

2nd International Annual Conference of the German Stem Cell Network

All about Stem Cells

The GSCN's annual conference brought 450 scientists together at the German Cancer Research Center (DKFZ) in Heidelberg from 3 – 5 Nov. 2014. For three days, everything revolved around stem cells.

Andreas Trumpp, conference president, GSCN president for 2014, and Heidelberg-based stem cell researcher, was very pleased with the outcome: "The GSCN is only in its second year, but already we have become the most important forum for the stem cell community in Germany." The numbers say it all: GSCN membership was up by more than 30 percent from its previous year, and the 2014 conference had more participants, exhibitors and posters than the 2013 event in Berlin.

Following a welcome by Otmar Wiestler, chairman of the DKFZ, Andreas Trumpp took to the stage and used his opening speech to chart the positive course that the GSCN had taken in 2014. The German Federal Ministry of Education and Research (BMBF) also provided positive feedback on the network. The scientific program then began with a keynote presentation by Eduard Batlle (IRB, Barcelona), in which he discussed his laboratory's latest findings on the formation and maintenance of stem cell niches in the intestines, and on the deregulation of these processes in tumorigenesis. Studies conducted in his labo-

ratory show that human colorectal cancers have a similar organization to healthy tissue.

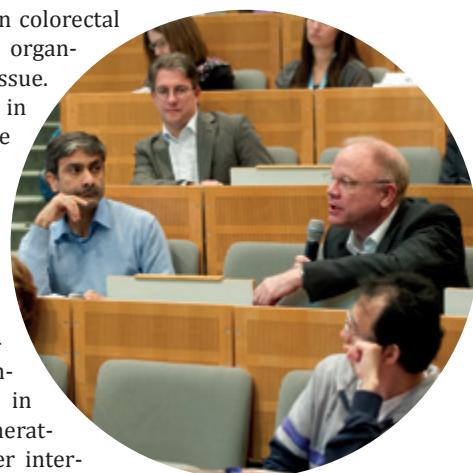
Many intestinal cells in tumors also differentiate and thereby lose their immediate danger. The exact opposite happens with the cancer stem cells. In this scenario, the TGF- β and BMP signaling pathways control the transcription factor GATA6 in both healthy and degenerated cancer cells. Another international highlight came in the form

of the keynote speech given by Parisian surgeon Philippe Menasché (Hospital Georges Pompidou), in which he discussed his experiences of using stem cell patches on hearts damaged by myocardial infarction. He described the first clinical trial on humans using a cell population of human embryonic stem cells that have the early cardiac genetic marker Isl-1. His findings clearly prove that the positive effects observed could not be ascribed to the direct installation of the transplanted cells, but to the way the foreign cells support the body's own regeneration processes. Menasché's talk demonstrated a key feature of the conference: rather than being solely a platform for mainly young scientists, it also focuses on exchange and contact between basic research and its application.

With this in mind, collaboration with industry was an important part of the conference. "We had very many registrations from industry," reported Daniel Besser, managing director of GSCN, referring to the 22 exhibition stands booked by various companies. "The industry stands are an important part of the event for us because they present the latest developments and give the scientists access to crucial partners."

The scientific talks

In three to four parallel sessions, researchers presented and discussed the latest data and results from stem cell research being conducted in Germany and abroad. Disease modeling using stem cells, state-of-the-art genetic engineering methods, and 3D-printed cells were all big topics. Once again, the participants were very interested in the latest findings on reprogramming and transprogramming somatic cells. A new feature of this year's sessions was that each chairperson gave an introduction to the topic of their session. This approach received very good feedback both during the conference itself and in the online survey that was conducted afterwards. The three-day conference





Eduard Batlle



Jürgen Knoblich

included 44 talks selected from 250 submitted abstracts in the following fields:

- Stem cells in regenerative therapies
- Stem cells in diseases: cancer stem cells
- Computational stem cell biology
- Somatic stem cells
- Stem cells in disease modeling and drug development
- Programming and reprogramming
- Hematopoietic stem cells
- Pluripotency and embryonic stem cells
- Stem cells in development

“Anyone who chooses not to present their latest data to fellow scientists and make them available for valuable feedback only has oneself to blame. This event covers almost the entire field in Germany,” said Trumpp, praising the diverse program.

What follows is a selection of the many excellent talks that were given during the parallel scientific sessions. During the Stem Cells in Development session, Achim Breiling (DKFZ, Heidelberg) presented data on the function of the three ten-eleven translocation enzymes (TET1-3) in embryonic stem cells. The findings show that the TET-dependent processing of 5-methylcytosine to 5-hydroxymethylcytosine protects DNA from hypermethylation. It is likely that uncontrolled hypermethylation deactivates genes that are important for development. These findings were confirmed by embryonic stem cells from which TET 1 and 2, or TET 1, 2 and 3 were removed. Speaking in the Programming and Reprogramming session, Lamia’a Bahnassawy (University of Luxembourg) spoke about her study into identifying factors that intervene in the regulatory circuit that



Philippe Menasché



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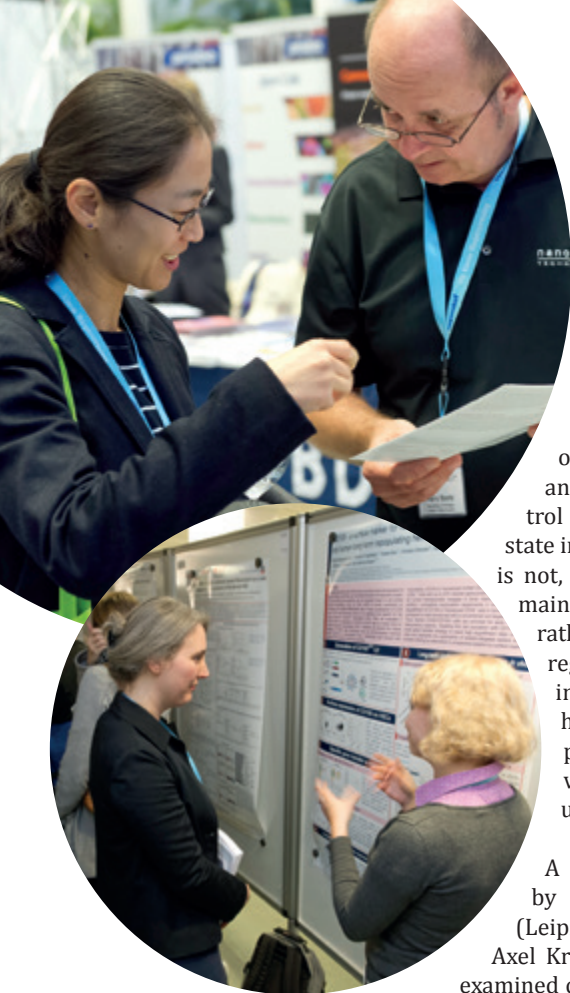
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maintains pluripotency. Within this process, the TRIM32 factor regulates at least two of the factors – c-Myc and Oct4 – that control the undifferentiated state in stem cells. TRIM32 is not, however, needed to maintain this state, but rather to interrupt the regulatory circuit during differentiation by helping degrade the pluripotency factors via the process of ubiquitination.

A joint presentation by Michael Ansorge (Leipzig University) and Axel Krinner (TU Dresden) examined cell migration. In the two-part talk during the Computa-

tional Stem Cell Biology session, Ansorge showed *in vitro* results of cell migration experiments, which Krinner then evaluated and compared with *in vivo* data using computer-based analytical methods. Their collaboration allowed the researchers to answer, in a simple 2D context, fundamental questions about how hematopoietic stem cells (HSC) interact with relevant regulators in the stem cell niches and about what role they play in the migratory behavior of HSC. The back-to-back presentation impressively highlighted the advantages of combining computer-based investigations with *in vitro* and *in vivo* studies. Speaking in the Hematopoietic Stem Cells session, Daniel Klimmeck (DKFZ, Heidelberg) gave a talk on the regulatory networks that control HSCs in their undifferentiated state and during their transition to progenitor cells. He presented studies on proteome, transcriptome and methylome analyses that involved comparing purified HSCs to the multipotent progenitors generated from them. His encyclopedic data facilitate that, in future, it will be possible to carry out easier, faster and more comprehensive analyses of the molecular, cellular and epigenetic processes that control the hematopoietic hierarchy.

During the Clinical Trials and Regulatory Affairs session, Ulrich Martin (Hannover Medical School) gave a talk on using stem cells in regenerative therapies. He discussed studies conducted in Hannover on developing heart muscle cells from induced pluripotent stem cells for cardiac therapies. Although the therapeutic application of these types of cells remains a very lengthy process, the studies have produced positive results. Nico Lachmann, also of the Hannover Medical School, participated in the Stem Cells in Regenerative Therapies session by presenting new studies on transplanting macrophages into the lungs to treat pulmonary alveolar proteinosis (PAP), a hereditary lung disease. The studies used macrophages from undifferentiated stem cells. The trials have so far been carried out on mice serving as humanized disease models for PAP. The researchers

hope that it will be possible to use durable cells from the blood system to treat patients in future.

This year's conference included workshops for the first time. "We want to develop close relationships with application and industry as frames of reference for basic research and as prospects for scientists," said Daniel Besser, explaining why this format had been introduced. "The workshops were well attended and were rated positively in the online survey." Participants could choose between workshops on the following topics: biobanks of human pluripotent stem cells (Andreas Kurtz / Joana Namorado); the clinical relevance of animal models (Georg Duda / Frank Emmerich, Regenerative Medicine Initiative Germany (RMIG)); and the differing expectations of the pharmaceutical industry and stem cell research (Oliver Brüstle / Ira Herrmann, Stem Cell Network North Rhine-Westphalia). Also new to the GSCN conference were the scientific meeting and general assembly of the German Society for Stem Cell Research.

The two poster sessions attracted a great deal of interest. Participants literally stood on tiptoe so that they could see and discuss the 200 posters on display. The work provided good insight into the current status of stem cell research. "The research and presentation were of an extremely high standard. I really struggled to pick three posters," said Ingo Röder (Dresden), describing his task as part of the jury for the poster awards. Franziska Zickgraf (Heidelberg) was delighted to have participated: "I'm really pleased to be presenting my poster here. It's helping me connect with interesting people and hear their thoughts and experiences," she said, discussing the outcome of her work.

The following participants won awards, provided by Peprotech, for their posters:

- Debojyoti Chakraborty, TU Dresden: *A novel lncRNA-protein interaction characterizes mouse embryonic stem cell fate*
- Peggy Matz, Düsseldorf University: *Endodermal progenitor cells derived from integration-free iPSCs as an in vitro model for dissecting endodermal cell fate decisions*
- Janine Müller, Bielefeld University: *Intrastriatal transplantation of adult human neural crest-derived stem cells improves functional outcome in rat model of Parkinson's disease*
- Roman Reinartz, University of Bonn: *Modeling polyclonal dynamics in glioblastoma*





The GSCN would also like to take this opportunity to congratulate the recipients of GSCN Travel Awards: Cantas Alev (Japan), Janine Müller (Bielefeld), Susann Rahmig (Dresden) and Yuval Rinkevich (USA).

Strategic working groups

The Public Outreach working group tried out its educational materials on the conference participants, who swapped their lunch hour for hopping over pictures of cells and arranging magnets of human organs. "It's really important that we explain stem cell research to the public. Doing so will allow us to discuss the ethical implications and present our work to a large audience," said Ira Herrmann (Düsseldorf) and Tobias Cantz (Hannover), explaining their aims as leaders of the working group. The workshop was a good opportunity for conference participants to acquaint themselves with the diverse materials so that they could use them during future open days or for laboratory tours at their respective institutes.

The strategic working group sessions focused on career development, funding, clinical trials and stem cell technologies. It is especially important that young researchers



receive support in developing their career prospects and in exploring the opportunities open to them. Other much-discussed topics at the conference addressed the fast and effective reprogramming of cells. The focus was on new quality assurance technologies and on methods for increasing the quantities of the new stem cells required.

The strategic working groups also included a new format that functioned rather like an intensive workshop: ten registered scientists gathered in the canteen to engage with a distinguished expert on a specific investigative method. These "meet-the-expert" events saw Claudio Mussolino (Freiburg), Boris Chichkov (Hannover) and Micha Druker (Martinsried) meet with a small group of participants

Photos: GSCN

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*Meet-the-expert-table
with Claudio Mussolino*

to discuss their processes in the fields of genetic engineering, laser printing, and reprogramming. A number of participants provided feedback to the GSCN Central Office, saying that the events had produced extremely effective and useful discussions. Andreas Bosio, head of the Stem Cell Technologies working group, was delighted with the positive responses: "We really want to include the expert sessions again in 2015. It's an unusual format and seems to work extremely well."

Wednesday brought the conference to a close with more highlights from international research in the form of talks by Shahrugim Tajbakhsh (Institut Pasteur, Paris) and Jürgen Knoblich (IMBA, Vienna). Tajbakhsh presented his laboratory's latest findings on the molecular regulation of muscle stem cells during development and regeneration. The Notch signaling pathway performs a special control function in this system. While the pathway is active in dormant muscle stem cells, it is deactivated very quickly when a cell begins to divide, e.g. after muscle injury. In dormant stem cells, Notch is particularly important for the interaction between the cells and their niche, and preserves stem cell identity. Knoblich's talk was part of a joint symposium on neural stem cells, which was also the sixth meeting of the BMBF-funded independent young researcher groups in neuroscience. Knoblich presented his laboratory's data on the 3D culturing of human brain cells. His team succeeded in producing organoids ("mini-brains") that are structured in a similar way to the human brain. The new technology allowed the scientists to shed light on the genetic defect involved in a form of microcephaly. If the microcephaly protein CDK5RAP2 is not present or has a genetic defect, this results in accelerated and therefore premature neural development. The tissue remains smaller than usual because fewer progenitor cells form. When the researchers repaired the defect, the mini-brains grew almost normally. The hope is that these cell culture systems will help scientists understand other human diseases for which studies in animal models are either impossible or too complex. The symposium also featured a talk by Amelia Eisch (University of Texas, Dallas) on the mechanisms underlying the formation of new nerve cells in adults, and one by Sebastian Jessberger (University of Zurich) on the function of neural stem cells and the processes that occur in these cell populations during the aging process. The Neural Stem Cell Symposium held on Thursday, 6 Nov. 2014, featured more high-level talks from outstanding international researchers.

Participants also enjoyed the conference's networking event – and views over Heidelberg – on the Tuesday evening. The relaxed atmosphere in the Molkenkur restaurant was the perfect setting for continuing discussions and

a celebratory atmosphere. The online survey shows that the participants were extremely satisfied with the conference, its content, and the organization. "Next year we will make sure we have enough space for the poster exhibition so that we don't have to put it in a separate marquee. Thankfully, that will be easy in Frankfurt," said GSCN managing director Daniel Besser, commenting on some of the criticisms expressed in the survey. Andreas Trumpp was delighted with the event: "The conference was a huge success. I liked the dynamic and lively exchange between researchers of all ages and industry representatives, the intensive networking and the high quality of the contributions. This is exactly what we want to support." Last year, the GSCN secured a three-year extension of its BMBF funding. "That was a highlight for us last year. Now our efforts are concentrated on enabling the network to run independently," said Thomas Braun, setting out the GSCN's plans for the future. As the new GSCN president, Braun, who is director of the Max Planck Institute for Heart and Lung Research in Bad Nauheim, will be inviting stem cell researchers to the 2015 GSCN conference, which will be held in Frankfurt am Main in mid-September.

The 2014 conference was the first to close with a public event at the end of the three days. Using GSCN-produced films from the laboratories of Andreas Trumpp, Magdalena Götz and Anthony D. Ho, as well as a panel discussion, it presented the reality of and prospects for stem cell research. Attracting 120 guests, the event, which received support from the Ernst Schering Foundation, was well attended and reflected the public's keen interest in finding out about the latest stem cell research and how the findings can be applied in therapeutic contexts.

The GSCN films about the stem cell researchers and the film of the 2014 conference are available on the GSCN website.



Photos: GSCN



GermanStemCellNetwork

3rd International Annual Conference

of the German Stem Cell Network (GSCN)
9 – 11 September 2015

Campus Riedberg, Otto Stern Center
Goethe University
Frankfurt/Main

www.gscn.org



International keynote speakers

Andras Nagy (Toronto) · Paul Riley (Oxford)
Hans-Willem Snoeck (New York) · Lorenz Studer (New York)

Presidential Symposium

Oliver Brüstle (Bonn), GSCN Awardees: Young Investigator,
Female Scientist, Publication of the Year

Abstract submission deadline for oral presentations: 31 May 2015

Oral presentations chosen from the best abstracts

Scientific sessions

- Pluripotency and embryonic stem cells
- Programming and reprogramming
- Somatic stem cells
- Hematopoietic stem cells
- Stem cells in development

- Stem cells in diseases: cancer stem cells
- Stem cells in regenerative therapies I
- Stem cells in regenerative therapies II: Mesenchymal stem/stroma cells
- Stem cells in disease modeling and drug development
- Computational stem cell biology

Program committee

Daniel Besser (Berlin) · Thomas Braun (Bad Nauheim) · Ulrich Martin (Hannover) · Michael Rieger (Frankfurt) · Elly Tanaka (Dresden) · Andreas Trumpp (Heidelberg) · Harald von Melchner (Frankfurt)

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