AOSpine—the leading global academic community for innovative education and research in spine care, inspiring lifelong learning and improving patients' lives.
Welcome to Bern

Dear colleagues,

Spinal fusions with screws, rods and cages are successful for the treatment of many spinal disorders but result in altered biomechanics and function of the spine.

At this symposium alternative approaches from emerging technologies using “smart biomaterials”, pharmaceutical and stem cell therapies for disc repair and regeneration are presented and discussed. This meeting aims to unite clinicians and researchers on a common platform to investigate the nature and causes of the degenerating spine and the intervertebral discs and its consequences for low back pain.

Translational research, where basic science is targeted to find its way back to the patient’s bed site, has become popular and is the major focus of this meeting. Learn about the latest insights on imaging, regenerative and pharmaceutical research that will change the way we treat our patients in future.

Sincerely,

Lorin Benneker
Chairperson
Inselspital
Bern
Switzerland

Benjamin Gantenbein
Chairperson
University of Bern
Bern
Switzerland

Thomas Blattert
Educational Advisor
Orthopädische Fachklinik
Schwarzach
Germany
**Event description**

This meeting aims to unite clinicians and researchers on a common platform to investigate the nature and causes of the degenerating spine and the intervertebral discs and its consequences for low back pain.

Translational research, where basic science is targeted to find its way back to the patient’s bed site, has become popular and is the major focus of this meeting. Learn about the latest insights on imaging, regenerative and pharmaceutical research that will change the way we treat our patients in future.

The event will comprise of evidence-based lectures and will provide ample time for discussion between faculty and participants.

**Target participants**

This event is targeted at certified surgeons, researchers and other medical specialists with more than 10 years of experience in the spinal field.

**Learning objectives**

After the event, participants will be able to:
- Describe the latest insights on imaging, regenerative, and pharmaceutical research and how these will change the way we treat our patients
- Discuss the current research findings in intervertebral disc biology, cell transplantation, biomaterials, biomechanics and sarcopenia
- Acknowledge emerging technologies’ potential to improve the outcome of conventional spine techniques
- Assess the strengths and weaknesses of basic science when being translated to clinical settings
Chairpersons

Lorin Benneker  Inselspital, University of Bern, Switzerland, Bern
Benjamin Gantenbein  University of Bern, Switzerland, Bern

Educational advisor

Thomas Blattert  Orthopaedische Fachklinik Schwarzach, Germany, Schwarzach

Clinical Committee

Paul Heini  Klinik Sonnenhof, Switzerland, Bern
Sven Hoppe  Inselspital, Switzerland, Bern
Gregory Jost  Basel University Hospital, Switzerland, Basel
Arme Mehrkens  Basel University Hospital, Switzerland, Basel
Constantin Schizas  Clinique Cecil, Switzerland, Lausanne

Scientific Committee

David Eglin  AO Research Institute, Switzerland, Davos
Sibylle Grad  AO Research Institute, Switzerland, Davos
Karin Wuertz-Kozak  ETH Zurich, Switzerland, Zurich

Keynote Speakers

Max Aebi  Salem Hirslanden Hospital, Switzerland, Bern
Conor Buckley  Trinity College Dublin, Ireland, Dublin
Stephen Ferguson  ETH Zurich, Switzerland, Zurich
Hans-Joerg Meisel  BG-Clinic Bermannstrost, Germany, Halle
Jivko Stoyanov  Swiss Paraplegic Research, Switzerland, Nottwil
Marina Tryfonidou  Utrecht University, Netherlands, Utrecht
Gianluca Vadala  Bio-Medico University of Rome, Italy, Rome

Guest off-topic Speaker

Peter Messmer  NVIDIA Switzerland, Switzerland, Bern
Friday, September 22, 2017

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<tr>
<th>TIME</th>
<th>AGENDA ITEM</th>
<th>WHO</th>
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<tr>
<td>08:15–09:00</td>
<td>Registration</td>
<td></td>
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<tr>
<td>09:00–09:10</td>
<td>Welcome and program overview</td>
<td>L Benneker, B Gantenbein</td>
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**Session 1  Surgery and Imaging**

<table>
<thead>
<tr>
<th>09:10–09:40</th>
<th>History of spinal surgery</th>
<th>M Aebi</th>
</tr>
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<tbody>
<tr>
<td>09:40–09:50</td>
<td>VEPTR 12 years results regarding operative treatment of scoliosis</td>
<td>C Wimmer</td>
</tr>
<tr>
<td>09:50–10:00</td>
<td>Ferromagnetic dissection and discectomy in scoliosis surgery: Comparison with electrical and mechanical tools</td>
<td>A Ramieri</td>
</tr>
<tr>
<td>10:00–10:10</td>
<td>Introducing SpinePRO: Digital clinical data collection for Spine Tango</td>
<td>T Jansen</td>
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<tr>
<td>10:10–10:20</td>
<td>Comparison of in vitro osteogenic potential of iliac crest and degenerative facet joint bone autografts for intervertebral fusion in lumbar spinal stenosis</td>
<td>J Geurts</td>
</tr>
<tr>
<td>10:20–10:30</td>
<td>Affordable surgical navigation based on finite element simulation and 3D printing technology</td>
<td>P Eltes</td>
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<tr>
<td>10:30–10:40</td>
<td>Aneurysmal bone cyst of the spine: an alternative treatment by direct injection of concentrated autologous mesenchymal stem cells</td>
<td>G Barbanti-Brodano</td>
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<td>COFFEE BREAK</td>
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</table>

**Session 2  Intervertebral Disc Biology I**

<table>
<thead>
<tr>
<th>11:00–11:30</th>
<th>Success stories and challenges of translational studies</th>
<th>M Tryfonidou</th>
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<tbody>
<tr>
<td>11:30–11:40</td>
<td>CD146 positive mesenchymal stem cells possess a superior migration potential towards induced degenerative intervertebral discs</td>
<td>S Wangler</td>
</tr>
<tr>
<td>11:40–11:50</td>
<td>Comparison of gene expression of discs from Diffuse Idiopathic Skeletal Hyperostosis (DISH) and healthy (trauma) patient</td>
<td>R May</td>
</tr>
<tr>
<td>11:50–12:00</td>
<td>Short- and mid-term effect of TNF-intradiscal injection and detrimental dynamic loading in intervertebral disc organ culture</td>
<td>Li Zhen</td>
</tr>
</tbody>
</table>
## Friday, September 22, 2017

### Rapid fire poster session

**M Tryfonidou, J Stoyanov**

<table>
<thead>
<tr>
<th>Time</th>
<th>Title</th>
<th>Authors</th>
</tr>
</thead>
<tbody>
<tr>
<td>12:00–12:30</td>
<td>Percutaneous cement discoplasty, a method for restoring the weight bearing capacity of lumbar spine in cases of unstable vacuum discs</td>
<td>G Jakab</td>
</tr>
<tr>
<td></td>
<td>Lytic versus degenerative spondylolisthesis. A comparison of patient reported outcomes following surgical correction and stabilisation</td>
<td>J Messner</td>
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<tr>
<td></td>
<td>Hypoplastic vertebral body and recurrent symptomatic disc herniation</td>
<td>R Lauebli</td>
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<td></td>
<td>Nucleus pulposus progenitor cells – isolation and injection into degenerative disc</td>
<td>D Frauchiger</td>
</tr>
<tr>
<td></td>
<td>Comparing two annulus fibrosus injury models in loaded bovine organ culture</td>
<td>D Frauchiger</td>
</tr>
<tr>
<td></td>
<td>The Influence of primary human Intervertebral Disc Cells on primary human Osteoblasts</td>
<td>R May</td>
</tr>
<tr>
<td></td>
<td>MRI-informed Biomimetic Design of Artificial Intervertebral Disc Scaffolds using 3D Bioplotting</td>
<td>E Hodder</td>
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<tr>
<td></td>
<td>Reduction of pelvic incidence and patient reported outcomes following surgical correction and stabilisation of lytic spondylolisthesis</td>
<td>J Messner</td>
</tr>
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<td></td>
<td>Real-time glucose concentration measurement in 3D intervertebral disc culture</td>
<td>D Frauchiger</td>
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</tbody>
</table>

### Session 3

**Biomaterials**

**H-J Meisel, L Benneker**

<table>
<thead>
<tr>
<th>Time</th>
<th>Title</th>
<th>Authors</th>
</tr>
</thead>
<tbody>
<tr>
<td>13:30–14:00</td>
<td>Cellular microencapsulation and microenvironmental challenges for intervertebral disc regeneration</td>
<td>C Buckley</td>
</tr>
<tr>
<td>14:00–14:30</td>
<td>Bitten by Translation: Are Veterinary patient dogs good models for Intervertebral Disc Repair using Cell Therapy?</td>
<td>J Stoyanov</td>
</tr>
<tr>
<td>14:30–14:40</td>
<td>Biomaterials: a good alternative to autologous bone for spine fusion</td>
<td>G Barbanti-Brodano</td>
</tr>
<tr>
<td>14:40–14:50</td>
<td>Genipin-enhanced fibrin hydrogel combined with engineered silk composite for intervertebral disc repair</td>
<td>D Frauchiger</td>
</tr>
<tr>
<td>14:50–15:00</td>
<td>Optimization of 3D Printed Hydrogels with Primary Cells for Tissue Engineering</td>
<td>E Bakirci</td>
</tr>
<tr>
<td>15:00–15:10</td>
<td>Proliferation and differentiation on engineered silk scaffolds: From MSC towards NP-like cells</td>
<td>D Frauchiger</td>
</tr>
<tr>
<td>15:10–15:20</td>
<td>In situ photopolymerized composite hydrogels for implants: application to a nucleus pulposus replacement</td>
<td>A Schmocker</td>
</tr>
</tbody>
</table>

### COFFEE BREAK

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The table includes titles and authors for various topics presented during the rapid fire poster session and session 3 of the conference. The topics cover a range of research areas within the field of biomaterials and intervertebral disc regeneration.
## Friday, September 22, 2017

### Session 4  Cell Transplantation  

<table>
<thead>
<tr>
<th>Time</th>
<th>Topic</th>
<th>Speaker</th>
</tr>
</thead>
<tbody>
<tr>
<td>16:00–16:30</td>
<td>Cell transplantation in lumbar spine disc degeneration disease</td>
<td>H-J Meisel</td>
</tr>
<tr>
<td>16:30–17:00</td>
<td>Disc regeneration using MSC transplanted via the endplate route</td>
<td>G Vadala</td>
</tr>
<tr>
<td>17:00–17:10</td>
<td>Nasal chondrocytes are potential autologous cell-transplant candidates for treating degenerative disc disease</td>
<td>M Gay</td>
</tr>
<tr>
<td>17:10–17:20</td>
<td>Autologous disc chondrocyte transplantation in lumbar spine disc degeneration disease – a prospective, controlled, randomized study</td>
<td>C Hohaus</td>
</tr>
<tr>
<td>17:20–17:30</td>
<td>The regenerative effects of notochordal cell matrix (NCM) on canine and human nucleus pulposus cells</td>
<td>F Bach</td>
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</tbody>
</table>

### Off-topic Lecture

<table>
<thead>
<tr>
<th>Time</th>
<th>Topic</th>
<th>Speaker</th>
</tr>
</thead>
<tbody>
<tr>
<td>17:30–18:00</td>
<td>Will I dream? How infinite compute power changes our interaction with machines</td>
<td>P Messmer</td>
</tr>
<tr>
<td>18:00–18:10</td>
<td>Closing Day 1</td>
<td>L Benneker, B Gantenbein</td>
</tr>
<tr>
<td>19:30</td>
<td>Dinner at Restaurant Kornhauskeller</td>
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## Saturday, September 23, 2017

### Session 5  Biomechanicals  

<table>
<thead>
<tr>
<th>Time</th>
<th>Topic</th>
<th>Speaker</th>
</tr>
</thead>
<tbody>
<tr>
<td>09:00–09:30</td>
<td>Biomechanical Research in Spine</td>
<td>S Ferguson</td>
</tr>
<tr>
<td>09:30–09:40</td>
<td>Bone mineral density of vertebas at instrumented levels and levels above the instrumentation increases during the first postoperative year after the lumbar spine fusion</td>
<td>M Neva</td>
</tr>
<tr>
<td>09:40–09:50</td>
<td>Analysis of osteoarthritis-specific structural changes of subchondral bone in degenerative lumbar facet joints</td>
<td>G Jeroen</td>
</tr>
<tr>
<td>09:50–10:00</td>
<td>A novel microgravity-augmented model for intervertebral disc aging</td>
<td>C Giger-Lange</td>
</tr>
</tbody>
</table>

COFFEE BREAK
## Session 6  Sarcopenia

<table>
<thead>
<tr>
<th>Time</th>
<th>Title</th>
<th>Speaker</th>
</tr>
</thead>
<tbody>
<tr>
<td>10:30–11:00</td>
<td><strong>Sarcopenia - the Burden of Ageing</strong></td>
<td>L Benneker</td>
</tr>
<tr>
<td>11:00–11:10</td>
<td>Musculoskeletal modeling of sarcopenia for prediction of associated spinal loads</td>
<td>S Ferguson</td>
</tr>
<tr>
<td>11:10–11:20</td>
<td>3-dimensional MRI analysis of paraspinal muscle degeneration</td>
<td></td>
</tr>
<tr>
<td>11:20–11:30</td>
<td>Restorative neurostimulation to induce episodic contractions of the lumbar multifidus leads to clinical improvements in patients with disabling refractory non-specific chronic low back pain</td>
<td>K De Smedt</td>
</tr>
</tbody>
</table>

## Session 7  Intervertebral Disc Biology II

<table>
<thead>
<tr>
<th>Time</th>
<th>Title</th>
<th>Speaker</th>
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</thead>
<tbody>
<tr>
<td>11:30–11:40</td>
<td>Model of disc degeneration in rat tail induced through a vascular isolation of endplate</td>
<td>M A Diez Ulloa</td>
</tr>
<tr>
<td>11:40–11:50</td>
<td>Anabolic effects of bioactive proteins and extracellular vesicles derived from notochordal cell-conditioned medium</td>
<td>F Bach</td>
</tr>
<tr>
<td>11:50–12:00</td>
<td>In toto and expanded human vertebral bone marrow cells cultured under normoxic and hypoxic condition: a novel strategy for spine surgery.</td>
<td>G Barbanti-Brodano</td>
</tr>
<tr>
<td>12:00–12:10</td>
<td>The expression of transient receptor potential (TRP) channels in intervertebral disc cells is regulated by pro-inflammatory cytokines</td>
<td>O Krupkova</td>
</tr>
<tr>
<td>12:10–12:20</td>
<td>Biological disc replacement using tissue-engineered intervertebral discs combined with a resorbable stabilization system – A proof of concept study in an ex vivo beagle model</td>
<td>G Lang</td>
</tr>
</tbody>
</table>

**12:20–12:40  Best Oral Award / Best Poster Award and closing ceremony**

FAREWELL LUNCH
Event organization

AOSpine Europe:
Diana Daaboul
Project Manager
Phone: +41 44 2002 445
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CH—8600 Dübendorf
Email: DDaaboul@aospine.org
www.aospine.org

AO funding sources: Unrestricted educational grants from different sources are collected and pooled together centrally by the AO Foundation. All events are planned and scheduled by local and regional AO surgeon groups based on local needs assessments. We rely on industrial/commercial partners for in-kind support to run simulations/skills training if educationally needed.

Event information and logistics

AO Courses Switzerland
Miriam Suter
Phone: +41 79 9129 475
Email: suter.miriam@ao-courses.com

Event organisation compliance: In certain countries where AO has no office but offers educational events, the AO cooperates with third party companies to conduct local organization and logistics, as well as to communicate with participants in the local language. In these cases the AO has put rules and guidelines in place (Letter of Secondment, AO Foundation—Principles of AO Educational Events) to ensure that this cooperation has no impact on the curricula, scientific program, or faculty selection.

Registration and venue

Registration fee:
AOSpine Members CHF 255.–
AOSpine non-Members CHF 300.–

Included in registration fee: Conference bag with documentation, coffee breaks, lunches, and course certificate.

Online registration and payment:
http://bern1709.aospine.org

Event venue:
University Hospital Bern
Auditorium Langhans
Pathologisches Institut H 128
Entrance 43 A
3010 Bern

European CME Accreditation:
An application has been made to the UEMS—EACCME® in Brussels for CME accreditation of this event.

Additionally an application has been made to the Medical Chamber of Switzerland.

Evaluation guidelines: All AOSpine events apply the same evaluation process with paper and pencil questionnaires. This will help us to ensure that we continue to meet your training needs.
Disclosure information

This peer-reviewed AOSpine Masters Symposium adheres to the policies of the European Accreditation Council for Continuing Medical Education (EACCME) in order to ensure balance, independence, objectivity, and scientific rigor in all of our activities. Thus, in compliance with the EACCME guidelines, all persons in control of content at the symposium have been required to disclose to AOSpine and the audience any potential, apparent or real conflict of interest. Such persons include, but are not limited to: planning and organizing committee members (chairpersons), educational advisors, faculty, and oral presenters.

Presenters directory

Bach Frances C.    Utrecht University, Netherlands
Bakirci Ezgi    University of Bern, Switzerland
Barbanti-Brodano Giovanni    Instituto Ortopedico Rizzoli, Bologna, Italy
Buckley Conor    Trinity College, Dublin, Ireland
De Smedt Kris    St. Augustinus Hospital, Antwerp, Belgium
Diez Ulloa Maximo Alberto    University Hospital Santiago de Compostela, Spain
Eltes Peter E.    National Center for Spinal Disorders, Budapest, Hungary
Ferguson Stephen    ETH Zurich, Switzerland
Frauchiger Daniela    University of Bern, Switzerland
Gabor Jakab    National Center for Spinal Disorders, Budapest, Hungary
Gay Max H.P.    University Hospital Basel, Switzerland
Geurts Jeroen    University Hospital Basel, Switzerland
Giger-Lange Christina    Lucerne University of Applied Science and Arts, Switzerland
Hodder Ella    School of Computing, Engineering and Mathematics, Brighton, UK
Hohaus Christian    Städtisches Klinikum Dessau, Dessau-Roßlau, Germany
Hoppe Sven    University of Bern, Switzerland
Jansen Tom R.    University Clinic Bonn, Germany
Krupkova Olga    ETH Zurich, Switzerland
Lang Gernot    Weill Cornell Brain and Spine Center, New York, USA
Lauebli Ralph    Interlaken, Switzerland
May Rahel    University of Bern, Switzerland
Meisel Hans-Joerg    BG Klinikum Bergmannstrost, Halle, Germany
Messner Juergen    Hull and East Yorkshire NHS Trust, UK
Neva Marko H    Tampere University Hospital, Finland
Ramieri Alessandro    Minal and Rome Sampienza University, Italy
Schmocker Andreas    EPFL, Lausanne, Switzerland
Stoyanov Jivko    Swiss Paraplegic Research, Nottwil, Switzerland
Tryfonidou Marianna    Utrecht University, Netherlands
Vadala Gianluca    Università Campus Bio-Medico di Roma, Italy
Wangler Sebastian    AO Research Institute, Davos, Switzerland
Wimmer Cornelius    Schön Klinik Vogtareuth, Germany
Zhen Li    AO Research Institute, Davos, Switzerland
AO Foundation—Principles of AO Educational Events

1) Academic independence
Development of all curricula, design of scientific event programs, and selection of faculty are the sole responsibilities of volunteer surgeons from the AO network. All education is planned based on needs assessment data, designed and evaluated using concepts and evidence from the most current medical education research, and involving the expertise of the AO Education Institute (www.aofoundation.org). Industry participation is not allowed during the entire curriculum development and planning process to ensure academic independence and to keep content free from bias.

2) Compliance to accreditation and industry codes
All planning, organization, and execution of educational activities follow existing codes for accreditation of high-quality education:
- Accreditation Criteria of the Accreditation Council for Continuing Medical Education, USA (www.accme.org)
- ACCME Standards for Commercial Support: Standards to Ensure Independence in CME Activities (www.accme.org)
- Criteria for Accreditation of Live Educational Events of the European Accreditation Council for Continuing Medical Education (www.uems.eu)

Events that receive direct or indirect unrestricted educational grants or in-kind support from industry also follow the ethical codes of the medical industry, such as:
- Eucomed Guidelines on Interactions with Healthcare Professionals (www.medtecheurope.org)
- AdvaMed Code of Ethics on Interactions with Health Care Professionals (advamed.org)
- Mecomed Guidelines on Interactions with Healthcare Professionals (www.mecomed.org)

3) Branding and advertising
No industry logos or advertising (with the exception of the AO Foundation and AO Clinical Division) are permitted in the area where educational activities take place. Sponsors providing financial or in-kind support are allowed to have a promotional booth or run activities outside the educational area with approval from the event chairperson.

4) Use of technologies and products in simulations
If case simulations are chosen as an educational method to educate skills, we only use technology approved by the AOTK System (AOTK)—a large independent group of volunteer surgeons developing and peer-reviewing new technology (more information about AOTK, its development and approval process can be found on the AO Foundation website: www.aofoundation.org).

5) Personnel
Industry staff is not allowed to interfere with the educational content or engage in educational activities during the event.
General information

**No insurance:** The event organization does not take out insurance to cover any individual against accidents, theft, or other risks.

**Security:** Access permitted with badge only.

**Dress code:** Casual

**Course language:** English

**Mobile phone use** is not allowed in the lecture halls and in other rooms during educational activities. Please be considerate of others by turning off your mobile phone.

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We thank our major industry partner DePuy Synthes for contributing with in-kind support (logistics) and for providing an unrestricted educational grant for this event.

We also extend our thanks to the following exhibitors for additional unrestricted educational grants:
The Global Spine Congress heads to Asia Pacific

Global Spine Congress
Singapore | May 2–5, 2018

www.gsc2018.org