



MEETING REPORT:

The First Midwest Conference on Stem Cell Biology and Therapy (SCBT)

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The First Midwest Conference on Stem Cell Biology and Therapy (SCBT) was held at the majestic Meadow Brook Hall (MBH), in Rochester, Michigan, USA, on May 9–11, 2008. The SCBT conference focused on (1) basic stem cell biology, involving the maintenance and renewal of embryonic, adult and umbilical cord blood stem cells, as well as the mechanisms of development and differentiation of stem cells, (2) potential therapeutic applications of stem cells for heart, lung, and blood diseases, developmental disorders, and degenerative/age-related diseases, (3) tissue engineering and biotechnology applications, (4) pharmacological and toxicological applications in drug discovery and development, and (5) stem cell ethics and political implications. The SCBT conference provided an enriching environment and experience for students, young investigators, and seasoned researchers and clinicians alike. It also offered a venue and opportunities for national and international collaboration in biomedical research and biotechnology venture activities, specifically for the Midwest region of the United States.

At the time, Michigan was among five states with the most restrictive laws on stem cell research. Research that could be done legally in many other states could, in Michigan, result in

civil penalties of \$10 million or felony criminal charges punishable by up to 10 years of imprisonment. One of the strategic objectives of the SCBT conference was to help dispel misinformation and public concerns regarding stem cell research in general and to garner public support for stem cell research specifically in the state of Michigan.

Since the establishment of the International Society for Stem Cell Research (ISSCR) in 2002, this organization has hosted annual meetings on the east or west coast of the United States, or in other countries. Several smaller conferences focusing on special aspects of stem cell research have been held in similar geographical locations. This has limited the opportunities for students and young investigators as well as others in the Midwest region of the United States involved in stem cell research to interact, network, and gain firsthand knowledge from world-renowned experts in the rapidly growing field of stem cell research. This prompted the idea to host the First Midwest Conference on Stem Cell Biology and Therapy (SCBT).

The conference offered low registration fees for students and young researchers, invited student abstracts/posters, and recognized the best student presentations. It provided workshops in both basic and clinical research using stem cells; educational seminar sessions; and discussion panels consisting of scientific, clinical, industrial, and public representatives to help promote the cause of scientific research in general and stem cell research in particular. The latter was crucial to dispel misinformation regarding stem cells and to engage the general public in these important issues and opportunities.

The conference brought forth discussions of various topics: principles driving research in stem cell biology; clinical impacts of stem cell research; scientific and clinical progress of the past few years; possible fundamental problems; future directions in stem cell biology and therapy involving collaborations between the basic scientist and clinicians; and essential facts clinicians and practitioners need to know when counseling patients.

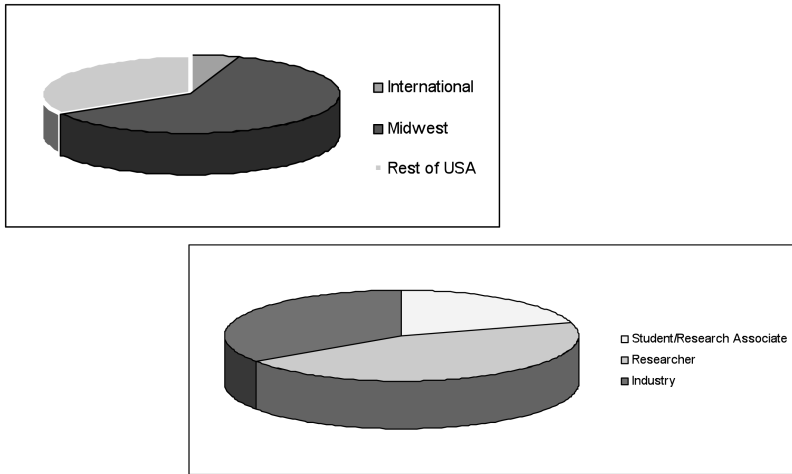


Figure 1. Geographical area and diversity of researchers participating in the First Midwest Conference on Stem Cell Biology and Therapy.

The SCBT conference focused on the latest advancements in basic research and the clinical applications of stem cells, and was jointly sponsored by Oakland University and William Beaumont Hospital, in cooperation with Providence Hospital, Michigan. The conference drew over 300 participants and representatives from academic institutions, hospitals, research laboratories and centers, and pharmaceutical and biotechnology companies around the world. Attendees included graduate and professional students; biomedical scientists, material scientists and engineers; medical researchers; cardiologists, neurologists, neurosurgeons, orthopedists, oncologists, urologists, and other physicians; registered nurses and nurse practitioners; allied health professionals; business representatives; social scientists and ethicists; and members of state and federal legislatures, civic societies, and the public at large. Figure 1 demonstrates the representative group participation in the SCBT conference.

The conference also provided continuing medical education (CME) to physicians and allied health professionals. The conference sponsors included Sigma Life Science, Blackstone Medical, Biospherix, ORGANogenesis, MIRA, and ATCC.

These sponsors also exhibited products and technology relevant to stem cell research and therapeutic applications.

This well-planned conference was structured into a unique 3-day format designed to bring together scientists and clinicians from various disciplines to share their research results and experiences as well as ideas concerning future research and therapeutic strategies in this rapidly advancing field of stem cell biology. Given the wealth of information presented and the range of topics covered, we will not even attempt to summarize all the findings in this brief report. We present here some of the highlights of the conference proceedings.

The conference began on Friday with optional workshops focusing on regulatory, basic science, and clinical aspects of stem cell research and applications. The workshops were attended by students, residents, and researchers from academic, medical, pharmaceutical, federal and biotechnology institutions. The unique workshops' structure offered conference participants insight into the regulatory issues governing human embryonic stem cell (hESC) research in the United States, institutional responsibilities associated with stem cell research, and isolation and culture methods of embryonic and umbilical cord blood stem cells which were presented by David Svinarich, PhD. In addition, Ibrahim Ibrahim, MD MPH PhD, explored the funding of stem cell research from federal, state, and private sources. Michael Chancellor, MD, (William Beaumont Hospital) discussed the development of the use of autologous muscle-derived cells¹ for treating urinary incontinence and other diseases. Following the workshops, G. Rasul Chaudhry, PhD welcomed the SCBT conference participants. Ananias Diokno, MD, and Virinder K.Moudgil, PhD greeted the guests, speakers, and participants on behalf of William Beaumont Hospital and Oakland University. Then Dr. Moudgil introduced Senator Carl Levin (D-Michigan) as the

¹ Here "autologous" means a graft of cells that come from the patient's own body and are injected into another part of the body.

keynote speaker of the conference. Sen. Levin highlighted the importance of embryonic stem cell (ESC) research. He also told the audience about past, present and planned future legislative efforts at the federal level to promote ESC research.

The other featured speakers of the opening session were Ales Hampl, DVM, PhD (IEMMU, Czech Republic), and Michael Chopp, PhD (Henry Ford Hospital and Oakland University). Hampl provided some interesting facts on how undifferentiated human ESC have established at least certain segments of molecular circuitries that are effective in sensing damage to DNA and in executing an appropriate response to it. He also showed that frequently generated chromosomal mutations, amplifications and translocations in hESCs are most likely contributed by alterations in the metabolism of centrosomes. Chopp shared some of his intriguing and exciting data about MSC therapy on remodeling the injured brain, where mesenchymal stem cell (MSC) therapy has future potential for treatment of stroke, trauma and other neurological diseases. Its success will no doubt accelerate the entry of other researchers and clinicians into this field. The first day ended with a magnificent reception at Meadow Brook Hall.

On the second day, 35 oral presentations, including a panel on ethics and political applications, were made in six well-organized and well-attended sessions. In addition, a poster session was planned for the young investigators. The conference concluded with an open business meeting session Sunday morning.

The simultaneous sessions of the second day reviewed technical foundations as well as aspects of current and future study in the major areas of basic and applied stem cell research. These areas included (1) basic stem cell biology, involving the maintenance and self renewal of stem cells and mechanisms of development and differentiation of stem cells; (2) stem cell therapy in clinical applications involving degenerative/ age-related diseases; heart, lung, and blood diseases, and developmental diseases; (3) tissue engineering and biotechnology applications; (4) pharmacological and toxico-

logical applications in drug discovery and development; and (5) stem cell ethics/political implications.

The stem cell biology sessions I, II and III included topics ranging from stem cell growth, differentiation, and proliferation by different factors to how HSC therapy can be applied to pre-clinical trials. These sessions were chaired by Kathleen Moore PhD, Kenneth Hightower PhD, and David Felton MD PhD. The stem cell therapy sessions focused on several promising avenues of therapeutic intervention for a variety of different clinical diseases, including degenerative/age related disorders such as cancer, multiple sclerosis, stroke, blood and other developmental diseases. The differentiation ability of adult and embryonic stem cells in the future may be used to enhance bone repair, retina regeneration, and cartilage repair and other neurological disorders. Deborah Gumucio, PhD, (University of Michigan) explained her exploration of an intestinal promoter (villin gene), which has been identified as a potential marker for gastric stem cells. The ability to prospectively identify and manipulate gastric progenitors *in situ* represents a major step forward in gastric stem cell biology and has implications for gastric cancer. Pamela Robey, Ph.D. and Doug Bauer, PhD (NIH) presented their work on skeletal stem cells and their promising cell source for reconstruction of bone lost due to trauma or disease and stem cell gene therapy in the canine model of leukocyte adhesion deficiency. Gary Hammer, M.D., Ph.D., (University of Michigan) discussed his findings on the cellular and molecular mechanisms by which signaling pathways and downstream transcription factors² coordinate the specification of adrenocortical cells³ within the adrenal gland in health and disease.

The afternoon public panel discussion provided an opportunity to discuss various aspects of the ethics and politics of

² A “transcription factor” is a protein that controls the reading of information in a gene by binding to a certain site on the DNA.

³ “Adrenocortical cells” are cells that come from the cortex of the adrenal glands.

stem cell use. Graham Parker, PhD (Children's Hospital of Michigan) presented information on the ethics of stem cell research and public opinion. State Representative Andy Meisner (D-district 27) discussed his introduction of a bill to remove restrictions on stem cell research in Michigan. This was perhaps one of the most important sessions because public perception and ethics are critical to the funding and advancement of stem cell research. One of the most novel applications of stem cells presented was stems cells used as a source of cells for screening and drug discovery. The drug design/development and biotechnology/tissue engineering sessions discussed potential stem cell applications in pharmaceuticals. Peter Sartipy, PhD (Cellartis AB, Sweden) and Barbara Tigges, PhD (BioE, Inc. R&D) presented the key components of drug design with hESC and MLPC from the pharmaceutical prospective. Dong-gang Yao, PhD (Georgia Institute of Technology) discussed using polycaprolactone scaffolds⁴ to promote the proliferation and growth of stem cells that differentiated into bone cells. Thomas G.H. Diekwisch, DMD PhD(Sc) PhD (Phil), (University of Illinois at Chicago College of Dentistry) described the importance of an extracellular matrix/stem cells interplay in craniofacial tissue engineering.

The young investigators' poster session allowed intermingling and dissemination of recent research findings, including work in progress. Thus, the participants not only learned about updates on the developments in stem cell research, but also advertised their own findings at the conference.

The conference poster committee reviewed and made awards to the students with the top three posters; these students were recognized in the evening before the keynote address. The keynote speaker for the evening was Andras Nagy, PhD (Mount Sinai Hospital, Toronto), who highlighted his findings on transgenic mouse genetics and applications in stem cell research. His talk focused on translating stem cell

⁴ A "polycaprolactone scaffold" is a polymer (plastic) structure used to support groups of cells and promote their growth.

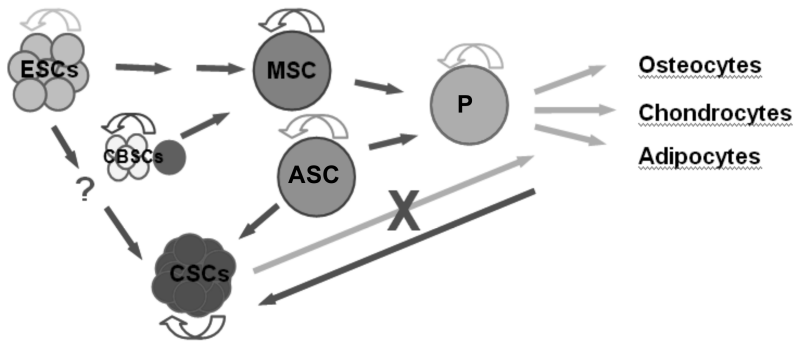


Figure 2. A Summary of Stem Cell Research discussed at the First Midwest Conference on Stem Cell Biology and Therapy. There are two main types of stem cells: pluripotent (cells that multiply indefinitely and can be differentiated into almost all of the cells found in the body, except trophoblast that form placenta during embryonic development); and multipotent (cells that have limited proliferation and differentiation potential). Embryonic stem cells (ESCs) are pluripotent cells isolated from the inner mass of blastocyst stage of embryos. Adult stem cells (ASCs) are multipotent cells isolated from various adult tissues. Both pluripotent and and multipotent stem cells may be found in the umbilical cord blood and cord tissue. While ESCs, CBSCs, MSCs, and ASCs can be differentiated into various cell lineages (see green arrows), CSCs cannot be differentiated. All stem cells can self-renew to a variable degree. Both differentiated cells (i.e. osteocytes and chondrocytes) and stem cells can become cancer stem cells. Abbreviations: ESCs, Embryonic Stem Cells; MSC, Mesenchymal Stem Cell; P, Progenitor; ASCs, Adult Stem Cells; CBSCs, Cord Blood Stem Cells; and CSCs, Cancer Stem Cells.

therapies into human medicine. His research group aims to create a leading program in tissue engineering, using bio-compatible materials and progenitor cells to repair injured tissue and replace diseased organs.

He discussed the different genetic mutations in mouse genes and how mouse genetics is utilized in basic and medical research. He also stressed the pro and cons of utilizing knock-out mice in different stem cell projects. A summary of the research presented at the SCBT conference is depicted in Figure 2.

On the third day, the meeting ended with a breakfast business meeting and closing remarks, which provided partici-

pants an opportunity to discuss plans for future meetings, research funding, and regulatory aspects of stem cell research.

One of the immediate benefits of the SCBT conference was that it helped garner public support for stem cell research. Subsequently, the voters of Michigan supported and approved Proposal 2 in the November 2008 election, thus allowing researchers to conduct stem cell research similar to other states and countries without undue regulatory burdens or fear of prosecution. Furthermore, a Public Cord Bank and Stem Cell Repository was established with the support of Oakland University and William Beaumont Hospital. The main goal of this collaborative endeavor is to generate new stem cell lines for basic research and therapeutic applications. If anyone has any questions or is interested in supporting stem cell research at Oakland University, please email: stemcell@oakland.edu.

In brief, the first SCBT was overwhelmingly successful and productive. It not only contributed to furthering the field of stem cell research but also helped in stimulating public support for this vital and rapidly progressing field of regenerative medicine. We hope that this meeting will be convened periodically to promote advances in stem cell biology and therapy.

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