9.00- 9.30
Keynote Lecture 3

THE SCIENCE OF TISSUE EXPANSION
Alex MARGULIS
Hadassah, Israel

9.50–11.10 SESSION 7 – ANGIogenesis,
Wound Healing & Burns

Moderators
Aernout LUTTUN
Laurence BOON

9.50 THE ASSESSMENT OF
THE PROTECTIVE EFFECT OF
LACTObACILLus PLANTARUm
FROM METHICILLIN-RESISTANT
STAPHyLOCoccUS AUReUS
INFECTIONS IN AN EXPERIMENTAL
BURN MODEL

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AKYÖN, Aycan Ugur KAYIKÇIOGLU

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INTRODUCTION: Methicillin-resistant Staphylococcus aureus is one of the most common microorganisms isolated in graft lysis and septic patients with extensive burns. The main objective of this study is to determine and quantitatively measure the protective and/or therapeutic effect of Lactobacillus plantarum application on the burn wound before and after the onset of Methicillin-resistant Staphylococcus aureus infection.

MATERIALS AND METHODS: For this reason third degree scald burn lesions affecting 10% of body surface area were formed on the back of five groups of rats. There were seven rats in each group with a total number of thirty-five. First group designed as control group and no intervention made after the burn. In the second group, Lactobacillus plantarum was applied right after the burn and then Methicillin-resistant Staphylococcus aureus was inoculated. In the third group, Methicillin-resistant Staphylococcus aureus was applied right after the burn and then Lactobacillus plantarum was inoculated. The other two groups were designed as controls of Lactobacillus plantarum and Methicillin-resistant Staphylococcus aureus.

RESULTS: On the fifth and tenth days bacterial loads and compositions were assessed by colony counts in tissue biopsies and wound swabs. In the second group in which Lactobacillus plantarum was applied before Methicillin-resistant Staphylococcus aureus infection, Methicillin-resistant Staphylococcus aureus colony counts were found to be significantly lower compared to the other groups (p<0.05). In the third group in which Lactobacillus plantarum was applied after Methicillin-resistant Staphylococcus aureus infection, Methicillin-resistant Staphylococcus aureus colony counts were not found to be significantly different compared to control groups (p>0.05). As a result Lactobacillus plantarum has shown to have a protective role in non-infected burn wounds when applied before Methicillin-resistant Staphylococcus aureus infection but a therapeutic effect of Lactobacillus plantarum was not demonstrated.

CONCLUSIONS: Lactobacillus plantarum is thought to have a promising role in prevention and treatment of burn wound infections.

10.00 DEVELOPMENT OF A NOVEL
WAY TO CREATE LARGER VASCULAR
CONDUITS OF DIFFERENT BIOMATERIALS

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INTRODUCTION: The design of vascular conduits to support the growth of tissue constructs is still in its infancy. We are limited in our ability to achieve precise spatial arrangement of cells and different biomaterials within this conduit. Additionally, fabrication of vascular networks requires a sophisticated set up and does not usually result in adequate vessel formation. In this study, we report a novel way to uniformly deposit different biomaterials using a concentric layering approach to create vessels.

MATERIALS AND METHODS: Rat-tail collagen type I was used as a scaffold material and to provide structural support to the vascular graft. For the design of a vascular conduit, a cylindrical PDMS mold of 5mm in diameter was used. The developed lumen was then coated with fibronectin and matrigel, followed by seeding with 3 x 10^6 cells/mL human umbilical vein endothelial
cells (HUVECs). Following incubation, the tissue architecture was characterized through immunostaining, histology and imaging using confocal microscopy.

RESULTS: Endothelial cells exhibited high viability (>90%) as measured via confocal microscopy using Hoechst 33342 and propidium iodide staining. Following 7 days of incubation, the necessary structural integrity of the endothelial monolayer lining the lumen was achieved. This was proven by the formation of a well-defined network of actin-filaments, stained with Alexa Fluor 488 phalloidin. Additionally, the diffusional permeability of this conduit was evaluated using fluorescent labeled dextran molecules. Future studies are focused on perfusing the lumen with media with a digital-control peristaltic pump.

CONCLUSIONS: We have successfully developed a novel method to generate a vascularized conduit while maintaining precise spatial control over the deposition of different biomaterials. The developed vascular graft has the potential to aid in flap based tissue reconstructions when combined with a tissue-engineered construct.

10.10 BENFOTIAMINE: A PROMISING REGIMEN TO TREAT DIABETIC COMPLICATIONS. ITS EFFECTIVENESS IN THE HEALING PROCEDURE OF DEFECTS IN DIABETIC ANIMAL MODELS

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INTRODUCTION: Diabetic foot ulcers are the most common cause of hospitalization for diabetic patients in the western world; it is estimated that 15% of diabetics will develop a chronic foot ulcer during their lifetime. Diabetic neuropathy, peripheral arterial disease and impairment in microvascular circulation are implicated in the formation of diabetic ulcers. Benfotiamine, a lipid-soluble, synthetic derivative of thiamine, has a well-known role in reducing the effects of hyperglycemia and oxidative stress, and has already been used to manage successfully diabetic complications. The main objective of this experimental study was to investigate the effect of benfotiamine on the healing procedure of defects in diabetic rats.

MATERIALS AND METHODS: Sixteen diabetic Wistar rats were included in the study. Eight animals were treated with benfotiamine orally with a dose of 80mg/kg/day for 8 weeks (Group A), while another eight diabetic rats were left untreated (Group B). By the end of the eighth week, a skin defect of 1.2x1.2cm was created on the back of all animals in both Groups. On the seventh postoperative day, the defects were clinically and histologically assessed, following surgical excision of the wound area. Macroscopical and histopathological characteristics, i.e. epithelialization, cell type and proliferation, collagen deposition and neovascularization) were recorded and analyzed by two independent pathologists.

RESULTS: The qualitative variables describing the healing process were quantified in a single score. There was found no statistical difference in the two groups of rats as far as the overall score of healing was concerned (p=0.936). Epithelialization, number and type of cells, collagen deposition and neovascularization did not show any statistical significance between the two groups of animals either.

CONCLUSIONS: Benfotiamine has been shown to have beneficial effects in the treatment of diabetic retinopathy, neuropathy and nephropathy. Its effectiveness in wound healing has not been proven in our animal study.

10.20 MULTIPOTENT ADULT PROGENITOR CELLS SUPPORT LYMPHATIC GROWTH IN WOUND HEALING AND LYMPHEDEMA

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INTRODUCTION: Lymphedema is a lifelong condition caused by lymphatic system deficiency. Current treatment strategies focus on symptom alleviation rather than functional restoration of lymphatic system failure. In addition, defective lymphatic growth is an important aspect of