20th Annual IFATS Conference

THERE’S ONLY ONE IFATS

October 5-7, 2023
Omni Shoreham Hotel, Washington, DC
Presidential Note

On behalf of the 2023 IFATS Program Committee and Board of Directors, it is a great honor to welcome you to the annual IFATS meeting in Washington DC.

The International Federation for Adipose Therapeutics and Science (IFATS) is the premier, global scientific society focused on promoting research on adipose biology and adipose-derived therapeutics. The annual conference, which began in 2003, has a rich tradition in being multi-perspective and features innovations in basic science, translational research, clinical and surgical practice, and industry-led initiatives. Annual features of the conference include regulatory and legal issues pertinent to regenerative therapeutics, clinician-driven therapeutic translation, basic science investigations in therapeutic mechanisms of action, and industry-academia commercialization partnerships.

This year’s IFATS program committee dedicated our efforts to achieving a 3-day conference embedded with inclusivity and diversity, including in our geographic reach, clinical expertise, career stage, and our racial and ethnic background. Toward these goals, we are excited to present three exciting days of scientific discussion and expert panels focused on unique avenues for improving patient care and therapeutic innovation translation, the impact of diversity in research translation and health equity, and new frontiers in adipose therapeutics.

A secondary goal for this year’s IFATS conference is increasing junior trainee accessibility and engagement. While enabling student and trainee opportunities has always been a pillar of the IFATS mission, this year we aimed to further increase the educational value of the meeting curriculum through a new program component called IFATS Academy. In these sessions, expert faculty provide fundamental knowledge on the neurobiology of pain, etiology of obesity and lipidemia, fat grafting clinical fundamentals, and academic career development, to enhance student understanding, promote attendee engagement, and encourage camaraderie. As the field of adipose science is still in its infancy, we hope that this novel program will inspire scientists and clinicians at pivotal career points to undertake research exploring mechanisms through which biologics, including adipose therapeutics, modulate tissue pathophysiology.

As we gather in this collaborative space, it is imperative that we remain mindful of the responsibility that accompanies scientific discovery. We are not only advancing the frontiers of knowledge but also impacting the lives of individuals seeking hope and healing. To this end, we have invited Graham Parker, PhD, of Wayne State University and Editor-in-Chief at Mary Ann Liebert, Inc., to lead us in discussions on ethical considerations, safety, and patient-centered care. These must remain at the forefront of our discussions, guiding us toward responsible and effective use of these exciting new therapies and discoveries.

Our conference is not just a platform for scientific exchange; it is a catalyst for change and a call to action. The discoveries made here have the potential to transform the way we approach patient care, to enhance the quality of life for millions. Together, we have the opportunity to bring science to the bedside, to make a tangible difference in the lives of those who need it most. I encourage you all to actively engage in the discussions, to collaborate, to challenge existing paradigms, and to foster innovation. The synergy of ideas and perspectives within this diverse gathering is our greatest asset. Let us harness the collective intelligence of this assembly to unlock the full potential of adipose biologics for the betterment of humanity.

Lauren Kokai, PhD
IFATS President
### Executive Committee - Board of Directors

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<tr>
<th>Name</th>
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<tr>
<td>William Futrell, MD</td>
<td>Past President 2005</td>
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<td>Adam J. Katz, MD</td>
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<td>Ricardo Rodriguez, MD</td>
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<td>J. Peter Rubin, MD</td>
<td>Past President 2004</td>
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### Executive Committee

- **Ramon Llull, MD, PhD**
  - Past President 2003
  - Winston-Salem, NC, USA

- **Ricardo Rodriguez, MD**
  - Past President 2016
  - Baltimore, MD, USA

### Board of Directors

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<td>Lauren Kokai, PhD</td>
<td>President 2023</td>
<td>Pittsburg, PA, USA</td>
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<td>Torsten Blunk, PhD</td>
<td>Past President 2022</td>
<td>Wuerzburg, Germany</td>
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<td>Ivona Percec, MD, PhD</td>
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<td>Past President 2015</td>
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<td>Marco N. Helder, PhD</td>
<td>Past President 2014</td>
<td>Amsterdam, Netherlands</td>
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<td>Kacey Marra, PhD</td>
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<td>Sydney Coleman, MD</td>
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<td>Julie Fradette, PhD</td>
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<td>Keith March, MD, PhD</td>
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<td>Jeffrey M. Gimble, MD, PhD</td>
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The first and only off-the-shelf allograft alternative to small-volume fat transfer

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### Scientific Program Committee

**Lauren Kokai, PhD – President**

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<tr>
<th>Name</th>
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<td>Trivia Frazier, PhD, MBA</td>
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### Invited Speakers & Session Moderators

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<td>Ian Valerio, Cpt, MD, MBA</td>
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### Abstract Reviewers

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<td>Evangelia Charni, PhD</td>
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<td>Bryan Choi, MD</td>
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<td>Susanna Kauhanen, MD, PhD</td>
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<td>Singapore Bioimaging Consortium / Duke-NUS Graduate Medical School</td>
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<td>University of Florida College of Medicine</td>
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### Free Paper Presenters

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<td>Alma Yrjänäinen, MSc</td>
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### WEDNESDAY - OCTOBER 4

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| 5:30 - 7:00 pm | IFATS EXECUTIVE BOARD MEETING  
Capitol Room |

### THURSDAY - OCTOBER 5 - Improving Patient Care and Innovation Translation

**Blue Room**

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| 8:30 - 9:00 am | Continental Breakfast in Exhibit Hall  
Blue Prefunction |
| 9:00 - 9:10 am | Welcome Remarks and Overview  
Lauren Kokai, PhD - IFATS President |
| 9:15 - 10:00 am | OPENING KEYNOTE SPEAKER:  
Unmet Surgical Challenges in War Wounded, An Urgent Need for Regenerative Therapeutics  
Dr. Valerio is a military captain and a leader in reconstructive, regenerative and restorative surgery, microsurgery and peripheral nerve surgery  
Boston, MA, USA  
Introduced by J. Peter Rubin  
Ian Valerio, Cpt, MD, MS, MBA  
Scientific Director, DoD Limb Optimization and Osseointegration Program, Assistant Professor of Surgery, USU Walter Reed  
Surgery and Rehabilitation, Bethesda, MD, USA |
| 10:00 - 10:30 am | Coffee Break in Exhibit Hall  
Blue Prefunction |
| 10:30 - 11:15 am | Regenerative Medical Advances in Military Medicine and Surgery Based on the Work Ongoing at USUHS, Walter Reed and Bethesda Naval Medical Centers  
Introduced by Jeffrey M. Gimble, MD, PhD  
Scientific Director, DoD Limb Optimization and Osseointegration Program, Assistant Professor of Surgery, USU Walter Reed  
Surgery and Rehabilitation, Bethesda, MD, USA  
Trauma Beyond the Injury Site  
Thomas A. Davis, PhD  
Vice Chair of Research, professor USU Walter Reed Surgery, Bethesda, MD, USA |
| 11:20 - 12:30 pm | Free Papers 1 - Pain & Wound Healing Indications  
Moderator: Summer Hanson, MD, PhD  
Stromal Vascular Fraction (SVF) Relieves Symptoms of Carpometacarpal I Osteoartrosis (OA) - Preliminary Interim Analysis of Randomized Control Trial (RCT)  
Presenter: Susanna Cecilia Kauhanen, PhD - Finland  
Affiliation: Helsinki University Hospital  
Authors: Susanna Cecilia Kauhanen, Jussi Kosola, Samuli Aspinen  
Combination Therapy with Adipose Fat Grafting for Hypertrophic Burn Scars  
Presenter: Sherry Collawn, MD, PhD - USA  
Affiliation: University of Alabama  
Authors: Sherry Collawn  
Outcomes and Complications after OPRA Osseointegration Surgery for Patients with Transfemoral Amputations  
Julio A. Rivera, PhD  
Scientific Director, DoD Limb Optimization and Osseointegration Program, Assistant Professor of Surgery, USU Walter Reed  
Surgery and Rehabilitation, Bethesda, MD, USA  
Preclinical Volume Retention of Fat Grafts Processed With REVOLVE™ Technology Active Filtration System or Decantation Methods in Irradiated and Nonirradiated Wounds  
Presenter: Patrick S. Cottler, PhD - USA  
Affiliation: Allergan Aesthetics, an AbbVie Company  
Authors: Christopher A. Campbell, Patrick S. Cottler, Graham M. Grogan, Nimesh Kabaria, Maryellen Sandor |


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<tr>
<th>Time</th>
<th>Session</th>
<th>Presenter</th>
<th>Affiliation</th>
<th>Authors</th>
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<tr>
<td>12:04</td>
<td>(p.19) - Mechanical Processing of Human Lipoaspirate with a Fluidic Device System Enhances Recovery of Mesenchymal Stem Cells and Promotes Wound Healing Through Hydrodynamic Shear Flow</td>
<td>Derek Banyard, MD, MS, MBA - USA</td>
<td>Sayenza Biosciences</td>
<td>Derek A. Banyard, Alexandra M. Sorensen, Mary Zeigler, Pisrut Phummirat, David Zalazar, Alan D. Widgerow, Jered B. Haun</td>
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<td>12:15</td>
<td>Advances in Facial Fat Transfer</td>
<td>Kamakshi R. Zeidler, MD - USA</td>
<td>Aesthetx</td>
<td>Kamakshi R. Zeidler</td>
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<td>12:30 - 1:30 pm</td>
<td>Lunch</td>
<td>IFATS ACADEMY - Neurobiology of Chronic Pain</td>
<td>Selwyn Jayakar, PhD</td>
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<td>1:30 - 2:30 pm</td>
<td>SPECIAL PRESENTATION BY PETER MARKS, MD, PhD: Adipose Stem Cells: Turning the Hype into High-End Medical Products</td>
<td>Peter Marks, MD, PhD</td>
<td>Director, Center for Biologics Evaluation and Research (CBER), Food and Drug Administration, Silver Springs, MD, USA</td>
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<td>2:30 - 3:55 pm</td>
<td>PANEL: Adipose Therapeutics for Pain: Demystifying Avenues of Medical Intervention</td>
<td>Fat Grafting to Enhance Peripheral Nerve Regeneration and Attenuate Neuropathic Pain</td>
<td>Stephen W. Kemp, PhD</td>
<td>Stephen W. Kemp, MD, PhD, Director, Neuromuscular Lab, Associate Editor, Muscle &amp; Nerve, Associate Professor, University of Michigan, Section of Plastic Surgery, Department of Surgery, Department of Biomedical Engineering, Michigan Neuroscience Institute Affiliate, Ann Arbor, MI, USA</td>
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<td>A Systems Pharmacology Approach to Analgesic Development</td>
<td>Selwyn Jayakar, PhD</td>
<td>Selwyn Jayakar, PhD, Fellow F.M. Kirby Neurobiology Center, Department of Neurology, Boston Children's Hospital and Harvard Medical School, Boston, MA, USA</td>
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<td>Cerebral Organoids to Study Central Mechanisms of Pain: The Effect of Stem Cell Secretome on Opioid Receptors and Neuroplasticity</td>
<td>Antonio Salgado, PhD</td>
<td>Antonio Salgado, PhD, Coordinating Investigator and Vice-dean for Research at the School of Medicine, Life and Health Sciences Research Institute (ICVS), University of Minho Portugal</td>
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<td>Fat Grafting as Treatment in Pain Syndromes</td>
<td>Francesco Klinger, MD</td>
<td>Francesco Klinger, MD, Reconstructive and Aesthetic Plastic Surgery School, Department of Medical Biotechnology and Translational Medicine (BIOMETRA), University of Milan, Plastic Surgery Unit, Humanitas Research Hospital, Milan, Italy</td>
</tr>
<tr>
<td>4:00 - 4:55 pm</td>
<td>Free Papers 2 - Head and Neck</td>
<td>Nanofat Graft in Treatment of Infraorbital Dark Circles</td>
<td>Yi Ru Su, MD - Taiwan</td>
<td>Yi Ru Su, Chi-Ming Pu</td>
</tr>
<tr>
<td>4:11</td>
<td>Nanofat as a Rescue for Peri Oral Rejuvenation Following Aggressive CO2 Laser and Microneedling Treatment</td>
<td>R. Brannon Claytor, MD - USA</td>
<td>R. Brannon Claytor</td>
<td>R. Brannon Claytor</td>
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<tr>
<td>4:22</td>
<td>Oil Cysts Formation after Lower Blepharoplasty with Fat Graft</td>
<td>Chi-Ming Pu, MD - Taiwan</td>
<td>Chi-Ming Pu</td>
<td>Chi-Ming Pu</td>
</tr>
<tr>
<td>4:33</td>
<td>Corneal Regeneration Using Human Adipose Stem/stromal Cells and Bioprinting</td>
<td>Susanna Miettinen, PhD - Finland</td>
<td>Tampere University</td>
<td>Susanna Miettinen, PhD, Anni Möör, Heli Skottman Heli</td>
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</tbody>
</table>
### 20th Annual IFATS Conference

**Fat Grafting: The Perfect Adjunct to Facial Rejuvenation Surgery**
- Presenter: Deniz Sarhaddi, MD - USA
- Affiliation: St. Louis Cosmetic Surgery, Inc.
- Authors: Deniz Sarhaddi

**5:00 - 5:45 pm**
**KEYNOTE SPEAKER:**
**Hyaluronic Acid Fat Graft Myringoplasty**
- Issam Saliba, MD, FRCS, FRCSC

**Presenters:** Professors, Otorhinolaryngology - Head & Neck Surgery, University of Montreal - School of Medicine, Otolaryngology & Skull Base Surgery, Chief Department of Otolaryngology - Head & Neck Surgery, University of Montreal, Chief Division of Otolaryngology - Head & Neck Surgery, University of Montreal, Director of Research - Division, University of Montreal, Medical Director - Polyclinique Centre-Ville ORL & Spécialités Médicales

**Introduced by:** Lauren Kokai, PhD

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### FRIDAY - OCTOBER 6 - Global Health Equity

**8:00 - 9:00 am**
**IFATS ACADEMY - Obesity and Lipedema: Etiology and Therapeutics**
- Susanna Miettinen, PhD and Sara Al Ghadban, PhD

**8:30 - 9:00 am**
**Continental Breakfast in Exhibit Hall**

**9:00 - 10:00 am**
**OPENING KEYNOTE SPEAKER:**
**Expanding Patient Demographic Diversity to Improve Translation of Regenerative Medicine Therapeutics**
- Mari van de Vyver, PhD

**Senior Researcher, Stellenbosch University | SUN · Department of Medicine · PhD Physiological Sciences, South Africa**

**Introduced by:** Lauren Kokai, PhD

**10:00 - 11:15 am**
**PANEL: Research Diversity Impact and Global Health Equity**
- Introduced by Trivia Frazier, MD, MBA

**Lack of Diversity in Genomic Databases is a Barrier to Translating Precision Medicine Research Into Practice**
- Vence L. Bonham, Jr., MD

**Acting Deputy Director, Office of the Director, Associate Investigator, Social and Behavioral Research Branch, National Human Genome Research Institute, National Institutes of Health**

**The Impact of Biologic Diversity on Measured Research Outcomes**
- Kun (Mark) Qian, MD

**Director, Advanced Research L’Oreal Research and Innovation**

**Optimizing Inclusion: Challenges in Policy and Practice**
- Nicole Redmond, MD, PhD, MPH

**Director, Applications and Prevention Branch (CAPB), Division of Cardiovascular Sciences (DCVS), National Heart, Lung, and Blood Institute (NHLBI)**

**Incorporating Patient Diversity within Adipose Tissue Models for Metabolic Disease Screening**
- Cecilia Sanchez, PhD

**Obatala Sciences, Inc.**

**Panel Sponsored by:**

![L'Oreal Research & Innovation](image.png)

**11:15 - 11:30 am**
**Coffee Break in Exhibit Hall**

**11:30 - 12:35 pm**
**Free Papers 3 - Adipose-derived Cell Therapeutics**
- Moderator: Ricardo Rodriguez, MD

**11:30**
**Use of Autologous Adipose-Derived Mesenchymal Stem Cells for Ovarian Rejuvenation Poor Responder IVF Patients: A Phase 1 Randomised Placebo Controlled Double Blind Crossover Study**
- Presenter: Carola Niesler, PhD - South Africa
- Affiliation: University of KwaZulu-Natal
- Authors: T. Mohamed, J.K. Adam, C. Niesler, A. Chikandiwa

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**Meeting Adjourns for the Day**
### 11:41 - 1:45 pm

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<tr>
<th>Time</th>
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| 11:41 | (p.22) - Definitive Results of the Preclinical Study Conducted in Rodents to Determine the Neuroprotective and Neurotrophic Effects of the Autologous Fat-derived Stromal Vascular Fraction (SVF) in the Acute Management of Spinal Cord Contusions | Presenter: Nicolas Serratrice, MD - France  
Affiliation: Neurosurgeon, Spine & Spinal Cord Surgeon, Associate Researcher  
Author: Nicholas Serratrice |

### 11:52 - 12:03

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<thead>
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<th>Time</th>
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</table>
| 11:52 | (p.22) - Age does not Seem to Affect ASC Stemness and Pro-Angiogenic Potential             | Presenter: Chloe Trotzier - France  
Affiliation: L’Oreal Research & Innovation  
Authors: Chloe Trotzier, Kun Qian, Celine Auxenfans, Ali Mojallal |

### 12:03 - 1:45 pm

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| 12:03 | Proteomic analysis: The Effect of Antioxidant Supplementation on Bone Marrow Derived Mesenchymal Stem Cells in Diabetes | Presenter: Michelle Maartens - South Africa  
Affiliation: Division of Clinical Pharmacology, Faculty of Medicine and Health Sciences, Stellenbosch University  
Authors: Michelle Maartens, Mare Vlok, C Smith, Mari van de Vyver |

### 12:14 - 3:00 pm

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<th>Time</th>
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| 12:14 | Breast Enlargement and Implant Replacement with Ex Vivo Expanded Stem Cell Enriched Fat Grafting | Presenter: Fred Koelle, MD, PhD - Denmark  
Affiliation: Stem Medical  
Authors: Fred Koelle |

### 12:45 - 1:45 pm

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<th>Time</th>
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<tr>
<td>12:45</td>
<td>Lunch and Learn with IFATS Key Opinion Leaders and Industry</td>
<td>Blue Prefunction and Terrace</td>
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<td>12:45</td>
<td>IFATS ACADEMY - Career Development: How to Get Your Work Published - an Editor's Perspective AND Decision Making for Academic Success - Graham Parker, PhD</td>
<td>Capitol Room</td>
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### 1:45 - 3:00 pm

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<th>Time</th>
<th>Session</th>
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<tbody>
<tr>
<td>1:45</td>
<td>PANEL: Adipose Health Disorders: Obesity and Lipedema</td>
<td>Blue Room</td>
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#### 1:45 - 2:00 pm

**Adipose Tissue Metabolism in Obesity**

Kirsii Pietiläinen, MD, PhD  
Professor of Clinical Metabolism, Programme Director, Research Programme for Clinical and Molecular Metabolism, Faculty of Medicine, University of Helsinki, Chief Physician, Obesity Center, Helsinki University Central Hospital, Helsinki, Finland

**Effects of Obesity on Adipose Stem/Stromal Cells**

Susanna Miettinen, PhD  
Professor of Cell and Tissue Technology, Adult Stem Cells Group, Faculty of Medicine and Health Technology, Tampere University, Tampere, Finland

**Characterization of Estrogen Receptors (ERs) and Estrogen Metabolizing Enzymes in Lipedema and Non-lipedema Adipose-derived Stem Cells (ASCs) in 2D Monolayer and 3D Cultures**

Sara Al-Ghadban, PhD  
Research Scientist, Dept. of Microbiology, Immunology & Genetics, University of North Texas Health Science Center, Denton, TX, USA

**A Comparison Study of Potential Translational Screening Tools for Lipedema**

Yinan Zheng, MD Candidate  
Vanderbilt University School of Medicine, Nashville, TN, USA

### 3:05 - 3:50 pm

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<tr>
<td>3:05</td>
<td>Free Papers 4 - Adipose in Health</td>
<td>Blue Room</td>
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</table>

#### 3:05

**Leptin Signaling Drives Tumor Growth in Triple Negative Breast Cancer**

Presenter: Courtney Brock - USA  
Affiliation: Tulane University School of Medicine  
Author: Courtney Brock

#### 3:16

**Stromal Vascular Fraction and Blood-derived Extracellular Vesicle miRNAs as Novel Biomarker for Lipedema**

Presenter: Eleni Priglinger - Austria  
Affiliation: Johannes Kepler University Medical Faculty Department for Orthopedics and Traumatology  
Authors: Eleni Priglinger, Karin Strohmeier, Sarah Moussa, Susanna Skalicky, Johannes Oesterreicher, Marlene Wahlmueller, Wolfgang Holthoner, Matthias Sandhofer, Martin Barsch, Matthias Hackl, Susanne Wolbank
### 20th Annual IFATS Conference

**IFATS Washington, DC | October 5-7, 2023**

#### 3:27 - Adipose Tissue Contains Extracellular Lipids Associated with Regions of Collagen
- **Presenter:** Elizabeth Kaleigh Johnston - USA
- **Affiliation:** Carnegie Mellon University
- **Authors:** Elizabeth K. Johnston, Megan DeBari, Qijia Zhou, Phil Campbell, Rosalyn Abbott

#### 3:38 - Novel Kinase Inhibitor Screening for Inhibition of Continuation of Adipogenic Differentiation in Adipose-derived Stem Cells
- **Presenter:** Caroline Rinderle, M.S. - USA
- **Affiliation:** The University of North Texas Health Science Center at Fort Worth
- **Authors:** Bruce Bunnell, Caroline Rinderle

#### 3:55 - Free Papers 5 - Adipose Modeling for Disease Research
**Moderator:** Megan Campbell Benz

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<thead>
<tr>
<th>Time</th>
<th>Paper Title</th>
<th>Presenter</th>
<th>Affiliation</th>
<th>Authors</th>
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<tbody>
<tr>
<td>3:55</td>
<td>ERK5 Characterization in a Novel Adipose-Based Breast Cancer Microphysiological System</td>
<td>Katherine L. Hebert - USA</td>
<td>Tulane University School of Medicine</td>
<td>Katherine Hebert, Thomas Cheng, Jack Elliott, Van Barnes, Frank Lau, Elizabeth Martin, Matthew Burow</td>
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<tr>
<td>4:06</td>
<td>In Vitro Tissue Reconstruction Using Stromal Cells from Adipose Tissue of Healthy or Obese Donors: Impact on 3D Cell Differentiation and Extracellular Matrix</td>
<td>Julie Fradette, PhD - Canada</td>
<td>LOEX-Universite Laval</td>
<td>Julie Fradette, Luis Sorroza-Martinez, Nabil Amraoui, Léa Gagné, Viviane Séguin, Marie-Frédérique Gauthier, Giada Ostinelli, André Tchernof</td>
</tr>
<tr>
<td>4:17</td>
<td>Comparison of Adipocyte Like Spheroids from Human Vascular Fraction and Adipose Stromal/stem Cells in Various Culture Conditions</td>
<td>Miia Juntunen, PhD - Finland</td>
<td>Tampere University</td>
<td>Miia Juntunen, Niklas Lostedt, Alma Yrjänäinen</td>
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<tr>
<td>4:28</td>
<td>A Novel Barrier-free, Open-top Microfluidic Chip for Generating Merged 3D Vascular Networks</td>
<td>Alma Yrjänäinen, MSc - Finland</td>
<td>Tampere University</td>
<td>Alma Yrjanainen, Elina Kalke, Ella Lampela, Jose Kreutzer, Jorma Viihinen, Jorma Viihinen, Kaisa Tomberg, Hanna Vuorenpää, Susanna Miettinen, Pasi Kallio and Antti-Juhana Mäki</td>
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#### 4:40 - Break and Visit Exhibits
**Blue Prefunction**

#### 5:00 - Keynote Speaker: 3D Bioprinting of Living Human Adipose Tissue for Grafting and as Model to Study Obesity
- **Presenter:** Paul Gatenholm, PhD
- **Affiliation:** CEO CELLHEAL, Sweden
- **Introduced by:** Rosalyn D. Abbott, PhD

#### 5:45 pm
**Meeting Adjourns for the Day**

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**- SATURDAY - OCTOBER 7 - Next Frontiers in Adipose Therapeutics**

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<tr>
<th>Time</th>
<th>Event</th>
<th>Location</th>
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<tbody>
<tr>
<td>8:00 - 8:45 am</td>
<td>Continental Breakfast in Exhibit Hall</td>
<td>Blue Prefunction</td>
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<tr>
<td>8:00 - 8:50 am</td>
<td>IFATS Members Meeting</td>
<td>Blue Room</td>
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<tr>
<td>9:00 - 11:00 am</td>
<td>Best Papers</td>
<td>Blue Room</td>
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<tr>
<td>9:00</td>
<td>Basic Science - Student</td>
<td>Blue Room</td>
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<tr>
<th>Time</th>
<th>Paper Title</th>
<th>Presenter</th>
<th>Affiliation</th>
<th>Authors</th>
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<tr>
<td>9:00</td>
<td>3D Adipose Tissue Model with Tunable Triglyceride Content Using Melt Electrowriting (MEW) Scaffolds Seeded with Multicellular Spheroids</td>
<td>Franziska Dusi - Germany</td>
<td>University Hospital Wuerzburg</td>
<td>Tamara Weidemeier, Martin Wätzing, Hannes Horder, Torsten Blunk, Petra Bauer-Kreisel</td>
</tr>
</tbody>
</table>
9:13  Basic Science - PI  
(p.30) - Acquisition of Myofibroblast Phenotype by Adipose Stromal Cells in Inflammatory Environments Depends upon Autocrine Activin A Activity  
Presenter: Dmitry Traktuev, PhD - USA  
Affiliation: University of Florida  
Authors: Stephanie Merfeld-Clauss, Keith L. March, Dmitry O. Traktuev

9:26  Translational - Student  
(p.31) - Stress-Induced Premature Senescence and Senolytic Intervention in the Adipose Stromal Vascular Niche  
Presenter: Marlene Wahlmueller, MSc - Austria  
Affiliation: Ludwig Boltzmann Institute for Traumatology  
Authors: M. Wahlmueller, MS Narzt, K. Missfeldt, V. Armingar, A. Krasensky, I. Lämmermann, B. Schaedi, M. Mairhofer, S. Suessner, S. Wolbank, E. Priglinger

9:39  Discussion

9:45  Clinical Science - Student  
(p.31) - Molecular Evaluation of Microfragmented Adipose Tissue Correlated to Clinical Outcomes in Patients Undergoing Treatment for Knee Osteoarthritis  
Presenter: Joshua Harrison, MD - USA  
Affiliation: University of New Mexico, School of Medicine  
Authors: Joshua Harrison, Melody Sun, Erin Milligan, Anil Shetty, Dustin Richter

9:58  Clinical Science - PI  
(p.32) - Assessment and Outlook for the Treatment of Scleroderma 2009-2023  
Presenter: Guy Magalon, PhD - France  
Affiliation: Aix Marseille Universite France  
Authors: Guy Magalon, Jeremy Magalon, Florence Sabatier, Aurélie Daumas, Brigitte Granel

10:11  Translational - PI  
(p.32) - Modeling Hormone-Sensitive Breast Cancer Using a Novel Three-Dimensional Microphysiological System  
Presenter: Megan Campbell Benz - USA  
Affiliation: Tulane University  
Authors: Megan C. Benz, Katherine L. Hebert, Elizabeth D. Martin, Frank H. Lau, Matthew E. Burow

10:30 - 10:45 am  Coffee Break in Exhibit Hall

10:45 - 11:30 am  KEYNOTE SPEAKER:  
Ethics in Regenerative Medicine  
Graham Parker, PhD  
Assistant Professor, Wayne State University  
Editor-in-Chief at Mary Ann Liebert, Inc., Integrative Health Science Facility Core, CURES NIEHS P30, Detroit, MI, USA  
Introduced by Ricardo Rodriguez, MD

11:30 - 12:10 pm  Industry Showcase

11:30  MFT Biologics  
Allograft Adipose Matrix – Latest Clinical Applications & Evidence  
Marc Long, PhD  
EVP R&D, Clinical & Medical Affairs, Strategy and Business Development - MTF Biologics

11:40  Sientra  
Enhanced Viability Fat Transfer with Viality™  
Miguel Medina, MD

11:50  Tissue and Cell Technologies  
Redefining the Fat Transfer Patient Journey with Fat Banking  
Blaine Hamilton  
Vice President, Commercial Operations

12:00  XCell Therapeutics Inc.  
Achieving a Seamless and Adaptable Shift from Serum to Chemically Defined Media-based Cultures  
Hyungtaek Jeon

12:10 - 1:00 pm  Lunch and Learn with IFATS Key Opinion Leaders and Industry

12:00 - 1:00 pm  IFATS ACADEMY - Fat Grafting Fundamentals  
Fred Koelle, MD, PhD and Summer Hanson, MD, PhD

1:00 - 2:05 pm  Free Papers 6 - Adipose Tissue Processing  
Moderator: Ramon Lull, MD, PhD
<table>
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<th>Time</th>
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<th>Speaker(s)</th>
<th>Affiliation</th>
<th>Authors</th>
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<tr>
<td>1:00</td>
<td><em>Millifat, Microfat, Stromal Vascular Tissue: Mechanical Preparation, Lipoconcentrate Gel, Topical Washing Buffer...Which Product for Which Application</em>&lt;br&gt;Presenter: Sophie Menkes, MD - Switzerland&lt;br&gt;Affiliation: Clinique Nesensd&lt;br&gt;Authors: Sophie Menkes</td>
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<td>1:11</td>
<td><em>Impact of Preparation Methods on the Extracellular Matrix Components of Different Fat Grafts</em>&lt;br&gt;Presenter: Eddy Hsi Chun Wang - USA&lt;br&gt;Affiliation: L'Oreal Research &amp; Innovation&lt;br&gt;Authors: Eddy Hsi Chun Wang, Chloe Trotzier, Clement Bellanger, Wan-Yi Yen Sweelin Chew, I-Chien Liao, Ying Chen, Qian Zheng, Charbel Bouez, Kun Qian</td>
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<td>1:22</td>
<td><em>Fat Graft Processing Using the REVOLVE™ System Versus LipoGrafter and Decantation: In Vitro Properties and Tissue Quality</em>&lt;br&gt;Presenter: Nimesh Kabaria, MS - USA&lt;br&gt;Affiliation: Allergan Aesthetics, an AbbVie Company&lt;br&gt;Authors: Sachin Shridharani, Nimesh Kabaria, Carrie Fang, Jared Lombardi, Eric Stec, Li-Ting Huang, Hui Li, Maryellen Sandor</td>
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<td>1:33</td>
<td><em>Whole Proteomic Analysis of Skin Regenerative Factors in Coleman-Fat, Nanofat, and SVF-Gel</em>&lt;br&gt;Presenter: Sweelin Chew, PhD - China&lt;br&gt;Affiliation: L'Oreal (China) Research &amp; Innovation&lt;br&gt;Authors: Sweelin Chew, Wan-yi Yen, Eddy Hsi Chun Wang, I-Chien Liao, Ying Chen, Qian Zheng, Nan Huang, Charbel Bouez, Kun Oian</td>
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<td>1:44</td>
<td><em>Activated Fat Grafting: A Novel Approach for Enhanced Fat Graft Retention and Natural Long-Term Results</em>&lt;br&gt;Presenter: Eray H. Copcu, MD - Turkey&lt;br&gt;Affiliation: Mest Health Services Inc.&lt;br&gt;Authors: Eray H. Copcu, Sule, Sule Oztan</td>
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<td>1:55</td>
<td><em>Examining Long-Term Responses of Diverse Human Body Systems and Disorders to Mechanically Obtained Fat-Derived Stromal Cells</em>&lt;br&gt;Presenter: Eray H. Copcu, MD - Turkey&lt;br&gt;Affiliation: Mest Health Services Inc.&lt;br&gt;Authors: Eray Copcu, Sule Oztan</td>
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<td>2:10 - 3:05 pm</td>
<td><strong>Free Papers 7 - Fat Grafting Retention &amp; Mechanisms</strong>&lt;br&gt;<strong>Blue Room</strong>&lt;br&gt;Moderator: Sherry Collawn, MD</td>
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<td>2:10</td>
<td><em>Improving Fat Graft Volume Retention with Vitamin D3</em>&lt;br&gt;Presenter: Amr Elmeanawy, MD - Egypt&lt;br&gt;Affiliation: University of Pittsburgh&lt;br&gt;Authors: A. Elmeanawy, S. Loder, A. Vagonis, B. Bengur, V. Nerone, R. Ricketts, Y. Villalvazo, Y. Surucu, P. Humar, J. Arellano, H. Malekzadeh, B. Shaaban, D. Ramkumar, A. Gavrilescu, PLL Lee, J. Rubin, L. Kokai</td>
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<td>2:21</td>
<td><em>Long Time Results After Breast Augmentation by Fat Graft</em>&lt;br&gt;Presenter: Dr. Klaus Ueberreiter - Germany&lt;br&gt;Affiliation: Park-Klinik Birkenwerder&lt;br&gt;Authors: Klaus Ueberreiter, Charlotte Ueberreiter</td>
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<td>2:32</td>
<td><em>Optimizing Adipose Stem Cell Therapy through Cell Supplemented Engineered Grafts</em>&lt;br&gt;Presenter: Summer Hanson, MD, PhD - USA&lt;br&gt;Affiliation: University of Chicago Medicine and Biological Sciences&lt;br&gt;Authors: Summer Hanson, Miguel Gonzalez, Luke Zhang</td>
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<td>2:43</td>
<td><em>Multiple Administrations of Adipose-derived Stromal Cells Concurrent with Fat Grafting</em>&lt;br&gt;Presenter: Ki Yong Hong, MD, PhD - Korea&lt;br&gt;Affiliation: Seoul National University Hospital - Korea&lt;br&gt;Authors: Ki Yong Hong, Hak Chang</td>
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<td>2:54</td>
<td>Oil Droplets in Apoptotic Unilocular Adipocytes: A Double-edged Sword in Determining Macrophage Phenotype and Its Implications on Fat Grafting</td>
<td>Blue Prefunction</td>
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<tr>
<td>3:05 - 3:15 pm</td>
<td>Coffee Break in Exhibit Hall</td>
<td>Blue Prefunction</td>
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</table>
| 3:15 - 4:00 pm | Free Papers 8 - Adipose Tissue Engineering  
Moderator: Emily Budziszewski                                                              | Blue Room   |
| 3:15     | Porous Poly(glycerol sebacate)-based Scaffolds For Enhancing Adipose Tissue Regeneration  | Blue Room   |
| 3:26     | A Biopolymer Scaffold for Improved Fat Graft Viability and Volume Retention               | Blue Room   |
| 3:37     | Xenograft-decellularized Adipose Tissue Derived from Humans and Rabbits Supports Adipose Remodeling in Rabbit Mode | Blue Room   |
| 3:48     | Fat Graft Enriched with Adipose-Derived Stem Cells for Breast Augmentation and Reconstruction: Clinical, Histological, and Instrumental Evaluation | Blue Room   |
| 4:05 - 4:50 pm | KEYNOTE PRESENTATION:  
Scenescience  
Ramon Llull, MD, PhD  
Associate Professor, Plastic and Reconstructive Surgery, Wake Forest University, School of Medicine, Winston-Salem, NC - USA  
Introduced by Guy Magalon, MD | Blue Room   |
| 4:50 - 5:00 pm | AWARD ANNOUNCEMENTS  
2024 President Announcement and Presentation | Blue Room   |
| 5:30 pm  | Meeting Adjourns                                                                           | Blue Prefunction |
| 6:00 pm  | Cocktail Reception (Pre-registration required)                                             | Blue Prefunction |
Synopsis of Conference Panels

**Regenerative Medical Advances in Military Medicine and Surgery Based on the Work Ongoing at USUHS, Walter Reed and Bethesda Naval Medical Centers**

**Thursday, October 5, 2023**  9:15 – 10:00 am

Introduced by Jeffery M. Gimble, MD, PhD

This panel focuses on problems and complications following combat-related blast injuries and the need for new regenerative solutions in the wound healing and recovery process.

**Patient Outcomes and Complications after OPRA Osseointegration Surgery for Patients with Transfemoral Amputations**
Rosalyn D. Abbott, PhD
Julio A. Rivera, PhD
Scientific Director, DoD Limb Optimization and Osseointegration Program, Assistant Professor of Surgery, USU Walter Reed Surgery and Rehabilitation
Bethesda, Maryland

**Adipose Therapeutics for Pain: Demystifying Avenues of Medical Intervention**
Thursday, October 5, 2023     1:30 – 2:45 pm

Introduced by Antonio Salgado, PhD

Though surgeons have utilized adipose for both structural and regenerative effects for over 30 years, more recent clinical evidence that adipose may also ameliorate pain provides new and exciting avenues for fat grafting use. In this panel, our speakers will provide medical and scientific expert knowledge on chronic pain etiology and mechanistic research findings on mechanisms through which adipose therapeutics mitigate inflammation, fibrosis, and chronic and debilitating pain.

**Research Diversity Impact and Global Health Equity**
Friday, October 6, 2023    10:00 – 11:15 am

Introduced by Trivia Frazier, PhD

The IFATS community is comprised of clinicians, basic scientists and industry representatives with significant interest in translating regenerative medicine research outcomes to practice. As such, our organization strongly supports efforts to increase diversity in research and to better understand the impact of research inclusivity on health equity. This panel will discuss how policy and practice can be used to increase diversity in research outcomes.

**Patient Outcomes and Complications after OPRA Osseointegration Surgery for Patients with Transfemoral Amputations**
Rosalyn D. Abbott, PhD
Julio A. Rivera, PhD
Scientific Director, DoD Limb Optimization and Osseointegration Program, Assistant Professor of Surgery, USU Walter Reed Surgery and Rehabilitation
Bethesda, Maryland

**Trauma Beyond the Injury Site**
Thomas A. Davis, PhD
Vice Chair of Research, Professor USU Walter Reed Surgery
Bethesda, Maryland

**Fat Grafting to Enhance Peripheral Nerve Regeneration and Attenuate Neuropathic Pain**
Stephen W. P. Kemp, PhD
Director, Neuromuscular Lab
Associate Editor, Muscle & Nerve, Associate Professor, University of Michigan, Section of Plastic Surgery, Department of Surgery, Department of Biomedical Engineering, Michigan Neuroscience Institute Affiliate
Ann Arbor, Michigan

**A Systems Pharmacology Approach to Analgesic Development**
Selwyn Jayakar, PhD
Fellow F.M. Kirby Neurobiology Center
Department of Neurology, Boston Children’s Hospital and Harvard Medical School,
Boston, Massachusetts

**Fat Grafting as Treatment in Pain Syndromes**
Francesco Klinger, MD
Reconstructive and Aesthetic Plastic Surgery School, Department of Medical Biotechnology and Translational Medicine (BIOMETRA), University of Milan, Plastic Surgery Unit, Humanitas Research Hospital
Milan, Italy

**Cerebral Organoids to Study Central Mechanisms of Pain: The Effect of Stem Cell Secretome on Opioid Receptors and Neuroplasticity**
Antonio Salgado, PhD
Coordinating Investigator and Vice-dean for Research at the School of Medicine, Life and Health Sciences Research Institute (ICVS), University of Minho
Braga, Portugal

**Fat Grafting as Treatment in Pain Syndromes**
Francesco Klinger, MD
Reconstructive and Aesthetic Plastic Surgery School, Department of Medical Biotechnology and Translational Medicine (BIOMETRA), University of Milan, Plastic Surgery Unit, Humanitas Research Hospital
Milan, Italy

**Lack Of Diversity In Genomic Databases Is A Barrier To Translating Precision Medicine Research Into Practice**
Vence L. Bonham, Jr. JD
Acting Deputy Director National Human Genome Research Institute
Bethesda, Maryland

**Optimizing Inclusion: Challenges in Policy and Practice**
Nicole Redmond, MD, PhD, MPH
Chief, Clinical Applications and Prevention Branch (CAPB)
Division of Cardiovascular Sciences (DCVS)
National Heart, Lung, and Blood Institute (NHLBI)
Washington, District of Columbia

**The Impact of Biologic Diversity on Measured Research Outcomes**
Kun (Mark) Qian, MD
Director Advanced Research, L’Oreal Research and Innovation
Clark, New Jersey

**Incorporating Patient Diversity within Adipose Tissue Models for Metabolic Disease Screening**
Cecelia Sanchez, PhD
Obatala Sciences Inc.
New Orleans, Louisiana
Adipose Health Disorders: Obesity and Lipedema  
Friday, October 6, 2023    1:45 – 3:00 pm  
Introduced by Susanna Miettinen, PhD and Sara Al-Ghadban, PhD

Global epidemic of obesity and its multiple metabolic consequences have triggered an increasing need for understanding the functions of human adipose tissue (AT) in health and disease. Obesity may alter the cellular content of AT and affect their functions, which may have implications on utilization of AT and its derivatives as therapeutics. Lipedema is a painful AT disorder that is often confused with obesity and lymphedema. As the AT is the primary affected tissue in patients, defining the role of adipose stem cells (ASCs) in the disease-associated processes will provide insights into the pathophysiology of lipedema and will help researchers develop potential treatment for the disease.

The 2023 IFATS panel on Adipose Health Disorders: Obesity and Lipedema is designed to provide an overview on the recent developments in the field of obesity and lipedema research and provide a platform to discuss about the special features of obesity and lipedema and how they should be considered when therapies are planned. It will discuss how policy and practice can be used to increase diversity in research outcomes.

Adipose Tissue Metabolism in Obesity  
Kirsi Pietiläinen, MD, PhD  
Professor in Clinical Metabolism, Programme Director, Research Programme for Clinical and Molecular Metabolism, Faculty of Medicine, University of Helsinki, Chief Physician, Obesity Center, Helsinki University Central Hospital  
Helsinki, Finland

Effects of Obesity on Adipose Stem/Stromal Cells  
Susanna Miettinen, PhD  
Professor of Cell and Tissue Technology, Adult Stem Cells Group, Faculty of Medicine and Health Technology, Tampere University  
Tampere, Finland

Characterization of Estrogen Receptors (ERs) and Estrogen Metabolizing Enzymes in Lipedema and Non-lipedema Adipose-derived Stem Cells (ASCs) in 2D Monolayer and 3D Cultures  
Sara Al-Ghadban, PhD  
Research Scientist, Dept. of Microbiology, Immunology & Genetics, University of North Texas Health Science Center  
Denton, Texas

A Comparison Study of Potential Translational Screening Tools for Lipedema  
Yinan Zheng, MD Candidate  
Vanderbilt University School of Medicine  
Nashville, Tennessee
INDICATIONS AND IMPORTANT SAFETY INFORMATION

INDICATIONS
The REVOLVE™ Advanced Adipose System (REVOLVE™ System) is used for aspiration, harvesting, filtering, and transferring of autologous adipose tissue for aesthetic body contouring. This system should be used with a legally marketed vacuum or aspirator apparatus as a source of suction. If harvested fat is to be re-implanted, the harvested fat is only to be used without any additional manipulation. REVOLVE™ System is intended for use in the following surgical specialties when the aspiration of soft tissue is desired: plastic and reconstructive surgery, gastrointestinal and affiliated organ surgery, urological surgery, general surgery, orthopedic surgery, gynecological surgery, thoracic surgery, and laparoscopic surgery.

IMPORTANT SAFETY INFORMATION

CONTRAINDICATIONS
Contraindications to autologous fat transfer include the presence of any disease processes that adversely affect wound healing, and poor overall health status of the individual.

WARNINGS
REVOLVE™ System must be used within the same surgical procedure. Reuse of this device in the same patient in a subsequent surgical procedure, or for more than one patient, may result in infection and/or transmission of communicable diseases. Do not use the product if sterile packaging is damaged.

This device will not, in and of itself, produce significant weight reduction. This device should be used with extreme caution in patients with chronic medical conditions such as diabetes, heart, lung, or circulatory system disease or obesity. The volume of blood loss and endogenous body fluid loss may adversely affect intra and/or postoperative hemodynamic stability and patient safety. The capability of providing adequate, timely replacement is essential for patient safety.

PRECAUTIONS
REVOLVE™ System is designed to remove localized deposits of excess fat through small incision and subsequently transfer the tissue back to the patient. Use of this device is limited to those physicians who, by means of formal professional training or sanctioned continuing medical education (including supervised operative experience), have attained proficiency in suction lipectomy and tissue transfer. Results of this procedure will vary depending upon patient age, surgical site, and experience of the physician. Results of this procedure may or may not be permanent. The amount of fat removed should be limited to that necessary to achieve a desired cosmetic effect. Filling the device with adipose tissue over the maximum fill volume line can lead to occlusion of the mesh resulting in mesh tear.

ADVERSE EFFECTS
Some common adverse effects associated with autologous fat transfer are asymmetry, over- and/or under-correction of the treatment site, tissue lumps, bleeding, and scarring. Potential adverse effects associated with REVOLVE™ System include fat necrosis, cyst formation, infection, chronic foreign body response, allergic reaction, and inflammation.

REVOLVE™ System is available by prescription only.

For more information, please see the Instructions for Use (IFU) and User Manual for REVOLVE™ System available at www.allergan.com/REVOLVEIFU or call 1.800.678.1605.

To report an adverse reaction, please call Allergan at 1.800.367.5737.


*Based on surgeon survey data for aesthetic and reconstruction procedures combined, March 2023 (n = 132).
Stromal Vascular Fraction (SVF) Relieves Symptoms of Carpometacarpal I Osteoarthritis (OA) - Preliminary Interim Analysis of Randomized Control Trial (RCT)

Presenter: Susanna Cecilia Kauhanen, PhD - Finland
Affiliation: Helsinki University Hospital
Authors: Susanna Cecilia Kauhanen, Jussi Kosola, Samuli Aspinen

INTRODUCTION: OA of the carpometacarpal (CMC) joint of the thumb causes pain, disability, decreased quality of life. For persistent symptoms not responding to conservative treatment surgery of variable invasiveness and efficacy prevail. SVF contains e.g mesenchymal stem cells, endothelial progenitor cells and stromal components. The purpose of this RCT is to delineate outcome after thumb carpometacarpal injection with SVF derived from adipose tissue. SVF injection with thumb splinting and splinting alone are compared.

METHODS: Our study is an open label RCT with 1:1 arms aiming at 30 + 30 patients 40-70 years of age with thumb OA (Eaton Littler II). Exclusion criteria are post-traumatic OA, relevant comorbidities, inflammatory joint disease, corticosteroid use, <6 mo from other hand surgery. Patients randomized into the SVF arm undergo liposuction in local anesthesia in a outpatient clinic setting. SVF is produced as validated for the Q-Graft system (Humanmed, Germany). SVF is injected into the CMC joint (appr 1 ml) under sterile conditions. Outcomes; pain on a visual analogue (VAS) scale and a Patient-Rated Wrist Evaluation (PRWE) questionnaire, global improvement (5-step likert scale), grip and pinch strength and Mental Health Quotient (MHQ) questionnaire. Complications are also recorded. Follow-up:1 mo (phone)3 and 6 months, and long term 1 year and 5 years.

RESULTS: Patients were operated under local anestesia without sedation. Sick-leave was 2 days. One patient had discomfort due to hematoma at the fatharvest site. Interim results of the first 12 patients in the SVF group are shown in the tables below.

Limitations of the study: low number of study subjects and short follow-up time. The lack of a sham- liposuction procedure in the "splinting alone" arm of the RCT, (limited financial research resources) is acknowledged.

CONCLUSION: We describe short term pain relief and functional improvement (PRWE, VAS) in CMC I OA patients receiving intra-articular SVF in a feasible outpatient setting. Adipose derived stem cells secrete cytokines and growth factors redirecting inflammation towards regeneration. Whether the positive effect of SVF on thumb OA is due to the cells injected into the joint or to splinting as such remains to be shown in our ongoing RCT.
Combination Therapy with Adipose Fat Grafting for Hypertrophic Burn Scars

**Presenter:** Sherry Collawn, MD, PhD - USA  
**Affiliation:** University of Alabama  
**Author:** Sherry Collawn

**INTRODUCTION:** Hypertrophic scarring following burns can result in a painful debilitating scar condition. This data will demonstrate that adipose grafting combined with platelet rich plasma (PRP) as well as injection of 5-fluorouracil (5-FU) and triamcinolone can result in dramatic improvement in skin texture with decreased pain and scarring, and improved range of motion.

**METHODS:** This prospective study follows 9 patients with hypertrophic burn scars that were all injected with the above 4 materials. Fat/PRP was mixed at a ratio of 0.8/0.2. Three syringes of 5-fluorouracil and triamcinolone were injected per session into multiple areas of scarring.

**RESULTS:** Patient’s demonstrate excellent improvement after 1 session of treatment. In figure 1 the patient only had one treatment session of her hypertrophic skin graft left knee with significant scar flattening. The other treated area not shown in the photo is the left foot. The patient in figure 2 is shown after two sessions of injection of right cheek, ear, neck and submental hypertrophic and keloid burn scars. He has had significant scar flattening with decreased pain and increased neck range of motion. Other treated areas not shown in the photo are the right axilla and shoulder.

**CONCLUSION:** Patients have had successful results with scar improvement with this quadrivalent injection therapy.

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Outcomes and Complications after OPRA Osseointegration Surgery for Patients with Transfemoral Amputations

**Presenter:** Julio A. Rivera, PhD - USA  
**Affiliation:** Henry M. Jackson Foundation for the Advancement of Military Medicine  
**Authors:** Julio A. Rivera, Benjamin K. Potter, Ashley B. Anderson, Angelica Melendez-Munoz, Jason M. Souza, Jonathan A. Forsberg

**INTRODUCTION:** Most individuals with transfemoral amputations experience difficulties with conventional socket wear. Osseointegration (OI) allows for the direct, transdermal skeletal attachment of external prostheses helping mitigate many challenges. Therefore, the purpose of this study was to (1) evaluate “before and after” changes in functional ability and pain and (2) evaluate the frequency and severity of complications with OI in service members and beneficiaries with transfemoral amputations (TFA).

**METHODS:** We conducted this prospective study in 41 TFA patients, initially as part of an FDA HDE study, and later continuing following PMA approval of the OPRA device for transfemoral amputations. Patient reported outcome measures including PROMIS and the Q-TFA were given at pre-op, 3, 6, 12, and 24-months after surgery. Incidence of soft and deep tissue complications were recorded to determine the propensity of infections at the skin penetration site. We used t-tests to evaluate the change in outcome measures from baseline to the 24-month follow-up.

**RESULTS:** All 41 enrolled TFA patients underwent OI surgery. There were 13 patients with bilateral TFA, for total of 54 implants. As of May 2023, 39 participants (95%) have reached the 24-month follow-up, showing significant improvements in most outcome measure domains. Twenty-three of the 54 implants (42%) developed superficial infection and were treated successfully with oral antibiotics and four implants (7%) developed deep infections.

**CONCLUSION:** We demonstrated significantly improved functional results for TFA osseointegration in a US patient population. Rates of superficial and deep infection were modestly improved compared to prior studies. Long-term functional and patient reported outcomes will be prospectively followed for the duration of the implant in order to determine the frequency of long-term complications such as loosening, fracture, stress shielding or chronic osteomyelitis.
Preflight Volume Retention of Fat Grafts Processed With REVOLVE™ Technology Active Filtration System or Decantation Methods in Irradiated and Nonirradiated Wounds

Presenter: Patrick S. Cottler, PhD - USA
Affiliation: Allergan Aesthetics an AbbVie Company
Authors: Christopher A. Campbell, Patrick S. Cottler, Graham M. Grogan, Nimesh Kabaria, Maryellen Sandor

INTRODUCTION: The processing of harvested fat for transplantation is critical to fat graft performance in vivo. In breast reconstruction, fat grafting may involve implantation adjacent to tissue damaged by radiation treatment. This preclinical animal study evaluated the effects of radiation on retention volume and quality of fat grafts after processing by decantation or the REVOLVE™ ENVI system (Allergan Aesthetics, an AbbVie Company), a filtration-based device that can process up to 600 cc of lipoaspirate.

METHODS: Lipoaspirate was collected from individual human donors (n=6), processed using either REVOLVE ENVI or decantation methods, and implanted (0.5 cc) into 60 athymic mice for 4 weeks. Animal dorsal implant sites had been either irradiated with a single 35-Gy dose 12 weeks before implantation or remained nonirradiated and aged 12 weeks. Assessments included volume retention of explanted grafts measured by magnetic resonance imaging (MRI) and weight-based methods, as well as volume composition of grafts before implantation (free oil, fat, aqueous fluid, cellular debris) measured in vitro.

RESULTS: MRI-based volume retention analysis demonstrated higher mean (SD) percent retention with REVOLVE ENVI than decantation: 94% (6%) vs 84% (7%) in nonirradiated sites (p<0.01) and 91% (7%) vs 85% (8%) in irradiated sites (p=0.70), respectively. Weight-based volume retention analysis revealed higher mean (SD) percent retention with REVOLVE ENVI than decantation: 102% (11%) vs 79% (13%) in nonirradiated sites (p<0.01) and 98% (18%) vs 76% (9%) in irradiated sites (p<0.01), respectively. Volume composition analysis demonstrated higher fat content and lower aqueous fluid and free oil content (9%) in irradiated sites (p<0.01), respectively. Weight-based volume retention analysis revealed higher mean (SD) percent retention with REVOLVE ENVI than decantation: 94% (6%) vs 84% (7%) in nonirradiated sites (p<0.01), respectively. Weight-based volume retention analysis revealed higher mean (SD) percent retention with REVOLVE ENVI than decantation: 94% (6%) vs 84% (7%) in nonirradiated sites (p<0.01), respectively.

CONCLUSION: REVOLVE ENVI-processed grafts, whether implanted in irradiated or nonirradiated sites, demonstrated significantly greater volume retention by weight than decanted grafts in a preclinical mouse model. Similar results were observed by MRI, except in nonirradiated sites, for which volume retention was similar for both processing methods. Graftable fat content was also greater with REVOLVE ENVI. Results suggest better early volume retention and quality of fat grafts with REVOLVE ENVI than decantation alone, in both healthy and radiation-treated surgical sites.

Mechanical Processing of Human Lipoaspirate with a Fluidic Device System Enhances Recovery of Mesenchymal Stem Cells and Promotes Wound Healing Through Hydrodynamic Shear Flow

Presenter: Derek Banyard, MD, MS, MBA - USA
Affiliation: Sayenza Biosciences
Authors: Derek A. Banyard, Alexandria M. Sorensen, Mary Zeigler, Pisrut Phummirat, David Zalazar, Alan D. Widgerow, Jered B. Haun

INTRODUCTION: Adipose tissue is an easily accessible source of stem and progenitor cells that offers exciting promise as an injectable autologous therapeutic for regenerative applications. Mechanical processing is preferred over enzymatic digestion, and the most common method involves shuffling lipoaspirate between syringes and filtering to produce nanofat. Although traditional nanofat (NF) has shown exciting clinical results, we hypothesized that optimization of fluid dynamics principles, integration, and automation of new device designs could enhance and standardize recovery of stem/progenitor cells, and potentially, augment the regenerative capacity of this non-enzymatic stromal vascular fraction (NESVF™) via shear-induced mechanotransduction.

METHODS: The authors designed and fabricated the emulsification and micronization device (EMD) and filtration device (FD) to replace traditional nanofat procedures. An Activation Device (AD) was added downstream to further enhance shear stress. Human lipoaspirate was used to optimize EMD and FD processing parameters and compared to traditional nanofat using standard ex vivo measurement assays. Samples were subsequently processed with the AD at different flow rates. Results were compared to collagenase digestion and NF methods both immediately and after 24 hour culture. Finally, expression of genes related to wound healing and functional angiogenic capacity were assessed.

RESULTS: Lipoaspirate processing with EMD and FD was superior to NF in terms of both recovered cell percentages (>1.5-fold) and numbers (two- to three-fold). Differences were statistically significant for total mesenchymal stem cells and a DPP4+/CD55+ subpopulation. MSC recovery and viability were not significantly affected by the AD, but EPCs were enriched in a shear stress-dependent manner. Culturing samples did not alter cell numbers substantially but did reveal changes in transcriptional programs linked to wound healing, particularly for immune priming, matrix remodeling, and angiogenesis. These responses were consistently stronger for our device platform than NF, and differences were statistically significant for CXCL1, IL1B, IL6, CSF3, and COL1A2. Notably, vessel sprouting was significantly improved for our devices compared to NF.

CONCLUSION: Mechanical processing of adipose tissue with a three-device technology platform resulted in enhanced enrichment of stem and progenitor cells, the activation of genes implicated in wound healing, and the induction of angiogenic sprouting when compared to traditional nanofat.
Nanofat Graft in Treatment of Infraorbital Dark Circles

**Presenter:** Yi Ru Su - Taiwan  
**Affiliation:** Cathay General Hospital  
**Authors:** Yi Ru Su, Chi-Ming Pu

**INTRODUCTION:** Infraorbital dark circle (IDC) refers to visible darkness of the periorbital areas. There are several clinical causes of IDC. Lasers, topical therapies, chemical peels, carboxytherapy, normobaric oxygen therapy, fillers, platelet-rich plasma and surgery are all been reported as treatment options. Nanofat is an ultra-purified adipose tissue-derived product that emulsified to 400 to 600 μm parcel. It can regulate neovascularization and tissue regeneration through paracrine effects. A wide range of improvements were seen in wrinkles, discolorations, and scars in previous research. We present a case series of IDC treated with nanofat grafting with and without combination of microfat graft, and review the current literature, to address the utility of nanofat graft in periocular rejuvenation.

**METHODS:** A retrospective review was performed of all patients who underwent nanofat grafting for treatment of IDC at the authors’ institution between January 2021 and June 2023, and follow-ups for more than 3 months were included. Patient’s preoperative data, intraoperative and post-operative outcomes were retrieved from the institution’s prospective database. Series preoperative and postoperative photography were taken for the outcome evaluation.

**RESULTS:** Ten women were included, 6 cases were treated with nanofat graft and 4 were treated with nanofat combined with microfat graft. The results showed nanofat graft can be a good option for improvement of infraorbital dark circle.

**CONCLUSION:** This report of 10 cases highlights the curative effect of nanofat graft transplantation in treatment of IDC. Proper diagnosis of underlying etiology is crucial during treatment planning. Besides, patients often require multiple treatments to achieve satisfying improvement. Even though nanofat graft theoretically has multiple effects target on most of the mechanism of IDC, combined treatment with surgery should always keep in mind as a choice.

Nanofat as a Rescue for Peri Oral Rejuvenation Following Aggressive CO2 Laser and Microneedling Treatment

**Presenter:** R. Brannon Claytor, MD - USA  
**Affiliation:** Claytor Noone Plastic Surgery  
**Authors:** R. Brannon Claytor

**INTRODUCTION:** Treating facial aging with CO2 lasering combined with microneedling are cornerstones of facial rejuvenation. Combining thermal injury with mechanical injury at the same treatment has traditionally been considered too injurious for practical usage with concerns about scarring or excessively long and painful recovery. Introducing nanofat as a rescue is a novel technique which we have demonstrated not only accelerates recovery but also dramatically reduces post procedure pain.

**METHODS:** 23 patients were treated with CO2 laser with 2 passes. The first pass was a minimal surface area with very deep penetration down to the reticular dermis. The second pass was high percentage surface area with a shallow tissue penetration which only partially vaporizes the epidermal layer. Immediately following the CO2 laser treatment the skin was treated with microneedling to a depth of 2.5 mm. During the microneedling treatment, nanofat was liberally deposited on the skin in small aliquots. The nanofat was absorbed into the skin through the microneedling pores.

**RESULTS:** All patients reported no pain on the Numerical Rating System 0-10. This was recorded in follow up phone calls the evening of the procedure and the next day. Patients were seen at 5 days post op and again recorded 0 pain on the Numerical Rating System. Additionally patients were able to out in public attending to activities of daily living as early as 5 days post procedure demonstrating rapid recovery.

**CONCLUSION:** Therapy with thermal CO2 remodeling and mechanical penetration with microneedling have the potential for more complete treatment of perioral rhytids, however, the injury from these treatments has the potential to have scarring and prolonged painful recovery times. Introducing triple therapy with the addition of nanofat accelerates healing and minimizes perineural inflammation which reduces pain.
Oil Cysts Formation after Lower Blepharoplasty with Fat Graft

**Presenter:** Chi-Ming Pu, MD - Taiwan  
**Affiliation:** Cathay General Hospital  
**Authors:** Chi-Ming Pu

**INTRODUCTION:** Oil cysts are pseudocysts, owing to their lack of epithelium or endothelium. An oil cyst is caused by central fat necrosis due to microenvironments around the fat drop that did not properly improve during the first three days after surgery. Clinically, oil cyst or fat necrosis presents as a palpable, discrete, and persistent subcutaneous firmness found by clinical examination. A recent systematic review of complications after breast augmentation with fat grafting showed that palpable cysts occurred in 2.0% of cases. However, no studies have been conducted to evaluate the complication rate of oil cyst formation occurring after lower blepharoplasty or total blepharoplasty with autologous fat grafting.

**METHODS:** A retrospective review was performed of all patients who underwent lower or total blepharoplasty combined with fat graft at the authors’ institution between January 2018 and June 2020. Complication rates were observed, and associations between preoperative variables and outcomes were assessed to evaluate the complication rate of oil cyst formation.

**RESULTS:** A total of 119 patients were included in the series. The average patient age was 54.88±11.94 years, and the average grafted fat was 1.88±1.0 ml. On a per-eyelid basis for all patients, the complication rate of oil cyst formation was 6.72 percent (16 of 238 eyelids). The average age of patients with oil cysts formation was 56.38±9.96 years. The occurrence of oil cyst formation was not significantly associated with age (p-value = 0.784), gender (p-value = 0.317), surgical type (p-value = 0.091), or fat volume (p-value = 0.215). The mean interval between the fat graft procedure and oil cyst noted was 236.5±118.9 days.

**CONCLUSION:** Lower blepharoplasty or total blepharoplasty combined with fat graft is an effective treatment of an aged eyelid. The complication rate of oil cyst formation is low and can be managed easily. Reduce surgical trauma might decrease the complication rate of oil cyst formation.

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Use of Autologous Adipose-Derived Mesenchymal Stem Cells for Ovarian Rejuvenation in Poor Responder IVF Patients: A Phase 1 Randomised Placebo Controlled Double Blind Crossover Study

**Presenter:** Carola Niesler, PhD - South Africa  
**Affiliation:** University of KwaZulu-Natal  
**Authors:** T. Mohamed, J.K. Adam, C. Niesler, A. Chikandiwa

**INTRODUCTION:** Despite the application of various methods to augment ovarian responsiveness, the management of poor ovarian responders remains challenging and pregnancy rates following in vitro fertilisation (IVF) are poor. Advances in adult stem cell research and their clinical application has prompted interest in their use in assisted reproduction. We report the first double blind, randomised, placebo-controlled clinical study using autologous human stromal vascular fraction (SVF):containing adipose-derived stem cells (ADSCs) for ovarian rejuvenation.

**METHODS:** Thirty patients were recruited. Twenty-one had lower-than-expected reserves for their age and nine had premature ovarian insufficiency (POI). Patients were randomized into a placebo group (10) and into an intervention group (20). SVF was obtained from adipose tissue following abdominal liposuction; the ADSC component was characterised using flow cytometry. Three equal insertions, adjusted based on ovarian volume, were performed at monthly intervals via an ultrasound-guided transvaginal needle puncture. The SVF was not cultured prior to transplantation. Those in the placebo group were then crossed over to the intervention group and received a single SVF (maximally concentrated) injection (crossover group).

**RESULTS:** The median viable SVF cell number inserted per patient over three months, and the % MSC (mesenchymal stem cells) thereof, was 1.6 x 10^6 and 13.2% respectively. Resulting AMH changes were variable over the treatment course with a notable placebo effect. Patients with POI showed no change in AMH, both to intervention and placebo. Despite this, a temporary return of menses was noted in a third of patients while on treatment. Patients with low reserves for age showed an increase in AMH, although not statistically significant when compared to placebo. In the crossover group, insertions were limited to one intervention comprising all cells; here a significantly higher median of 3.4 x 10^6 SVF cells were injected containing an average of 16.9% MSCs. No significant change in AMH was noted. To date 12 patients have undergone ovarian stimulation and IVF post stem cell therapy; of these nine have had embryo transfers with a resulting pregnancy rate of 33%. There were also 2 spontaneous pregnancies.

**CONCLUSION:** Although the application of SVF-derived adipose-derived stem cells for ovarian rejuvenation remains experimental, the current study provides further support for the safety of this approach and presents encouraging results as to its efficacy in assisted reproduction.
INTRODUCTION: Spinal cord injuries (SCI) lead to functional alteration with important consequences such as motor and sensory disorders. The repair strategies developed to date remain ineffective. The autologous adipose tissue-derived stromal vascular fraction (SVF) is composed of a “cocktail” of mesenchymal and hematopoietic stem cells with trophic, pro-angiogenic and immunomodulatory effects. Numerous therapeutic benefits have been shown for tissue regeneration, peripheral neuropathies as well as in the context of certain neurodegenerative diseases, but never in the context of SCI.

METHODS: Our strategy is based on the very early injection of the autologous SVF after spinal contusions. To verify our hypothesis, we conducted a preclinical study in adult male rats (300 g). Spinal cord contusions are performed at the T10 thoracic level using a dedicated impactor; thus all animals are rendered paraplegic. The epididymal fat is removed in a second operation, then the autologous SVF cells are purified (>90% viability), before being injected directly into the spinal cord lesion within 4 hours after the trauma (1 million cells, maximum dose obtainable in rats for their age). The same work was then repeated after intensive training of the animals on a treadmill.

RESULTS: Autologous SVF implantation promotes 1) locomotor recovery (BBB test, Ladder rung walking test, Catwalk), 2) H-reflex normalization, and ventilatory frequency adjustment to an isometric exercise. 3) In vivo 7T MRI, shows signs of regeneration and revascularization. We also identified a biomarker for the following of the inflammation. These results were confirmed by 4) immunohistological stainings (angiogenesis with CD31, number of neurons with MAP2 and axonal regeneration with GAP43), and by 5) studying proinflammatory cytokines (IL-1, IL-6, TNF-α) by ELISA. 6) Finally, intensive training significantly potentiates the regenerative effects of SVF.

CONCLUSION: These very encouraging results obtained in rats demonstrate, in addition to an immediate neuroprotective effect, significant revascularization and signs of bone marrow regeneration after implantation of the autologous SVF cells. The work is currently being carried out in pigs before moving on to humans.
**Proteomic Analysis: The Effect of Antioxidant Supplementation on Bone Marrow Derived Mesenchymal Stem Cells in Diabetes**

**Presenter:** Michelle Maartens - South Africa  
**Affiliation:** Division of Clinical Pharmacology, Faculty of Medicine and Health Sciences, Stellenbosch University  
**Authors:** Michelle Maartens, Mare Vlok, C Smith, Mari van de Vyver

**INTRODUCTION:** Bone marrow resident mesenchymal stem cells (MSCs) are sensitive to changes in the micro-environment and vulnerable to glucose toxicity. Under diabetic conditions, exposure to hyperglycaemia, inflammation and oxidative stress within the micro-environment impairs the regenerative capacity of MSCs and dysregulate their immunomodulatory functions. The antioxidants N-acetylcysteine (NAC) and ascorbic acid 2-phosphate (AAP) has been shown to improve the viability and growth rate of diabetic MSCs ex vivo and suppress excessive pro-inflammatory cytokine release. The exact mechanism of action is however still unclear and needs elucidation.

**METHODS:** Bone marrow MSCs were isolated from obese diabetic mice (B6. Cg-lepob/l (ob/ob); >40g, 6 weeks, n=8) and the cell number expanded in culture with or without antioxidant supplementation for a period of 12 days. Antioxidant treatment consisted of 75mM NAC + 0.6mM AAP with media being changed every 4 days. Upon reaching 70% confluence, conditioned media was collected, and the cells lysed to harvest the intracellular protein content. Protein samples were processed using standardized procedures and analysed using label free LC-MS/MS. Statistical analysis was performed in Scaffold and functional pathway analysis and protein interactions were mapped for the differential proteins of interest (p < 0.05) (identified through biostatistical analysis of the LC-MS/MS data) using STRING. Zebrafish larvae was subsequently exposed to the bone marrow MSC conditioned media, and their behaviour and cognitive abilities assessed.

**RESULTS & CONCLUSION** Consistent with previous findings, antioxidant supplementation was able to improve the ex vivo growth rate of MSCs. LC-MS/MS identified 5602 proteins of which 747 was unique to the non-supplemented group and 395 was unique to the antioxidant supplemented group. The differentially expressed proteins are known to influence biological processes such as cell structure (matrix proteins), redox homeostasis (NADH oxidase, PRDX1), and immunomodulation (MRC1, STAT1). The diabetic MSC conditioned media negatively affected zebrafish responses, whereas this effect was less pronounced in the zebrafish exposed to antioxidant treated conditioned media was collected, and the cells lysed to harvest the intracellular protein content.

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**Leptin Signaling Drives Tumor Growth in Triple Negative Breast Cancer**

**Presenter:** Courtney Brock - USA  
**Affiliation:** Tulane University School of Medicine  
**Authors:** Courtney Brock

**INTRODUCTION:** Individuals with a high body mass index (BMI) have an increased risk of developing many cancers, including breast. In triple negative breast cancer (TNBC), a clinically aggressive subtype, patients who are obese have higher rates of mortality and shorter disease-free survival compared to lean patients. While these epidemiological associations are clear, the molecular underpinnings that contribute to poor outcomes for obese TNBC patients are not fully elucidated. Previous work has shown that obesity affects TNBC pathology through cross-talk between obese-imprinted adipose stem cells (ASCs) and TNBC cells. In obese individuals, ASCs have an altered secretory profile resulting in higher levels of leptin, an adipokine involved in inflammatory and wound-healing processes. Increased leptin and leptin receptor expression is associated with poor outcomes (increased mortality, increased recurrence) in many cancers, including breast. Therefore, this study seeks to examine the role of leptin signaling in triple negative breast cancer.

**METHODS:** This project examines the role of leptin signaling in TNBC using patient-derived cell lines and patient-derived xenografts (PDX), as well as a pharmacological inhibitor of the leptin receptor, Allo-aca (AA). To determine the effects of obesity on tumor growth in vivo, a high fat diet (HFD) was used to induce obesity in SCID/Beige mice.

**RESULTS:** PDX tumors implanted into HFD mice had an increased growth rate compared to tumors implanted into lean controls. Additionally, treatment with AA slowed tumor growth rate in both obese and lean animals, suggesting the role of leptin in regulating tumor growth. Exposure to conditioned media harvested from obASCs increased the percentage of TNBC cells that expressed cancer stem cell markers in vitro, whereas exposure to AA decreased the percentage of cancer stem cells. Similarly, exposure to leptin increased expression of EMT (epithelial to mesenchymal transition) genes, whereas treatment with AA reduced expression of EMT genes.

**CONCLUSIONS:** These molecular differences may contribute to the differences in cancer outcomes between obese and lean individuals with breast cancer, and further study of leptin signaling and its contributions to the obesity-cancer axis in TNBC is critical.

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**Stromal Vascular Fraction and Blood-derived Extracellular Vesicle miRNAs as Novel Biomarker for Lipedema**

**Presenter:** Eleni Priglinger - Austria  
**Affiliation:** Johannes Kepler University Medical Faculty  
**Authors:** Eleni Priglinger, Karin Strohmeier, Sarah Moussa, Susanna Skalicky, Johannes Oesterreicher, Marlene Wahlmueller, Wolfgang Holnthoner, Matthias Sandhofer, Martin Barsch, Matthias Hackl, Susanne Wolbank

**INTRODUCTION:** Lipedema is a chronic medical condition characterized by enlargement/deposition of adipose tissue in the extremities. Due to a lack of diagnostic tests, lipedema is largely under-diagnosed, urging for novel diagnostic biomarkers. Here, miRNAs have been proposed as promising biomarkers based on their controlled release from cells into biofluids, where they are found inside small extracellular vesicles (sEVs) and protein complexes.

We have previously studied the relevance of stromal vascular fraction (SVF) involvement in lipedema and associated extracellular miRNA profiles where we identified for the first-time specific changes in EV-miRNAs compared to healthy controls. We extended our study to plasma samples, since non-invasive, circulating lipedema biomarkers will facilitate clinical trials.

**METHODS:** An unbiased quantitative analysis of small non-coding RNAs including miRNAs in SVF fractions as well as total extracellular RNA (total exRNA) was performed on platelet poor plasma samples by next generation sequencing. A proof-of-concept for the utility of miRNAs as diagnostic biomarkers was based on four different cohorts: early-stage lipedema and healthy (BMI matched), healthy obese and lipedema obese (BMI matched). In addition, a thorough characterization of isolated EV phenotypes was performed by NTA and flow cytometry to clarify their cellular origin.

**RESULTS:** We identified differently regulated sEV-miRNAs in peripheral blood from lipedema individuals compared to the previously identified SVF-miRNA profile derived from SVF. When comparing sEV-miRNAs derived from lipedema peripheral blood to obese, lipedema obese and healthy individuals we found several miRNAs distinctly up or downregulated. To complete the picture, a detailed and systematic investigation of the blood-derived sEVs showed significant differences in EV concentration between healthy and lipedema. The phenotypes relevant for SVF alterations in adipose tissue represented only a minority of circulating EVs (<2%). When comparing these phenotypes in the cohorts, differences could be observed in mesenchymal, blood and lymphatic endothelial and macrophage subsets.

**CONCLUSION:** We could show that EVs and their respective cargo can provide insight into the progression of lipedema. When corroborating the findings of this study, peripheral blood plasma EV-miRNAs could be used to identify early-stage lipedema. Readily available systems for blood-based RT-qPCR testing will accelerate translation into clinical practice.
Figure 1. Adipose tissue contains extracellular lipids (red) not contained within the cytoskeleton (f-actin staining (green)) of the cell (A). Staining=AdipoRed (red) and Phalloidin (green). These extracellular lipids were defined to have a maximum diameter of 15.43 μm (mean + 1 standard deviation) based on all extracellular lipids measured (B). Bulk adipose tissue contains intracellular lipids (red) and extracellular lipids (red) that conjugate to Annexin-V (cyan) (C). Staining=BODIPY (red) and Annexin-V (cyan). Extracellular lipids (small red) tended to appear in regions of collagen (blue) (D). Staining=AdipoRed (red) and Second Harmonic Generation (blue). All individuals had a colocalization score above 0.5, indicating that in general these extracellular lipids colocalize with collagen (E). Scale bar=100 μm.
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Novel Kinase Inhibitor Screening for Inhibition of Continuation of Adipogenic Differentiation in Adipose-derived Stem Cells

Presenter: Caroline Rinderle, M.S. - USA
Affiliation: The University of North Texas Health Science
Authors: Bruce Bunnell, Caroline Rinderle

INTRODUCTION: Obesity is characterized by excess fat accumulation and a body mass index of 30kg/m² or greater. Over 40% of Americans are obese, increasing the prevalence of heart disease, type 2 diabetes, and cancer. Adipose-derived stem cells (ASCs) are adult mesenchymal stem cells capable of differentiating into mature adipocytes through the process of adipogenesis. Preliminary data has shown that kinase inhibitor compounds can downregulate adipogenesis if present before the induction of differentiation. However, different kinases are likely responsible for initiating and continuing differentiation. Treatment throughout differentiation may give insight into kinases responsible for continuing adipogenesis. Suppose the differentiation of ASCs can be prevented or halted mid-differentiation via kinase inhibition. In that case, obesity may be prevented or reversed, reducing associated illness and better outcomes.

METHODS: ASCs from an obese donor were treated with 100nM of KCGS Drug Library kinase inhibitors obtained from Dr. David Drewry at the SGC at UNC Chapel Hill. Cells were treated 72 hours before induction of adipogenesis, 7 days into adipogenesis, and 14 days into adipogenesis. In one group, cells were treated with kinase inhibitor compounds in adipogenic media, which was removed and replaced with control adipogenic media after 72 hours. In another group, cells were treated with maintenance media, removed after the 72-hour treatment period, and replaced with maintenance media. The cells were differentiated for 21 days and stained with an Oil Red O lipid droplet stain. After imaging and drying overnight, the stain was removed and quantified.

RESULTS: Two kinase inhibitor compounds cause decreased differentiation when treated before induction. ASCs that differentiated for 14 days before treatment could not recover fully before the endpoint, and ASCs differentiated for 7 days before drug treatment effectively halted differentiation. However, the cells were unable to recover for the remaining 14 days.

CONCLUSION: Determining which kinases are responsible for initiating and continuing the differentiation of ASCs into mature adipocytes will give insight into potential therapeutics for preventing and curing obesity. In the future, qRT-PCR and western blots will be performed to confirm the phenotypic changes observed after kinase inhibition via gene and protein expression changes.
INTRODUCTION: Breast Cancer is the second leading cause of cancer death in women and incidence rates are increasing 0.5% per year. Triple negative breast cancer (TNBC), which is classified by negative hormone receptors (HR-) and human epidermal growth factor receptor 2 (HER2) negative, is the most aggressive subtype and occurs more often in younger Black and Hispanic women. Kinases in the MEK5/ERK5 pathway, part of the mitogen-activated protein kinase (MAPK) family, regulate proliferation, cell survival, differentiation, and apoptosis. In TNBC ERK5 signaling is linked to drug resistance and metastatic progression. ERK5 interacts with the tumor micro-environment (TME) to promote extracellular matrix (ECM) factors. Therefore, ERK5 should be further characterized in a 3D system that recapitulates the cell-to-tissue interaction.

RESULTS: Our findings show that expression of inflammation, integrin, and pro-angiogenic factors differ in 2D culture compared to 3D culture. In addition, we demonstrate how HBT can modulate tumor heterogeneity through the use of multiple patient donors, observed through differences in inflammation markers in lean and obese donors in our 3D microphysiology system. In addition, activated NFkB protein expression varied in 2D culture compared to 3D. ERK5 expression increased collagen content in HBT, and ERK5-knockout cells had decreased collagen content compared to parental control cells.

CONCLUSION: In conclusion, our results in 2D culture compared to 3D culture show ERK5 interaction with the TME can vary based on individual patient factors; however, ERK5, in the presence of HBT plays a role in cancer proliferation. Overall, these data suggest that ERK5 is a potential target for therapies.
Comparison of Adipocyte Like Spheroids from Human Vascular Fraction and Adipose Stromal/Stem Cells in Various Culture Conditions

Presenter: Miia Juntunen, PhD - Finland
Affiliation: Tampere University
Authors: Miia Juntunen, Niklas Lestedt, Alma Yrjänäinen, Marika Kuuskeri, Susanna Miettinen

INTRODUCTION: Due obesity epidemic, need for studying adipocytes and adipose tissue biology has increased. Adipocytes are difficult to culture and maintain, therefore different ways to produce adipose tissue like structures have been investigated such as spheroid cultures. With 3D spheroid cultures, larger unilocular lipid droplets (LDs) have been observed. In this study, the aim was to compare human stromal vascular fraction (SVF) cells and adipose stromal/stem cells (ASCs) in formation of adipocyte like spheroids in both adipogenic and endothelial cell supporting conditions.

METHODS: SVF and ASCs were isolated from human adipose tissue samples (n=3). 10 000 cells were plated on low attachment 96-well plate in different culture conditions: basic medium (BM), adipogenic medium (AM), endothelial medium (EM), and AM and EM combinations. The size of the spheroids was monitored with microscopy for 28 days. Formation of LDs within spheroids was studied with confocal microscopy. In addition, adipogenic and angiogenic gene expression, secretion of adiponectin and lactate hydrogenase (LDH) was measured.

RESULTS: SVF cells and ASCs formed spheroids in all studied conditions. Largest spheroids were formed with combination media. LDs were formed with AM conditions with SVF cells and ASCs and spheroids in AM started to float before 21 days of culture with ASCs. Adipogenic gene expression was highest with AM cultured spheroids with both SVF cells and ASCs. EM alone or in combination media did not increase expression of angiogenic genes. Highest secretion of LDH was observed with largest spheroids in combination conditions and highest section of adiponectin in AM and combination conditions with both SVF cells and ASCs.

CONCLUSION: Both SVF and ASCs showed adipocyte like spheroid formation capacity and differentiated towards adipocyte like spheroids in adipogenic culture conditions.

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A Novel Barrier-free, Open-top Microfluidic Chip for Generating Merged 3D Vascular Networks

Presenter: Alma Yrjänäinen, MSc - Finland
Affiliation: Tampere University
Authors: Alma Yrjänäinen, Elina Kalke, Ella Lampelä, Jose Kreutzer, Jorma Vihinen, Jorma Vihinen, Kaisa Tornberg, Hanna Vuorenpää, Susanna Miettinen, Pasi Kallio and Antti-Juhana Mäki

INTRODUCTION: Microfluidic chips designed to recapitulate human tissue functions are a significant advancement from the traditional 2D cell cultures. Still, establishing 3D co-cultures requires better resolution of the microfluidic chips enabling distinct cell culture compartments for different co-cultures. Here, we introduce a novel microfluidic chip design allowing the generation of two barrier-free 3D cell culture compartments within the device under fluid flow. We studied the formation of two vascular networks and quantified the vasculature in terms of vascular volume, total vessel length and average vessel diameter under three different flow conditions. Finally, we assessed the interconnectivity between the vasculatures.

METHODS: Two distinct vascular networks were generated in a stepwise manner. Fibrin-embedded GFP-tagged Human Umbilical Vein Endothelial Cells (GFP-HUVECs) and human Adipose Stem/Stromal Cells (ASCs), in 5:1 ratio, were pipetted to the lower cell culture compartment and fibrin-embedded RFP-HUVECs and ASCs were similarly mixed and pipetted to the upper cell culture compartment. Three gravity-based flow conditions were re-established in every 24 hours for five days. The forming vasculatures were imaged daily (Leica DMi8). Chips were stained with phalloidin and DAPI and imaged with a laser scanning confocal microscope (Nikon AIR) to observe and quantify the formed vascular network utilizing 3D image segmentation (Imaris).

RESULTS: SVF cells and ASCs formed spheroids in all studied conditions. Largest spheroids were formed with combination media. LDs were formed with AM conditions with SVF cells and ASCs and spheroids in AM started to float before 21 days of culture with ASCs. Adipogenic gene expression was highest with AM cultured spheroids with both SVF cells and ASCs. EM alone or in combination media did not increase expression of angiogenic genes. Highest secretion of LDH was observed with largest spheroids in combination conditions and highest section of adiponectin in AM and combination conditions with both SVF cells and ASCs.

CONCLUSION: All flow conditions allowed the formation of lumenized, ASC-supported vasculatures. We showed that GFP- and RFP-vascular networks were able to join and form a merged vascular network between the cell culture compartments. Moreover, we observed morphological differences of the vascular networks between the studied flow conditions. We also showed notable variation in vascular volume and total vessel length between the flow conditions.

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**ABSTRACTS - SATURDAY, OCTOBER 7, 2023**

**BEST PAPER SESSION**

**3D Adipose Tissue Model with Tunable Triglyceride Content Using Melt Electrowriting (MEW) Scaffolds Seeded with Multicellular Spheroids**

**Basic Science - Student**

**Presenter:** Franziska Dusi - Germany  
**Affiliation:** University Hospital Wuerzburg  
**Authors:** Tamara Weidemeier, Martin Watzling, Hannes Horder, Torsten Blunk, Petra Bauer-Kreisel

**INTRODUCTION:** Representative in-vitro models of adipose tissue are of key importance to understand its multifaceted role in metabolism, but also in the development of diseases such as metabolic disorders and cancer progression. However, 3D models that recapitulate human adipogenesis and adipose (patho-)physiology in long-term culture are still rare. In this study, we present an advanced 3D model consisting of spheroids in a tailored melt electrowriting (MEW) scaffold, which developed a coherent adipose tissue-like structure and could be long-term-cultured. Improved differentiation of adipose-derived stromal cells (ASC) and elevated matrix production, which was tunable by fatty acid supplementation, was demonstrated.

**METHODS:** ASC differentiation was performed in self-assembling spheroids, generated in low-adherence agarose micromolds. Spheroids were seeded into MEW scaffolds with spheroid size-adapted, box-structured pores and differentiated for three weeks using a hormonal cocktail. Further stimulation was conducted with either palmitic acid (PA) (100 µM), oleic acid (OA) (250 µM) or linoleic acid (LA) (250 µM). Differentiation and lipid storage were assessed via triglyceride (TG) quantification and gene expression analysis of adipogenic marker genes. Extracellular matrix development was characterized by immunohistochemical staining of matrix components.

**RESULTS:** Culture in spheroids and MEW scaffolds exhibited improved differentiation of ASCs, as compared to conventional 2D culture, indicated by an increased TG/DNA content and elevated ECM production. Expression analysis of adipogenic marker genes confirmed distinct adipogenesis within the 3D constructs. Histology and staining of ECM deposition indicated a coherent, adipose tissue-like structure, which was maintained in long-term culture over 10 weeks. Stimulation with OA and LA significantly increased lipid droplet size and triglyceride content. Fatty acid treatment led to a further increase in collagen deposition in spheroid culture. Additional physiological characterization of fatty acid stimulated adipocytes such as lipolysis and secretion of inflammatory cytokines is currently conducted.

**CONCLUSION:** The presented easy-to-handle 3D adipose tissue model exhibits improved differentiation of ASCs and matrix production yielding coherent adipose tissue constructs that can be long-term cultured. Fatty acid supplementation increased lipid droplet size and TG content, as well as ECM deposition, underlining the plasticity of the model and demonstrating its potential as a tool for studies on adipose tissue (patho-)physiology.

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**Acquisition of Myofibroblast Phenotype by Adipose Stromal Cells in Inflammatory Environments Depends upon Autocrine Activin A Activity**

**Basic Science - PI**

**Presenter:** Dmitry Traktuev, PhD - USA  
**Affiliation:** University of Florida  
**Authors:** Stephanie Merfeld-Clauss, Keith L. March, Dmitry O. Traktuev

**INTRODUCTION:** Many pathologies are associated with tissue ischemia and inflammation. Prolonged inflammation leads to functional deterioration of organs, often due to progressive loss of microvasculature and fibrosis. Mesenchymal stromal cells are numerous in the perivascular niche and likely play a key role in both tissue and vascular homeostasis and pathologies, including fibrosis. Many pathologies are accompanied by systemic increases in Activin A (ActA), a factor active in immune-modulation, angiogenesis and fibrosis. Here, the effects of inflammatory cells and factors, particularly IL-1β, in modulation of the phenotype of adipose stromal cells (ASC) were assessed, with a specific focus on the contribution of ActA to this process.

**METHODS:** Peripheral blood mononuclear cells from healthy donors, activated with LPS (10 ng/mL; aPBMC), were presented to ASC and expression of smooth muscle cell (SMC)/myofibroblast markers were evaluated 5 days later. Expression of factors that induce myofibroblast generation, including ActA, transforming growth factors 1-3 (TGFβ1-3) and connective tissue growth factor (CTGF) were assessed in ASC. Neutralizing antibodies and silencing RNAs to ActA, TGFβ1-3, and CTGF were used to define the signaling cascade of aPBMC. Endothelial cell proliferation in response to factors produced by ASC and ASC+aPBMC co-cultures were compared.

**RESULTS:** ASC, exposed to aPBMC, upregulated SMC markers, including αSMA, SM22α, and Calponin I. A similar effect was achieved by exposing ASC to IL-1β, whereas blocking IL-1β prevented aPBMC-induced ASC differentiation. aPBMC induced ActA expression, upregulated TGFβ1-3, and tripled expression of CTGF, a key pro-fibrotic factor. Silencing IL-1β activity prevented aPBMC-induced expression of ActA, activity of which was essential for upregulation of CTGF and αSMA expression in ASC. ActA upregulated mRNAs for several extracellular matrix proteins, but to a lesser extent than TGFβ1, suggesting that ActA is a weaker pro-fibrotic agent than TGFβ1. ASC secretome promoted endothelial cell proliferation, whereas secretome of ASC+aPBMC co-cultures was ineffective until ActA was scavenged, which then restored ASC angiogenic activity.

**CONCLUSION:** aPBMC, through IL-1β, induce expression of ActA in ASC, that, in an autocrine fashion, induces transition of ASC from a progenitor toward a myofibroblast phenotype. ActA is weakly fibrotic, upregulates pro-fibrotic CTGF, and inhibits ASC paracrine angiogenic activity.
Stress-Induced Premature Senescence and Senolytic Intervention in the Adipose Stromal Vascular Niche

INTRODUCTION: Adipose tissue senescence plays a central role in obesity and aging. Here, senescent cells are involved in the generation of a pro-inflammatory environment, in the evolution of chronic diseases and progression of age-related metabolic dysfunction. Targeting and elimination of senescent cells have become important tools to ameliorate pathological states, outlining the therapeutic relevance of senolytic compounds – and in consequence to study their activity in relevant models.

METHODS: We established treatment conditions to generate stress-induced premature senescence (SIPS) 2D and 3D in vitro models representing the human adipose stromal vascular niche. We started from adipose-derived stromal/stem cells (ASC), which we adapted to freshly isolated microtissue-stromal vascular fraction (MT-SVF), where cells are embedded within their native extracellular matrix. We demonstrated induction of senescence on different cellular levels, including morphology, cell cycle arrest, senescence-associated β-galactosidase (SA-βgal) activity, mRNA expression by qPCR and protein expression by histological stainings. We determined the abundance of senescent cells in adipose tissue and MT-SVF, with respect to aged and lipedema patients. To eliminate senescent cells using inhibitors of arachidonic acid converters, we optimized the senolytic treatment in the senescent 2D ASC in vitro model and in the ex vivo MT-SVF samples. Senolytic activity was determined by viability measurements and live fluorescence apoptosis monitoring using caspase staining.

RESULTS: The optimal treatment conditions to generate SIPS in vitro models in 2D and 3D were defined as two subsequent exposures with 200 nM Doxorubicine for six days. We confirmed induction of senescence in the 2D in vitro models through SA-βgal activity, at the mRNA level (LMNB1, CDK1, p21) and additionally by G2/M phase cell cycle arrest in ASC. Significant differences in Lamin B1 and p21 protein expression confirmed senescence in our MT-SVF 3D model. Senolytic treatment of SIPS ASC and endogenous MT-SVF induced apoptosis detected by caspase activity in senescent cells.

CONCLUSION: As multiple cell types cause heterogeneity and complexity in adipose tissue senescence, our established microtissue models representing the perivascular niche are highly relevant for future studies. They give great value to studying adipose tissue pathologies linked to senescence and facilitate analysis of the endogenous senescent state.

Molecular Evaluation of Microfragmented Adipose Tissue Correlated to Clinical Outcomes in Patients Undergoing Treatment for Knee Osteoarthritis

INTRODUCTION: Microfragmented adipose tissue (MFAT) is an emerging therapy for treatment of inflammatory conditions including osteoarthritis (OA). In our previous study, we conducted a randomized placebo controlled trial comparing MFAT with a saline placebo (P) and corticosteroids (CS) for treatment of knee OA. During our trial, the processed MFAT was cryopreserved from the 25 patients in our treatment group. This study evaluates how the chemokine and cytokine profile of the MFAT correlates the profile to pain relief and functional improvement after knee OA treatment with MFAT.

METHODS: Patients with radiographic knee OA, a minimum pain score of 3 on the visual analog scale (VAS), and absent history of knee injections were eligible for inclusion. The VAS pain scale, Western Ontario and McMaster Universities Osteoarthritis Index (WOMAC), and the Knee Injury and Osteoarthritis Outcome Score scale (KOOS) were recorded pre-procedure and at specified time points post-procedure up to one year. The adipose tissue from the 25 patients in our MFAT group underwent analysis with Enzyme-linked immunosorbent assay (ELISA) and Polymerase chain reaction (PCR) for evaluation of the milieu's chemokine and cytokine profile. The results were correlated with the functional outcome scores of the patients in our prior study.

RESULTS: During the evaluation of the MFAT, we identified a propensity for an anti-inflammatory profile within the MFAT milieu. Additionally, patients who were found to have an increased clinical response to treatment had chemokine and cytokine profiles of their MFAT that were skewed to markers consistent with an anti-inflammatory profile. On the contrary, patients that were found to have subdued clinical responses to treatment were found to have increased markers consistent with inflammation.

CONCLUSION: MFAT is an effective treatment for knee OA. This data indicates MFAT injection consistently provides the largest improvement in outcome scores at 6-12-month follow-up compared with the P and CS groups, however, patients respond to the MFAT treatment with varying degrees. The patients that were found to be high responders to MFAT treatment were shown to have increased production of anti-inflammatory chemokine and cytokines when compared to patients that did not respond as well to the treatment.
Assessment and Outlook for the Treatment of Scleroderma 2009-2023

Clinical Science - PI

Presenter: Guy Magalon, PhD - France
Affiliation: Aix Marseille Universite France
Authors: Guy Magalon, Jeremy Magalon, Florence Sabatier, Aurélie Daumas, Brigitte Granel

INTRODUCTION: The Treatment of Scleroderma has benefited from Regenerative Surgery with the use of Microfat, PRP, Stromal Vascular Fraction and now, Mechanical Preparations. Between 2009 and 2023, we participated in 5 clinical trials. The results were very favorable for the treatment of the face and the technique is now used routinely. For hand treatment, despite two randomized trials, it is still impossible, due to obtain an authorization to use Stromal Vascular Fraction.

METHODS: Aiming at volumetric and trophic effects. We used 16 to 22 cc of fat, which was harvested with 14 gauge or 2mm cannulas, and reinjected with 21 gauge or 0.8mm cannula. In addition, we treated hands with the Stromal Vascular Fraction, aimed at an angiogenic and anti-fibrotic effects. We harvested 135-270 g of fat which allowed us to get 5 cc of stromal vascular fraction with the Celution system. We got on average 50x10^6 cells which were divided into 10 doses of 1 cc. A subcutaneous injection was performed in the patient’s every finger with 25 gauge or 0.5mm cannula.

Both facial and finger procedures were performed under local anesthesia.

RESULTS: On the face, we observed a continuous improvement process. The pain was reduced in the temporomandibular joints, the tissues softened, the buccal aperture was improved with special consideration to the aesthetic enhancement. The improvement was immediately assessed. Some patients underwent a second injection procedure, 2 years after the first one. On the hands, we observed interesting results, with a very rapid improvement of the vascularization of the fingers and later of trophic disorders that allowed a functional enhancement and a better quality of life.

CONCLUSION: New randomized clinical trials must be set up according to the requests of health authorities with even more data and our hopes are to develop a strategy in Asia, facilitated by the large number of patients.

Modeling Hormone-Sensitive Breast Cancer Using a Novel Three-Dimensional Microphysiological System

Transitional - PI

Presenter: Megan Campbell Benz - USA
Affiliation: Tulane University
Authors: Megan C. Benz, Katherine L. Hebert, Elizabeth D. Martin, Frank H. Lau, Matthew E. Burrow

INTRODUCTION: Breast cancer is a heterogeneous disease that is exacerbated by an accumulation of signaling cues from cell-intrinsic and cell-extrinsic factors. Many of these cues are derived from the tumor microenvironment (TME). The TME is a bio-mechanical and biochemical reservoir for extracellular matrix (ECM) and signaling factors (cytokines, growth factors, lipids, and hormones). Additionally, the TME houses a diverse array of cell populations including adipocytes, vasculature, stem cells, immune cells, and cancer cells. This has relevance to breast cancer pathology, as it is well established that the TME can modulate cellular proliferation, survival, and ultimately result in resistance to therapy in breast cancer. Despite our understanding of the complex interaction of cancer cells within the TME, there is currently a gap in the ability of in vitro models to accurately mimic the TME in vivo, thus limiting the development of novel therapeutics.

METHODS: The goal of this study is to develop a complex and dynamic micro-physiological 3D tumor model for pre-clinical studies for use in hormone receptor positive cancers. Here, we have developed a technique to maintain healthy human breast tissue (HBT) alive ex vivo for up to 2 weeks in the presence of breast cancer (BC) cells, creating a breast cancer micro-physiological system (BC-MPS). RNA sequencing was performed to detect breast cancer cell line signatures retained in the BC-MPS system.

RESULTS: Results demonstrate the retention of the breast cancer cell line transcriptome for up to 14 days in vitro. In addition, we identify alterations to genes in the HBT associated with the TME in the presence of BC cells, specifically the ECM and metabolism. Finally, we demonstrate that cancer cells in our system respond to hormone treatment as observed by the increase in progesterone receptor gene expression in our system following treatment with 17-beta estradiol.

CONCLUSION: Given the impact of the TME in breast cancer pathology, it is critical for the contributions of the TME to be included in pre-clinical models of breast cancer. Our novel model will allow for the modulation of estrogen receptor signaling in a complex 3D system, providing a new avenue to test endocrine therapies.
Millifat, Microfat, Stromal Vascular Tissue: Mechanical Preparation, Lipoconcentrate Gel, Topical Washing Buffer…Which Product for Which Application

**Presenter:** Sophie Menkes, MD - Switzerland  
**Affiliation:** Clinique Nescens  
**Authors:** Sophie Menkes

**INTRODUCTION:** We aimed to show that our millifat, microfat, stromal vascular tissue, lipoconcentrate, topical washing buffer… procedures improve volumes, skin quality, while yielding a regenerative effect. These new techniques can also achieve good results in neck, decolletage, hands, and genital area with improvement of vaginal dryness, mucosa trophicity, genito-urinary symptoms of menopause (GSM), loss of elasticity and volume of external genitalia, but also in hair loss.

**METHODS:** This presentation aims to present different techniques, different products: restoration of volumes of fat compartments, regenerative therapies for skin, tear trough, hair, or vaginal mucosa.

**RESULTS:** Millifat is the gold standard to refill the deep fat compartment of the face, microfat to refill the superficial fat compartments of the face or labia majora, stromal vascular tissue and modified stromal vascular tissue to regenerate skin, tear trough, hair, or genital mucosa.

**CONCLUSION:** Fat grafting has revolutionized regenerative medicine, aesthetic and reconstructive surgery. Fat grafting provides a safe and minimally invasive technique to improve signs of aging, sun damage, smoking… Many unanswered questions remain in terms of the biology, survival mechanisms, and regenerative properties. The future of fat grafting includes cell-based therapy, extracellular matrix–based scaffolds, Exosomes...

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Impact of Preparation Methods on the Extracellular Matrix Components of Different Fat Grafts

**Presenter:** Eddy Hsi Chun Wang - USA  
**Affiliation:** L'Oreal Research & Innovation  
**Authors:** Eddy Hsi Chun Wang, Chloe Trotzier, Clement Bellanger, Wan-Yi Yen Sweelin Chew, I-Chien Liao, Ying Chen, Qian Zheng, Charbel Bouez, Kun Qian

**INTRODUCTION:** Autologous fat grafts like Coleman-Fat (CF), Nanofat (NF), and SVF-Gel (SG) have shown regenerative properties beyond simply adding volume to the skin, offering anti-aging effects. However, there hasn't been a direct comparison of how the different preparation methods for these grafts affect the extracellular matrix (ECM), despite ECM being a major component of fat grafts. This study aimed to compare the preparation methods and their impact on the morphology and ECM profile of the grafts to understand their potential anti-aging properties.

**METHODS:** Lipoaspirate (LPA) was obtained from 14 donors and processed into three types of fat grafts (CF, NF, SG) through emulsification and filtration. Morphological analysis of the grafts was conducted using immunohistochemistry, and ECM protein quantification was performed using Western blot. High-resolution topology analysis was performed using cryo-SEM.

**RESULTS:** The analysis revealed noticeable macro and micro-level differences in the morphology of each graft type. CF exhibited a compact and firm structure compared to LPA. NF and SG, on the other hand, were highly disrupted due to emulsification and filtering, resulting in poorer shape retention. An enrichment of ECM was observed in NF and SG, with only a few remaining adipocytes. The enriched ECM appeared to trap cells, and the presence of CD34+ cells was observed. Micro-level analysis with cryo-SEM showed that NF and SG experienced micronization of adipocytes, while SG also displayed ECM enrichment between the remaining adipocytes. Histology and Western blot confirmed an enrichment of collagen (Collagen1, 5, 6), laminin, and fibronectin in NF and SG. SG exhibited a relative enrichment of Col6:Col1 and Laminin:Fibronectin while NF also demonstrated enrichment of Col5:Col1.

**CONCLUSION:** By utilizing the same LPA source to prepare different fat grafts, this study provided an unbiased assessment of how preparation techniques can significantly influence the relative enrichment of key ECM components. Emulsification and filtering increased the amount of ECM, particularly in SG. Notably, NF showed higher ratios of Col5:Col1, Col6:Col1, and Laminin:Fibronectin, which are known to be involved in the adipogenesis process. Additionally, the enriched ECM was found to sequester CD34+ cells, offering new insights into the regenerative mechanisms of fat grafts.
Fat Graft Processing Using the REVOLVE™ System Versus LipoGrafter and Decantation: In Vitro Properties and Tissue Quality

Presenters and Affiliations:
- Nimesh Kabaria, MS - USA
- Affiliation: Allergan Aesthetics, an AbbVie Company
- Authors: Sachin Shridharani, Nimesh Kabaria, Carrie Fang, Jared Lombardi, Eric Stec, Li-Ting Huang, Hui Li

INTRODUCTION: This study compared quality and properties of fat grafts processed using the REVOLVE™ system (Allergan Aesthetics, an AbbVie company), a filtration-based device; the LipoGrafter™ System (MTF Biologics), a decantation-based device with controlled vacuum liposuction; or standard decantation.

METHODS: Lipoaspirate (N=6 patients) was processed using REVOLVE, LipoGrafter, or decantation. Analyses of each graft included volume composition (free oil, fat, aqueous fluid, and cellular debris), hematocrit content, fat particle size, viable adipocyte count, and adipocyte activity, and stromal vascular fraction (SVF) was analyzed for viable progenitor cell count (CD45/CD31-/CD34+ cells) and colony-forming units (CFU).

RESULTS: Mean (±SEM) fat content of grafts was higher with REVOLVE than LipoGrafter or decantation: 77.7±3.6% vs 71.2±4.1% vs 60.8±3.8%, respectively (p<0.01, REVOLVE vs decantation). Free oil was significantly lower with REVOLVE than LipoGrafter or decantation (0.5±0.4% vs 6.2±2.0% vs 15.6±4.0%, respectively; p<0.05). Cellular debris content was minimal. Hematocrit levels were lower with REVOLVE than LipoGrafter or decantation (148±30.5 μm vs 989.3±511 μm vs 1180.0±76.2 μm, respectively; p<0.05 for all comparisons). Percentage of tissue particles >1000 μm was highest with REVOLVE at 67.6±3.6% (LipoGrafter: 76.7±2.6%; decantation: 55.1±2.8%; p<0.01 vs REVOLVE). More viable adipocytes and greater adipocyte activity resulted with REVOLVE than LipoGrafter or decantation (respectively, 4.2±1.0±1.0×105 cells/cc vs 2.6±1.0±105 cells/cc vs 2.7±1.0±105 cells/cc vs 4.3±0.3 μg glycerol/cc processed fat vs 3.8±0.3 μg glycerol/cc processed fat vs 3.7±0.2 μg glycerol/cc processed fat; log-transformed values). REVOLVE SVF contained more progenitors than LipoGrafter or decantation (22,686±10,623 cells vs 13,743±4549 cells vs 10,184±4794 cells); CFU in SVF was comparable (73±1.0 CFU/cc vs 73±1.0 CFU/cc vs 60±1.0 CFU/cc, respectively; log-transformed values).

CONCLUSION: Lipoaspirate processed using REVOLVE resulted in the highest quality fat grafts, the largest fraction of concentrated graftable fat, which was high in large-particle fat globules, and the lowest free oil and hematocrit content, which may contribute to greater fat retention and lower complication rates clinically.

Whole Proteomic Analysis of Skin Regenerative Factors in Coleman-Fat, Nanofat, and SVF-Gel

Presenters and Affiliations:
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INTRODUCTION: Autologous fat grafts such as Coleman-Fat, nanofat, and SVF-Gel, have been widely used for volume correction as well as facial rejuvenation. While the regenerative efficacy is mostly contributed to the stem cells in these fat grafts, other components of the fat grafts may also play a key role. To gain an insight into the skin rejuvenation efficacy of fat grafts and the impact of adipose tissue on skin aging, we aim to elucidate the differences between these fat grafts.

METHODS: Total protein was purified from freshly isolated Coleman, micro-, nano-fat and SVF-gel from 8 female donors aged 33 to 55. After which, whole proteomic analysis was carried out via nano-flow liquid chromatography-mass spectrometry. Annotated biomarkers were further analyzed for differential expression between lipoaspirate, Coleman-Fat, nanofat and SVF-Gel. Downstream pathway analysis was done to identify prevalent protein networks in each fat graft. Correlation analysis was performed to identify biomarker signatures specific to age group, body mass index and ethnicity.

RESULTS: For the first time, we compared whole proteome of Lipoaspirate, Coleman-Fat, nanofat, and SVF-Gel from single donors. Initial results revealed significant differences in abundance of lipids, extracellular matrix proteins, cytokines, and growth factors. Abundant adipokines such as leptin did not differ significantly between donor groups. However, we observed a difference in collagen and growth factor abundance over body mass index.

CONCLUSION: In conclusion, our pilot study revealed that nano-fat and SVF contain the highest concentration of secretory factors with relevance to skin regeneration and anti-aging. Whole proteomic analysis for a panel of regenerative biomarkers prior to fat grafting may support personalization of fat graft processing to maximize patient satisfaction.
Activated Fat Grafting: A Novel Approach for Enhanced Fat Graft Retention and Natural Long-Term Results

INTRODUCTION: Fat grafting is a commonly performed procedure in plastic surgery with a long history of application. Despite numerous studies on the pathophysiology of fat grafting, many aspects remain unclear. The survival of fat grafts is influenced significantly by the presence of fat-derived stromal cells. To enhance fat graft retention and achieve better outcomes, "cell-enriched" fat grafting has been proposed. This study introduces a novel technique called "activated fat grafting," which involves releasing stromal cells using ultra-sharp blades without damaging the fat tissue parenchyma, followed by the application of fat grafting.

METHODS: Different sizes of fat grafts (2400, 1200, 600, 400, 200, and 100 microns) were prepared using ultra-sharp blades specific to each anatomical area and depth. The process involved releasing stromal cells within the adipose tissue. A total of 128 patients underwent fat grafting on various body areas, including the face, breast, extremities, genital areas, and others. Patients were followed up for a minimum of 6 months and a maximum of 6 years. Flow cytometric and dual-fluorescence analyses were performed to confirm the liberation, number, and viability of stromal cells. Histopathological examination evaluated the integrity of adipocyte cells using a sharp blade system. Long-term results were assessed by both clinicians and patients, with additional radiological assessment through MRI examinations.

RESULTS: Laboratory studies demonstrated that the use of sharp blades allowed the desired diameter of adipose tissue to be achieved without completely disrupting the parenchyma, while also releasing stromal cells and determining their presence and quantity. Clinicians and patients reported satisfactory long-term results in all cases. The regenerative effect was observed through both volume improvement in the tissue and increased fat graft retention.

CONCLUSION: Adipose tissue contains parenchymal cells, predominantly adipocytes, interconnected with stromal cells through bonds and bridges. By separating these bonds using sharp blades, the stromal cells can be released without compromising the viability of adipocytes. This approach, termed "activated fat grafting," enables improved graft retention and the preparation of different-sized fat grafts tailored to each anatomical area and depth. Consequently, this technique facilitates the attainment of natural, long-term results while minimizing complications such as graft visibility.

Examining Long-Term Responses of Diverse Human Body Systems and Disorders to Mechanically Obtained Fat-Derived Stromal Cells

INTRODUCTION: Regenerative medicine holds immense promise as a rapidly growing field that utilizes the body's inherent healing capacity for targeted treatments. Adipose tissue is an excellent source of stromal cells, which play a crucial role in regenerative therapies. Mechanical methods, particularly those involving ultra-sharp blade systems, have shown exceptional success in efficiently obtaining stromal cells from adipose tissue. However, the response of different body systems and organs to regenerative applications can vary significantly. This study aims to evaluate these responses using ultra-sharp blade systems.

METHODS: Regenerative treatments were administered in 442 cases across various indications, and their long-term outcomes were assessed over a minimum of 2 years and a maximum of 7 years. The procedure involved manually extracting fat under local or general anesthesia using a specialized cannula. After centrifugation and removal of blood and tumescent fluid, the resulting condensed fat was sectioned using Adinizer ultra-sharp blades with diameters of 2400, 1200, 600, and 400 microns to separate stromal cells. The isolated stromal cells were then applied according to specific protocols for each indication. Patients were monitored extensively during the follow-up period.

RESULTS: Regenerative treatments utilizing stromal cells were successfully employed for both aesthetic and therapeutic purposes in various anatomical regions, including skin and subcutaneous tissues (aging, burns, cancer, radiation injury, diabetic foot), urogenital region (erectile dysfunction, Peyronie’s disease, ovarian insufficiency, endometrial and testicular rejuvenation, bladder reconstruction, urinary incontinence), scalp, vocal cord, bone tissue (aseptic necrosis), joints (osteoarthritis), adipose tissue (lipodystrophy, necrosis), plantar fascia, and lung (regenerative rehabilitation).

CONCLUSION: The acquisition of stromal cells from adipose tissue can be categorized into two approaches: direct methods targeting the connections between parenchymal and stromal cells, such as enzyme and ultra-sharp blade systems, and indirect methods that may compromise parenchymal cell viability. Among these approaches, ultra-sharp blade systems have demonstrated the most successful outcomes. Stromal cells obtained using this method have shown remarkable efficacy in treating various challenging clinical conditions. Notably, the urogenital and skeletal systems exhibit the most favorable responses to regenerative interventions.
Improving Fat Graft Volume Retention with Vitamin D3

Presenter: Amr Elmeanawy, MD - Egypt
Affiliation: University of Pittsburgh

INTRODUCTION: Our long-term research goal is to improve the mean volume of autologous fat graft retention for all patients and reduce the number of low retention outliers. Toward this, we have investigated vitamin D3 in both inactive (cholecalciferol) and active (calcitriol) forms as a therapeutic approach to augmenting retention. VD3 has established functions in immunomodulation and cell maturation, which we hypothesize improves macrophage and adipogenic precursor maturation for enhanced graft healing. We have previously shown VD3 as beneficial in murine and allogeneic pig models. In this final preclinical study, we investigate oral, high dose VD3 in a clinically relevant, autologous fat grafting pig model.

METHODS: Autologous inguinal adipose was harvested from each of 3 female Yucatan pigs, placed into sterile receptacles and manually minced with surgical scissors. Warm saline was used to prevent lipid coagulation. The fat product was Coleman processed with removal of free oil/fluid. 5cc adipose aliquots were weighed and injected bilaterally in 16 well-defined areas on the dorsum. Pigs received one of the following treatments: Naïve control, post-grafting VD3, and pre and post-grafting VD3. Oral inactive VD3 (cholecalciferol) was administered thrice weekly as 2, 50K IU capsules with food. Following euthanasia, the fat grafts were meticulously extracted from the dorsum, quantified in relation to both volume and weight, and flash frozen or histologically processed.

RESULTS: All pigs tolerated the procedures well and had no serious adverse events. Ultrasound images showed that fat graft placement was consistent and within the mid- to deep dermal white adipose tissue, with no leakage into muscle. All fat grafts were identifiable at three months, with clear differences noted in the quality of grafts at a macroscopic level based on treatment group. While control grafts were pale and fibrotic, VD3 pre-treated grafts were soft, pliable and appeared very healthy. Finally, both post- and pre/post- VD3 treatment significantly improved graft retention by over 200%. Naïve grafts had a mean retention of 19 +/- 17% compared to 40 +/- 22% for post- VD3 and 42 +/- 26% for pre/post VD3.

CONCLUSION: Cholecalciferol, also known as inactive Vitamin D3, has shown potential as a drug for improving long-term fat grafting outcomes. Our data suggests that it is a safe and effective approach for increasing fat graft retention through multiple mechanisms of action including increased revascularization.
Optimizing Adipose Stem Cell Therapy through Cell Supplemented Engineered Grafts

Presenter: Summer Hanson, MD, PhD - USA
Affiliation: University of Chicago Medicine and Biological Sciences
Authors: Summer Hanson, Miguel Gonzalez, Luke Zhang

INTRODUCTION: Little is known about the regenerative mechanism of fat when transferred from one part of the body to another as in autologous fat grafting. This is particularly pressing, given the rich proteins and progenitor cells, including adipose derived stem cells (ASCs), within the stromal vascular fraction (SVF) of fat. The purpose of this work was to develop a model of engineered adipose tissue grafts supplemented with stromal or stem cells for soft tissue regeneration.

METHODS: Discarded lipoaspirate was used. A 2 x 2 grid was devised on the flanks of 8-week-old nude mice with 0.5mL of graft (or saline ASC control). Engineered grafts were supplemented with either pure ASCs or cells from the SVF (SVCs). Standard grafts and cell solution were used as controls. At 1, 2, 4 and 8 weeks, animals were sacrificed, and tissue specimens were processed for volume, histology, and protein expression.

RESULTS: The ASC/saline control had dissipated over the 8-week study period while the standard graft had 59.2% retention. Adipose scaffolds supplemented with pure ASCs and SVCs demonstrate higher volume retention at 8 weeks (76.6% versus 77.3% respectively, p>0.05). All grafts expressed comparable concentrations of markers of functional adipose tissue (adiponectin, leptin) with minimal expression in the ASC controls. The adipose scaffold supplemented with SVF cells has higher expression of inflammatory markers such as C reactive protein (CRP) and the ST2 signaling protein. Grafts engineered with pure ASCs demonstrate higher concentration of remodeling proteins including HGF, and MMP-9 as well as VEGF.

CONCLUSION: The authors identified differences in cytokine expression in the engineered grafts particularly in inflammation and wound healing. These secretomes may impact graft retention and fat necrosis in the clinical setting but more importantly allow for promoting regeneration and repair of fibrosis as in radiation injury.
**Multiple Administrations of Adipose-derived Stromal Cells Concurrent with Fat Grafting**

**Presenter:** Ki Yong Hong, MD, PhD - Korea  
**Affiliation:** Seoul National University Hospital - Korea  
**Authors:** Ki Yong Hong, Hak Chang

**INTRODUCTION:** Cell-assisted lipotransfer, a fat graft mixed with adipose-derived stromal cells, is known to enhance fat graft retention. Previously, we showed that intravenous injection of adipose-derived stromal cells can improve the survival of grafted fat. In the present study, we investigated the effects of a secondary intravenous injection of adipose-derived stromal cells on fat grafting.

**METHODS:** Wild-type C57BL/6J (B6) mice were used as donors for grafted fat and as recipients. Adipose-derived stromal cells were harvested from green fluorescent protein and DsRed B6 mice. The recipient mice were divided into three groups: SI (n = 10), RI1 (n = 10), and RI2 (n = 11). All groups received intravenous injections of green fluorescent protein adipose-derived stromal cells immediately after fat grafting. The RI1 and RI2 groups received repeated intravenous injections of DsRed adipose-derived stromal cells at 1 and 2 weeks, respectively, after fat grafting. The grafted fat volume was measured using micro-computed tomography.

**RESULTS:** Secondarily injected DsRed adipose-derived stromal cells were recruited to the grafted fat and resulted in a higher retention of graft volume and vascular density (p < 0.05). The stromal-derived factor-1 and C-X-C chemokine receptor type 4 genes related to stem cell homing were highly expressed in the grafted fat and adipose-derived stromal cells (p < 0.05). The RI2 group showed a higher graft volume and vascular density than the SI and RI1 groups (p < 0.05).

**CONCLUSION:** A secondary intravenous injection of adipose-derived stromal cells at a 2-week interval enhances the effect of adipose-derived stromal cell enrichment in fat grafting. These findings refine clinical protocols and enhance the therapeutic value of cell-assisted lipotransfer.

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**Oil Droplets in Apoptotic Uniocular Adipocytes: A Double-edged Sword in Determining Macrophage Phenotype and Its Implications on Fat Grafting**

**Presenter:** Chen Lei, MD - China  
**Affiliation:** The First Affiliated Hospital of Fujian Medical University  
**Authors:** Songyu Wang, Jong Ye, Meishui Wang, Feng Lu, Biao Wang

**INTRODUCTION:** Fat grafting procedure is increasingly popular, but is limited by its unstable retention rate. The current research focuses on the revascularization of grafted fat. In this study, we explored the unique properties of apoptotic uniocular adipocytes and their relationship with macrophages.

**METHODS:** Membrane mature adipocyte aggregate cultures (MAAC) method was used to culture uniocular adipocytes in vitro. STS was used to induce apoptosis in uniocular adipocytes, multiocular adipocytes, and ASCs. The apoptotic uniocular adipocytes were examined under SEM. Methanol was used to stimulate the fusion of apoptotic uniocular adipocytes, and the fused large oil droplets attracted multiple cell debris, as indicated by DAPI/PI staining. Co-culture with apoptotic uniocular adipocytes and fused oil droplets.

**RESULTS:** Cultured uniocular adipocytes maintained their morphology even after the induction of apoptosis. In contrast, multi-ocular adipocytes and ASCs cracked and released their cellular components, as confirmed by SEM. Methanol triggered the fusion of apoptotic uniocular adipocytes, and the fused large oil droplets attracted multiple cell debris, as indicated by DAPI/PI staining. Co-culture with apoptotic uniocular adipocytes induced the M2 phenotype, while M1 phenotype was induced when co-cultured with fused oil droplets.

**CONCLUSION:** In our study, we demonstrated that the surface tension of uniocular adipocytes sustained basic cellular morphology and subsequently induced M2 activation. In an unstable culture environment (such as the addition of methanol), surface tension tore the apoptotic adipocytes by fusion, subsequently inducing M1 activation. These results provide new insights into the effects of cellular morphology, which may influence the outcome of fat grafting.
Porous Poly(glycerol sebacate)-based Scaffolds For Enhancing Adipose Tissue Regeneration

Presenter: Rachel Louise Furmidge - United Kingdom
Affiliation: The University of Sheffield
Authors: Rachel L Furmidge, Victoria Workman, Victoria Giblin, Frederik Claeyssens, Vanessa Hearnden

INTRODUCTION: Autologous fat grafting is still limited by high rates of adipose tissue resorption following transplant, and often additional procedures are required to achieve the desired tissue volume, increasing costs. As such, there is a need for an improved fat graft that can maintain volume following transplantation. A regenerative approach, combining both grafted adipose tissue and a regenerative biomaterial that promotes angiogenesis and cell survival may be an effective strategy for enhancing volume retention of transplanted adipose tissue. Poly(glycerol sebacate) (PGS) is a synthetic biomaterial which is highly suited to adipose tissue engineering, as it is much softer than commonly used biomaterials and is also highly elastomeric, mimicking the mechanical properties of adipose tissue. We herein report the development and optimisation of porous PGS-methacrylate (PGS-M) scaffolds for adipose tissue regeneration applications.

METHODS: Polymerised high internal phase emulsion (polyHIPE) templating of photocurable PGS-M pre-polymer was used to create porous three-dimensional scaffolds. The parameters of material fabrication were altered to investigate the effect on the porous structure, and scaffolds were characterised using scanning electron microscopy (SEM) and the mechanical properties of PGS-M scaffolds were measured. PGS-M scaffolds were seeded with adipose-derived stromal cells (ADSCs) isolated from primary human adipose tissue to assess cell migration through the scaffolds. In addition, a chick chorioallantoic membrane (CAM) assay was performed to assess the angiogenic potential of the scaffolds.

RESULTS: Fabricated scaffolds had a range of pore sizes (average pore size 27 µm and 94 µm) and interconnectivity depending on fabrication parameters. PGS-M scaffolds showed elastomeric properties, with mechanical properties within an acceptable range for soft tissue. Migration of ADSCs into the scaffold could be observed following 14 days of in vitro culture. Ingrowth of blood vessels could be observed on the CAM assay in response to the placement of PGSM scaffolds onto the CAM.

CONCLUSION: These results indicate that PGS-M polyHIPE scaffolds can support the growth of ADSCs, and by altering the parameters of fabrication, the pore size can be tuned, enhancing cell migration through the scaffold. PGS-M scaffolds promote an angiogenic response when implanted onto the CAM assay, and we envisage that with further development, these scaffolds could be used to enhance volume retention of grafted adipose tissue.
Xenograft-Decellularized Adipose Tissue Derived from Humans and Rabbits Supports Adipose Remodeling in Rabbit Model

Presenter: Hong-Wei Liu, PhD - China
Affiliation: The First Affiliated Hospital
Authors: Wei Liu, Hong-Yin Huang

INTRODUCTION: Decellularized adipose tissue (DAT) provides a suitable microenvironment for adipose stem cells (ADSCs) and promotes their adipogenic differentiation. Recent studies have focused on allogeneic DAT; however, insufficient adipose sources limit its wider application of allogeneic DAT. In this study, we compared the ability of allogeneic and xenogeneic DATs to induce adipose regeneration to explore the feasibility of xenogeneic DAT as an adjunctive material for tissue repair.

METHODS: Decellularized adipose tissue from humans and rabbits was prepared using the Flynn's method. The proliferation, migration, and adipogenic functions of the allogeneic and the xenogeneic groups were compared. Rabbits were used to construct transplantation models: allogeneic (transplanted r-DAT) and xenogeneic groups (transplanted h-DAT). Comparison of DAT transplantation outcomes between the two groups.

RESULTS: Xenogeneic DAT supports adipose regeneration. In vitro, adipose-derived stem cells cultured on DAT developed adipogenesis without media cues and were not statistically different from the effects of allogeneic DAT on cell migration, proliferation, and adipogenic capacity. In vivo, the animal model showed angiogenesis and adipogenesis, and the adipogenic ability of xenogeneic DAT was not statistically different from that of allogeneic DAT.

CONCLUSION: Xenogeneic DATs can induce adipose regeneration, and its adipogenic ability has no statistical difference, compared with allogeneic DATs. Xenografts are expected to be useful for soft tissue repair.

Fat Graft Enriched with Adipose-Derived Stem Cells for Breast Augmentation and Reconstruction: Clinical, Histological, and Instrumental Evaluation

Presenter: Pietro Gentile, MD, PhD - Italy
Affiliation: Associate Professor of Plastic and Reconstructive Surgery, University of Rome
Authors: Pietro Gentile

INTRODUCTION: Fat graft enriched with adipose-derived stem cells (FG-e-ASCs) has been utilized in outcomes of radiotherapy after mastectomy, and breast soft tissue defects. The scientific results using FG-e-ASCs in breast augmentation and breast reconstruction have been reported.

METHODS: A total of 46 patients affected by breast hypoplasia (SG-1) were treated with FG-e-ASCs, comparing results with those of a CG-1 (n = 30) treated with fat graft not enriched with adipose-derived stem cells (FG-ne-ASCs). 121 patients affected by the outcomes of breast oncoplastic surgery (SG-2) were treated with FG-e-ASCs, comparing the results with the CG-2 (n = 50) treated with FG-ne-ASCs. The preoperative evaluation included a complete clinical evaluation, photographic assessment, magnetic resonance imaging (MRI) of the soft tissue, ultrasound (US), and mammography (MG). Biopsy was performed only in SG-2. Postoperative follow-up took place at 1, 3, 7, 12, 24, 36, and 48 weeks, and then annually.

RESULTS: SG-1 patients, treated with FG-e-ASCs showed 58% maintenance of the contour restoring and of 3-dimensional (3D) volume after 3 years compared with the patients of the CG-1 treated with FG-ne-ASCs, who showed only 29% maintenance. In 67.4% (n = 31) of breast augmentation treated with FG-e-ASCs, we observed a restoration of the breast contour and an increase of 10.3 mm in the 3D volume after 36 months, which was observed in only 20.0% (n = 6) of patients in the CG treated with FG-ne-ASCs. Volumetric persistence in the SG-1 was higher than that in the CG-1 (P < .0001 SG vs. CG). In 72.8% (SG-2 n = 88) of breast reconstruction treated with FG-e-ASCs, we observed a restoration of the breast contour and an increase of 12.8 mm in the three-dimensional volume after 12 weeks, which was only observed in 27.3% (n = 33) of CG-2. Volumetric persistence in the SG-2 was higher (70.8%) than that in the CG-2 (41.4%) (p < 0.0001 vs. control group).

CONCLUSION: The use of FG-e-ASCs was safe and effective in patients of SG-1 and SG-2.
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