of Iran, Tehran, Iran*

*Microbiology Research Center (MRC), Pasteur Institute of Iran, Tehran, Iran*

Recently, Microcarrier-based cell culture method has been developed to providing a high surface area for sufficient cell proliferation of the specified tissues. Adhesion and harvesting of cells to and from microcarriers are two critical stages influencing final cell productivity and quality. After a comprehensive study on these crucial factors, all of cellular mechanisms which involved in the attachment and detachment process such as seeding conditions, chemical and mechanical harvesting methods and microcarriers' surfaces treatments were reviewed and discussed. The results of studies demonstrated that, development of cost-effective biodegradable microcarriers such as gelatin coated Ca- alginate hydrogels can be applied as biocompatible microcarries in tissue engineering applications and employment of other external-stimuli-responsive materials in microcarrier technology are suggested for future works. However, to achieve optimum results, a better understanding of thermodynamic forces involved in the attachment process, cell membrane characteristics and cell-surface interactions is critical.

Keywords: Microcarrier, Adhesion, Harvesting, Surface Modification, Tissue Engineering.

## **Wound Tissue Type Classification Using Deep Neural Network**

**Alizadeh Ghazijahani Hamed\*, Nejati Hossein, Abdollahzadeh Milad, Malekzadeh Toubia, Cheung Ngai-Man, Hock Lee Kheng, Leng Low Lian**

*PHD, Student of Image Processing; Artificial Intelligence, Singapore University of Technology and Design (SUTD), Singapore, Singapore*

Tissue assessment for chronic wounds is the basis of wound grading and selection of treatment approaches. While several image processing approaches have been proposed for automatic wound tissue analysis, there has been a shortcoming in these approaches for clinical practices. In particular, seemingly, all previous approaches have assumed only 3 tissue types in the chronic wounds, while these wounds commonly exhibit 7 distinct tissue types that presence of each one changes the treatment procedure. In this paper, for the first time, we investigate the classification of 7 wound issue types. We work with wound professionals to build a new database of 7 types of wound tissue. We propose to use pre-trained deep neural networks for feature extraction and classification at the patch-level. We perform experiments to demonstrate that our approach outperforms other state-of-the-art. We will make our database publicly available to facilitate research in wound assessment.

Keywords: Wound, Tissue, Classification, Deep learning, Artificial Intelligence

## **Platelet Rich Plasma (PRP): New Insights in Dermatology**

**Mansouri Parvin\*, Nik-Khah Nahid, Chalangari Reza, Martits-Chalangari Katalin**

*Skin & Stem Cell Research Center, Tehran University of Medical Sciences, Tehran, Iran*

Platelet Rich Plasma (PRP) is being used as a new therapeutic option for different pathologies

in the field of dermatology, such as trichology, wound healing, skin rejuvenation, scar revision and more recently in the treatment of autoimmune inflammatory skin diseases including psoriasis, lichen planus, scleroderma and vitiligo.

PRP combined with other modalities such as fractional lasers, micro - needling, cell - based therapies, carboxy therapy, phototherapy, and ... are innovative treatments.

In this manner the knowledge of the biology, mechanism of action and classification of PRP should help clinicians in selecting a system that meets their specific needs for a given indications.

## **Anti Leishmanial Potentials of Euphorbia Wallichii Root Extracts and Their Effects on Membrane Permeability and Apoptosis**

**Nazif Ullah\*, Mubarak Ali, Bilal Ahmad**

*Department of Biotechnology, Abdul Wali Khan University Mardan, Pakistan*

Leishmaniasis is a neglected tropical disease effecting millions of people around the globe especially in developing and under developed countries. The disease is reported to be caused by a protozoan of the genus *Leishmania* whereas sand-fly of genus *Lutzomyia* or phlebotomus are main source of transmission. Three types of leishmaniasis are known till now i.e. cutaneous, Mucocutaneous and visceral leishmaniasis. Currently there is no vaccines available to treat any of the 3 types of this disease and the available drugs are highly associated with side effects like (problem in oral administration, trouble in intestinal regions, joints get rigid/stiff). Therefore, the world is now looking towards plants and plant products for the possible solution of leishmaniasis. In present project, we screened various fractions (N-Hexane, Ethyl Acetate, Chloroform and Water) of *E. wallichii* root extract for potential anti-

leishmanial activity, its possible mechanism of action and for the presence of biologically active phytochemicals. Ethyl Acetate (EWEA) and Water (EWAQ) showed high antileishmanial potentials with IC50 value of 6.6  $\mu\text{g/mL}$  and 11.3  $\mu\text{g/mL}$  against promastigote and 9  $\mu\text{g/mL}$  and 13  $\mu\text{g/mL}$  against amastigotes form of *Leishmania tropica* respectively. On investigation of cytotoxicity, membrane permeability, Apoptosis and ROS generation assays, our results confirmed that all the four fractions of *E. wallichii* root extract bears no cytotoxic effect to human erythrocytes at lower doses. Whereas EWEA and EWAQ were able to induce membrane polarization and apoptotic death without any persistent reactive oxygen species generation in leishmanial cells. Results from different assays showed that this plant has high anti-leishmanial potentials by killing leishmanial cells via membrane damage and apoptosis. Phytochemical investigations of the same fractions have further confirmed the presence of high quantity of tannins and saponins which may be involved in conferring membrane permeability and hence death to parasite. Therefore, further investigation like in-vivo testing and isolation of the potent anti-leishmanial compound/s are highly recommended for drug development and future treatment of leishmaniasis.

Keywords: Anti-leishmanial, apoptosis, *Euphorbia wallichii* and membrane permeability

## **Evaluation OF Mechanical and Antibacterial Properties of Wound Dressing Based on Chitosan and Platanus Orientalis Leave**

**Bandbon Balanga Atefe Sadat\*, Tavakoli Rahmatollah**

*MSc, Department of Medical Engineering, Faculty of Engineering, Maziar, Noor, Iran*

During the process of wound healing, wound dressings are used for dermal and Epidermal repairing. This dressings as a permeable physical barrier to oxygen and moisture protect the wound against the penetration of microorganisms. Natural biopolymers are widely used in restorative medicine due to the biofeatures such as bicompatibility, Biodegradability and the similarity to the extracellular matrix. Biopolymers such as polysaccharides are widely used in the development of wound dressings, because of the abundance in plants and products of the body. However films that are made from them have poor mechanical strength. In this study Chitosan films incorporated with extract and powdered of platanus orientalis leaves prepared by casting method. Mechanical properties and water absorption capacity of the films were determined. Highest water absorption capacity and elongation at break were obtained from powder-chitosan (P-C) film. The antimicrobial test was carried by agar diffusion and growth inhibition effects of the films including extract and powdered leaves were tested on gram positive microorganisms of staphylococcus aureus and enterococcus faecalis and gram negative microorganisms of Escherichia coli and pseudomonas aeruginosa. The extract-powder-chitosan (E-P-C) film showed the antimicrobial activity on all of microorganisms used in the study.

Keywords: Chitosan, Antibacterial, Escherichia Coli, Pseudomonas, Staphylococcus

## **Prevalence of Diabetic Foot Ulcer and Comparison of two Methods of Ozonotherapy with Simple Dressing and Dressing in Patients Referred to Wound Clinic in Bandar Abbas 2017-2018**

**Kheiry Fatemeh\*, Rakhshan Mahnaz, Afrashteh Sima**

*Master of Nursing, Clinical Research Development Center of Children Hospital, Hormozgan University of Medical science, Bandar Abbas, Iran*

**Background:** Diabetic foot ulcer is one of the most common causes of diabetes related hospitalization, leading to extremity amputation, which has many effects on the quality of life of these individuals. Nowadays, a variety of methods have been developed to accelerate wound healing including ozone therapy. The present study was carried out to determine the prevalence of diabetic foot ulcer and compare ozone therapy dressing with standard dressing in the treatment of diabetic foot ulcer.

**Methods:** this cross-sectional study evaluated the prevalence of diabetic foot ulcer and the effect of related treatments in patients referring to wound clinic in Bandar Abbas city between June 2017 and October 2017. Data were collected from patients' medical record. Descriptive data on demographic characteristics and two treatment methods were expressed as frequency, percentage, mean, and standard deviation. Data analysis was performed using SPSS, version 23.

**Results:** the average age of the participants was 44.9±20.3. of the total participants, 72.7% were male, and 45.8% displayed diabetic foot ulcer for an average duration of five years. About 34.8% of diabetic patients received ozone therapy dressing, and 65.2% received standard dressing. Patients received ozone therapy dressing for three weeks in three sessions, and standard dressing for 6 weeks in 6 sessions, showing the longer treatment period of standard dressing compared with ozone therapy with dressing. Other reasons for referral to this clinic were bedsore (18.2%), second-degree burns (6.6%), fungal infection between fingers (3%), surgical wounds (12.4%) and trauma (10.3%).

**Conclusion:** Ozone therapy with dressing improved treatment period and ulcer healing about two times higher than standard dressing.

Keywords: Diabetic Foot, Ozone Therapy, Dressing



## Investigating Healing Effects of Aloe Vera Extract and Mesquite Pod Fruit Extract on Skin lesions in Rats

**Kalantar Mansour**

*Ph.D, Assistant Professor of Biotechnology, Department of Biotechnology, Yazd Branch, Islamic Azad University, Yazd, Iran*

Today with unfavorable impacts and side effects of chemical drugs, traditional medicine and prescription of herbal plants have attracted specific attention. Treatment and healing of lesions can be considered among major issues which human has faced from the first of creation. Using Aloe vera extract and powder of mesquite pod fruit extract has been long common in Iran for treatment of skin lesions. Therefore, the present study aims to investigate quick healing and restoration effects of mesquite pod fruit extract as well as Aloe vera extract on laboratory rats. The research was a laboratory trial which was done on 50 rats which were divided randomly into five groups including ten rats after complete anesthesia and creating spinal injuries in completely similar conditions and characteristics. For treatment, five interventions were used as follows: 1. Normal saline solution (0.9% physiologic serum); 2. Mesquite pod fruit extract (with density of 0.5 to 99.5% solvent); 3. Pure Aloe vera extract; 4. Combination of mesquite pod fruit extract and Aloe vera extract (95% Aloe vera extract and 0.5% mesquite pod fruit extract); and 5. Nitrofurazone 1% ointment (positive control). Features including 1. Rats' body temperature, 2. Testing injury site blood, 3. Lesion extent, 4. Histology microscopic experiment during sixteen days of treatment were measured and collected data were analyzed using SPSS statistical software by mean $\pm$ -SEM as well as survival analysis tests at significance level of 0.05. According to the results, intervention by combination of mesquite pod fruit extract and Aloe vera

extract is significantly better regarding all features studied, while given the feature of lesion extent it shows a significant difference in treatment and healing of the lesion. Results of a study done by Nakhai Moghadam and colleagues confirm the results obtained by the present study.

Keywords: Lesion, Healing, Mesquite Pod Fruit Extract, Aloe Vera Extract, Laboratory Rats

## Investigation on the Effect of AFA Extract on Excisional Wound Healing in Adult Male Rat

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Aphanizomenon flos-aquae (AFA), blue-green algae, have many beneficial health effects. Recently, fucoidan, known polysaccharide component of AFA algae, has been claimed to stimulate stem-cell mobilization. Stem cells play an essential role in tissue repair process. Therefore, in this study we use excisional wound model to investigate the effectiveness of trademark AFA extract - StemEnhance - on skin wound repair process.

Methods: Twenty eight male wistar rats (200-250 gr) randomly assigned into 4 groups; 1) control group without any treatment, 2, 3) StemEnhance (SE) groups were given 200 or 400 mg/kg SE by oral gavage once daily and 4) sham group were given saline as vehicle. Following anesthesia, two round excisional wound was created under sterile conditions by 6mm puncher on the dorsum of all rats. Day of wounding assigned as zero. Gavage of 2ml SE or saline started from 1st day and continued to 7th day post-wounding. Wound size was monitored daily by digital camera. At 9th day repaired tissues were harvested by 8 mm puncher. Histopathological parameters were assessed by H&E staining.

Results: macroscopic imaging of wound area revealed that there was no statistically significant difference in wound closure rate between SE groups and sham/control groups. However, histological findings showed that the number of neutrophil and macrophage decreased but epidermal thickness and microvessel density increased in treatment groups. In conclusion, it seems that StemEnhance improves healing process by ameliorating inflammatory response and stimulating proliferation of keratinocyte and angiogenesis.

Keyword: AFA, Wound, StemEnhance

## **Gallic Acid Wound Healing Effects in Rat Burn Model**

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Gallic acid (GA) is a part of tannins that is used for topical treatment of surface wounds, burns, and dermatitis. Therefore, the aim of this study was to evaluate the burn wound healing effect of topical GA on second degree burn induced by the comb burn model in rats. This experimental study was performed on 65 Wistar rats and animals were randomly divided into 13 groups of 5. The first group was healthy or non-burned rats and 12 other groups were burn wound that assigned in two subgroups of six to be studied in two time periods of 7 and 21 days. Burn groups at each time period included burn control group that was not treated, eucerin group that received topical eucerin as a cream base, GA at three different percentages 1, 2 and 5 and silver sulfadiazine, respectively. Macroscopic examinations were done on days 7, 14 and 21 and percentage of wound healing of burn tissues calculated on days 7 and 21. Biochemical factors, including malondialdehyde (MDA) and glutathione (GSH) levels and catalase activity were determined in wound tissue and serum. Skin hydroxyproline level and histological examination were done by two methods of hematoxylin-eosin

and Masson's trichrome staining. GA as well as silver sulfadiazine improved wound healing and wound closure. In GA treated groups, the GSH levels and the activity rate of catalase in wound tissue and serum and tissue hydroxyproline significantly increased and the MDA levels decreased. The histopathologic findings in groups treated with different percentages of GA improved and this improvement was percentage dependent. It is concluded that the use of GA was beneficial in the treatment of burn due to its antioxidant effect, and burn wound healing improved with increasing of GA concentration.

Keywords: Burn, Oxidative Stress, Gallic Acid, Wound Healing, Rat

## **Using Maggot Debridement Therapy to Remove Main Bacteria Species from Diabetic Foot Ulcers In Tehran, Northern Iran**

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Introduction: Diabetic foot ulcer is a major long time complication of diabetes mellitus. Diabetics have a 15% higher risk for amputation than the general population. Aim: This study was aimed at using medical maggot for removal of main bacteria pathogens in diabetic foot ulcers.

Materials and method: A randomized case-control clinical trial method was used in this study. A total of fifty (50) clients with diabetic foot (Wagner's grade II or III) were randomly selected. The maggot debridement therapy (MDT) was included into the routing treatment protocol of the wounds of those categorize as case group, whereas wounds of those

categorized as control group were treated with standard healing protocol. Larvae of *Lucilia sericata* sterilized and used as the MDT agent. The application of MDT on the wound was done at an interval of 48 hours. Wound swab microscopy, culture and sensitivity for bacteria isolation and identification was done before MDT and after washing the larvae out in both the case and control groups.

Results: The reduction of the infected cases with this bacteria didn't show significant difference after 2 days ( $p=0.1$ ). But after 4 days, the second use of larvae, the reduction was significantly differed in case group ( $p=0.002$ ). However there wasn't any reduction in the cases of control group during this period of treatment.

Conclusion: Several mechanisms have been mentioned for the antimicrobial activity and effectiveness of MDT. Results of the present study demonstrate the ability of MDT to remove main bacterial species either in infected cases with one organism *P. aeruginosa* or *S. aureus*, or in infection with both pathogens.

Keywords: Maggot Debridement Therapy, Chronic Wounds, *Pseudomonas Aeruginosa*, *Staphylococcus Aureus*, Diabetic Foot Ulcer, Disinfection

## **Application of Complementary Medicine to Improve the process of postpartum Episiotomy Wound Healing**

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Background: Episiotomy is one of the most commonly used midwifery surgeries that needs care. Today, the use of complementary and alternative methods in promoting the quality of postpartum care has a special place. Therefore, this study was conducted to evaluate the efficacy of complementary therapies for episiotomy wound

healing.

Material and Methods: A review of articles published in 2001 to 2017 in the pubmed, Google scholar, SID, Magiran, Irandoc and Medline databases linked to 32 articles was investigated

Results: The results of this study showed that Marigold, Rae flower, aloe vera and turmeric, due to their healing, anti-inflammatory and antimicrobial properties, significantly increase episiotomy ulcer healing rate. Pineapple, saffron and olive oil are also substances that are effective in accelerating the process of episiotomy ulcer healing. Also, the use of pineapple, lavender essential oil, floral mistletoe, rose mildew, apple ointment and Aloe vera gel significantly reduce the amount of episiotomy pain and the amount of need for honey. Topical application of lavender cream is effective in relieving pain in the epinephrine ulcer repair. It is possible to use the combination of essential oil of lavender (olive oil) with olive oil base instead of iodine. This combination does not increase the incidence of pain and infection and reduce the inflammation of the wound. Among all the essential oils, Chamomile had no effect on the wound healing process, but chamomile cream accelerates the repair of episiotomy ulcers. Honey cream also does not reduce pain but it affects the speed of wound healing. Sitting bathing olive oil improves the damage to the perineum. Kegel exercises and muscle relaxation exercises, warm compresses, reduce episodes of pain after episiotomy. Even cold compresses over diclofenac suppositories and acetaminophen tablets have a greater effect on wound healing.

Conclusion: The use of medicinal herbs to care for effective epizootic ulcers is effective, appropriate, affordable, low cost and free of chemical contamination and reduces the need for drug medication. It is necessary to provide adequate information and training for the use of these plants. However, further studies are needed to understand their possible effects and complications.

Keywords: Episiotomy, Complementary Medicine, Healing, Anti - Inflammatory, Pain Reliever

## **New Methods to Prevent Hypertrophic Scar**

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Skin is a multilayer organ that acts as an interface between the internal organs and the external environment, forming a barrier that prevents the body dehydration and the penetration of external microorganisms. As the skin is permanently exposed to the external atmosphere, it is extremely vulnerable to the appearance of different types of lesions, such as burns, ulcers, and wounds. Some factors affect wound healing such as obesity, skin type, surgical site and type, Asian and African ethnic. There are some ways to help preventing hypertrophic scar that can be categorized in to first months after wound and three months after it. Some methods such as a special dressing, Using silicon sheet at first week, special bandage with tention can be helpful in first month after injury. Choice of incision design, avoiding surgery on the skin directly over extensor joints, Small suture, Absorbable sutures should be considered by surgeons. In this presentation, all methods will be explained.

## **To Compare Effect of Hydrocolloid Dressing and 1% Silver Sulfadiazine Dressing on Burn Improve Wounds in Patients with Second –Degree Burn**

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Background and Objective: The present study is a Quasi-experimental study which has been done in department of Emergency, Imam Khomeini

hospital, Hamedan. The aim is to study the effects of hydrocolloid dressing as compared to 1% silver sulfadiazine in healing process of the second degree burns.

Material and Methods: In this study we selected 30 patients every one was two burn lesions, one lesion a test group (with tragacanth gel dressing) and the second lesion ad control group (with 1% silver sulfadiazine dressing). The instruments were check list to determine the percentage of burn area, healing and check list to elaborate degree of pain. We completed for each dressing session. To analysis the data we used pair T-test and k-square and fisher test.

Results: According to results, duration of healing the wound in test group was 8.06 days and in control group it was 13.2 days, Using pair Ttest there was a significant difference between two group (P=0.000) that indicates shorter periods of healing in second stage burns of test groups compared to control group also indicates meaning number the mild degree of pain (1.97) in test group as compared to moderate degree of pain (4.64) in control group, using pair T-test there was significant difference between two groups (P=0.000) that indicates test severe pain test group as compared to control group. One important finding was the score of wound healing was a significant statistical difference between two groups (P=0.000). Additionally for all criteria of burn healing there was a significant difference  $P < 0.05$  between two groups that indicates better healing process & second degree burns in test group compares to control group.

Conclusion: it is suggested applying hydrocolloid dressing for second degree burns.

Keywords: Hydrocolloid Dressing, Tragacanth Gel, 1% Silver Sulfadiazine, Burn Wound Healing, Burn Status

## **Treatment of 100 Chronic Thalassemic Leg Wounds by Plasma-Rich Platelets**

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**Background:** Thalassemia is a heterogeneous group of congenital hemoglobinopathies caused by mutations in the globin gene complex that result in an unbalanced globin synthesis. Unmatched globin chains bind to the cytosolic surface of red blood cell membrane where they cause oxidative damage that might in part be responsible for membrane weakness. The deformability of red blood cells and hypercoagulable state in thalassemic patients have been incriminated in leg ulcer formation, as this might cause ischemia to the skin and consequently friability and ulceration.

**Methods:** Platelet-rich plasma (PRP) gel is considered an advanced wound therapy for chronic and acute wounds. PRP gel consists of cytokines, growth factors, chemokines, and a fibrin scaffold derived from a patient's blood. In this study, we treated 100 thalassemic leg wounds using PRP.

**Results:** There was wound size reduction in patients after 4 weeks of treatment. In wounds with 2-3.5 cm<sup>2</sup> surface area, complete closure happened after 12.5 weeks, 5-12 cm<sup>2</sup> wounds completely closed after 13.2 weeks, and finally, 4.5-6 cm<sup>2</sup> wounds healed completely after 14 weeks. None of the wounds reopened after 8 months of monitoring.

**Conclusion:** This study will help extrapolation of the use of PRP for at least thalassemic leg wound treatment.

**Keywords:** Thalassemic Leg Wounds, Plasma-Rich platelets

## **The Study of Effectiveness of Pulsed Dye Laser (PDL) with Wavelength of 585 Nanometer in Decreasing Surgical Scars of Thyroidectomy**

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medical Sciences, Tehran, Iran*

**Background:** During the past two decades "Pulsed- dye Laser beam" has been used for Hypertrophic and Keloid treatment of scars, which has been successful to various extents. This clinical trial randomized with control group was planned and carried out in order to study the impact of prophylactic use of (two weeks after surgery) PDL 585 nm in minimizing thyroidectomy scars.

**Substances and Procedures:** In this research study 60 patients who had underwent thyroidectomy, were randomly selected and exposed to low dosage of PDL 585nm( Overlapping at fluency of 10% J/cm<sup>2</sup> 8-10, narrow size of 7mm, pulse time impedance of 1/5-3 ms) . An assessment of Patients' scars was made both prior to the start of the process and during follow- up phases i.e. the end of the 1st and 2nd months and two months after the last laser beam exposed by an independent physician, using Vancouver Scar Scale (VSS) and preparation of standard photography. The output resulted from the research was analyzed by SPSS22 software, using descriptive statistical methods (frequency and percentages) and inferential statistics (Chi-Square statistical and Fisher Exact Test). A meaningful level of 0/05 was taken into consideration.

**Findings:** Two months after the third laser radiation session, laser group lesions showed remarkable improvement in view of pigmentation, vascularity, flexibility and height. This difference was meaningful between treatment and control groups (p value<0.00), but no difference was observed in the two groups (p>0.05) in view of the parameters under study which is associated to the type of string used in treatment groups.

**Conclusion:** Outcomes of this randomized clinical trials show that prophylactic treatment of scar in three PDL 585nm laser radiation sessions with low dosage can be considered as a proper and immune methods in the improvement of pigmentation, vascularity, flexibility resulting from baseline of thyroidectomy.

Keywords: PDL, Thyroidectomy, Scar, Pulsed-Dye Laser, VSS

## **Evaluation of Cord Blood Platelet Gel for the Treatment of Skin Lesions in Children with Dystrophic Epidermolysis Bullosa: Pilot Study**

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**Background:** Epidermolysis bullosa (EB) consists of a number of genetically skin diseases characterized by defects in the adhesion of the epidermis to the dermis that cause mechanical fragility of the skin and abnormal wound healing. Wound care is, therefore, of critical importance in the management of EB and current cure are not always satisfactory. In this study, we performed a pilot evaluation. of the effectiveness of platelet gel from cord blood (CBPG) as allogeneic product for the treatment of skin lesions in three children with EB.

**Methods/Study design:** Cord blood samples are collected in sterile conditions. These samples were transferred to GMP grade clean room for processing. All CB samples were negative for viral and bacterial infection. Then, bags contain CB were centrifuged and two parts (RBC and PRP) were separated. Gelation was done under sterile condition by adding thrombin within 20-30 minutes. Prepared gel changed twice peer week, time and size of wounds were measured.

**Results:** The clinical outcomes of this small group of patients were shown this trial have high efficiency and effectiveness in compare to the current standard care for these patients. Time of

healing and size of wounds decrease significantly. CBPG releases a number of growth factors such as PDGF, TGF- $\beta$ 1 and - $\beta$ 2, IGF, EGF, FGF and EGF which can affect wound healing.

**Conclusion:** In conclusion, this pilot study reveals that CPBG is a promising and safe option for the treatment of EB skin lesions but need for larger studies.

## **Nanofibers Application in Skin Tissue Engineering**

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Over the past decade tissue engineering implements the principles of engineering and life sciences to make biological substitutes that retain, repair or develop tissue function.

In extracellular matrix (ECM) protein fibers diameter are smaller than the cells and could provide a direct contact with the cells in three dimensional orientations, therefore the cells must have interaction with scaffold in three dimension areas.

Electrospinning as an simple and versatile technique for fabrication of biomimetic non-woven nanofibrous scaffold has gained so much attention in skin tissue engineering. Different kinds of biopolymers have been used for electrospinning process by our research team. Chondroitin sulfate as natural signaling molecules have been used in nanofibrous structure in combination with gelatin and PVA for skin tissue engineering. Considering the synthetic polymers acceptable mechanical property and natural polymers biocompatibility, it would be a good candidate to combine the high biocompatibility of natural polymers such as chondroitin sulfate and gelatin with the superior mechanical property of synthetic polymers

such as polycaprolacton or PVA using mixing-electrospinning or core-shell morphology which is crucial in skin tissue engineering. The PCL/gelatin core/shell nanofibers were fabricated using emulsion electrospinning for skin tissue engineering. The fabricated nanofibrous structure could be used for hydrophobic drug delivery systems in skin wound dressing

### **Endothelial Cells Adhesion and Proliferation on Collagen/Hyaluronic Acid/Bioglass Nanoparticles Scaffolds**

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**Background and Aim:** In recent years, many studies have focused on the synthesis of suitable scaffolds for wound healing with different structures. Among multiple three-dimensional scaffold fabrication techniques, the freeze-drying method can be used to create porous structures for inducing endothelial (HUVEC) cells adhesion and proliferation. The biological healing process is influenced by angiogenesis, microenvironment, and extracellular matrix. This evaluation aimed to study the effect of the collagen/hyaluronic acid/bioglass nanoparticles scaffolds on endothelial cells behavior.

**Methods:** Collagen/hyaluronic acid/ bioglass nanoparticles (BGNPs) (various ratios of BGNPs: 0.5 wt%, 1.5 wt% and 3 wt %) were fabricated and their biomechanical, physicochemical and biocompatibility properties were examined. The morphology of collagen/hyaluronic acid/BGNPs scaffolds were evaluated with scanning electron microscopy (SEM). MTT and DAPI nuclear staining were performed to assess cell adhesion and proliferation on freeze-drying samples.

**Results:** Microscopic images and nuclear staining of cultured endothelial cells on collagen/hyaluronic acid/BGNPs scaffolds denoted the better adhesion and proliferation of HUVEC cells on the freeze-drying scaffolds with 1.5% BGNPs content. The results of biocompatibility analysis revealed that the most suitable ratio for endothelial cells proliferation was collagen 2% and 2.5% hyaluronic acid incorporated with 1.5% BGNPs.

**Conclusion:** The collagen/hyaluronic acid/BGNPs scaffold in our study was shown to have a suitable impact on cellular viability. So, collagen/hyaluronic acid/BGNPs scaffolds could be a promising template to promote angiogenesis needed in the wound healing process.

**Keywords:** HUVEC, Freeze-Drying Technique, Collagen/Hyaluronic Acid/BGNPs

### **Alginate / Gelatin / Nano - Silica Hydrogel Microcapsules for Bone Tissue Engineering Applications**

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Hydrogel microcapsules have diverse applications in bone tissue engineering due to their hydrophilic nature and desirable structure for cell growth which allows for excellent nutrient and oxygen transfer. In this study, 1 wt% alginate (alg)/ 1.25 wt% gelatin (gel)/ 1 wt% nano-silica (nSiO<sub>2</sub>) hydrogel microcapsules containing MG-63 cells with density of 2E6 cells per ml of gel were prepared in calcium chloride bath (0.1M) using electrostatic droplet generation method with voltage of 8 Kv. Alg/gel/nSiO<sub>2</sub> hydrogels were characterized by mechanical strength, swelling and biodegradation analyses and were compared with control hydrogels (alg/gel). The presence of

nano-silica in alg/gel hydrogels led to controlled swelling and biodegradability behavior. Moreover, mechanical strength in nano-silica containing hydrogels intensified. Proliferation and viability of encapsulated MG-63 cells were evaluated by trypan blue staining and MTT assay. alg/ gel/ nSiO<sub>2</sub> microcapsules were biocompatible when tested to MG-63 cell line. At the end of 28 days, no dramatic discrepancy in the cell numbers of alg/ gel/ nSiO<sub>2</sub> and alg/ gel microcapsules was detected and both types of microcapsules were biocompatible. However, alkaline phosphatase activity and alizarin red staining analyses demonstrated that introduction of nano-silica into conventional alg/gel hydrogel microcapsules can encourage better matrix mineralization and calcium deposition. Thus, these results prove that prepared alg/ gel/ nSiO<sub>2</sub> hydrogel microcapsules can induce better bone generation and would be a forthcoming candidate for bone tissue engineering applications.

Keywords: Bone Tissue Engineering, Hydrogel, Alginate, Gelatin, Nano-Silica

## **Effect of Gelatin on Characteristics of Enzymatically - Gellable Alginate Hydrogels for Cartilage Tissue Engineering Application**

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In situ formed injectable hydrogels have proved to be a promising candidate for noticeable applications such as drug delivery and tissue engineering due to their ability to fill irregularly shaped tissue imperfections, needlessly invasive surgeries, and non-immunogenicity. Alginate, a natural anionic linear polysaccharide, is one of the most common biomaterials due to its abundance, biocompatibility, and gentle cross-linking procedure. To improve the mechanical stability, it is necessary to modify the structure of common alginate. Modification of

alginate with phenol moieties (Alg-Ph), which can be gel enzymatically with horseradish peroxidase (HRP) along with H<sub>2</sub>O<sub>2</sub> as an electron donor, can increase alginate hydrogel stability in the cell culture medium. In this work, alginate was modified by tyramine hydrochloride in the presence of EDC/NHS for 1 day at 25°C. To provide mammalian cell adhesive, gelatin was added to the enzymatically-gellable alginate and the obtained hydrogel (Alg-Ph-Gel) was characterized by SEM, gelation time, enzymatic degradation, mechanical and swelling properties as well as water vapor loss for use in cartilage tissue engineering applications. Chondrocyte at X<sub>0</sub> = 2 × [10]<sup>6</sup> cells/ml gel was cultured for 14 days and MTT assay was used for cell activity measurements. SEM images showed the addition of gelatin could increase the uniformity of the pore sizes inside the Alg-Ph-Gel hydrogels. Alg-Ph-Gel hydrogels also showed higher gelation time, degradation rate, as well as swelling properties as the hydrogels, swelled 1.6- fold more than the Alg-Ph hydrogels after 72 h in PBS. However, mechanical strength, as well as water vapor loss, decreased for the Alg-Ph-Gel hydrogels. Chondrocyte cells cultured in the Alg-Ph-Gel hydrogels could maintain their original phenotype and proliferate more than 1.4-fold higher than the cells cultured in the Alg-Ph hydrogels after 14 days (p < 0.05). The study demonstrates that gelatin can improve the enzymatically-gellable alginate hydrogels for cartilage tissue engineering application.

Keywords: Alginate, Hydrogel Scaffold, Alginate Modification, Gelatin, Tissue Engineering

## **Management of pressure ulcer**

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A pressure ulcer is localized injury to the skin and/or underlying tissue usually over a bony prominence, as a result of pressure, or pressure in combination with shear and/or friction. The National Pressure Ulcer Advisory Panel Literature reviews demonstrate several etiologies of pressure ulcers. Earlier reviews focused on a model of pressure ulcer development caused by pressure-induced



capillary closure cutting off blood supply and leading to tissue ischemia, injury, and death. The cells are deprived of oxygen and nutrients, waste products of metabolism accumulate in the cells, and the tissue consequently dies.

More recent research, using techniques such as magnetic resonance imaging (MRI), has documented cellular distortion and damage from pressure. There is also a renewed appreciation for the effects of shear in damaging deeper tissue and microclimate (moisture and temperature) in rendering tissue less tolerant of the effects of pressure. After the skin has been compressed, it appears pale, as if the blood had been squeezed out of it. When pressure is relieved, the skin takes on a bright red flush called reactive hyperthermia. The flush is due to vasodilatation, a process in which extra blood supply to compensate for the preceding period of impeded blood flow. Elements of pressure ulcer prevention include identifying individuals at risk for developing pressure ulcers, preserving skin integrity, treating the underlying causes of the ulcer, relieving pressure, paying attention to the total state of the patient to correct any deficiencies, and educating the patient and his or her family about pressure ulcers. Numerous intrinsic factors affect the ability of the skin and supporting structures to respond to pressure and shear forces these factors include age, spinal cord injury, nutrition, and steroid administration, Systemic blood pressure, extracorporeal circulation, serum protein, smoking, hemoglobin and hematocrit, vascular disease, diabetes mellitus, vasoactive drugs.

## **GABA Production as a Potential Wound Healing Agent in *Synechocystis* sp. PCC6803 With Inactivated Glutamate and Ketoglutarate Decarboxylase Pathways**

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GABA ( $\gamma$ -aminobutyric acid) is a four carbon non-protein amino acid produced by the

decarboxylation of glutamate which is also known as GAD pathway. GABA production is ubiquitous in all life forms ranging from prokaryotes to eukaryotes. It functions as an inhibitory neurotransmitter in mammalian brain, whereas it is known to have various environmental stress relieving roles in plants and bacteria. One of the important roles of GABA in mammals is the healing process of cutaneous wounds especially during early wound healing stage. Because of the beneficial functions of GABA and increasing commercial demand, various attempts have been made for chemical and biological synthesis of GABA. However biological synthesis of GABA is considered as a more promising method due to the simple catalytic reaction, cost effectiveness and environmental compatibility. In blue-green algae *Synechocystis* sp. PCC6803, the GAD (glutamate decarboxylase) and KGD ( $\alpha$ -ketoglutarate decarboxylase) pathways are known to complete the tricarboxylic acid cycle (TCAC). However there are evidences that in bacteria and plants, polyamine catabolism in part also contributes to the metabolic pool of TCAC via GABA formation. A novel polyamines degradation pathway was discovered/studied in *Synechocystis* by disrupting both the GAD and KGD pathways by genetic engineering to generate a double mutant strain ( $\Delta$ gad: $\Delta$ kgd). The novel pathway might leads to GABA production and subsequently connects to TCAC in *Synechocystis*. The  $\Delta$ gad: $\Delta$ kgd was found not only viable but also having higher intracellular  $\alpha$ -ketoglutarate and polyamines content as compared to wild type. Gene expression analysis using RT-PCR indicated that in  $\Delta$ gad: $\Delta$ kgd strain the  $\gamma$ -aminobutanol dehydrogenase (gabdh) pathway (the catalytic pathway for polyamine catabolism to GABA) was highly up-regulated. To further validate the association of polyamine catabolism with GABA synthesis, another mutant strain called as  $\Delta$ gabdh was created by disrupting gabdh pathway. Metabolite analysis in  $\Delta$ gabdh strain indicated very high intracellular GABA, glutamate, succinate and spermidine accumulation. For the first time, the study has demonstrated the link between

polyamine degradation and GABA synthesis via gabdh pathway in blue-green algae. The metabolites and gene expression analyses indicate that the gabdh pathway contributes to upregulate the flux from  $\alpha$ -ketoglutarate to spermidine and subsequently to GABA in the absence of GAD and KGD pathways in *Synechocystis* sp. PCC6803. The gabdh pathway might also serve as the sole contributor in providing precursor substrate to keep the TCAC intact in *Synechocystis*. This work forms the basis for further development of GABA production by employing cyanobacteria that are safe and eco-friendly microorganisms.

Keywords:  $\gamma$ -Aminobutyric Acid, Metabolism, Polyamines,  $\gamma$ -Aminobutanal Dehydrogenase, *Synechocystis* PCC6803

## **The Combined Effects of Nano - Zinc, Nano - Albumin and Honey in Healing the Wounds Caused by Third-Degree Burn in Male Mice**

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Background: Previous studies showed that sesame oil stimulates fibroblast production in vitro and in skin wounds. There is more evidence based on therapeutic properties of honey. Therefore in this study, we observe the effect of the combination of sesame oil, honey and cucurbita on locally healing wounds caused by the third- degree burn.

Methods: in this experimental study, 24 adult balb/c mice randomly divided into experimental groups. Mice sacrificed and a sample of wound bed was provided and fixed in formalin. The practical histologic process was performed on them. The samples were stained with Mallory trichome method and microscopic observations were performed on them. A Part of the sample was

frozen to extract protein and performing MDA test and measuring total antioxidant in future.

Results: A complete tightening of the wound and less scar was observed in the macroscopic observation of burn wound surface after treatment in the group treated with sesame and pumpkin (treatment group 5) compared to control group and other groups. In the microscopic assessment, a significant increase ( $p < 0.05$ ) was observed in the total thickness of skin, number and diameter of the hair follicles in the experimental group compared to other groups.

Discussion: Results show that the combination of sesame and pumpkin with different percentage accelerates the healing burn wound in balb/c mice , while using the above-mentioned matters individually have fewer effects on improvement compared to the combination form.

Keywords: Sesame, Pumpkin, Honey, Male Balb/c Mice, Third-Degree Burn

## **Application of Black Carrot Anthocyanin for Wound Healing**

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Wounds heal through 4 overlapping phases. Any interruption to these pathways leads to non-healing wound. One of the inhibitors of the wound healing process is infection. The need for detection of infection stems from the complexity of not only the dynamic wound infection and healing biochemistry but also the distinguishing normal wound drainage from initial inflammatory response and from infectious process. It seems a quick diagnosis of infection can be helpful in improving wound healing, eliminating unnecessary use of antibiotics, preventing the

bacterial resistance and reducing in costs. The aim of this article is to investigate the ability of pH sensitive gelatinous hydrogel integrated with black carrot anthocyanin for early detection of infection. The present article also studies the effect of anthocyanin on different cellular aspects. As an initial step for developing hydrogel for detection of infection, the *in vitro* biocompatibility of hydrogel was evaluated using L929 mouse fibroblasts. The results provide evidences of good adhesion, spreading, viability and morphology. 6 h after cells seeding on the samples, they were well attached to the surface of the hydrogel and 48 h after seeding they were spread over the surface and connected with each other. The results of the FTIR/ATR analysis showed anthocyanin could inhibit glutaraldehyde free radicals residual. Anthocyanin also could change its color after addition of bacterial supernatant. Thus, hydrogel containing black carrot anthocyanin may be a therapeutic and diagnostic strategy to promote wound healing and early detection of infection.

Keywords: Wound Healing, Infection, Anthocyanin, pH

## **Effect of Intraperitoneal Administration of Silymarin on Cervical Linear Esophagotomy Wound Healing in Rats**

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Wound healing consists of a complex variety of interactions which finally aid in restoration of tissue function and its elasticity. Wound healing in the esophagus is of great importance due to its specific structure and its positioning adjacent to vital structures, making it the interest of many scientists. Various parts of the plant *Silybum Marianum* has been widely used in the folk medicine of Iran and other parts of the world. The

active compounds of the plant are constituents of the seeds which include four Flavunolignans collectively known as Silymarin. The aim of the present study was to evaluate the effects of Silymarin on the healing process of experimental wound models of Rats made via esophagotomy incision.

Following the esophagotomy, the animals were divided into 3 groups of 7 for post-operational care: Group 1 (control): Received only water during the first 24 hours and then were fed on pelleted diet for 4 days and were finally fed on standard diet until the end of day 14 and remained untreated. Group 2 (solvent): Were kept on the same dietary condition as the control group except that the animals in this group received 5 daily injections of the solvent, DMSO + distilled water (1ml) for five consecutive days. Group 3 (treatment): Received the same diet as the previous group, however were given the same amount of Silymarin + distilled water instead of the sole solvent.

Evaluation of the wound healing process was performed clinically, by necropsy and histopathologically 14 days after the onset of the experiment (esophagotomy). Histopathological sections were prepared and the specimens were stained with H&E and Masson Trichrome staining. The results showed that the number of fibroblasts, capillary buds and the organized collagen content of the wound were significantly higher in the treatment group compared to the control and solvent groups ( $p < 0.001$ ). Sub-mucosal tissue evaluation showed inflammation and edema in the control group. The inflammatory cell count was decreased among the groups with a rank order of control > solvent > treatment ( $p < 0.001$ ). Moreover, a significant difference was observed in collagen formation and its consistency between the control and the treatment group ( $p < 0.001$ ).

According to the positive effects of intraperitoneal administration of silymarin in the process of cervical linear esophagotomy wound healing in rats, it can be concluded that the use of silymarin can improve and enhance the processes of esophageal wound healing within the indicating

period in the rat.

**Keywords:** Silymarin, Linear Esophagotomy, Healing, Anti-Inflammatory, Collagen, Angiogenesis, Rat

## **Combination of Negative Pressure Wound Therapy with Non-Cultured Autologous Suspension of Cells, Isolated Using the ReCell for Reconstruction of an Extensive Burn Scar**

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**Background:** Burn scars remain a serious physical and psychological problem for the affected people. Clinical studies as well as basic scientific research have shown that Negative pressure wound therapy can significantly increase the quality of burn wounds with comparatively low risk and stress for the patient.

Negative pressure wound therapy (NPWT) has been used in the treatment of acute and chronic wounds for almost 20 years and is now widely used around the world. Of all potential applications of NPWT in burn care, using NPWT as a skin graft bolster dressing has the most supportive data and the innovative epithelial cell harvesting device enables to collect and apply a cell suspension into an area of damaged skin to enhance healing and in doing so, improve the scar outcome.

The goal of this study is to evaluate whether two established methods – Negative pressure wound therapy and non-cultured autologous skin cell suspension – can be successfully combined.

**Methods:** A comprehensive electronic search was done in clinical evidence databases for clinical trials, systematic reviews and health technology studies. The databases and search engines were PubMed, Scopus and sciencedirect. The search was done up to July 2018. Key references were manually searched to find

relevant studies.

**Results:** The precise 5 mechanism of action NPW Therapy facilitates improved wound healing include: fluid removal, blood flow changes, microdeformation, macrodeformation, and maintenance of wound hemostasis. There are also several secondary effects likely pathways that alter the biology of wound healing including angiogenesis, neurogenesis, granulation tissue formation, cellular proliferation, differentiation, and migration. The cell suspension contains a mixed population of basal keratinocytes, melanocytes, Langerhans cells and fibroblasts. As the cells collected are predominantly from the basal layer, they are highly proliferative and result in enhanced epithelialization. Additionally the presence of viable melanocytes results in the appropriate pigmentation of many skin types.

**Conclusion:** The use of combining autologous non-cultured cells harvested using the ReCell device in conjunction with the NPWH dermal template appears to provide an improved alternative to the burn scar. Not only that, but the use of non-cultured cells increases the applicability of this method to clinical situations, including the treatment of acute burns, with no time lag for the culturing of cells to be applied. It also provides a method that can be readily adopted in clinical practice. Further more research is needed in this area.

**Keywords:** Negative Pressure Wound Therapy, ReCell, Burn Scar

## **Preparation and Evaluation of Chitosan - Carboxymethyl Cellulose Composite Film with Mentha longifolia Extract for Wound Healing Activity**

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The skin is the largest organ in the body which protects the internal organs against

external injury. When the skin is damaged, microorganisms attack easily and cause infection in humans. Many efforts have been made for development of new products to protect the skin from damage and dehydration. Due to the variety of wound dressing products, it may be wrong to choose wound dressing appropriately. Although, protection of the wound from infection is one of the reasons for using a wound dressing, acceleration of wound healing process is the main goal.[1] Many phytochemical compounds such as phenols, flavonoids, carotenoids, vitamins, tryripsenes, tannins, fatty acids, and amino acids are present in all parts of the plant with biological activity. These natural factors improve wound healing and regenerate the lost proteins in the burn.[2,3]

The aim of this study was to investigate the antibacterial and antifungal properties of *Mentha longifolia* extract on chitosan-carboxymethyl cellulose composite bed for wound making. For this purpose, the effect of the ethanol extract of *M.longifolia* on the composite film bed of chitosan-carboxymethyl cellulose was investigated. Concentrations of 5%, 10%, 20% ethanolic extracts of *M. longifolia* leaves with control sample (pure film) were investigated. The results of the experiments and the tests showed that *M. longifolia* extract has antimicrobial properties and is resistant to gram-positive bacteria in the presence of 20% of the extract on the film substrate, more than the sample with concentration Lower extract and pure chitosan-carboxymethyl cellulose film. Also, the presence of *M. longifolia* extract with 40% concentration increased the water absorption rate and swelling rate. Surface morphology also showed that increasing the concentration of extract in the film can improve the healing activity of the wound.

**Keywords:** Wound Dressing, Biopolymer, Composite, Chitosan - Carboxymethyl Cellulose, *Mentha longifolia* Extract

## **Knowledge and Practice of Nurses Towards Prevention of Pressure Ulcer and Related Factors**

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**Background:** Pressure ulcers are the common conditions among patients hospitalized in acute and chronic care facilities and impose significant burden on patients, their relatives and caregivers. Pressure ulcers have been described as one of the most costly and physically debilitating complications since the 20th century. The pain and discomfort due to pressure ulcer prolongs illness, rehabilitation, time of discharge and even contribute to disability and death. This study was aimed to

**Methods:** this study is a systematic review article by surveying articles of databases and credible scientific websites include Google scholar, PubMed, Scopus, Science direct and Medline with Mesh keywords Pressure ulcer, nurse, Knowledge, practice, prevention. We used a combination of key-words and subject headings. It was conducted during 2008 – 2018.

**Results:** Nearly half (54.4 %) of the nurses had good knowledge; similarly 48.4 % of them had good practice on prevention of pressure ulcer. Educational status [Adjusted Odds Ratio (AOR)=2.4, 95 % CI (1.39-4.15)], work experience [AOR=4.8, 95 % CI (1.31-10.62)] and having formal training [AOR=4.1, 95 % CI (1.29-9.92)] were significantly associated with knowledge on prevention of pressure ulcer. Heavy workload and inadequate staff (lack of tie) (83.1%), shortage of resources/equipment (67.7%) and inadequate training

(63.2%) were among the major barriers identified in the study.

**Conclusion:** Knowledge and practice of the nurses regarding prevention of pressure ulcer was found to be inadequate. Having higher educational status, attending formal training and being experienced were positively associated with knowledge; while shortage of facilities and equipments, Heavy workload, inadequate training and inadequate staff number showed negative association with practice of nurses pressure ulcer prevention. In-service training and upgrading courses are some of the important steps to improve nurses knowledge and practice on prevention of ulcer pressure.

**Keywords:** Pressure Ulcer, Nurse, Knowledge, Practice, Prevention

## **Histological Study of the Effect of Bovine Vitreous Humor on Accelerating Wound Healing in Healthy Wistar Rats**

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Skin is the largest organ, covering the body. As a result, it is more susceptible to damages compared to other organs. In recent years, there has been increased interest in the use of animal tissues and cell products for treating wounds. Bovine vitreous humor is a gel rich in collagen and hyaluronic acid that is a slaughterhouse waste, and can be a good candidate for the production of biological dressings.

**Objective:** Production of biological dressings from bovine vitreous humor.

**Hypothesis:** Bovine vitreous humor accelerates the process of wound healing.

**Method:** The cow's eye was opened from the cornea and sections were taken separately from the central and posterior parts of the vitreous humor. In this study, we used male rats of the Wistar strain weighing between 200 and 250 g. Three wounds 6 mm in diameter were created on the back of each rat. One wound was treated with povidone iodine (BETADINE®) and the other two wounds were treated separately with the posterior and middle sections of the vitreous humor. On days 1, 3, 5, 8, and 14 after treatment, tissue samples were taken from the wounds. After fixing, sectioning, mounting on slides, and staining, the sections were photographed and were subjected to statistical analysis using the ImageJ software.

**Results:** In microscopic analysis, the treatment and control groups were compared on the first, third, fifth, eighth, and fourteenth days for inflammatory cell density, angiogenesis, epithelium thickness, development of granulation tissue, and presence of hair follicles. There was no statistically significant difference between the treatment and control groups on the first and third days. On the fifth day, density of inflammatory cells was higher in the treatment group compared to the control group. Epithelium was thicker and blood vessels, granulation tissue, and hair follicles were more developed. On the eighth day, epithelium thickness, number of inflammatory cells, and development of blood vessels were higher in the wounds treated with central vitreous humor compared to the control group or the wounds treated with posterior vitreous humor. On the fourteenth day, epithelium thickness, number of inflammatory cells, and development of blood vessels were higher in the control group compared to the treatment groups.

**Conclusion:** Bovine vitreous humor has no significant effect on wound healing.

**Keywords:** Bovine Vitreous Humor, Wound Healing, Biological Dressings

## The Causes of the Formation of Bed Sores and its Treatment

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**Background:** Bedsore, a common problem in health centers and hospitals, especially in the wards and intensive care unit. The cost and morbidity for patients and health systems are created. In general bedsores or pressure sores, lesions of the skin and subcutaneous tissue caused by prolonged pressure and are often located in areas where the skin over bony prominence has caused such as hip and heel. This study aimed to learn the causes of its formation and its treatment was conducted.

**Methods:** This study is a review article by searching scientific data bases and websites including Google scholar, Elmnet, SID, Pub med. by keyword, bed sore during the years 2000 and 2017 was performed.

**Results:** The results showed that the prevalence of bedsores in health centers and hospitals between 5.3% to 11% and factors such as spinal cord injuries and diseases that cause damage to the nervous system in 85% of cases. Aging (due to thinning of the skin and reduce the power of healing and reproduction), weight loss (due to reduced muscle mass and subcutaneous fat), Poor nutrition and inactivity are causing bed sore also there is significant relationship between the duration of hospitalization and bedsores.

**Conclusion:** Hospitalized patients need to continuous and effective care. To prevent bed sore one of the most important factors to prevent bedsores, maintaining healthy skin. The use of vitamins A and D to prevent drying of the skin, topical use of olive oil, bath was in bed with a direct flow of water because increases the blood flow in the body, among the factors that prevent the bedsores also increase knowledge and skills necessary to nurse are an effective role in the prevention of bedsores.

**Keywords:** Bed sore

## Evaluation of Mummy on the Function of HUVEC Cells and Fibroblast in Skin Wound Healing

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In recent decades, due to the advancement of modern methods in wound healing and the desire to use the herbal remedy as complementary medicine has made it possible for physicians to discuss and seriously challenge in the field of patients' skin wounds and healing them. Therefore, the purpose of this study is to investigate the effect of mummy on HUVEC cell line and fibroblasts. In this study, The mummy was applied on HUVEC cell line and fibroblasts at 31.25, 62.5, 125, 250, 500, 1000, and 2000 µg / ml concentrations and the mortality rates of the cells was examined at three durations of 24, 48, and 72 hours after the incubation using the MTT test and compared with the control group. Results of the MTT test showed that, the viability of HUVEC cells in concentrations of 500 to 2000 µg / ml in 24-hour incubation, decreased significantly  $P < 0.01$  and  $P < 0.001$  respectively. Also, the percentage of viable cells increased than the control group in concentrations of 31.25 to 1000 µg / ml and 500 µg / ml at 48 h ( $P < 0.01$  and  $P < 0.001$ ) and 72 ( $P < 0.001$ ) hours, respectively. In the HF2FF cells level, the survival of the cells in concentrations of 250 to 2000 µg / ml of mummy material at all three incubation time (24, 48 and 72 hours) had a significant decrease compared to control, which indicates the toxicity of the mummy substance in these concentrations. The findings from our result show that mummy in different concentrations of endothelial cells over the periods of 48 and 72 hours not only caused the cell cytotoxicity, but also increased the proliferation of endothelial cells, except in the high concentration. In fibroblast cells, the mummy can have a stimulant effect on the growth and survival of fibroblastic cells at low doses, which will ultimately result in facilitate and accelerate skin regeneration. It has a side effect on the cells at high concentrations due to being toxic.

**Keywords:** Mummy, Wound Healing, Fibroblast Cells, HUVEC Cells

## **Exosomes for Repair, Regeneration and Wound Healing**

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Wound healing is a highly orchestrated physiological process consisting of a complex events, and scarless wound healing is highly desired for the development and application in clinical medicine. Application of regenerative medicine strategies for repair of organs/tissue impacted by chronic disease is an active subject for product development. Such methodologies emphasize the role of stem cells as the active biological ingredient.

However, recent developments in elucidating mechanism of action of these therapies have focused on the role of paracrine, “action-at-a-distance” in mediating the ability to catalyze regenerative outcomes without significant site-specific engraftment. A salient component of this secreted regenerative milieu are exosomes: 40-100nm intraluminal vesicles that mediate transfer of proteins and nucleic acids across cellular boundaries. Recently, several studies have demonstrated that exosomes are one of the key secretory products of various cell type especially mesenchymal stem cells (MSCs) to regulate many biological processes such wound healing. Hence, understanding these exosomes effects may help to improve wound management and highlight a new therapeutic model for cell-free therapies with decreased side effects for the wound repair.

Exosomes contribute to organ development and mediate regenerative outcomes in injury and disease that recapitulate observed bioactivity of stem cell populations. Encapsulation of the active biological ingredients of regeneration within non-living exosome carriers may offer process, manufacturing and regulatory advantages over stem cell-based therapies.

## **Effect of Adipose - Derived Mesenchymal Stem Cells on Healing of Skin Radiation - Induced Injury in Guinea Pig Model**

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**Background:** The skin is a complex radiosensitive organ that is frequently irradiated in an accidental or therapeutic context. Radiotherapy is a common modality in cancer treatment. The increase in the incidence of the radiation-induced skin injury cases and the absence of standard treatments escalate the interest in finding new and effective methods for these lesions. Mesenchymal stem cells could be used to repair injured tissues. The use of stem cells from adipose tissue in regenerative medicine could be an interesting alternative to bone marrow stem cells because they are easily accessible and available in large quantities. We have studied the potential use of adipose-derived mesenchymal stem cells (AdMSCs) to limit radiation-induced skin injuries.

**Methods:** Female guinea pigs were divided into 4 groups: (a) controls, consisting of nontreated guinea pigs; (b) radiation-treated guinea pigs; (c) radiation-treated guinea pigs receiving AdMSCs; and (d) radiation-treated guinea pigs receiving AdMSCs conditioned medium. AdMSCs or AdMSCs conditioned medium was injected intradermal 24 h after radiation. Guinea pigs were exposed to a single fraction of X-ray irradiation of 60Gy to a 3.0×3.0 cm area with 1.3 cm bolus on 100 cm SSD in abdominal skin tissue. The skin was isolated using a low-pressure clamp and irradiated. Guinea pigs were followed for 4 weeks with serial Photographic analysis and sonographic evaluation (40MHz, 75MHz) of the irradiated areas. Skin changes were measured using clinical assessments defined by the Kumar scale. Tensiometry, cutometry and elastography were performed and was obtained Young's modulus.

**Results:** Macroscopic analysis and histology results showed that the lesions were evolving to a less severe



degree of radiation dermatitis after AdMSCs transplant when compared to irradiated non-transplanted controls and AdMSCs conditioned medium groups. Clinical scores for the studied skin parameters of treated guinea pigs were significantly improved. A faster healing was observed when compared to untreated guinea pig and AdMSCs conditioned medium groups. The in vivo results showed the effectiveness of using AdMSCs on reducing the time needed for complete healing and increasing the time for hair loss by high dose radiation to 7 day for AdMSCs against 3 day for control.

Conclusion: These results suggest a possible use of AdMSCs for the treatment of the early phase of the radiation\_ induced skin injuries.

Keywords: Adipose - Derived Mesenchymal Stem Cells (AdMSCs), Radiation Skin Injury, Guinea Pig Model, Mega Voltage Radiotherapy

## **Chitosan / Modified Egg Shell Wound Healing Scaffold Containing Vitamin D and Herbal Remedy for Diabetic Wounds**

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Aim and Background: Freeze Drying is a modern method for high level of stability and long time maintain in the field of medicine and physician. One of the areas where the use of this method is very impressive, it is the synthesis of wound healing scaffolds that can be accompanied by various repair and excitation factors for wound healing. In this article, the use of a restorative plant extract, egg shell as an agent containing calcium phosphate and collagen that has antibacterial properties and also silver nanoparticles is emphasized.

Method: In the preparation method, scaffolds for wound healing was prepared by freeze drying of a solution containing sterilized and powdered egg shells, almond

and Mahaleb extract, silver nanoparticles, and vitamin D. Each scaffold had certain contents and the chitosan were used as the main material for the construction of scaffolding in all scaffolds. Each solution of Chitosan, AgNps, vitamin D, herbal extracts and egg shells were dissolved in acetic acid, phosphoric acid and water soluble solvents, and various ratios were prepared and put on special plates for freeze-drying. Afterwards The work and preparation of scaffolds were used for various antibacterial tests and etc. tests.

Results and discussion: The Scanning Electron Microscope images of the scaffolds proved that porous structures are formed in the form of interconnected which can facilitate the exchange of air and oxygen, as well as the materials needed by the cells in the wound site. Presence of chitosan, AgNps and egg sell in the scaffold has led to the creation of an appropriate antibacterial property in the structure and resists against bacteria, which are mainly gram-positive staphylococcus aureus which these findings are derived from antibacterial test of nanoparticles, scaffolds, and also Minimum Inhibitory Concentration test.

Conclusion: The results of this work showed that egg sell incorporated AgNps and chitosan have a great potential to be used as the biodegradable, bio-based and antibacterial wound healing scaffold.

Keywords: Chitosan, Ag Nanoparticles, Scaffold, Staphylococcus Aureus, Vitamin D

## **Fabrication of a Novel pH - Sensitive PLLA / PVA / Hyaluronic Acid/Tragacanth 3D Printing Wound Healing Scaffold with Antagonistic Bacteria as the Antibacterial Agent**

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3D Bio-printing technique has emerged as

an accurate manufacturing technique for the production of bio-engineered structures. 3D Bio-printing uses a computer-aided transfer process for the simultaneous deposition of living cells and biomaterials (bio-ink) in predefined spatial locations to construct bio-engineered structures in regenerative medicine, wound healing scaffold and basic cell biology studies. The main advantages of 3D bio-printing that distinguish it from the traditional methods of freeze-drying and electrospinning are the possibility of accurately controlling the porosity of the scaffolds and high speed of printing.

In this study, we use the 3D-printing technology as a new method to produce poly-L-lactic acid (PLLA) scaffolds. PLLA is a polyester which is biodegradable in alkali pH (pH of granulation and epithelialization of wound healing process) and carries the nutrients that are needed for tissue regeneration and on the other hand, provides mechanical strength in order to maintain the scaffold structure. In the next phase we use polyvinyl alcohol (PVA) as a hydrogel that resists to degradation in alkali pH but degrades in acidic pH, therefore in the early inflammation stages of the skin wound, it can be gradually degraded and release an intended antibacterial agent simultaneously. In addition, 90% of PVA hydrogel is consist of water hence it can provide moisture requirement of the wound region and decrease the scar after healing.

Recent studies have shown great interest in using natural polymers incorporation with synthetic polymers to improve the efficiency of the final scaffold. Hyaluronic acid (HA) and tragacanth are among the natural polymers that are suitable for scaffold fabrication. Hyaluronic acid (hyaluronan) is a natural non-antigenic polymer. Current studies demonstrate that HA has the ability to induce angiogenesis and enhance the healing of chronic wounds. Gum tragacanth is a viscose and water-soluble mixture of polysaccharides obtained from sap which is drained from the root of the *Astragalus* plant and dried. It absorbs water to become a gel, which can be stirred into a paste

and has been used as a traditional treatment for skin burns. These natural polymers mimic the extracellular matrix (ECM) and also provide the main components for ECM regeneration such as D-glucuronic acid and N-acetyl-glucosamine. Therefore, in order to improve the beneficial application of the PLLA scaffolds, we coated the PLLA pores with HA and tragacanth.

The microbial microflora can adversely affect the wound healing process. Specific bacteria, such as *Staphylococcus aureus*, have been correlated with infections and complications in the wound healing process. More specifically, *Anaerococcus*, *Corynebacterium*, *Porphyromonas* and, *Streptococcus* are some of the most common bacterial genera which have been found to be abundant in the microbiota of chronic wounds. It is possible to biologically control these pathogens by employing antagonistic and probiotic bacteria which can cause disorders in their function and effectively suppress them. Lactic acid bacteria is an antagonist for the *Staphylococcus aureus* which is the main bacterial population of the wound region. Also, lactic acid bacteria alongside bifidobacteria are the most studied probiotics. Probiotics are microorganisms that have been used to improve the healing of intestinal ulcers and infected cutaneous wounds.

Probiotics have many advantages that make them a good choice against the wound region's pathogens. Some of the most important features of probiotics are (a) inactivation of toxins and metabolites of pathogenic bacteria, (b) production of antimicrobial substances that inhibit the growth of pathogenic microorganisms, like bacteriocins which represent small secretory peptides that show wide range of antimicrobial activity both in-vitro and in-vivo, (c) Stimulation of host immune response, and (d) Probiotics can also induce re-epithelialization through induction of chemokines.

The antibacterial activity of probiotic strains towards skin pathogens has been shown in many in-vitro studies with human fibroblast and keratinocytes. Recently two types of bacteria have been investigated in some in-vitro studies: (a)

L.rhamnosus GG which promote cell migration, and allowing the cells to close the artificial wound rapidly, and (b) L.reuteri which increase the rate of cell division, helping to reproduce the pool of cells destroyed by the creation of the wound.

We have used the extraction of antagonistic and probiotic bacteria which contain all the bacteriocins secretory peptides in the PVA. Therefore, during the inflammation phase of the wound healing, the PVA will be degraded and the antibacterial activity of the scaffold will be fulfilled.

In this work, we hypothesized that the PLLA/PVA scaffold coated with HA/ tragacanth would have an improved tissue regeneration ability in the wound region and also it would show an effective antibacterial activity due to the presence of antagonist/probiotics bacteria in the PVA.

Keywords: Wound Healing, 3D Bio - printing, Smart Scaffold, PLLA, PVA, Antagonistic Bacteria

## **The Use of Naringin - Loaded PCL / Gelatin Nanofiber Scaffold as a Wound Dressing**

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In the present study, naringin, a flavonoid isolated from the grape and citrus fruit species, was incorporated with poly ( $\epsilon$ -caprolactone)/gelatin composite mats in order to develop a potential wound dressing. The composite mats were prepared by electrospinning of poly ( $\epsilon$ -caprolactone)/gelatin (1:1 (w/w)) solution incorporated with 1.50 %, 3 % and 6 % (w/w) of naringin. The electrospun mats were evaluated in vitro and in vivo wound healing activity. The study showed that after 2 weeks, the full-thickness excisional wounds of Wistar rats treated with

the naringin-loaded dressings achieved a wound closure of higher than 94 % and the dressing containing 6 % (w/w) naringin had almost 100 % wound closure. The sterile gauze, as the control group, showed nearly 86 % of wound closure after this period of time. Our results provided evidence that supports the possible applicability of naringin-loaded wound dressing for successful wound treatment.

Keywords: Electrospinning, Gelatin, Naringin, Poly ( $\epsilon$ -caprolactone), Wound Dressing

## **Effects of Acellular Amniotic Membrane Matrix and Bone Marrow - Derived Mesenchymal Stem Cells in Improving Random Skin Flap Survival in Rats**

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Background: The necrotic skin flap represents a great challenge in plastic and reconstructive surgery. In this study, we evaluated the effect of bioscaffolds, acellular amniotic membranes (AAMs), and bone marrow-derived mesenchymal stem cells (BM-MSCs) on random skin flap (RSF) survival in rats by applying a cell-free extracellular matrix scaffold as a supportive component for the growth and proliferation of BM-MSCs on RSFs. AAM matrix scaffolds were created by incubating AMs in ethylenediaminetetraacetic acid 0.05% at 37°C, and cell scrapers were used. OBJECTIVES: The aim of the present study was to assess the effect of AAM as a scaffold in TE, and combined with transplanted BM-MSCs, on the survival of RSFs and on the biomechanical parameters of the incision-wound flap margins 7 days after flap elevation. MATERIALS AND METHODS: BM-MSCs and AAMs were transplanted into subcutaneous tissue in the flap area. On the 7th postoperative day, the surviving flap

areas were measured using digital imaging software, and the flap tissue was collected for evaluation. Forty rats were randomly divided into four groups of 10 each: group 1 received an AAM injection; group 2 underwent BM-MSC transplantation; group 3 received both AAM injection + BM-MSC transplantation; and group 4 was the control group, receiving only saline. **RESULTS:** The survival area in the AAM/BM-MSC group was significantly higher than in the control group ( $18.49 \pm 1.58$  versus  $7.51 \pm 2.42$ ,  $P < 0.05$ ). The biomechanical assessment showed no significant differences between the experimental groups and the control group ( $P > 0.05$ ), and there was no correlation with flap survival. **Conclusion:** Our findings showed that the treatment of flaps with BM-MSC and AAM transplantations significantly promoted flap survival compared to a control group. The viability of the flap was improved by combining BM-MSCs with AAM matrix scaffolds.

**Keywords:** Amnion, Bone Marrow, Mesenchymal Stromal Cells, Rats, Surgical Flaps

## **Differentiation of Adipose - Derived Mesenchymal Stem Cells into the Tenocyte by Platelet - Derived Growth Factor-BB**

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**Background:** The potential use of stem cell-based therapies for the repair and regeneration of various tissues, in particular tendon, offers a paradigm shift in plastic and reconstructive surgery. We characterized the differentiation of Adipose -derived Mesenchymal Stem cells (AMSCs) into tenocyte-like cells in response to Platelet-Derived Growth Factor-BB (PDGF).

**Materials and Methods:** AMSCs were isolated and expanded with basic culture medium, containing DMEM,

10% fetal bovine serum, 1% penicillin/streptomycin. The cells after five passages (P<sup>0</sup>), were treated for 14 days with supplemented medium containing PDGF-BB (20 ng/ml), L-Prolin and Ascorbic Acid (AA) to differentiate to tenocytes. The cells in control group, was cultured with basic culture medium. At the end (14th day), Sirius Red staining was used to assess Col3A1 production. The absorbance was measured at 540 nm and data are presented as mean  $\pm$ SD ( $n = 3$ ). In order to assess morphology, H&E staining was performed.

**Results:** With the addition of PDGF, an increase in tenocyte-like elongated morphology was observed in AMSC compared to control cells after 3 days. The OD (Optical density) study showed that the degree of differentiation to tenocytes has increased over time. Accordingly, AD-MSCs differentiation into tenocytes using TDM (tendon differentiation medium) was investigated. A t-test analysis revealed that the amount of collagen production is not significantly different between treated and control groups ( $p=0.05$ ).

**Conclusion:** Our results indicated that hPDGF-BB may be of benefit in the differentiation of AMSCs toward tenocytes. In addition, tenogenic effects of PDGF may introduce it as a suitable growth factor for neo-tendon formation as well as promotion of tendon regeneration.

**Keywords:** Human, Tenocyte Differentiation, Mesenchymal Stem Cells, PDGF\_BB

## **Alternative Light Sources of Daylight Photodynamic Therapy**

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Daylight-mediated photodynamic therapy (daylight PDT) is a simple and pain free traditional treatment in some dermatologic disorders like actinic keratoses. Weather conditions may not always allow daylight PDT outdoors. There has been comparisons of the spectrum of different

lamp candidates for indoor “daylight PDT” and investigated their ability to photobleach protoporphyrin IX (PpIX). Furthermore, it has been measured the amount of PpIX activating daylight available in a glass greenhouse, which can be an alternative when it is uncomfortable for patients to be outdoors. Various lamps like halogen lamps (overhead and slide projector), white light-emitting diode (LED) lamp, red LED panel and lamps used for conventional PDT have been investigated in the physical process to find if they might be beneficial when the weather outside is rainy or windy with no day light.

Here we discuss the physical properties of these alternative light sources for characterization to apply in PDT.

Keywords: Artificial Daylight, Photodynamic Therapy, Greenhouse, Daylight PDT, Methyl Aminolevulinate

## **Anti - Inflammatory Effect of Sulfated Polysaccharide of Persian Gulf Sargassum Species In Vivo**

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Background: Sulfated polysaccharide extracted from seaweed has various biological activities including anti-inflammatory, anti-clotting, and anti-oxidant activity. Many red and brown algae have the sulfated polysaccharide. The aim of this study is to evaluate the anti-inflammatory effect of sulfated polysaccharide extracted from brown algae Sargassum in vivo.

Methods: Briefly, Persian Gulf brown algae were washed and dried shade for 3 days. Dried seaweed was ground and sieved to pass through a 500 µm sieve. 50 g of dried ground seaweed was extracted in 1 L of 0.03 M HCl with continuous stirring at 200 rpm for 4 h at 90 °C water

bath. The suspended seaweed was filtered, and the extract was precipitated using 60% ethanol for the production of the sulfated polysaccharide. The acute anti-inflammatory activity of sulfated polysaccharide of Sargassum sp. was evaluated by carrageenan-induced paw edema in rats in four groups, includes control, positive control, negative control, and sulfated polysaccharide groups.

Results and Discussion: Edema after injection carrageenan is measurable. After 30 minutes, edema is almost the same in all three groups (control+, control-, sulfated polysaccharide). After one hour, the mean of paw edema in the negative control group increased 15% but in positive and sulfated polysaccharide group are the same and they increased by only 2%. Pick of inflammation was occurred 3 hours after injection. In this time, edema in control – group increased 80%, control + increased 39%, and sulfated polysaccharide group increased 20%. After that paw edema decreased in all groups.

Conclusion: Seaweed polysaccharides have various biological activities, including anti-inflammation. Carrageenan has been used for decades to induce inflammation and to study the mediators of inflammation and the effectiveness of anti-inflammatory mediators. The polysaccharides purified from the brown algae Sargassum sp. possesses anti-inflammatory effect that can be a possible candidate for the development of new drugs to treat various inflammatory diseases.

Keywords: Anti-Inflammatory, Brown Algae, Sargassum Species, Sulfated Polysaccharide

## **Acceleration of Skin Wound Healing: Nanoemulsion Spray Analgesic and Immediate Dressing Skin Wound**

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Background: One of the most important issues in medical sciences is wound healing and repair. The

development of new methods to improve skin wound healing may affect the outcomes of medical conditions. We evaluate the molecular, cellular and clinical effects of Plant compounds on wound healing. Application of natural ingredients and herbs for treating ulcers has been in the history of human life. Nowadays, due to the lack of side effects of medicinal plants and a variety of effective compounds in plants, as well as numerous disadvantages of synthetic drugs there has been tendency to use medicinal plants in clinic. Aloe Vera is a medicinal plant used to treat skin disease. Effects of using Plant compounds e.g. aloe vera gel on the healing process were investigated by microscopic method, cell counting and TGF- $\beta$  gene expression in the wound bed. Nanoemulsion. Encapsulation of component within the vesicles, along with the presence of membrane channels to control the entrance of substrate and subsequent exit of the enzymatic reaction product.

**Methods:** In this experimental study, 72 Wistar rats weighing 180 -200 gr were placed under general anesthesia and sterile conditions. Square shape wound with 1.7\* 1.7 mm dimension was made on the back of the neck. Rats divided to control and experimental groups and to three subgroups with 4, 7, and 14 days of study. In 1st experimental group Nanoemulsion spray was used twice on the wound, once in 2nd experimental group and for positive control group phenytoin cream 1% was applied daily from the surgery days; the control group did not receive any treatment. For histological studies, samples were taken from the wound and adjacent skin. This tissue examined for histological staining with H&E and masson's trichrome then wound surface and wound healing were evaluated separately, Also TGF- $\beta$  gene expression by estimated by RT-PCR. Results showed that fibroblasts in both groups were significantly increased, caused to acceleration of wound healing. It concluded that twice application of Nanoemulsion spray will increase TGF- $\beta$  gene expression, ultimately accelerate wound healing process.

**Results:** The macroscopic and microscopic evaluation showed that wound healing increased because the fibroblast numbers in two experimental groups improved compared with control group. The percentage of wound healing on different days in the experimental and control groups were significant. Data were analyzed by using

one-way ANOVA test and  $P < 0.05$  was significant.

**Conclusion:** Present study showed that the twice application of topical Nanoemulsion spray can result in rapid wound healing in rats.

**Keywords:** Wound Healing, Nanoemulsion Spray, Open Skin Wound, TGF- $\beta$

## **Detection of Wound Site Bacteria Using Gold Nanorods - based Biosensor**

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Wound healing is a complex process with many potential factors that can delay healing. There is increasing interest in the effects of bacteria on the processes of wound healing. Wound infection is deleterious to wound healing, but the diagnosis of wound infection is controversial. Thus, the detection of the bacteria on the wound site is so important. There are several methods for the detection of the pathogenic bacteria. Nowadays, using the gold nano particle-based biosensor for the detection of the microorganisms is considered due to owing some properties such as unique optical and electronic properties, shape size-dependent properties, ease of bio-conjugation and non-cytotoxicity. So, this study aims to assess, through a systematic literature review, the application of gold nanorods- based biosensor for the identification of the bacteria on the wound site. For this purpose, we conducted an electronic search in all database for published articles. Most studies demonstrated that the detection of the bacteria using gold biosensors is useful because of practical, rapid, simple, sensitive as well as reliable. The results show that use of the nanotechnology applications in various fields of medicine, especially in the detection of the microorganisms, is growing interest.

**Keywords:** Wound, Diagnosis, Biosensor, Gold Nanorods

## Effect of Paromomycin Loaded Solid Lipid Nanoparticle Formulation on Leishmanial Infection: In vitro and In vivo Study

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Leishmaniasis, is a worldwide disease and leading to high mortality and morbidity in human populations. The drugs that are already in clinical use are limited to a number of toxic chemical compounds and the parasite drug resistance has been increased. Therefore, there is an essential need to design new anti leishmanial drug treatment strategy. One promising strategy could be developing novel delivery systems and formulations of the existing pharmaceutical ingredients to improve the drug efficacy. In the present study paromomycin sulfate (PM) has been formulated in solid lipid nanoparticles (SLN) and it's in vitro and in vivo efficacy was investigated against *L. tropica* and *L. major*. In order to compute CC50, IC50 and EC50 of PM and PM-SLN formulations, MTT test and Parasite-Rescue-Transformation-Assay were used. SYTO Green Staining, Fluorescent Microscope Imaging and Quantitative Parasite Burden were applied for evaluation of the cell percentage infection. To determine the drug efficacy in vivo, footpad thickness and Real time PCR was assessed in infected BALB/c mice. Nitric oxide test and cytokine assay (interleukin-4 (IL-4) and gamma interferon (IFN - $\gamma$ )) were performed. All together, the results show that PM loaded SLN is significantly more effective than PM for the inhibition of the parasite propagation ( $P < 0.05$ ) and accelerate the immune response toward healing and controlling the disease in BALB/c mice model.

**Keywords:** Leishmaniasis, Solid Lipid Nanoparticle, Drug Delivery, Balb/c, IL-4, IFN - $\gamma$

## Evaluation of Tau Protein Interaction with Titanium Oxide Nanoparticles Using Fluorescence Spectroscopy

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**Background:** Due to the vast applications of nanoparticles in the medical field, as well as the production and targeting of biomolecules, studies on the properties of these particles are essential. Titanium oxide nanoparticles (TiO<sub>2</sub> NPs) have antibacterial activity and are recognized as photocatalytic materials which are applied in drug delivery system. In this study, the interaction of TiO<sub>2</sub> NPs with tau, as a protein model of the nervous system, was investigated by fluorescence spectroscopy.

**Methods:** The intrinsic fluorescence intensity of tau protein upon interaction with varying concentrations of TiO<sub>2</sub> NPs (4–20  $\mu$ M) was performed by exciting the protein sample (4  $\mu$ M, phosphate buffer pH 7.4, 10 mM) at 270 nm, using a spectrofluorometer MPF-4 model at three different temperatures of 289, 310, and 315 K.

**Results:** After addition of varying concentrations of TiO<sub>2</sub> NP, the fluorescence intensity of tau showed a continuous reduction around 305 nm. Also, it was observed that TiO<sub>2</sub> NP effectively quenched tau protein fluorescence via static quenching mechanism, with association constants range from  $6 \times 10^7$  M<sup>-1</sup> to  $3 \times 10^7$  M<sup>-1</sup> at temperature range of 298–315 K. In addition, positive values of  $\Delta S^\circ$  and  $\Delta H^\circ$  indicated that the interaction of TiO<sub>2</sub> with protein and subsequent complex formation is mediated by hydrophobic interactions.

**Conclusion:** In brief, these results exhibit potential details regarding the structure alteration of tau in biological systems to design and decorate new medicinal agents using TiO<sub>2</sub> NPs as potential applicant in biomedical and pharmaceutical applications.

**Keywords:** Titanium Oxide Nanoparticle, Tau, Thermodynamic, Fluorescence Spectroscopy, Interaction

# Poster Presentations

P1

## Evaluating the Effect of Oral Bromelain (Pineapple) on Episiotomy Wound Healing in Primiparus Women

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Background: Episiotomy is the most common perineal incision in midwifery to facilitate the expulsion of the fetus. Perineal damages cause disability in many normal daily activities. The purpose of this study was to determine the effect of bromelain on episiotomy wound healing in primiparus women.

Material and Methods: This article is review study and information compiling has been done with pub Medsciences direct - Scopus- Cochrane Library and Google scholar from 2000 till 2018.

Results: Bromelain has significant effect on better and faster healing of episiotomy wound. Hence, it can be used to accelerate episiotomy wound healing.

Keywords: Bromelain, Episiotomy, Wound Healing

P2

## Effects of Low-Power Light Therapy on the Tissue Repair Process of Chronic Wounds in Diabetic Feet

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Background: To analyze the efficacy of the therapeutic use of Low-Level Laser Therapy (LLLT) on the tissue repair process of chronic wounds in patients with diabetic

feet through the analysis of Pressure Ulcer Scale for Healing (PUSH) scales, pain and the measurement done using the ImageJ© software.

Methods: This clinical trial was carried out with 24 patients 30-65 years of age, who had chronic wounds on their foot due to complications of diabetes mellitus. The patients were randomly allocated in two different groups of equal numbers: Control and Laser Groups. The LLLT equipment used in the research has a wavelength of 660 nm, 30 mW power, continuous mode emission, 6J/cm<sup>2</sup> dosimetry, 48/48h in a 4-week period. Measurement and the aspect of wounds were noted in the PUSH scale and the pain was evaluated weekly. The Mann-Whitney U nonparametric test was used to compare groups.

Results: The Laser Group presented a significant increase of the tissue repair index when compared with the Control Group, with a significant statistical difference ( $p < 0.016$ ). There was no significant difference between the groups in all the weeks using the PUSH scale.

Conclusions: The use of LLLT on chronic wounds in a diabetic foot demonstrated efficacy on the progression of the tissue repair process in a short period.

Keywords: Chronic Wounds, Diabetic Foot, Phototherapy, Wound Healing

P3

## Role of Entegrins in Wound Repair and its Periodontal Implications

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Wound healing in human periodontium is a complex process which involves both cell - cell and cell-matrix interactions. Entegrins play a major role in regulation of these cell - cell, cell - matrix interaction. Wound healing involves two major



events i.e. re-epithelialization and connective tissue repair. In this concise review, we will discuss the role of integrins in these major events as well as their implications in periodontal wound repair. Integrins are differentially expressed in both of these major events. In re - epithelialization, keratinocytes express novel integrins receptors  $\alpha\beta 1$ ,  $\alpha 5\beta 1$  and  $\alpha\beta 6$  which are not expressed in normal healthy epithelium. Re-epithelialization also involves interaction of integrins with TGF- $\beta$  and fibronectin. Similarly, in connective tissue repair, the activation of fibroblast as well as the expression of integrins  $\alpha 5\beta 1$  and  $\alpha 3\beta 1$  is upregulated. In healthy periodontium, integrin  $\alpha\beta 6$  is normally expressed in junctional epithelium which is generally expressed only at wound sites in other parts of the body. The epithelialization at implant surface has not been yet fully explored with respect to interactions among integrins and other extra-cellular matrix molecules.

Keywords: Fibroblasts, Integrins, Keratinocytes, Periodontium, Wound Repair

P 4

## Studying Effects of Auraptene on HTLV-1 Infected Leukemia/Lymphoma Cells in Vitro

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Auraptene, also known as 7-geranyloxycoumarin, is the most abundant prenyloxycoumarin identified in nature. This coumarin derivative is mainly synthesized by plants belonging to Rutaceae and Umbeliferace families. Auraptene possessed a wide range of pharmacological properties including antioxidant, anti-inflammatory, antimicrobial, antigenotoxic and neuroprotective effects. Adult T-cell leukemia/lymphoma (ATLL) is a peripheral T-cell lymphoma caused by human T-cell leukemia/lymphoma virus type1 (HTLV-1). Iran, especially Khorasan province, is known as one of the endemic regions for HTLV-1. Despite advances in treatment

of ATLL, the average survival rate of this malignancy is low. In present study, we investigated auraptene effects on the expression of CSC markers in human Adult T-cell leukemia/lymphoma cells. In this regard, MT-2 cells were treated with combination of 20  $\mu\text{g/ml}$  auraptene and 2  $\mu\text{M}$  arsenic for 72 h, while cells treated with 0.1% DMSO and 2  $\mu\text{M}$  arsenic (used as auraptene solvent) were considered as relevant control. Then, the total cellular RNA was extracted and treated with DNase I. In the following, cDNAs were synthesized by M-MuLV reverse transcriptase, and their fidelity was confirmed by PCR using GAPDH primers. Real-time RT-PCR was conducted using SYBR green mix and specific primers for CD44 and BMI-1. Results of current study revealed that auraptene (in non-toxic concentration) significantly ( $p < 0.05$ ) down regulated the expression of CD44 and BMI-1 in MT-2 cells. Accordingly, this natural coumarin could be considered as an effective agent to attenuate malignant properties of human ATLL cells in future in vivo studies.

Keywords: Auraptene, ATLL, HTLV-1, CD44, BMI-1

P 5

## Why We Shouldn't Apply Iodine on Wounds

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Almost in every house iodine is present as a disinfectant and is used as soon as there is a cut, but are not aware of the harms it may cause. Here we attempt to discuss the harms.

Why we shouldn't apply iodine on wounds?

Iodine compositions are discussed in the previous articles and so far we know that this solution includes ion that deteriorates the tissues and causes wounds to heal later and leaves a bigger scar on the skin. Wash the wound and keep it clean and to avoid infections, clean around the

wound with iodine so you will avoid infections. In case of deep wounds, see a doctor as soon as possible.

How to clean a wound?

As said before, never use iodine to wash a wound and use a serum instead. If you observe the hospitals in these cases they never use iodine for washing the wound area, instead serum is used.

Some people think that if they pour iodine inside a wound, it will kill the microbes, on the contrary, not only it doesn't kill microbes, but also deteriorates the cells inside the wound and hinders restoration of tissues and lengthens the healing process and causes growth of microbe cells.

If you are at home, and you have a wound, try to clean it with serum and use sterilized bandage to keep it clean from infections. You can apply iodine to around the wound so you have completed the disinfecting process.

What kind of wound need Tetanus vaccine

Among the past years, nearly all the youth population of the country have been vaccinated so for skin wounds we do not need this vaccine, provided that you have already been vaccinated. Please consider that if the wound is trampled or in touch with infections and at least 5-10 years have passed from the vaccination time, you are better to see a doctor and inject the Tetanus vaccination so you suppress any probable harms.

Keywords: Wound, Iodine, Washing, Wound Dressing, Tetanus Vaccine

P 6

## **Synthesis and Preparation of Biodegradable Hybrid Hydrogel Incorporated with Curcumin Nanomicelles for Full Thickness Wound Healing**

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There is a clinical need for a novel, more efficient

therapy for full thickness wound healing. In the current study, curcumin encapsulated PEG-PLA [poly(lactide)-block-poly(ethylene glycol)] nanomicelles were incorporated into dextran hydrogel for a full thickness dermal wound healing application. To assess the application of the hydrogel as a therapeutic wound dressing, its morphology, swelling pattern, kinetics of degradation, and capacity to control curcumin release were evaluated.

It was found that the prepared hybrid hydrogel had acceptable biocompatibility, incorporation capacity of curcumin nanomicelles, and mechanical properties.

An in vitro release experiment also demonstrated the sustained release of curcumin from dextran hydrogel, which was first controlled by the diffusion of curcumin from hydrogel and continued through hydrogel matrix erosion at the terminal phase.

An in vivo wound healing experiment was carried out using dressing hydrogels on full thickness wounds in BALB/c mice.

An histological study demonstrated that the application of curcumin nanomicelles incorporated hydrogel could significantly augment the re-epithelialization of epidermis and collagen deposition in the wound area.

Expression of CD31 and vimentin in wound tissue was investigated using immunohistochemistry tests on the eighth day post wounding. The results obtained demonstrated that curcumin nanomicelles incorporated hydrogel could significantly accelerate angiogenesis, fibroblast accumulation, and the process of wound healing.

Together, the data indicate that the prepared hybrid curcumin PEG-PLA nanomicelles incorporated dextran hydrogel is a promising candidate for full thickness wound treatment that increases re-epithelialization, collagen deposition, angiogenesis, and tissue granulation.

Keywords: Dextran, Hydrogel, Curcumin, Wound Healing, Micelle, Hybrid Hydrogel

P 7

## **Comparing the Effects of Silicon Coating Along with the Silver Nano Crystal with Normal Vaseline Gauze on the Donor Graft Among the Patients of Plastic Surgery Clinic of Isfahan University of Medical Sciences in 2016**

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**Background:** Skin grafting is used for recovering the scars of which the stitching is difficult or led to remaining of the big scars. In this method, skin is taken from the healthy donor site and transferred to the scar area which itself creates a new scar requiring the rapid improvement with the least scar, pain and cost. To cover this new scar, there are various ways including the normal Vaseline Gauze, silver Nano-silicon and etc. where this study tries to examine the different impacts on the same person including the rapid recovery, reduction of pain, scar and costs, etc.

**Methods:** In this clinical trial study, 49 patients were selected randomly from among those suffering trauma and burning on hand and leg. Scar of their donor area was divided into two parts; one part was covered by Vaseline gauze and the other by silver Nano-silicon. Then, a questionnaire was filled for recording the data related to recovery, scar, costs, pain and comfort of patient and nursing crew within distances of one day, two days, two weeks, four weeks, three months and six months. Finally, the obtained information were analysed by SPSS.

**Results:** The average of dressings detachment was different significantly in two parts ( $p < 0.05$ ). Results showed that coating of silver Nano crystal is detached earlier. Also, pain in two parts was not different significantly in early days and at the end of the second week, pain on the Nano crystal part was significantly low ( $p < 0.05$ ). In the second

week, itching in Nano crystal was lower, skin colour returned back faster to its natural status; the skin covered by the Nano crystal required less moisturizer ( $p < 0.05$ ). Patient's and nurse's comfort were in higher level in Nano crystal part and they preferred it over the Vaseline gauze. Hypertrophic scar was not observed in any group and was not comparable. Costs of Vaseline gauze was significantly lower than the silver Nano-silicon.

**Conclusion:** With regards to the results, it seems that silver Nano-silicon coating is preferred due to rapid recovery as well as fast reduction of pain and high itching and finally comfort of patient and nursing crew over the normal Vaseline gauze. In connection to the costs, the raw cost of silver Nano-silicon is higher, but in this study, the hidden costs was considered like the patient's return to normal life, cost of other medicines and emulsions (pain killer and moisturizer). Silver Nano-silicon coating decreases such costs. Based on what said above, it is suggested to use it more in donor site scars and other similar scar.

**Keywords:** AG Coat, Vaseline Gauze, Donor Site

P 8

## **Investigation of Association of Burns and Determination of LA50 in Patients with Burns in Imam Khomeini Hospital of Urmia**

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**Background:** Burn is the second cause of childhood death and is a kind of damage to meat or skin caused by heat, electricity, chemicals and radiation. The LA50 is the burn percentage, which can lead to death in 50% of cases. The purpose of this study was to investigate the relationship between burns and the determination of LA50 in patients with burns at Urmia Imam Khomeini Hospital.

**Material and MethodS:** In this study, 690 burn injured patients were hospitalized in Imam Khomeini Hospital in Urmia. The frequency of sex, age and type of burn and the distribution of burn sex and burn percentage were calculated and the LA50 was calculated. Finally, the data were analyzed by soft Analyzed SPSS V24.

**Results:** Among the respondents, 62% were males and 38% were females. In general, the most common type of burns was liquids and hot food, 42%, and burns due to ignition of 41% and direct fire and fire, 17%, 69% out of prognosis and 20% death and eleven percent Patients were left with the satisfaction of the patients. The mean age of the patients was  $30.2 \pm 12$  and the mean mortality was 26.7%. Also, with the mortality rate with burn injuries, Pearson test was  $P < 0.05$  and Square = 47.19 % In the TREND chart was determined by comparing TBSA% to 29.47%

**Conclusion:** The most common cause of burns related to liquids and hot foods was that the LA50 and the rate of burns in the country are improving but require increased treatment and infection control and percentage of burns.

**Keywords:** Burn, Death, LA50, TREND

P 9

## **Investigation of the Relationship Between Silver Sulfadiazine and Nitrofraasone Dressing in Burn Patients in Imam Khomeini Hospital, Urmia**

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**Background:** Burn is a major contributor to child mortality in developing countries. Burns are the third leading cause of accidental deaths in all age groups and the second cause of injury in the age group of up to 6 years. Silversulfadiazine and nitrofurazone have been found on many organisms. Gram positive and negative has bactericidal effect and is used to treat infections of burn wounds. Silversulfadiazine and Nitrofurazone are used in grade 2 and 3 burns

and skin lesions and skin infections. The aim of this study was to evaluate the relationship between silver sulfadiazine and nitrofraasone dressing in burn patients in Imam Khomeini Hospital of Urmia.

**Material and Methods:** Our statistical population included 68 patients with burns referring to burn ward of Urmia Imam Khomeini Hospital. Patients were divided into three groups. The first group included patients who were dressed with silver sulfadiazine daily, the second group was those who were dressed only with nitrofurase, and the third group was those who were dressed together with silverosulfadiazine and nitrofuraseon one day, and the results were collected The data were analyzed by SPSSV.24 using Chi-square test

**Results:** Frequency of patients in the group treated with sulfosulfadiazine was ( $P = 0.001$  OR = 17.55% CL = 95.7), which indicates a significant relationship. In the second group, frequency (CL95 = 11.17, OR = 0.17) % 18.66), which showed a low correlation with the incidence of improvement and in the third group, no significant correlation was observed (OR = 21.19 OR = 45.22, 95% = 95.29) for the presence of infection based on There were no significant correlations between the clinical signs of microbiology between the three groups ( $P > 0.001$ ). Also, there was no significant relation between epithelization and the number of days of admission with the disease ( $P > 0.001$ ).

**Conclusion:** Based on the results, dressings in patients with burns of fluids showed a high improvement compared to the drug sulfosulfadiazine, indicating that the choice of medication for the treatment of burn patients should be done with high precision.

**Keywords:** Burn, Silversulfadiazine, Nitrofurazone, Infection

P 10

## **Application of Fucoidan Extracted from Algae in Wound Healing and Tissue Regeneration**

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Wound healing is a complex biological process that depends on the condition of the wound, the patient's health and physical and chemical support. The discovery of natural ingredients has proven to be remarkable for ideal skin regenerating, including highly diverse marine macromolecules, which are a great source of tissue Engineering substitute for wound healing. So far, research has proven that marine derivatives of macromolecules such as chitin, chitosan and fucoidan have the potential to significantly accelerate the process of wound healing and tissue regeneration. Fucoidan is a sulfated polysaccharide found in the algae cell walls. Reports have demonstrated that fucoidan has a remarkable role in wound healing and skin formation replacing tissue engineering. Fucoidan derived from the *Fucus vesiculosus* species and the chitosan composite film has been shown to improve skin wound, including the regeneration of papillary forms of the skin, epithelial reformation, and the rapid closure of the rabbit's wound surface. Similar results have been obtained from chitosan-fucoidal hydrogels that effectively protect against Rat's wound. Studies have shown that UV-B induces MMP-1, which fucoidan inhibits its expression at the level of mRNA and protein. The results have shown that algae fucoidan has a potential role in reducing the risk of some inflammatory pathologies, including degradation of extracellular matrix by MMP-1. Fucoidan attach to the fibroblast growth factor and protect them from proteolysis. It seems that its therapeutic mechanism, due to the binding of its glycosaminoglycan, to stromal derived factors (SDF-1), is a precursor to brain stimuli that can contribute to angiogenesis with vascular endothelial growth factor and fibroblast growth factor. Therefore, Fibroblast growth factor-2 containing fucoidan-chitosan hydrogel microcomplexes are effective and available for ischemic diseases. In general, extraction of bioactive compounds such as algal derived sulfate polysaccharides can play an important role in the

development of cosmetic industry.

Keywords: Fucoidan, Algae, Wound Healing, Tissue Engineering

**P 11**

## **Superficial Modification of Exosomes for Cancer Cell Targeting**

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Cancer is a global health concern with growing prevalence, incidence and mortality rates, especially in developing countries. Main reasons for failure of current therapeutic modalities include metastasis of cancer cells and their innate/acquired resistance to chemoradiotherapy. To introduce novel strategies against metastatic and resistant cancer cells, recent attempts have focused on engineering of biogenic exosomes. These natural vehicles could be used to directly transfer drugs, therapeutic microRNAs and proteins to cancer cells. To enhance efficacy of exosome-mediated delivery, the superficial structures of exosomes could be modified to facilitate targeted uptake only by cancer cells.

In this regard, engineered exosomes that express GE11 peptide, which binds to epidermal growth factor receptor on tumor cells with epithelial origin, effectively deliver their drug cargo to tumor cells. Likewise, expression of exosomal membrane protein Lamp2B fused to Interleukin 3 receptor, which is overexpressed on leukemia cells, enhanced exosome specificity in vivo. Besides modifying exosomes by a ligand on their surface to target cancer cells, they could also be engineered to induce cell death, as reported for TRAIL+ exosomes that express tumour necrosis factor-related apoptosis-inducing ligand. Although various approaches were used to modify structure and function of exosomes, a thorough

understanding of their biology is still necessary before translating this exciting approach to clinical studies.

Keywords: Exosome, Surface Modification, Cancer Therapy

P 12

## **The Impact of Tourniquet Release Time on Wound Healing in Patients Undergoing Tibia Fracture Plating Surgery**

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**Background:** The use of tourniquet is very common in orthopedic surgeries. By obstructing blood flow in the limb, tourniquet may result in muscle ischemia and skin flap hypoxia. This study aimed at determining and comparing the effects of tourniquet release time on wound healing in patients undergoing tibia fracture plating surgery.

**Methods:** This study was a randomized clinical trial, wherein 40 patients with acute extra-articular tibia fractures were randomly assigned to 2 groups of A (releasing the tourniquet after fracture fixation and before wound closure) and B (releasing the tourniquet after wound closure and application of compression dressing). Duration of surgery in each group was recorded and independent t test was utilized to compare the 2 groups. The wound healing rate was investigated in the patients 24 hours and 14 days after surgery using the Redness, Oedema, Ecchymosis, Discharge, Approximation (REEDA) scale. In this tool, 0 represents “lack of the variable” and 3 indicates “maximum variable score”. The scores in this scale range from 0 to 15. The Mann-Whitney test was used in order to compare the wound healing rates between the 2 groups.

**Results:** There was no significant difference between the 2 groups concerning the average duration of surgery. Wound redness, edema, ecchymosis,

discharge, approximation, and the general condition of wound healing showed no significant difference in the 2 groups 24 hours after surgery, while there was a significant difference 14 days after surgery with the aforementioned parameters being greater in group B than group A.

**Conclusion:** The results showed that releasing the tourniquet before wound closure in group A led to improve wound healing. Wounds need oxygen for restoration and prevention from infections. As the use of tourniquet occludes blood flow to the limb for a while, it can result in increased wound hypoxia after surgery and delayed healing process; hence, less tourniquet time is more desirable for oxygenation of tissues and wound dryness.

Keywords: Tourniquet, Tibia Fracture, Internal Fixation of Fractures, Wound Healing, Infection

P 13

## **Effect of Structure and Composition of Functional Sutures on Wound Healing- a Review**

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**Background:** Polymer sutures are natural or synthetic textile materials in monofilament, multifilament, twisted, and braided form, which are widely used in wound closure. Sutures are classified based on origin, absorbability, and structures. The using of antibiotics or other therapeutic agents in the suture structure has become an attractive and interesting research in wound healing.

**Objectives:** This review attempt to describe key properties of sutures include physical, mechanical, handling, and biological properties. Also the types of functional sutures will present.

**Methods:** Suture properties and fabrication techniques have been studied in this work. Among the different fabrication methods, electrospinning

and melt spinning are used to produce functional sutures emphasizing their potential as drug delivery devices that are discussed in this study.

**Results and Discussion:** The method of using nanoparticles, antibiotics, and other bioactive molecules in suture structure are studied. The role of medicated sutures for controlling the drug release will be discussed. In addition, advantages and drawbacks of each created structures are introduced.

**Conclusion and Future Perspectives:** The role of polymers in the fabrication of reliable drug deliver sutures with functional properties is most important. We still have a long way to produce biocompatible and functional sutures with the desirable mechanical properties for wound healing goals.

**Keywords:** Functional polymeric Sutures, Wound Healing, Biomaterial, Fabrication Method, Drug Delivery

P 14

## **Development of Bilayer Lyophilized Wafer for Treating Wounds by Using Moxifloxacin as an Antibiotic**

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Wafers, as porous modern wound dressings, have some advanced properties such as; ability to absorb exudate, providing optimum moisture balance and gaseous exchange at the wound surface leading to reduced risk of fluid accumulation and infection risk. In this study, we designed and optimized a bilayer lyophilized Moxifloxacin loaded wafer and evaluated its wound healing properties in vitro and in vivo. Bioadhesion force, drug release profile and swelling index was optimized using Design Expert v7 software. To evaluate the efficacy of optimized wafer, disc diffusion test and wound healing experiment applied. Faster wound healing and pathologic evaluation of

treated wounds proved the efficacy of optimized wafer. Addition studies, differential scanning calorimetry and scanning electron microscopy, indicated presence of Moxifloxacin crystals on the surface of polyvinylpyrrolidone and gelatin surface which explained the release profile of Moxifloxacin from wafers.

**Keywords:** Wound Healing, Modern Wound Dressing, Tissue Engineering, Moxifloxacin, Wafer

P 15

## **Subcutaneous Wound Treatment with Herbal Extract**

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**Background and Purpose:** Bed sore is one of the most common diseases that occurs in people with spinal cord. In this disease, the person experiences severe or superficial injuries to soft tissues due to inability to move. The cause of the wound is to squeeze a body out of the body, with the circulatory system cut off at that point, and the mechanism of action of transport of oxygen and food is generally lost and causes wounds and loss of the inner tissues of the site. There is practically no remedy for the treatment of these, and we use almond root extract for treating these ulcers, and so far, we have saved the lives of several patients, who were generally rescued by the doctor, and the difficult living conditions we revived these loved ones.

**Methods:** The root extract of the almond tree contains substances that, if inserted directly in to the wound can repair the wound in a short time. Then, these materials should be identified and detached purely. To do this, the extract was digested by gas chromatography and identified the ingredients, and then separated by column chromatography of each material in pure form. We used laboratory mice to identify the wound healing materials. To do this, we created two wounds of the same size for each rat , the two wounds being one as an (untreated) and the

other used as (medication) this treatment method was followed up for twenty mice for on week . After one week of treatment , each wound recovered from the mucus, two samples were taken from the drug, one for testing the hydroxyproline test, which the collagen builder unit and the laboratory for examination the effective materials identified in the wound healing were tested for toxicity test by (M.T.T) cells were fed to the genetic and cellular centers of Iran. The antibody was tested on human fibroblast cells in a cell culture medium. Since ensuring that the materials were not toxic, patients were satisfied with the satisfaction of the patients and were tested by the experts.

Keywords: Herbal Extract, Chromatography, Bedsore

P 16

## **A Guinea Pig Model of Acute Skin Injury Using Mega Voltage Radiotherapy**

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Background: The most complication of radiotherapy is the skin radiation injury. To study this issue and create modalities for intervention and due to lack of experimental models, Has been suggested a novel model of acute Skin radiation injury.

Methods: On this study female guniea pig with an average weight 250 gr were used. They were distributed in two groups. The control group did not receive radiation. Guinea pigs were exposed to a single fraction of X-ray irradiation of 20, 30, 50, 60, 80 Gy to a 3.0×3.0 cm area with 1.3 cm bolus on 100 cm SSD in dorsal and abdominal skin. The skin was isolated using a low \_pressure clamp and irradiated. Guniea pig was followed for 4 weeks with serial Photographic analysis and sonographic evaluation of the irradiated areas. skin changes were measured using clinical assessments defined by the Kumar scale. Tensiometry

was performed and was obtained Young's modulus.

Results: Loss of dermal integrity was shown after a single dose of Mega Voltage X-ray radiation above 30 Gy. At 20 and 30 Gy healing was observed after the peak injury. At dose of 60 Gy and higher, ulceration and full thickness dermal injury was observed starting around day 14 and did not heal in abdominal skin. Changes in the skin were time- and radiation dose-dependent. Fullthickness injury occurred without animal mortality or gross changes in the underlying organs.

Conclusion: The guinea pig is a small animal model for the short-term screening of acute skin radiation injury. This technique can be used to study radiation \_induced injury and suggested to evaluat skin wound healing, cell therapy and transplant for these clinical issues.

Keywords: Radiation Skin Injury, Guinea Pig Model, Megavoltage Radiotherapy

P 17

## **Chitin - Based Materials and Wound Tissue Engineering**

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Tissue engineering provides opportunities to reconstruct living tissues and organs where significant amounts of tissue have been lost. Here, we aimed to mention the overall properties of an ideal bio-scaffold which is intended to regeneration and repair of wounds. Recently,  $\beta$ -chitin/nanosilver composite scaffolds were prepared for wound tissue engineering applications using  $\beta$ -chitin hydrogel with silver nanoparticles. The antibacterial, blood clotting, swelling, cell attachment and cytotoxicity studies of the prepared composite scaffolds were evaluated. The prepared  $\beta$ -chitin/nanosilver composite scaffolds were bactericidal against E. coli and S. Aureus and



showed good blood clotting ability as well. Cell attachment studies using Vero (epithelial cells) showed that the cells were well attached on the scaffolds. Similarly,  $\alpha$ -chitin/nanosilver composite scaffolds showing similar results were developed for wound tissue engineering applications using  $\alpha$ -chitin hydrogel with silver nanoparticles. These results suggested that chitin/nanosilver composite scaffolds could be potential candidates for wound tissue engineering. Despite these concerns, using bio-scaffold and tissue engineering investigation provides opportunities and great progress these days. It should be mentioned to use bio-scaffolds which diminish the requisite for organ replacement, reduce present unalterable side effects, and develop the quality of patients' life.

Keywords: Chitin, Tissue Engineering, Wound Healing

P 18

## **Chitosan Nonocomposite Scaffolds and Wound Healing**

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Chitosan-based scaffolds are used as a natural material in regenerative medicine. Because it has anti-bacterial, anti-fungal and non-toxic properties. So, using chitosan-based biomaterials are useful in wound healing.  $\beta$ -chitin/HA nanocomposite scaffolds were synthesized from a mixture of  $\beta$ -chitin hydrogel and nHA by freeze-drying technique. The cytocompatibility of the nanocomposite scaffolds was studied using Vero, NIH 3T3 and HDF cells. The results indicated non-toxicity with enhanced attachment and proliferation of these cells onto the nanocomposite scaffolds. Similar results were observed with  $\alpha$ -chitin/HA nanocomposite scaffolds synthesized from  $\alpha$ -chitin hydrogel and nHA by freeze-drying approach. These results essentially signify that the synthesized

nanocomposite scaffolds can serve as potential candidates for wound tissue engineering. Similar concepts could be thought of for regenerating other tissues or organs using chitosan scaffolds. Further studies are needed to demonstrate the potential uses of chitosan scaffold in the tissue engineering/regenerative medicine area.

Keywords: Chitosan, Nanocomposite, Tissue Engineering, Wound

P 19

## **Influence of Collagen on Characteristics of Enzymatically-Gellable Pectin Hydrogels for Tissue Engineering Applications**

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Pectin is a natural polysaccharide that has recently gotten interests in biomedical and biopharmaceutical applications. Collagen, that is another useful macromolecule in tissue engineering applications, was added to the enzymatically-gellable pectin to enhance its adhesive properties and cell interactions due to the lack of adhesive molecules in polysaccharides. Herein, to enrich the other features of pectin such as mechanical strength, it was modified by tyramine hydrochloride in the presence of EDC/NHS for 1 day at 25°C. Then the pectin/ collagen in situ hydrogels (PC) with a different ratio of pectin and collagen were produced. The PC hydrogels of 2.1% pectin/ 0.9% collagen (PC1), 1.5% pectin/ 1.5% collagen (PC2) and 0.9% pectin/ 2.1% collagen (PC3) were prepared and characterized by enzymatic degradation, SEM, mechanical strength, swelling properties and water vapor loss using optimized ratio of horse radish peroxidase (HRP) and H<sub>2</sub>O<sub>2</sub> respectively, 0.1 U/ml and 0.35 mM. Afterwards, fibroblast cells as model stem cells at  $1 \times [10]^6$  cells/ml gel was seeded for 7 days and MTT assay was done for cell activity measurements. PC1 hydrogels

displayed high swelling ratio and further better mechanical performance in comparison with other PC hydrogels. SEM images illustrated high porosity of PC3 hydrogel as compared to other hydrogels containing less collagen. In cell growth analysis, however, PC3 hydrogels revealed about 2 times increase in fibroblast cell proliferation. The study demonstrated the potential of enzymatically-gellable pectin as an economical scaffold for use in tissue engineering applications.

Keywords: Tissue Engineering, Pectin, Collagen, Scaffold, Hydrogel, Enzymatic

P 20

### **Investigating the Causes of Bed Wound in Patients in Internal and Infectious Diseases in a Number of Government Hospitals in Tehran and Providing Educational Strategies and Measures to Prevent and Reduce Causes of it During the Second Half of 1396 - first Half of 1397**

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Background: (including: reasons for choosing a subject, expressing the problem and goals):

Necessity of doing work: Over the years, nursing work in the infectious, internal and external sores and mortality resulting from it and prolonged hospitalization due to bed sores and observation. Increasing costs, reducing the quality of life of the patient and their families were tangible, and we decided to take into account the problems such as excessive consumption of expensive medical equipment and the use of various antibiotics to control pain and sometimes require different surgical consultations. And orthopedics and surgical procedures and the use of separate

manpower due to lack of press L, and many preclinical measures: Radiology, ultrasound, MRI, CT scan and various tests, all of which lead to overriding the main goals of validation and health plan. We decided to take steps to eliminate or reduce the causes of wound healing. This is to minimize the risk of wound healing. The causes of bedding in patients or reducing it to the lowest possible level are the main goals of this study. Sectors has been in direct contact with patients who suffer from pain and pain resulting from bed.

Keywords: Bedsore, Cause Make Wound Ulcer, Nurse Wound, Nutrition in Bed Sore

P 21

### **The Role of Nutritional Supplements in Healing Pressure Ulcers**

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Background: Pressure ulcers (PU) are common problems for the elderly, hospitalized patients, and immobile or wheelchair-dependent patients. PU are associated with high treatment costs and negative health outcomes. Nutritional approaches can reduce the intensity of sore development and healing costs. The aim of this study is to examine the effects of nutritional support on the healing of PU.

Material and Methods: This study is a review article, performed by examining various library and internet sources, on the role of nutritional supplements in the healing of pressure ulcers. Articles in both Persian and English are located with relevant keywords from the following databases: PubMed, Scopus, SID, Medline, Science Direct and Iranmedex.

Results: The results show that nutritional

supplements alongside normal food intake are one of the logical strategies in treating PU. An oral diet high in energy, rich in proteins and rich in arginine and glutamine amino acids, also containing high amounts of anti-oxidants (vitamins C and E), zinc, electrolyte solutions, vitamin D, and calcium is essential for repair and wound healing, improving blood flow, and reducing scar progression.

**Conclusion:** Specific nutritional supplements can accelerate the healing of PU, and are associated with better outcomes.

**Keywords:** Nutrition, Healing, Pressure Ulcers, Supplementation, Vitamins

P 22

## PH Value In Chronic Wounds: Case Report

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**Background:** Wound healing, particularly chronic wound, is a complicated, multifactorial process which can be affected by many internal and external parameters. The pH of the wound is an important factor that strongly influences on the success of healing process. Bacterial toxicity, biofilm formation, oxygen release, and protease activity can be affected by the pH of the wound.

**Methods:** This work is aimed to discuss the pH of the chronic wounds. 100 hospitalized patients with chronic wound were randomly selected and the pH of the wounds has been measured by pH strips. Afterwards, the results were statistically analyzed by SPSS.

**Results:** The pH values of chronic wounds have been reported and statistically discussed. The measured pHs has been compared with reported values based on literature. The wound type has been considered in the statistical analysis.

**Conclusion:** The results showed that most of

infected chronic wounds have an alkaline pH, while the healing and inflammatory phase occur in neutral pH.

**Keywords:** Wound Healing, Chronic wound, pH, Infection

P 23

## Preparation of Biocompatible Oral Adhesives Based on Polyurethane

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Tissue adhesives are changing continuously due to technology and innovations. Tissue adhesives have been considered in the field of jaw and facial surgery. In these surgeries, the closure of soft tissue ulcers is done with primary and mechanical methods such as sutures and staplers. The major problems with the use of mechanical methods have led surgeons to think about ways to replace them. In the meantime, tissue adhesive has been used extensively for its good advantages, including the insulator bleeding, ease of use, and reduced surgical time. However, available tissue adhesives still have many limitations, including high cost, low adhesion strength, exhausting preparation, the possibility of transmission of infection and high toxicity. The aim of this project is to provide biocompatible oral adhesive based on polyurethane to overcome some of the problems caused by the lack of optimum material. In this study, the synthesis of adhesive was carried out in two steps. In the first step, polyurethane pre-polymer was synthesized. The presence and quantity of NCO groups were investigated using FTIR technique, and the poly urethane group and free NCO bands in the adhesive were detected as 2257 cm<sup>-1</sup> and 1515 cm<sup>-1</sup> respectively. The molecular weight of the base polymer was determined 4142 g / mol using GPC technique. In the second step, in order to improve adhesive properties, 2% of the chitosan gel and 0.1% carboxymethyl cellulose were

added to the adhesive composition. Then adhesion of the cells to the structure of the synthesized adhesive was observed with SEM technique, the survival rate of the samples by MTT colorimetric method on the L929 fibroblast cell line according to ISO 10993-05 was obtained. which seems to be a good fit in comparison with the adhesion of the base polymer and fibrin Glubran 2 adhesive. At the end, it seems that the polyurethane-based oral adhesive is competitive with other tissue adhesives in terms of adhesion and provides acceptable results in terms of biocompatibility.

Keywords: Tissue Adhesive, Oral Adhesive, Polyurethane, Chitosan gel, Carboxymethyl Cellulose, Biocompatibility

P 24

## **Regenerative Effect of Hay Plant Extract on Improving Skin Experimental Wounds**

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Background: The skin is an important emotional organ in the human body, which plays a basic role in the thus, creating any scars on this important organ can lead to a disorder in the human body. Today the effects of herbal medicine are due to the lack of condition of the researchers. This study has been performed in order to review the effect of the healer plant extract on the restoration of the skin experimental. The methods: In this study the review of information from the databases of clinical trials and SID, Pubmed, Medlib, Scopus, Proquest, Magiran, Iranmedex, Direc, Google Scholar, Irandoc with the keyword include the healing of the wound, hay and mouse.

Findings: eventually were examined by clinical trials with the criteria to study. The review showed that the average length of the wound in the groups that received hay extract was less than the average length of the wound in the witness groups. The

speed of growth in groups that had received a couple of hay juices was faster than the witness groups. The conclusion: based on the regenerative effects of hay plants extract can be acknowledged that the compounds in this plant are effective in healing skin wounds in all skin thickness.

Keywords: Healing Wound, Hay Extract, Mouse

P 25

## **Cell Viability Induction by PVA / CMC Nanofiber to Wound Healing**

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Nowadays, tissue engineering extremely used for different healing types of the skin wound and skin tissue repair. In this study, full-thickness excisional wound healing is considered by tissue engineering methods. At first, nanofiber scaffolds prepared by electrospinning in different ratio of polyvinyl alcohol/ carboxy-methyl chitosan (2, 3, 4 and 5%) and is cross-linked by glutaraldehyde. Morphology of nano-fibers was studied by SEM and cell viability rate on the scaffolds evaluated by MTT assay using human fibroblasts (HDF) and human placental mesenchymal stem cells (PMSCs). Our results indicated that the PVA/CMC 4% scaffold could provide cell viability. It seems that this type of the scaffold can be used for wound healing also, can accelerate the healing range in full-thickness excisional wounds.

Keywords: Tissue Engineering, Nanofiber, Carboxy-Methyl Chitosan, Skin Wound Healing

P 26

## **Curcumin-Loaded Electrospun Nanofiber as a Wound Healing Agent**

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**Background:** The turmeric plant is a herb belonging to the ginger family and has been used throughout history as a dietary spice and colouring agent in Indian and Chinese cuisines. In more recent times, curcumin has been studied extensively for its use as an anti-cancer, anti-ageing and wound healing agent. Recently studies have been focused on incorporating natural extracts with polymer-based electrospun nanofibers for various biomedical applications.

**Methods:** Electrospinning is a technique for producing ultra-fine (in micros and nanos) fibres as a result of charging and ejecting a polymer melt or solution through a spinneret under a high voltage electric field (up to 30 kV) and solidifying or coagulating it to form a filament. Different materials (natural and synthetic) that have been used in the design and development of nanofiber wound dressings, and the various methods of in vitro and in vivo evaluation of wound dressing materials.

**Results and conclusion:** The herbal drug encapsulated nanofibers with potential antibacterial property can be used as effective drug delivery system and in developing wound dressings for infants, elderly and infirm people to protect them against common infections. The produced electrospun nanofiber has great potential in biomedical applications. The loaded-herbal drug retained its biological functionality even after it had been subjected to a high electrical voltage, indicating that the medicated fibres developed by our system have the great potential in drug delivery, wound healing as well as promising materials for treating surfaces that contain pathogenic microorganisms, especially in the hospital environment.

**Keywords:** Nanofibers, Herbal Medicine, Wound Dressing, Curcumin

P 27

## **Effect of Ozone Therapy Evaluate on Wound Healing**

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**Background and objective:** Treatment of non-healing wound is one of the clinical challenges. Some studies report that ozone therapy can treat chronic, diabetic, posttraumatic and non-healing wounds. Ozone therapy is an alternative therapy that is safe and useful for some disease such as AIDS, cancer, multiple sclerosis, and heart diseases. In the ozone therapy, oxygen is injected into the body via different methods include vaginal, rectal, intramuscular, subcutaneous and intravenous. The aim of this study is to review the effect of ozone therapy on wound healing.

**Method:** This review article was carried out by searching in electronic databases such as PubMed, Google Scholar, and SCOPUS by using the search terms «»ozone therapy», «»wound healing», «»chronic ulcer». A selection of relevant English-language clinical trial, systematic reviews within the last 11 years (2007- 2016) was performed.

**Results:** Studies show that the effect of ozone therapy on various wounds is different. In the diabetic patient with foot ulcers and on the healing process of 2nd-degree burns, ozone treatment reduces the size of the wound. And after treatment, the expressions of vascular endothelial growth factor (VEGF), transforming growth factor  $\beta$  (TGF- $\beta$ ), and platelet-derived growth factor (PDGF) proteins in the ozone group were more than the control group.

Ozone therapy is a simple treatment for Buruli ulcer and can be used as an alternative therapy.

**Conclusion:** In blood, ozone almost immediately disintegrates forming reactive oxygen species and lipid oxidation products. Reactive oxygen species cause platelet aggregation and release of platelet-derived growth factors, transforming growth factor  $\beta$ , and interleukin-8, which play a major role in rapid wound healing. According to the results, Ozone therapy has been shown speed up the healing process, reduce the pain, modulate the immune system, and act as an antibacterial agent. So, it is an effective treatment for wound healing.

**Keywords:** Ozone Therapy, Wound Healing, Chronic Ulcer

P 28

## **Tenogenic Induction of Human Adipose - Derived Mesenchymal Stem Cells by Combined Growth Factors**

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Background: Mesenchymal stem cells (MSCs) have become extremely interesting for regenerative medicine and tissue engineering. Stem cell-based therapy has been proven to be a powerful and successful instrument, in particular for the healing of tendon lesions. This study aimed to determine whether adipose-derived MSCs (AMSCs) could be induced to differentiate into tendon-like cells in response to exogenous platelet-derived growth factor-BB (PDGF-BB) and growth differentiation factor-6 (GDF-6).

Material and Methods: human AMSCs (hAMSCs) were isolated and cultured into flasks with culture medium, containing DMEM, 10% fetal bovine serum and 1% penicillin/streptomycin. The cells at passage 5 (P5) were treated with specific medium containing PDGF-BB (20 ng/ml) and GDF-6 (20 ng/ml), L-Proline and Ascorbic Acid as tenogenic differentiation medium. The cells at control group were cultured in medium without the mentioned supplements. This culture condition was continued for 14 days. Sirius Red staining was used to determine Col3A1 production. For analysis, the absorbance was measured at 540 nm and data are presented as mean  $\pm$ SD (n=3). H&E staining was used to assess cell morphology.

Results: The differentiated cells were more slender, elongated and spindle shaped. A tenocyte-like elongated morphology was observed in treated AMSC after 3-days. A t-test analysis revealed that amount of collagen production is higher in treatment group compared with control group (p=0.05). Moreover, hAMSCs showed a tenocyte-like aligned distribution after 14 days.

Conclusion: These findings suggest that in general, PDGF and GDF-6 may have tenogenic effect on hAMSCs. Our data support that hAMSCs can be considered as a suitable candidate for therapeutic approaches in tendon lesions.

Keywords: Mesenchymal Stem Cells, Tenogenic Differentiation, PDGF-BB, GDF-6

P 29

## **Tenogenic Differentiation Potential of Adipose - Derived Mesenchymal Stem Cells**

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Mesenchymal stem cells (MSCs) have potential applications in regenerative medicine and tissue engineering and may represent an attractive option for tendon repair and regeneration. Additionally, adipose tissue yields a high number of Adipose-derived Mesenchymal Stem Cells (AMSC) per volume of tissue. Tendinitis and degenerative diseases of flexor tendons are common and debilitating musculoskeletal conditions in equine athletes. In horses with tendinitis, peptide, cell, or small-molecule therapies are used in attempts to decrease the high incidence of recurrence and bolster the limited intrinsic tendon repair capacity. Tendon healing is generally slow and involves a wide range of molecules in a complex but regulated mechanism. Exogenous agents that positively influence any of these phases may be of major therapeutic value in tendon repair. To promote and support tendon healing, one viable strategy is the use or administration of growth factors at the wound/rupture site. Platelet-enriched plasma concentrates have also emerged as useful agents, supplying an array of growth factors including PDGF, IGF-I, TGF- $\beta$ 1, and, in smaller amounts, EGF, VEGF, hepatocyte growth factor, and basic fibroblastic growth factor. Despite the interest in PDGF as a therapeutic option for tendon healing, there is little

compelling evidence to confirm that PDGF induces cell proliferation and matrix production in tendon samples. Growth factors (GFs) such as EGF, FGF, PDGF and TGF- $\beta$  participate in tendon formation, ECM synthesis or healing, and may assist tenogenic differentiation. Experiments were performed with and without growth factors (IGF-1, TGF- $\beta$ 1, IGF-1/TGF- $\beta$ 1, PDGF-BB, and BMP-12), in co-cultures of tenocytes and MSCs mixed in different ratios and by culturing MSCs with spent media obtained from primary tenocytes. This review aims to summarize the strategies currently used for differentiation of MSCs to tenocytes as well as their advantages and limitations, and factors affecting tenogenic differentiation were summarized.

P 30

## **A Report on the Treatment of Skin Wounds in Diabetic Patients with Laser**

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**Background and Aim:** Diabetes mellitus is a metabolic disorder in which a person has high blood glucose levels due to inadequate insulin production by the pancreas. Wounds in these individuals cannot heal Properly over time due to circulatory changes that hinder and stagnate the healing process.

**Methods:** We report the case of an 67-year-old female type 2 diabetes mellitus carrier, presenting to clinical-dermatological examination pressure ulcer (PU) in the right calcaneus region.

**Results:** The patient was treated with photodynamic therapy using curcumin and blue light-emitting diodes (LEDs), laser therapy, and the application of a cellulose membrane in order to promote ulcer decontamination by local action, accelerate wound healing, and maintain favorable conditions of asepsis and moisture, respectively. The ulcer healing occurred after 30 days of

treatment and total epithelialization was observed.

**Conclusion:** From the results obtained in this case report, we conclude that the combination of photodynamic therapy, laser therapy, and coating with a cellulose membrane is a promising treatment for the healing of PU in diabetic patients.

**Keywords:** Laser, Therapy, Treatment, Dermatological

P 31

## **Antibiotic - Resistance Determinants in Acinetobacter Baumannii Strains Isolated from Foot Diabetic Infection in Isfahan - Iran**

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**Background:** Acinetobacter baumannii is an important multidrug-resistant opportunistic pathogen that frequently causing various nosocomial infections and is a serious threat to burn patients. These infections usually caused by the outbreak strains. The aim of this study was to show antibiotic resistance pattern and molecular typing of A.baumannii genes isolates collected from foot diabetic patients.

**Material and Methods:** In this study, 307 different strains was detected. 100 Acinetobacter baumannii strain was selected in Isfahan hospitals. Antibiotic resistance pattern was determined by disk diffusion method (Kirby Bauer). The presence of genes coding in antibiotic resistance were analyzed by using of M-PCR method.

**Results:** The antibiotic resistance pattern for Acinetobacter baumannii show the high resistance for ciprofloxacin, ceftazidime, and tetracycline with frequency of 97.2%, 88.3%, and 86.2%, respectively. Moreover, the most sensitive antibiotics were chloramphenicol, and nitrofurantoin with frequency

of 3.9% and 2.8% resistance. CITM (91.1%) was the highest detected genes.

Conclusion: High prevalence of antibiotic resistance pattern among *Acinetobacter baumannii* isolated from foot diabetic patients in Isfahan hospitals indicate the importance role of multidrug resistant isolates.

Keywords: *Acinetobacter Baumannii*, Multidrug-Resistant, Burn Patient, M-PCR

P 32

## **Assessment of Treatment in Diabetic Ulcer by Using Optical Coherence Tomography (OTC) and Optical Coherence Tomography Angiography (OTCA)**

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The procedure of wound healing depends on complicated interactions between a number of highly controlled factors. This system of events occurs normally in the majority of wounds; however, it can go perverse at several steps along the path, specifically with underlying disease like diabetes. Diabetic ulcer has a high burden and it has been estimated that a diabetic ulcer needs a charge of around \$50,000.

Different methods have been run through, to manage such ulcers, like wound dressings, Growth factors, skin substitutes, hyperbaric oxygen, negative pressure wound therapy, and also numerous options are widely used in management of diabetic foot.

It derives as no wonder that the field of wound healing is an extremely dynamic field. New research in wound healing apply different methods and different combination of methods to promote the outcome of wound healing, though, need to

an assessment device is intellectual more than before.

In clinical dermatology, categorize the subsurface structural and vascular features but not using an invasive diagnostic tool was very challenging, but by presenting optical coherence tomography (OTC) it is possible to identify different stages of wound healing in ulcers non-invasively. Some methods of Optical coherence tomography angiography (OTCA) which are advanced and can detail anatomical features and also vascularization of the wound healing processes seem to be useful in supervision the treatment pathway in diabetic foot ulcer management.

OCT AND OCTA can evaluate the stage and response to healing methods, and also vascularization response in diabetic food ulcer management, and in the future, may help to promote more effective treatment options. We consider that OCT and OCTA are of devices which are very efficient in skin lesions and can have a significant place in future wound healing managing assessment and especially in diabetic ulcer.

Keywords: Diabetic Ulcer, Optical Coherence Tomography, Optical Coherence Tomography Angiography, Wound Healing, Supervision Treatment

P 33

## **Stem Cell Therapy in Chronic Cutaneous Wound Healing, A Review**

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Background: Skin is considered as the largest organ of the body, responsible of numerous vital functions, therefore management and treatment of its lesions is of crucial importance.



The natural wound healing process involves several overlapping stages as inflammation, neovascularization and extracellular matrix formation leading to tissue remodeling and re-epithelialization. Different types of cells and various signaling factors as chemokines, cytokines, and growth factors collaborate in the process. Disrupted mentioned procedure in severe conditions, can lead to formation of non-healing aged wounds and abnormal scars.

Current remedies for these kind of lesions included administration of growth factors and cytokines to boost angiogenesis, tissue formation, and modulating inflammation, as well as applying profitable skin grafts. Hyperbaric oxygen (HBO<sub>2</sub>) therapy, is another current method but with limited effectiveness.

Eventually regenerative medicine has created a new promising horizon for treatment of skin chronic ulcers by using stem cells (SCs).

**Material and Methods:** This review is an attempt to summarize the enhancing role of stem cell therapies in healing cutaneous wounds which is prepared by searching up-to-date articles of top researchers among journals with high impact factor.

**Results:** The skin has the ability of self-regenerating due to endogenous stem cells, mainly located in hair follicles and endothelium of capillaries which can participate in wounds healing too, yet can be impaired due to microenvironment changes or inadequate because of aging or in serious pathophysiologic conditions, such as diabetes, deep burns, chronic ulcers, and prolonged ischemic conditions in the extremities.

Cellular therapy can be a promising approach by which exogenous stem cells will be transferred to wound bed by aid of an appropriate scaffold.

SCs can participate in wound healing as a source of replacing cells as well as secreting different factors which lead to immunomodulation influences and accelerating cell proliferation and differentiation especially fibroblasts, also proceeding angiogenesis, augmentation of

matrix components deposition e.g. collagen, and recruitment of some specific lineage to the wound site, such as endothelial stem cells and some lymphocytes.

Several sources of obtaining SCs are available which will be discussed below and choosing the adequate safe population is the most challenging part.

Embryonic Stem Cells (ESC) are capable of high self-renewal and differentiation to any type of cells, but their potential tumorigenesis risk and ethical issues should be considered.

Another option can be Adult Mesenchymal Stem Cells (ASC) which has a more limited capacity comparing with ESC, however, at the site of the wound, they can interact with the environment and be differentiated into a variety of different cells. Among all of ASCs, Hematopoietic Stem Cells and Adipose-Derived Stem Cells are the most studied ones with promising consequences.

The next alternate is induced Pluripotent Stem Cells (iPSCs), which is created by reprogramming adult differentiated cells, but their application needs further assessment for their safety and risk of mutagenesis.

Another key participant to a successful therapy is the used scaffold for delivering SCs, various types of them can be enumerated, as biologic scaffolds, e.g. Human Amniotic Membrane, or bioengineered and synthetic ones made of compatible components.

Different cell treating processes are done to modulate the SCs for a better consequence.

To achieve a better understanding, many other endeavors are done too, as three-dimensional extracellular matrix establishment and simulation of micro environmental conditions of wound to study more detailed behaviors of the cells.

**Conclusion:** Valuable efforts have been devoted into finding effective cures for chronic wounds by aid of stem cell therapies, but lots of researches should be done yet to deepen the knowledge about aged wounds and role of SCs in its healing. More

studies are still needed to increase the overall safety and efficacy of stem cell transplantation.

selection the proper source of SCs, developing the processes of isolating, preparing, multiplying and transplanting SCs to the wound area are main practical challenges ahead.

Considering importance of chronic wound treatment in health and appearances of patients, stem cell therapy should be supposed as a beneficial tool in spite of its high costs.

Keywords: Stem Cell Therapy, Non-Healing Wounds, Chronic Ulcer, Regenerative Medicine

P 34

## **Entreaty of Regenerative Medicine in Pharmaceutical and Cosmetic Industry; Skin on a Chip**

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Along with all well-established features of engineered skin in regenerative medicine, there exists a growing demand for other applications of skin organoids. Currently, animal models serve as gold standards for testing, but the drawbacks associated with such models are high costs, uncertainties in interpretation of the results in many pathologies, as well as methodological flaws in both preclinical and clinical study designs that may contribute to the current translational failure rate. World Preview 2017 evaluates that prescription drug sales are forecasted to grow at an impressive annual compound rate of 6.5%, eventually hitting \$1.06 trn worldwide in 2022. The growth in global economies, changing lifestyles, rising demands of skin and sun care products due to varying climatic conditions encourages the growth of the market for cosmetics. However, increasingly modern methods allow the 4R principle of reducing, refining, replacing

and rehabilitating animal experiments to be put into practice, as required wherever possible by European legislation. In vitro systems that use human tissues and are accurate with respect to the human body would be preferable; Explant, organotype culture and three-dimensional culture methods are routinely used for in vitro screening of toxicants. One best of elegant platform is organ on a chip, thus to the center of our interest is skin on a chip. Sublimed in dermis, epidermis or whole skin on a chip. Skin-on-chip has the potential to provide an accurate determination of pharmacology and toxicity profile in human. With a reinvigorate prospect of sensational attributes of skin on chip, we will review recent results of our lab and other relevant groups, also uncover some our laboratory experimental corollaries.

Keywords: Animal Test Alternatives, In vitro Pharmaceutical and Cosmetic Tests, Skin on Chip

P 35

## **Evaluate the Effect of Low Level Laser Therapy on Wound Healing**

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Background: Low level laser therapy (LLLT) utilizes a pencil-like beam of electromagnetic waves of a single frequency and defined wavelength. Low-level laser therapy applications include acceleration of wound healing, enhanced remodeling and repair of bone, restoration of normal neural function following injury, pain attenuation, and modulation of the immune system.

The aim of this study is evaluate the effect of low level laser therapy on wound healing.

Methods: This review article was carried out by searching studies in PubMed, Google Scholar, ScienceDirect, by using the search terms “level laser therapy,” “wound healing,” “LLLT”. The

search was completed through October 2017. In this review, 45 articles that are associated with subject, were found and of these, 19 articles were applied.

**Results:** In examining the effects of LLLT on cell cultures in vitro, some articles report an increase in cell proliferation and collagen and elastic fibers. Other studies showed, the extent of edema and the number of inflammatory cells were reduced with LLLT.

On average, follow-up at 8 days after treatment revealed that the laser group had smaller wounds than the treated and the untreated wounds. Also, pain relief and functional recovery of patients treated with LLLT were significantly improved comparing to untreated patients.

**Conclusion:** The LLLT resulted show that low power lasers promote wound healing in both experimental models of tissue repair and human cases of wounds and ulcers. LLLT may produce an indirect healing effect on surrounding tissues. There are no absolute contraindications for LLLT; however, it is always better to be cautious when treating patients in high-risk categories. These data indicate that LLLT is an effective modality to facilitate wound contraction of wounds.

**Keywords:** Low Level Laser Therapy, Wound Healing, LLLT

P 36

## **FOXO1 Plays a Key Role in Wound Healing**

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The re-epithelialization, involving keratinocyte migration and proliferation, begins after damage. Keratinocyte mobilization is a critical aspect of wound re-epithelialization, but the mechanisms that control its precise regulation remain poorly

understood. The transcription factor, Forkhead Box Protein O1 (FOXO1), has been recently found to be an important regulator of wound healing. FOXO1 is protecting keratinocytes from oxidative stress by regulating antioxidant genes in wound healing. The aim of this review is to investigate positive effect of FOXO1 in wound healing.

Previous research has shown that the decrease in FOXO1 levels affects other genes involved in cell migration which. The researchers found that many of these genes were significantly less pronounced, especially the gene related to TGF- $\beta$ 1, which is a vital growth factor in wound healing. It has been suggested that FOXO1 stimulates TGF- $\beta$  promoter activity resulting in the upregulation of TGF- $\beta$  expression. Increased TGF- $\beta$  stimulates expression of integrins and matrix metalloproteinases to improve wound healing through increased keratinocyte migration and decreased apoptosis. Oxidative stress increases in cells lacking FOXO1. Oxidation stress is harmful to wound healing. The wound repair environment is a stressful environment for the cell; it seems that the high-level FOXO1 settings protect the cell from oxidative stress. The results of this study showed that FOXO1 has an integral role in two key processes in wound healing: activation of TGF- $\beta$ 1 and protection of cells against oxidative degradation.

**Keywords:** Wound Healing, Stress Oxidative, FOXO1, TGF- $\beta$ 1

P 37

## **Methicillin Resistant Staphylococcus Aureus - Related Genes Isolated from Diabetic Foot Infections in Isfahan - Iran**

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**Background:** Staphylococcus aureus is one of the

important pathogen all around the world. The present investigation carried out to study the distribution of SCCmec types and antibiotic resistance properties in methicillin-resistance *Staphylococcus aureus* isolated from Diabetic Foot Infections in 2017.

**Methods:** 230 clinical wound specimens were collected from Isfahan wound center in Isfahan hospital. Samples cultured, and biochemical method used to confirm isolates. Methicillin resistance isolates subjected to several M-PCR methods. The patterns of antibiotic resistance were studied using disk diffusion method.

**Results:** We found that 100 out of 200 samples detected from Diabetic Foot Infections and 90% of them were resistance to methicillin. The most commonly infected samples collected from woman's (63%). Of mec positive strains, the distribution of SCCmec III (35%) was the highest type.

**Conclusions:** This infection with these strains require more advanced hospital care with emerging demand for novel antibiotics and infections with these strains require higher levels of hospital cares with emerging demand for novel antibiotics. Hence, the clinicians' role in judicious usage of antibiotics is pivotal.

**Keywords:** Methicillin Resistance, Diabetic Foot Infections, SCCmec Typing, *Staphylococcus*

P 38

## **Comparison of Islamic Traditional Prescriptions (Iranian vs. Iraqi) for Diabetes Treatment**

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**Aim and Background:** Diabetes mellitus is categorized as a metabolic disease, caused by disorders of the level of glucose in the blood. Research has shown that alpha –amylase and alpha-glucosidase enzymes play an important role in regulating the amount of glucose in the blood

that they can lower blood glucose levels and control the disease if they are inhibited. A group of plants with their own chemicals can target the active site of enzymes and reduce the enzyme activity by reducing activity or inhibition. This article focuses on the use of traditional Iranian and Iraqi medicinal prescription in the use of indigenous plants to control that  $\alpha$ -amylase and  $\alpha$ -glucosidase enzymes to control diabetes.

**Methods:** Initially, the plant samples were dried and extracted. The extraction process was done in such a way that the samples were crushed, milled, mixed together and dissolved using different solvents. Finally, the extracts were prepared using a rotary and freeze-dried powder. Upon completion of the extraction,  $\alpha$ -amylase and  $\alpha$ -glucosidase enzymes affect them and measure their inhibition that this is achieved by producing a color effect and absorbing enzymes at certain wavelengths. The extract having the ability to inhibit the enzyme more than 70% monitor for their inhibitory separated compound using high performance thin layer chromatography (HPTLC) on-plate enzyme assay. The resulted compound removed from the plate and Identified using LC-ESI/MS.

**Results and Discussion:** The results obtained from the enzymatic tests of various extracts as well as HPTLC on-plate, indicate that the extract containing *Prunus Dulcis* and *Prunus Mahaleb* extract with an inhibitory effect of about 75 to 80% can inhibit both the enzyme and reduce its activity. In the case of the HPTLC spectrum, it was also found that the extracts examined at 366 nm wavelengths had certain bands in different parts of the plate, and when we put these plates in the enzymatic action, we found that the enzyme inhibitory function is evident in the extracts loaded in the plates. The identified compounds belong to hydrophilic parts of the prescription.

**Conclusion:** The results of this work showed that extract from indigenous plants in Iran and Iraq has the potential to inhibit important enzymes in the control of diabetes, and they can be used as drugs for the treatment of diabetes.

Keywords: Diabetes, Traditional Medicine,  $\alpha$ -glycosidase,  $\alpha$ -amylase, On-plate HPTLC Enzyme Assay

P 39

## Critical Thinking Strategies for Wounds

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Many wound care teams provide a specialized level of care using various wound care therapies and are managed by qualified healthcare professionals (QHPs) from different specialty backgrounds such as family medicine, podiatry, and plastic surgery. However, these QHPs are sometimes challenged by reimbursement issues, limited therapy and dressing options, reduced access to multidisciplinary team members, and cost-driven factors unique. This article presents an overview of describes a holistic approach to treating patients, and provides clinical guidance on the decision-making process for selecting optimal treatment plans for the patient.

Methods: Internet and journals were searched for studies published between 2010 and 2018 reporting outcomes for homogeneous groups of male and females. 12 studies were selected and reviewed and used for background and report of result.

Result: CRITICAL THINKING IN DEVELOPING TREATMENT PATHWAYS Selecting appropriate products and therapies. Once a complete assessment has been performed and patient and wound factors affecting healing are identified and addressed, it is time for the important task of choosing the optimal wound treatment. The method of choosing treatment should be systematically and consistently employed for all patients. Dressing choice must be based on the fundamental process of wound repair and adhere to the basic concepts in wound

management.

Keywords: Critical Thinking, Wound Healing, Chronic Wounds, Advanced Wound Therapy

P 40

## Alteration in Hemoglobin Structure upon Interaction with Titanium Oxide Nanoparticles

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Background: The unique properties of titanium oxide nanoparticles (TiO<sub>2</sub> NPs) have made them widely used in medical and food applications. However, their probable toxic effects against biomacromolecules especially proteins are not well understood. The present study was aimed to evaluate the effects of TiO<sub>2</sub> NPs on the human hemoglobin (Hb) using circular dichroism (CD) and UV-visible (UV-vis) spectroscopic methods.

Methods: The far (190-260 nm) circular dichroism bands of Hb (3  $\mu$ M in phosphate buffer pH 7.4, 10 mM) before and after addition of various concentrations of TiO<sub>2</sub> NP with the ranging from 3 to 30  $\mu$ M were recorded using a spectropolarimeter, model Aviv 215 at room temperature. Also, heat denaturation curves of free Hb and Hb/TiO<sub>2</sub> NP complex at various temperatures (25-95°C) were measured by monitoring the changes of absorbance intensity at 280 nm using Cary spectrophotometer.

Results: Far CD spectrum of Hb revealed a strong double-minimum potential at 210 and 222 nm, indicating  $\alpha$ -helical structure. Upon addition of nanoparticle, a decrease in Hb  $\alpha$ -helix and increase in  $\beta$ -sheet and random coil contents were observed. In addition, the thermal stability analysis showed that the T<sub>m</sub> of free Hb was approximately 60°C, whereas, the observed T<sub>m</sub> of Hb/TiO<sub>2</sub> NP was about 50°C which demonstrates the decline in

protein stability after adding NP.

**Conclusion:** The result of this study showed that TiO<sub>2</sub> NPs interact with blood proteins, inducing considerable conformational changes and possibly cytotoxic effects, respectively.

**Keywords:** Hemoglobin, Titanium Oxide Nanoparticle, Circular Dichroism Spectroscopy, Interaction, Structure

P 41

## **Prevention of Diabetic Foot Pains**

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**Background:** One of the health problems today is the increase in the diabetes which causes immediate or delayed complications. Diabetes foot is one of the most important and undesirable side effects of diabetes. An effort to prevent the onset of diabetes and its complications can help reduce the cost of the economy. The purpose of this study is to prevent the onset of diabetic foot.

**The Search Method:** This study was a review article by reviewing article from the base of reputable scientific website including Google scholar, SID, Scopus and the keyword preventions diabetes, diabetic foot ulcer from 2009 to 2016.

**Results:** According to studies foot ulcers generally range from about 50 to 58 of the body surface severity caused by arterial disease such as neuropathy and peripheral vascular disorders. The incidence of wounds was 66% at random and 18% at the time of external exertion. In 85% of the time an intricate amount of diabetic could be prevented.

**Holding:** Implementing care recommendations plays an important role in reducing diabetic ulcers. Due to the low awareness of diabetic patients and the care of diabetes there is a need for targeted training programs to improve the awareness of

diabetic patients. Although diabetic foot ulcer are not completely preventable but with duration in the underlying factors training program can be greatly reduced by reducing the burden.

**Keywords:** Prevention Diabetes, Diabetic Foot Ulcer

P 42

## **Comparative Evaluation of “ARTADERM 1” and “Cod Liver Oil Ointment” on Healing Process in Burn of the Second Degree in Rat**

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**Background:** The treatment of skin burn is one of the most important challenges in medical science. Burns are divided into three degrees and each one has different effects on skin and other tissues. Many efforts have been applied by clinicians to manage wound healing through using genes, cytokines, chemokines and surgery. Some mechanisms that are involved in the process are local: tissue hypoperfusion, edema, prolonged inflammation, hypercoagulability, free radical damage and accumulation of cytotoxic cytokines.

**Material and Methods:** In this study twenty-eight female Wistar rats weighing 200-250 grams obtained and all of them were kept in controlled temperature of 23-25 °C and light period of 12- hours lightening and 12-hours darkness. Due to make burns after rats' general anesthesia Ketamine (40 mg/kg) and Xylazine (5 mg/kg) by Intra Peritoneal (IP) method was performed, after shaving of rats, A brass metal piece 1.4 cm × 3 mm thickness with 100 °C was kept on back of rats for fifteen seconds and it was made similar deep second-degree burns. No significant difference was found among four

groups regarding the primary wound surface area. The rats randomly were separated into four groups consisting of seven rats. In the control group the burn injury only was covered with sterile gauze, Artaderm ointment group, cod liver oil group, Eucerin group. The injury area was covered with sterile gauze bandage and this process continued for 21 days. On the 0, 7th, 14 th and 21st day of the experiment, tissue samples were taken under anesthesia from predetermined areas from all subjects in all groups. Wounds were daily examined for any changes in appearance of wounds, the color and smell of any discharge and time of scar separation.

Results: Statistical comparison of the burn area of study groups on days 7-14 and 21 post-burn, showed that between the control group and other groups, there was significant difference ( $P < 0.05$ ). While the best results for the treatment group Artaderm. According to studies, pathology, quickly restored with remarkable Artaderm was a significant difference between the effects of the other drugs. After stained with H & E , the treated group by Artaderm herbal ointment treatment significantly reduced the number of lymphocytes and enhanced the number of fibroblasts at the earlier stages and increased number of fibrocytes at the later stages of wound healing and 1 A herbal ointment improved re-epithelization, fibroblasts proliferation, and collagen bundle synthesis compared to cod liver oil and Eucerin and control group.

Conclusion: In the end, according to the results medication Artaderm in terms of healing the wounds and the healing has successfully demonstrated its therapeutic effect, has strong healing properties that can be used as a drug burn along with other existing burn ointments.

Keywords: Second Degree Burns, Cod liver Oil, Artaderm Ointment, Alcoholic Extracts, Rats

P 43

## **A Care Bundle to Prevent the Pressure Ulcer in the Intensive Care Units; A Systematic Review**

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Background: Pressure ulcer (also known as PU) or pressure sore is a localized injury of the skin or its underlying tissue which usually develops over bony prominences of body as a result of a long period of pressure.

Pu s are combined with pain, risk of infection and sepsis, longer time of hospitalization and higher costs and mortality, and they also have effect on health\_related quality of life.

Although they can be life-threatening, yet they are preventable.

Today's challenge is to implement evidence\_based pressure ulcer prevention in clinical practice.

A care bundle or prevention bundle is a small set of evidence\_based interventions for a defined patient with the goal of promoting cooperation among health care members, and translation of guidelines.

The existing one, which has been revised upon the EPUAP( European Pressure

Ulcer Advisory Panel 2014) and RNAO (the guidelines of Registered Nurses Association of Ontario 2009) includes 5 important elements of PU:

1. Risk assessment
2. Skin assessment
3. Support surface
4. Nutrition
5. Repositioning

Which runs in the different departments of a hospital, especially Intensive Care Units because of its high prevalence rate.

**Objectives:** To evaluate the effects of implementing a care bundle to prevent the increasing the prevalence rate of pressure ulcers in the Intensive Care Units.

**Methods:** To find related articles, search was conducted on Web of science, PubMed and Scopus databases for the articles which were published between 2007 and 2017 with these keywords: pressure ulcer, pressure ulcer prevention, prevention bundle, care bundle to prevent pressure ulcers.

**Results:** After a final selection, a number of 22 Randomized Control Trials that assessed implementing the prevention bundle method in the ICU s, were included.

**Conclusion:** 21 out of 22 studies which were included, reported success and decreasing prevalence rate. Just one of them did not report an obvious difference between the control and intervention group. This may be because of the prevention bundle did not provide an adequate training for nurses.

Although, due to the novelty of this method, it is believed that success in interventional groups is due to the nurses's thoughts about being watched, but it cannot be denied the significant effect of this intervention on reducing the prevalence of pressure ulcers.

**P 44**

## **Therapeutics Effects of Larval Therapy on the Chronic Ulcers**

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**Background:** Chronic wounds, such as pressure ulcers, diabetic wounds, or vascular ulcers, are associated with high morbidity and less mortality. Treating these wounds will cost more than £ 3 billion to the health system in the United States. In this review article, we review the impact of larval therapy as a natural healing for these wounds.

**Methods:** Chronic wound, larval therapy, wound care and their Persian synonym words were searched in

SID, Magiran, Pubmed, Sciencedirect and Cochrane databases without time limit in both English and Persian. Then the articles were reviewed and entered into the study according to the subject matter of the study.

**Findings:** After reviewing the articles obtained by searching the databases, 35 articles were obtained. The articles included review articles and clinical trials on the use of larval therapy in the treatment of chronic ulcers.

**Conclusion:** The results showed that due to high efficacy, safety and feasibility, its use is expanding, and there are sufficient clinical evidences to use larval therapy, especially in infectious wounds with several bacteria resistant and severe complicated that the surgery is impossible. **Keywords:** Chronic Wound, Diabetic Foot Ulcer, Venous Ulcer, Larval Therapy.

**P 45**

## **Effects of Green Tea on Wound Healing**

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The wound healing is a complicated overlapping process such as hemostasis / inflammatory, proliferative and remodeling phase. Delay in wound healing leads to infection. Wound infection is one of the common infective diseases in the world. One way to heal infectious wounds is reduction of bacteria on wound site. There are different plants that help wound healing such as green tea. So in this study we focus on Green tea's medicine effects.

Green Tea (*Camellia sinensis*) has several compounds that include catechins, polyphenolic, flavonoids, amino acids, caffeine and vitamins. Green Tea (GT) can operate as an anti-oxidant, anti-inflammatory, anti-aging and also it can improve wound healing. Polyphenols contain anti-cancer, anti-viral, anti-inflammatory and also potent anti-bacterial properties. Catechin increases volume of collagen therefore, it decreases in wound area. Study of the Young Park et al, 2014, showed that GT



and Hyaluronic acid microneedles were improved treatment of skin's infected wounds. Flavonoids have anti-oxidant, anti-inflammatory and antimicrobial operation.

As a result, GT can help to accelerate wound healing, prevents scar tissue formation and also decreases the inflammation process time so that GT's components reduce considerable wound healing period.

Keywords: Wound Healing, Green Tea, Catechins, Polyphenol

P 46

## Role of Proteins in Wound Healing

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Wound healing is a restoration of the structure and function of the tissue damaged through the reconstruction and replacement processes. Wound healing is important because skin is the first agent to protect the body from external factors. Damage to the skin can cause infection and disturbed of homeostasis .The three repair mechanisms after tissue injury are inflammation, proliferation and tissue remodeling. In the inflammatory phase, vascular permeability and cellular absorption increase .monocytes differentiate into macrophages. After a few days of wound healing proliferation phase begins.in this phase, fibroblasts and collagen are replicated. The tissue remodeling phase leads to collagen repair and contraction of the wound.

A number of proteins play a role in the wound healing process; including : bFGF (Fibroblast growth factor),Occluding and claudin-1,Anti-inflammatory cytokines, Tight -Junction proteins,P53,IL6,IL4,TNF- $\alpha$  (tumor necrosis factor alpha),IL1 $\beta$ ,Fibulin-5,TGF- $\beta$ 3 (transforming growth factor beta3),HSP90 $\alpha$ . in this paper, proteins that play an important role in the wound healing process were investigated. Study of proteins involved in

wound healing, can be developed new methods for improving the wound healing.

Table1: Proteins involved in wound healing

protein	function	Wound healing phase
bFGF	increases apoptosis	cell homeostasis mechanism/inflammatory phase
Occluding and claudin-1	cell adhesion agent	proliferation phase
Anti-inflammatory cytokines	Creating inflammation	inflammatory phase
Tight-Junction proteins	communicate cells in tissues	tissue remodeling
P53	increases apoptosis	tissue remodeling
IL6	Creating inflammation	inflammatory phase
IL4	makes and differentiated antibodies more faster	inflammatory phase
IL1 $\beta$	Creating inflammation	inflammatory phase
Fibulin-5	promotes the development of fibroclasticity	proliferation phase
HSP90 $\alpha$	epidermal fibroblasts & regulating cell homeostasis	inflammatory phase
TNF- $\alpha$ (tumor necrosis factor alpha)	Creating inflammation	inflammatory phase

Keywords: Proteins, Wound Healing, bFGF, Tigh-Junction Proteins, Wound Healing phase

P 47

## Optimization of Cell Proliferation and Repair with the Help of Microcarrier - based Cell Culture Technology

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Recently, Microcarrier-based cell culture method has been developed to providing a high surface area for sufficient cell proliferation of the specified tissues. Adhesion and harvesting of cells to and from microcarriers are two critical stages influencing final cell productivity and quality. After a comprehensive study on these crucial factors, all of cellular mechanisms which involved in the attachment and detachment process such as seeding conditions, chemical and mechanical harvesting methods and microcarriers' surfaces treatments were reviewed and discussed. The results of studies demonstrated that, development of cost-effective biodegradable microcarriers such as gelatin coated Ca- alginate hydrogels can be applied as biocompatible microcarries in tissue engineering applications and employment of other external-stimuli-responsive materials in microcarrier technology are suggested for future works. However, to achieve optimum results, a better understanding of thermodynamic forces involved in the attachment process, cell membrane characteristics and cell-surface interactions is critical.

Keywords: Microcarrier, Adhesion, Harvesting, Surface Modification, Tissue Engineering

P 48

## **Fat Tissue Properties in Wound Healing**

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Fat is abundant easily accessible tissue and for the first time in 1912 was described for treatment of facial lipoatrophy by Eugene Holler. Adipose tissue, which contains cellular and extracellular matrix component with stem cells in its cellular component, is considered as a promising source in the field of wound healing and regenerative medicine. For search strategy we use databases from pubmed, medline, google scholar with mesh terms such as Wound healing, fat tissue, Adipose derived stem cell. The purpose of this

review article is to investigate the wound healing properties of fat and adipose derived stem cells.

Keywords: Wound Healing, Fat Tissue, Adipose Derived Stem Cell

P 49

## **Human Placenta Mesenchymal Stem Cells: New Approach in Wound Healing**

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Placental tissue draws great interest as a source of cells for regenerative medicine because of the phenotypic plasticity of many of the cell types isolated from this tissue. Furthermore, placenta, which is involved in maintaining fetal tolerance, contains cells that display immunomodulatory properties. These two features could prove useful for future cell therapy-based clinical applications. Placental tissue is readily available and easily procured without invasive procedures, and its use does not elicit ethical debate. Numerous reports describing stem cells from different parts of the placenta, using nearly as numerous isolation and characterization procedures, have been published.

We isolated adherent cells from Collagenase-digested term placentas and established two clones by limiting dilution. We examined these cells for morphology, surface markers, gene expression patterns, and differentiation potential and found that they expressed several stem cell markers, hematopoietic / endothelial cell-related genes, and organ-specific genes, as determined by fluorescence-activated cell sorter analysis. They also showed osteogenic and adipogenic differentiation potentials under appropriate

conditions. We suggest that placenta-derived cells have multilineage differentiation potential similar to MSCs in terms of morphology, cell-surface antigen expression, and gene expression patterns. The placenta may prove to be a useful source of MSCs.

Keywords: Placenta, Mesenchymal Stem Cells, Wound Healing

P 50

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The MSCs have been shown to possess a strong ability to improve tissue damage in response to skin injury, by contributing to collagen deposition, wound contraction, angiogenesis, regeneration of skin appendages, and enhanced growth of epidermal cells. Currently, most of the studies related to MSCs in clinical treatments are on BMMSCs; only limited studies mentioned the application of WJMSCs. However, the process of obtaining the umbilical cord-derived MSCs is much easier and does not harm the donor, compared with that of BMMSCs. Similar to BMMSCs, MSCs derived from Wharton's Jelly can adapt to the culture conditions of the dermal equivalents (DEs), suggesting that WJMSCs confer a therapeutic benefit by supporting the regeneration of the dermal compartment. Interestingly, a small population of WJMSCs coexpresses the mesenchymal marker vimentin

and the epithelial marker pan-cytokeratin (CK). By contrast, BMMSCs are CK-negative after isolation and on DEs. Compared with BMMSCs, WJMSCs can survive on DEs and can adapt more easily to the culture conditions of the skin. Therefore, WJMSCs can promote skin epithelization, vasculogenesis, and collagen deposition, by secreting a number of soluble factors, during the wound healing phase. Therefore, WJMSCs can be used as an interesting and promising tool to regenerate skin wounds. The restoration of cutaneous appendages, after a severe skin injury, which is related to the function of the regenerated skin and affects the quality of life, may be an important function of WJMSCs during skin repair. The regeneration of sweat glands, after deep burns, has been an unresolved challenge. To address this problem, our group previously induced BMMSCs to acquire the phenotype of sweat gland cells in vitro and then transplanted them into fresh skin wounds, made by excising the anhidrotic scars of five patients after their deep burn injuries were healed. The MSCs transformed into sweat gland cells and facilitated the recovery of functional sweat glands. This phenomenon may help address the problem of sweat gland depletion in patients surviving extensive deep burns. The WJMSCs, in a specific induction system, may hopefully differentiate into sweat gland cell-like cells. Recently, WJM-SCs were successfully induced to differentiate into sweat gland cells in vitro. Studies indicated that WJMSCs can differentiate into sweat gland-like cells, via a novel and feasible system that is more effective than our previous method. The WJMSCs, as a novel source of stem cells, can differentiate into sweat glands, for further re-generation of the epidermis and skin appendages.

As a challenge that WJMSC transplantation has not yet been approved by the Food and Drug Administration and that clinical trials of MSC transplantation, showing no adverse events, have not yet reached the 10-year mark, WJMSCs have not been extensively used for clinical therapies. In addition, a number of

challenges and side effects in WJMSC-based therapy remain to be addressed. First, the umbilical cord is an allogeneic tissue for the recipient. The second problem is an ethical one. Although the umbilical cord is a disused organ, both the donor and the recipient have the right of informed consent. Third, a complete detection system, to test any potential disease risk in donors, has yet to be established. Fourth, the isolation and further expansion of primitive MSCs probably have several uncertain factors, such as the use of animal serum and the most common culture method in vitro, which should be avoided in clinical-grade therapy to prevent cell contact with xenogeneic proteins. Fifth, potential long term risks associated with MSC therapy that may not have been observable within a short period, after administrations have recently been confirmed in preclinical studies. These risks include potential maldifferentiation, immunosuppression and malignant tumor growth, which are the primary safety concern, as well as the promotion of tumor growth, when the treatment was systemically administered into animals with coexisting malignancy. Lastly, as products of cell therapy, product consistency, cell stability, and toxicity should also be considered.

Keywords: Cord, Mesenchymal Stem Cells, Wound Healing

P 51

## **Human Amniotic Membrane Mesenchymal Stem Cells: A Revolution in Wound Healing**

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The mesenchymal stem cells (MSCs), which are derived from the mesoderm, are considered as a readily available source for tissue engineering. They have multipotent differentiation capacity and can be differentiated into various cell types. Many studies have demonstrated that the MSCs identified from amniotic membrane (AM-MSCs) are shows advantages for many reasons, including the possibility of noninvasive isolation, multipotency, self-renewal, low immunogenicity, anti-inflammatory and nontumorigenicity properties, and minimal ethical problem. The AM-MSCs may be appropriate sources of mesenchymal stem cells for regenerative medicine, as an alternative to embryonic stem cells (ESCs). Recently, regenerative treatments such as tissue engineering and cell transplantation have shown potential in clinical applications for types of wounds. Therefore, amnion and MSCs derived from amnion can be applied to cell therapy in wounds.

We isolation and the phenotypic characterization of mesenchymal stem cells from the amniotic membrane. The placentas included in the study were derived from pregnancies with a normal evolution. Along with the placentas, umbilical cord blood and maternal peripheral blood samples were taken. The isolation and the culture of cells from the amniotic membrane was followed by the determination of the markers of these cells. The cells expressed markers characteristic of stem cells. Immunofluorescence evidenced the pluripotential properties of these cells.

Keywords: Amniotic Membrane, Mesenchymal Stem Cells, Wound Healing

P 52

## **A Case Report of the Extensive Traumatic Ulcer Healing Using Negative - Pressure Wound Therapy (NPWT)**

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**Background:** 5.8 million people die annually due to trauma. A traumatic wound may be a small incision or a large scar which damages the underlying soft tissues including muscle and bone. Deciding whether to treat widespread and profound wounds from trauma is difficult for a physician, and the most common way of treating them is to wash dead tissue and debris. Wound healing in this method without auxiliary treatments is very difficult and slow in many cases.

**Methods:** A 44-year-old woman who had a wide and deep wound on the right thigh due to an accident, and in addition to antibiotic therapy for more than 40 days, was hospitalized and washed daily in the operating room, his leg washed with serum. But his wound did not recover, and had a lot of discharge and funky. At the beginning of the treatment, the traditional daily washing and gas dressing method was discontinued and the patient was exposed to 12 days (four sessions) under vacuum pressure using a negative pressure device. First, the location of the wound was washed and then on the wound, black foam was placed and applied after a completely closed environment, applied for up to three days, a negative and continuous pressure of 120 mmHg to the wound. After three days, the dressing was removed and the process repeated.

**Results:** After the first session of Vacuum Therapy, the formation of granulation and wound depth was quite evident, finally, after 12 days (fourth session), the widespread and deep wound of the patient was completely granulated with tissue, the wound edges, which had a massive scar around the wound, were completely attached to the wound bed, and the ulcer was completely superficial, and the day 14 was closed by a plastic surgeon using a graft.

**Conclusion:** Vaccination therapy can be a good treatment for widespread and secreted wounds due to trauma. Therefore, it is recommended to use this method in patients with traumatic ulcer.

**Keywords:** Trauma, Vacuum Therapy, Wound

**P 53**

## **A Comparative Study on the Effect of Aloe Vera Gel and Silver Sulfadiazine Ointment on the Healing of Burn Wounds**

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**Background:** Healing of burn wounds is one of the most important health care priorities. There are various methods for treating hemorrhage. One of the most common methods for controlling it is that dressing with sulfadiazine is 1%. This dressing has many benefits, including extensive antimicrobial activity, reduced wound infections, and reduced burn death rates. However, there are significant disadvantages, including difficult access, high costs, sticking to the surface of the wound, creating scar, causing toxic effects on keratinocyte regeneration, laceration in the stomach, skin discoloration and reduced transparency, leukopenia, and met hemoglobin. Today, the use of medicinal plants in the control of wounds is increasing, one of the most important herbs in this field is Aloe Vera, considering the importance of burn wounds, the lack of uniform dressing to control it with minimal complications and the most effective and limited studies in this This study was designed to compare the effect of aloe Vera gel and sulfadiazine ointment.

**Methods:** This study was a randomized controlled clinical trial. Patients with second-degree burns with burns less than 20% were randomly assigned to two groups of intervention (35 subjects) and control (n = 35). One day, for 30 days, the ulcer site Burn was grouped in group A with aloe Vera gel and in group two (control group) was dressed with silver sulfadiazine ointment and on the days of 1, 3, 6, 10, 15, 22, 30 the characteristics and extent of the wound were accurately recorded. Data was then entered into the soft SPSS-21 software was analyzed and analyzed.

**Results:** The results showed that there was a significant difference between the mean burn wound in groups Aloe Vera and Sulfadiazine ( $P = .004$ ). At the beginning of the study, the extent of ulcers in the Aloe Vera gel group was  $9.1 \pm 2.2$  cm and in the sulfadiazine group  $8.9 \pm 6.3$  cm. On the fifteenth day, the extent of the ulcer in the gel group of aloe Vera and sulfadiazine was  $1.2 \pm 0.2$  and  $1.3 \pm 0.6$  cm, respectively. On the same day, the extent of the scar remained in the sulfadiazine group  $0.1 \pm 1$  cm and in the Aloe Vera group was  $0.5 \pm 0/00$  cm.

**Conclusion:** The results showed that dressing with Aloe Vera gel in a shorter time period than silver sulfadiazine improved the burn wound. Also, the scar remained less than the remaining, due to the positive effects of Aloe Vera gel, cheapness and easy access, It is recommended that this combination be used to control burn wounds along with other therapies.

**Keywords:** Aloe Vera, Silver Sulfadiazine, Burn

P 54

## **A Comparative Study on the Effect of Olive Oil and Aloe Vera Gel on Prevention of Pressure Ulcer**

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**Background:** Pressure ulcer is a disorder in skin integrity, prevention of which is one of the most important health care priorities around the world. Nowadays, ointment is used to prevent contagious ulcer. It has been able to reduce the incidence of pressure ulcers to a minimum, but disadvantages, it has difficult access and high cost. Today, the use of medicinal herbs for the prevention of ulcers is increasing, Among the important plants in this field are olive and aloe Vera, given the importance of pressure ulcer, lack of unit prevention, with minimal

complications, maximum efficiency and minimum price, limited studies in this field, therefore, the aim of this study was to evaluate and compare the effect of olive oil and Aloe Vera gel on the prevention of pressure ulcers.

**Methods:** This study was a randomized controlled clinical trial. Patients were randomly assigned to one of three intervention groups and one control group, and placed under pressure in a group of Aloe Vera gel (35) daily and three times in 30 days. Group two was infused with olive oil (35 people), without massage and pressure. All groups and in the third group (control group) received routine care, including a two-hour change in condition, a daily skin test, the use of mat wavy, examination of patient sheets and their lack of moisture and caution when moving the patient. In all groups one day was investigated among the Braden tool and the location characteristics of the pressure were carefully recorded. If the score obtained from the Braden criterion was greater than 18 or Starling's criterion for the onset of the wound, the patient would immediately be excluded from the study for initiation of therapeutic measures. The data then entered the SPSS-21 software and was evaluated.

**Results:** The results showed that 33.33% of patients (35 patients) had pressure ulcers, in group one, 25.71% (9 patients), in group two, 17.41% (6 patients) and in group 57% of the patients (20 persons) were ulcerated and 49% of the wounds were in the saccharum, 33% in the bauxites, 8% in the heel, 6% in the scapula and 5% in the spinal column, and the findings indicated that the incidence of wounds in the group Control was more than the intervention group ( $P = .003$ ) and the incidence of pressure ulcer in group 1 (Aloe Vera) was greater than that of group (Olive) ( $P = 0.01$ )

**Conclusion:** The results showed that the use of olive oil and aloe Vera has been effective in preventing pressure ulcers. Due to the easy availability and cost-effectiveness of these compounds, it is recommended that they be used in order to prevent the occurrence of pressure ulcers of the patients, along with other common methods. **Keywords:** Olive, Aloe Vera, Pressure Ulcers.

P 55

## A New Chitosan - PEG Wound Dressing with Enhanced Mechanical Properties

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A successful wound dressing is required to show acceptable structural, mechanical and biological properties. Here we aimed in developing a new wound dressing using chitosan as a biocompatible material with the antibacterial property and regenerative potentials, in combination with polyethylene glycol polymer (PEG) for mechanical and structural enhancement by crosslinking chitosan to well carboxylated PEG. The percentages of polymers, the carboxylation process and method of mixing were major parameters to obtain a proper porous structure with appropriate biological and mechanical properties and economical advantage. Hence we used wide ranges of chitosan percentage (15, 30, 50, 70, and 85 percent) and molecular weight of PEG (2000, 3350, 4000, 6000, and 10000), and two methods of fabrication through casting and freeze drying to obtain a novel chitosan based wound dressing with enhanced properties.

To produce the CS-PEG wound dressing, first two ends of PEG chains were carboxylated in combination with Succinic Anhydride. Carboxylation of PEG was performed in four different methods and the optimized method was selected based on FTIR results (For properly carboxylated PEG a noticeable peak is observed in FTIR graph in 1730-1750 Hz), the toxicity of the final material and facility of synthesis method. Our results indicated that the successful method of fabrication was achieved when the solution of PEG in methylene chloride was combined with succinic anhydride at 60 °C. Then chitosan functional group (NH<sub>2</sub>) and

carboxylated PEG functional group (COOH) were cross-linked during an esterification reaction. The chemical bond affinity of CS – PEG chains increased by use of EDC and NHS in CS – PEG structure. An optimized strategy to achieve enhanced dressings relies not only on selection of proper constituents but also on a suitable method of fabrication with economical advantage. Two methods of fabrication were used to prepare CS-PEG films. In the first method, the synthesized solution was casted and dried at ambient temperature. In the second method, the solution was frozen abruptly by liquid Nitrogen and was dried by a freeze dryer leading to the sponge type highly porous structure. The fabricated films of two methods were examined to compare their chemical, mechanical and biological properties.

Different material properties were examined including swelling, biodegradability, water vapor transmission, and porosity. Furthermore, samples were mechanically characterized by elastic modulus, viscoelastic parameters, and dynamic moduli. All tests were repeated at least three times and the average  $\pm$  standard deviation values were calculated. We performed structural tests on dried samples of two methods to select the optimized method. The processed samples showed a proper swelling behavior, gaining most swelling in PBS within the first 30 minutes. The degree of swelling of examined samples in both PBS and blood decreased by an increase in the percentage of chitosan most likely due to a reduction in cross-linked chain distances, however such trend was not observed by increasing chitosan percentage. The CS-PEG hydrogels are capable of absorbing blood and exudates within the range of 3-10 times of their weights which can facilitate the remodeling and healing of granulated tissues. Besides, the high range of blood absorption (3-5 times of the dressing weight) can assist the homeostasis phase in the injury site. On average samples produced by freeze-drying method were swollen to 5.83 folds by mass during 48 hr incubation in PBS, with 4.78 folds in the first

two hours. The synthesized CS-PEG hydrogels showed longer biodegradation compared to pure chitosan. Samples with a higher percentage of chitosan showed slower biodegradability rates, as samples with 30% chitosan were thoroughly decomposed before 28 days. Hence they were not considered as appropriate candidates for wound dressing. On the other hand, the rate of degradation among samples with a high ratio of chitosan (85%) was by far low, such that after 28 days, only 26% of the mass was reduced. It was concluded that samples with chitosan ratios of 50% and 70% were degraded with sustained rate and appropriate time span for wound healing. Although samples produced by freeze-drying showed proper swelling and blood absorption properties, they indicated poor results in biodegradability and mechanical properties compared to samples produced by casting. The majorities of freeze-dried samples were degraded within two weeks and showed low strength with the average value of 0.26 MPa. Both results indicated inadequate features for a suitable wound dressing candidate. Therefore such samples were disregarded from further analyses. Samples with 70% and 50% of chitosan and molecular weight of 2000, synthesized by casting method were selected after meeting the adequate requirements as proper candidates for the wound dressing. The selected samples not only showed adequate elastic characteristics, but they also performed well in viscoelastic behavior. Skin tissue is considered to be viscoelastic; the candidate dressings similarly showed viscoelastic behavior. The stress relaxation data of samples described a viscoelastic solid state similar to soft tissues including skin, with the dominant effect of storage modulus (represented by the elastic element) compared to loss modulus (represented by the viscous element). Furthermore, the storage modulus showed a stable behavior in a wide range of frequencies. CS – PEG films porous structure with small size pores provided an appropriate environment to enable absorbance and drainage of wound exudate and

transmission of vapor and passage of Oxygen and CO<sub>2</sub> while forbidding the entry of external contamination into the wound environment. It seems that the average pore size of 2.3  $\mu\text{m}$  that was provided by the synthesized dressings of CS70%-PEG2000 through casting method is an appropriate value for the mentioned purposes. In general, the permeability of samples after one week was in the range of 200 - 7300 gr/m<sup>2</sup>. The degree of permeability in CS-PEG films increased by the decrease of chitosan ratio most probably due to an increase of cross-linked chain distances. The high reduction rate of bacteria colonies (the average 95 percent) of each sample after 24 hours of culturing *Escherichia coli* and *Staphylococcus aureus* bacteria shows outstanding antibacterial properties of fabricated CS-PEG wound dressings, likely due to high content of chitosan. The reduction of colony formation was more in CS70 than CS50. This benefit reduces the possibility of infection and wound odor, and subsequently enhances healing and reconstruction of granulated tissue. Moreover, they indicated non-toxicity for L929 fibroblast cells with over 98% viability in MTT assay. The selected samples were introduced as wound dressing candidates.



Keywords: Wound Dressing, Chitosan, Polyethylene Glycol, Mechanical properties, Biocompatibility



P 56

## Effects of Low Level Laser Photobiomodulation and P-coumaric Acid on Lactate Dehydrogenase Activity of Melanoma Cancer Cells

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The cancer cells demonstrate high rate of glycolysis instead of oxidative phosphorylation, to generate energy for rapidly proliferating tumor cells. The lactate dehydrogenase (LDH) enzyme catalyzes the reversible transformation of pyruvate to lactate under anaerobic conditions, coupled with the oxidation of NADH to NAD<sup>+</sup>. Numerous studies have suggested that elevated LDH is hallmark of aggressive form of carcinomas. In this study, LDH activity was determined in human melanoma A375 cancer cells treated with low level laser (LLL) photobiomodulation and then p-coumaric acid.

Human melanoma cancer cell line A375 was exposed to irradiation with a red laser source (660 nm; power density: 30 mW cm<sup>-2</sup>) and another sample was kept in dark as control. After treatment with laser, the cells were treated with different concentrations of P-coumaric acid (0-1 mg/mL) for overnight. The LDH assay was used to determine the enzyme activity. The morphology of cells was studied using inverted light microscopy.

The results indicate that early treatment with low level laser photobiomodulation and then P-coumaric acid decreases the LDH activity as compared with the dark group. As LDH is a promising target for anticancer therapy, application of low level laser photobiomodulation and then P-coumaric acid could be considered as novel opportunities in human melanoma cancer treatment.

Keywords: Human Melanoma Skin Cancer, P-coumaric Acid, Photobiomodulation (PBM), Lactate Dehydrogenase (LDH).

P 57

## Role of Macrophage in Repair of Injured Spinal Cord and Wound Healing

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Unlike the repair and remodeling of skin and muscle tissues after injury, spinal cord tissue is not regenerate properly. Macrophage activation as an inflammatory factor plays a pivotal role in restoration process of injured tissues. Following tissue injury, macrophages through the secretion of pro and anti-inflammatory cytokines and chemokines promote repair process. In current review we compare the inflammatory and healing responses of macrophages based on phenotypic activation in spinal cord tissue and tissues that completely restored. During normal healing of injured tissue, sequence activation of M1, M2a, M2b and M2c macrophages promote inflammation, proliferation and remodeling phases. However, M1 and M2a macrophages during spinal cord injury have prolonged inflammatory phase and the proliferation and remodeling do not initiate properly. Long activation of macrophages in spinal cord causes chronic inflammation and wound not restored. Determining which phenotypes of macrophages are needed to promotion of repair or demotion of damage process can help to design new approaches in order to promote spinal cord reconstruction and motor function improvement.

Keywords: Macrophage, Spinal Cord Injury, Wound Healing

P 58

## **Infection Control and Burn Wound Healing in Rats with Essential Oil**

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**Background:** Burn wound is a good place to develop resistant to infections. In this study, the use of diluted plant essential oil for controlling bacteria in the burn was investigated.

**Materials and Methods:** Grade 2 ulcer burns to specific dimensions in three groups of rats after anesthesia. Confirmation of bacterial susceptibility to the diluted essential oil through dilution Micro dilution method and disk diffusion. In this design, after inoculation of Pseudomonas bacteria, the first group was treated with essential oil and the second group was treated with silver nitrate ointment and the third group had no treatment. During the treatment and debridement of the wounds, the presence of infection and its symptoms as well as inflammation and healing rate were studied. A warm coloring and microbial culture were performed and biopsies from the wounds of two groups of extract and silver nitrate ointment were subjected to histological examination.

**Results:** In the dilution Micro dilution method, the concentration of 5 mg / ml was obtained as MIC. The results and observations were performed in three treatment groups with extract and treatment of silver and the group without treatment were microscopic and macroscopic, and the physiological signs of their mice and their wounds, as well as pathological examination. In the Silverstone group, the wound healing rate was very low due to the presence of more bacteria and inflammation. Oscars were not easily debrided due to inflammation. In the control group, the scar was formed, but the recovery rate was very low and no similar symptoms were observed in the extract and silver groups.

**Conclusion:** It was proved that Oregano essential oil was able to control first and second degree burn wound infections in vistar rats. This material is recommended for the clinical trials on human.

**Keywords:** Infection Control, Burn, Wound Healing, Essential Oil

P 59

## **Evaluate the Effect of Colloidal Silver Combined to Recell Technique on Wound Healing**

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**Background:** Recell technique is a new methods for the first and second-grade wound healing. Method of this technology is producing cell suspension from patient's skin, which is a safe, and sprayed into the wound.

The use of colloidal silver is important for wound healing because of antimicrobial effect on wound.

The aim of this study is to compare efficacy of recell technique and silver colloidal on wound healing.

**Methods:** This review article was carried out by searching for studies in Pubmed, Embase, Scopus and Cochrane library (from inception to Mar 2018), by using the search terms "recell" "silver nanoparticle" "wound healing" and "silver colloid". The search was limited to articles published in English. In this review, 310 articles that are associated with subject, were found and of these, 32 articles were applied.

**Results:** The cells, which were converted to suspension by Recell machine, have free edge. And they causes wound healing by produce interleukine-1 (IL-1) and proteins (such as HSP90 and HMGB1) after about 5 to 7 days. This technique has greatly reduced the scarring and the effects of skin grafts, especially on burns.

Silver colloidal have broad-spectrum antibacterial efficacy, reducing inflammation by regulate cytokines (include reducing MMP9, IL6 and increasing VEGF, IL10, INF $\gamma$ ) and stimulating the migration and proliferation of keratinostattites, activating macrophages that resulting in wound healing and repair it.

Conclusion: Considering the antimicrobial role of silver nanoparticles, it can be considered as complementary to Recell's technique. Colloid silver assumes the role of reducing the infection of wound. So, the combination of these two techniques can be used to treat wound healing better.

Keywords: Wound Healing, Recell, Colloidal Silver, Anti-inflammatory Effect, Anti-microbial Activity, Cytokin *University of Medical Sciences, Iran.*

Oral ulcers are one of the most common causes of referral to dermatologists. One common classification is based on acute, chronic or recurrent cases of the disease. Chronic cases of the disease can be caused by various causes, including: traumatic, infectious diseases, systemic or autoimmune diseases such as bullous diseases and lichen planus, neoplastic ,.... patient history, location of the lesions and other characteristics of the wounds, along with histopathologic findings and, if necessary, direct immuno-fluorescence and culture can help to properly diagnose the chronic wound causes. One of the important causes of chronic oral ulcers, which is often neglected from patients due to asymptomatic nature in most cases, is Squamous cell carcinoma . The ulcerative form of this disease is often destructive , therefore the diagnosis of SSC in chronic and prolonged ulcers should be in the mind of the therapist. The purpose of this review article is to investigate the causes of these ulcers, diagnosis and Therapeutic approaches.

