



The German stem cell network GSCN - a nationwide network with many tasks



Stefanie Mahler, Daniel Besser*

German Stem Cell Network (GSCN), c/o Max Delbrück Center, Robert-Rössle-Str. 10, 13125 Berlin, Germany

ABSTRACT

The German Stem Cell Network (GSCN) aims at creating synergies between all areas of basic and applied stem cell research and to provide an interface between science, education, politics and society as a whole. The central task of the GSCN is to pool the expertise in stem cell research in Germany and develop synergies between basic research, regenerative medicine and pharmacology. The initiative promotes innovative research activities on a national and international level. In addition, targeted information and events are offered to encourage the public discourse on stem cell research. The objectives of the network are:

- To maintain an organizational structure for a German network for basic and applied stem cell research;
- To organize joint annual conferences on stem cell research to be rotated among German cities;
- To coordinate scientific and strategic working groups;
- To provide a platform for communication on stem cell research, enabling exchange of important news, discussions and networking between scientists, institutions, policy-makers and the general public (in German and English);
- To publish documents about basic and applied stem cell research in Germany and help to organize public meetings and outreach programs on these topics.

1. The mission of the GSCN

The German Stem Cell Network (GSCN) is a nationwide network of and for stem cell researchers (Saini, 2013). The goal of the GSCN is to create synergies between all areas of basic and applied stem cell research and to form an interface between science, education, politics and society. The network has made it its central task to bundle the existing competences in the field of stem cell research in Germany and to develop synergies with the fields of regenerative medicine in order to bring about new national and international research activities and collaborations (GSCN, 2013d). In addition, public relations measures provide target group-specific information and education on this important field of research.

The GSCN defines itself as a hub for contacts and as a platform for the rapprochement of different fields around the dynamically developing and relatively young cross-sectional technology of stem cell research. In such a diverse and interdisciplinary field, it is important to create an opportunity for the exchange of knowledge, data, protocols and know-how to a mutual benefit. A scientific network is dynamic and successful if it is supported, enriched and driven from a center of content and logistics.

In addition to scientific exchange, a task of the GSCN is to provide decision-makers with decisive information - thus representing the interests of stem cell researchers as a group in discussions with politicians

and initiating national decision-making processes. Stem cell research and regenerative medicine are promising prospects for a large group of patients whose diseases have not yet been cured or treated. The GSCN is particularly committed to providing this target group with scientifically based information on the current state of applied stem cell research. This includes the communication of progress and success in clinical trials as well as warnings against unproven, dubious therapies. Stem cell biology is a relatively young field that is growing dynamically and evolving in many areas of basic research, applied research, drug testing and organoid research. In the field of public relations, the GSCN has set itself the goal to inform students in schools about stem cell biology in order to bring their knowledge up to date.

2. A brief history of the GSCN

The German Federal Ministry of Education and Research (BMBF) gave the go-ahead for the establishment of a platform for stem cell research in Germany in 2009. The goal was to establish a scientific network for the evolving field of stem cell research. The call was followed by several application phases and further discussions until 2013, when a committee consisting of 13 renowned scientists founded the GSCN. This process succeeded in integrating large parts of the national stem cell community into the GSCN and simultaneously building a bridge to the field of regenerative medicine. The establishment of the

* Corresponding author.

E-mail address: d.besser@mdc-berlin.de (D. Besser).

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GSCN was preceded by a national dialogue with German stem cell researchers on the contents and objectives of the network at a kick-off meeting of the founding committee in Frankfurt (20 March 2013) as well as comprehensive online surveys. The online survey (15 April - 30 June 2013) was completed by 148 scientists, 13 institutes and 20 companies. It concluded that the desired version of the network was a bottom-up approach that focused on young scientists and the presentation of their data at annual conferences, in addition to providing the scientific community with the necessary platform for exchange and networking. Research group leaders are important initiators in the decision-making bodies of the GSCN and are available at the GSCN Annual Conferences as session chairs and discussion partners.

3. Governance and finances

The GSCN is an association with more than 400 members, including 19 research institutes and 15 companies (GSCN, 2013a). A central office with a managing director, a project manager and a communications coordinator is located at the Max Delbrück Center for Molecular Medicine (MDC) in Berlin (GSCN, 2013c). The governance structure of the non-profit association GSCN is organized on three levels: The determining organ of the society is the General Meeting of the members, which assembles once a year at the GSCN Annual Conference, decides on the affairs of the network, receives the financial report and exonerates the Executive Board. All board members are elected by the members through annual online elections. The Executive Board consists of five persons, an acting president, a senior president, a designated president, a treasurer and an assessor. All incumbents are appointed to the Executive Board for six years and the presidents rotate every two years to the following position. The Executive Board is the legal representative of the GSCN and is assisted by the managing director and the staff of the GSCN central office. The managing board is supported by an Extended Board of 15 scientists who are elected for three years. The Extended Board discusses and advises the Executive Board on important decisions. At their annual meeting, they jointly decide on the future directives for the network (GSCN, 2013f).

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4. Structures in the GSCN

The network is structurally organized into 14 working groups: seven scientific groups (GSCN, 2013e):

- Pluripotency and re-programing
- Somatic stem cells and development
- Basic, translational, applied hematopoiesis
- Stem cells in disease (cancer stem cells)
- Stem cells in regenerative therapies
- Stem cells in disease modeling and drug development
- Computational stem cell biology

and seven strategic working groups:

- Funding programs and policies
- Career development
- Public engagement and outreach activities
- Ethical, legal and social aspects (ELSA)
- Patient information (stem cell therapies)
- Clinical trials and regulatory affairs

- Technologies in stem cell research.

The working groups are reflected in the conference program, and their initiators propose annual keynotes, sessions in their subject areas and select the oral presentations from the submitted abstracts.

5. Scientific and strategic events

The scientific activities of the GSCN are mainly based on the GSCN working groups, its members and cooperating professional societies. The main event of the GSCN is the Annual Conference (GSCN, 2013b). Since 2013, the GSCN has organized the central stem cell conference in Germany rotating among different cities with the support of the GSCN Acting President and her/his institute, often at the same location:

- 2013: Berlin (Max Delbrück Center for Molecular Medicine (MDC))
- 2014: Heidelberg (German Cancer Research Center (DKFZ))
- 2015: Frankfurt (Goethe University)
- 2016: Hannover (Hannover Medical School (MHH))
- 2017: Jena (Friedrich Schiller University and Leibniz Institute for Aging Research - Fritz Lipmann Institute (FLI))
- 2018: Heidelberg (German Cancer Research Center (DKFZ))
- 2019: Berlin (Max Delbrück Center for Molecular Medicine (MDC))

The conferences have so far been attended by approximately 400 scientists each and consist of parallel sessions structured according to the GSCN working groups. In addition to introductory and concluding international keynotes, these three-day meetings serve mainly to present new data from young scientists, and to network and establish new contacts and collaborations. A central element is the "Presidential Symposium": By invitation of the GSCN President there is an international keynote speaker, followed by three presentations of the GSCN prize winners in the categories GSCN Young Investigator Award, GSCN Female Scientist Award and GSCN Best Publication of the Year Award. Part of the conference is the annually growing industry exhibition, where companies present their products and hold lectures in their own sessions within the conference framework.

In addition to the conference, the GSCN initiates, organizes and finances scientific and strategic workshops, which are led by members of the working groups and/or in cooperation with other institutes such as the Paul Ehrlich Institute (PEI) as the national authority for the approval of biological products. The spectrum of topics ranges from mathematical modeling and bioinformatics to grant writing workshops for young researchers. A special annual workshop that takes place once or twice a year is the non-PI meeting - a meeting of young scientists without group leaders. This enables the researchers to support each other and exchange information on scientific questions as well as discuss structural topics amongst their peers. The GSCN presents itself at conferences of other professional societies or thematically relevant conferences (e.g. Gordon Conferences and ISSCR Annual Meetings as well as International Symposia) with sessions, lectures and booths and offers financial support and travel stipends for young scientists. The GSCN has also supported the PluriCore network, since its foundation in 2015, an association of German core units on stem cell technologies for the exchange of protocols, cells and scientific data, in terms of organization, content and funding (GSCN, 2015). The PluriCore network is presented separately in the article "Cores: laboratories organization for stem cell technology advancement" in this journal.

6. Public affairs

In its function as the ambassador of stem cell science in Germany, the GSCN seeks contact with decision-makers in science policy institutions and in the relevant committees of the federal parliament (Bundestag) for the life sciences and funding policy. To strengthen its position, the GSCN has written two white papers on current topics in stem cell research (GSCN, 2016c). In 2016, the GSCN published "Public

funding of stem cell research - Germany in an international comparison" with a collection of new data on public funding in the USA, Sweden, Great Britain, Japan and Germany. The GSCN concluded that there is a relative decline in public funding for stem cell research in Germany, while the other countries in the comparison, which also rank among the world leaders in stem cell research, are increasing their funding in the expectation that stem cell therapies will soon be marketable.

The second white paper "Translation - from stem cells to innovative therapies. Analysis and Recommendations for the Clinical Translation of Stem Cell Research in Germany", published in 2018, examined the hurdles in the translation process in a SWOT analysis based on interviews with national and international scientists, and formulated recommendations for action for politicians. Both white papers were presented to members of the Bundestag at meetings and were aimed to initiate discussion and action.

An important topic in the stem cell community are "unproven therapies", i.e. stem cell-based therapies that have not been proven by scientific studies. They are usually offered to patients who are incurable by standard therapies or for whose condition there is no therapy at all. The providers of these stem cell therapies promise a success rate with these "all-rounders" cells for the most diverse diseases and hide their lack of scientific efficacy – since it does not exist. The GSCN has published articles on this topic and has written a brochure that is available online and in print and informs patients about the current status of stem cell therapies (Besser et al., 2018) (GSCN, 2016b).

Current topics of stem cell research as well as reports from the activities of the GSCN are published once a year in the GSCN Annual Magazines (GSCN, 2014). The central office publishes the bilingual magazine with a conference report, an extensive editorial section and an annual report on the network activities. It is published online and sent in print to the scientific community, association members and decision makers. In 2017, the GSCN was also involved in the preparation of the 8th Stem Cell Report for the year 2016/2017 of the Federal Government (Deutscher Bundestag, 2019).

7. Public outreach

The current state of stem cell research is important for many stakeholder groups. Patients and their families hope for early therapies. The scientifically interested public sees the dynamics and findings in stem cell research which, together with developments in the neighboring fields of regenerative medicine, reproductive medicine and gene editing, can lead to socially relevant changes. Students at schools are educated in life sciences and experience that current research is often not yet reflected in the teaching content.

In 2016, the GSCN initiated the UniStem Day in Germany especially for the target group of school students (GSCN, 2016a). This education day for pupils on stem cell topics was founded in Italy in 2009 and since then has increased its European reach - in March 2019 more than 33,000 young people took part in the UniStem Day all over Europe. In Germany, the GSCN is responsible for dissemination, and institutes in 15 cities with well over 1000 pupils took part in 2019 with lectures, workshops, laboratory units and games. The GSCN has also developed German and English teaching material on stem cell research for teachers and students in the form of a scientific conference. The material is available as an Open Educational Resource (OER) on the internet in the English language at www.understanding-stemcells.info (GSCN and Schering Stiftung, 2018) and in German at www.stammzellen-verstehen.de (GSCN and Schering Stiftung, 2017). The material can be downloaded free of charge and edited according to need.

The GSCN offers free public events for all stakeholder groups several times a year, with stem cell researchers on the podium who present

their research in laymen's terms and discuss their questions with the audience. A special feature of the GSCN is that it produces short film portraits of the researchers - these are used as an introduction during the event and later distributed via social media channels.

8. Outlook and perspectives

Every year, the GSCN widens its range of activities with the aim of expanding its communication platform for stem cell research within the German research community. These levels of action will be further differentiated and strengthened in the future.

A further goal of the scientific community, which the GSCN actively supports, is the establishment of stem cell banks both with human and animal pluripotent cells. Stem cell banks with human cells are discussed elsewhere in this *Stem Cell Research* special issue. Besides the general trend in medicine to establish human stem cell banks, archives of animal pluripotent stem cells are extremely rare. However, they will be of special importance in the future. These collections are a comprehensive source of biodiversity and could be the foundation of saving rare and critical endangered species. Such material can initiate an entire new field in conservation strategies using pluripotent stem cells for the generation of artificial gametes for in vitro fertilization approaches. Moreover, such material allows to study the evolution derived special traits on cellular level in different species without utilizing animals in such research. Decoding special adaptations and mechanisms in the animal kingdom may provide potentially new inside in disease related mechanisms and novel treatment options. In Germany the Leibniz Institute for Zoo and Wildlife Research (IZW) in Berlin started their collection of non-domestic species material. Since 2014 the IZW cooperates with the Max Delbrück Center for Molecular Medicine (MDC) to utilize the archive for the generation of induced pluripotent stem cells (iPSC). Currently the IZW Biobank contains iPSCs from seven species including from primates such as bonobo, gorilla and orangutan as well as southern and northern white rhinoceroses. Together with the support of the GSCN it is planned to establish a nation-wide network of biobanks specialized in animal material like germ cells, DNA and somatic cells.

A special aspect is the support of translation of research with human stem cells, since it is potentially significant for an ageing society. A continuous ethical reflection on scientific developments are of great importance here, as it assesses the social significance of research, its applications and its acceptance. A further topic is the European perspective on stem cell research, since EU policy has a regulatory influence on national legislation, e.g. drug regulations on ATMPs, and should therefore be accompanied by information and policy. The GSCN is actively taking part in these activities and discussions on a national as well as international level.

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