

# BAKER INSTITUTE POLICY REPORT

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## STEM CELLS: SAVING LIVES OR CROSSING LINES QATAR STEM CELL WORKSHOP

IN COLLABORATION WITH THE QATAR FOUNDATION FOR EDUCATION, SCIENCE AND COMMUNITY DEVELOPMENT

On March 15, 2009, the James A. Baker III Institute for Public Policy at Rice University and the Qatar Foundation for Education, Science and Community Development co-hosted the “Qatar Stem Cell Workshop” in Doha, Qatar. The event centered on stem cell research, policies, and regulations. The fourth event in the Baker Institute’s “Stem Cells: Saving Lives or Crossing Lines” conference series, the workshop focused on the latest discoveries in stem cell science and opened up a dialogue in the Middle East on ethical and religious perspectives on human embryonic stem cell (hESC) research.

More than 150 local doctors, scientists, students, and community leaders from Qatar attended the workshop to hear talks from eminent scholars and scientists discussing the latest scientific discoveries and applications of stem cells. Presentations included introductory talks by Nobel laureates Dr. Gunter Blobel and Sir Martin Evans on the fundamentals of stem cell biology. In addition, Dr. Irving Weissmann, director of Stanford University’s Institute for Stem Cell Biology and Regenerative Medicine, gave a keynote address on his current research in stem cell biology, and Dr. Herbert Gottweis, professor of political science at the University of Vienna in Austria, presented an overview of stem cell policies around the world (full agenda and speaker bios are available in Appendices A and B, respectively).

The event was part of an ongoing collaboration between Rice University’s Baker Institute and the Qatar Foundation. In 2007, the State of Qatar and the Emir of Qatar, His Highness Sheikh Hamad Bin Khalifa Al-Thani, endowed the International Stem Cell Policy Program at the Baker Institute. Since its inception, the endowment has also supported research, lectures, conferences, and workshops in Houston and Doha.

This report reviews stem cell biology and the presentations by workshop speakers as well as outcomes from the event. This report is also based on the discussions of the International Stem Cell Policy Program Advisory Panel (members listed in Appendix C) and the consensus of its members with regard to outcomes of the workshop.

### STEM CELL BIOLOGY

The workshop began with a presentation on stem cell biology by Dr. Günter Blobel, the John D. Rockefeller, Jr. Professor of Cell Biology at The Rockefeller University.

Stem cell biology is a growing field of research with many different applications. Stem cells can be used to expand our knowledge about cell division, including the abnormal cell division associated with cancer. They could provide insight as to how cells develop specialized functions, i.e., “differentiate,” and help us understand early human development. Furthermore, researchers can employ stem cells to determine toxicity levels of new drugs in advance of human testing. Stem cells could also be used in regenerative medicine to replace injured or damaged organs and tissues.

Stem cells are defined by their ability to replicate and divide indefinitely, each cell producing one copy of itself and one cell of a different type.<sup>1</sup> In humans, there are multiple sources of stem cells. hESCs are isolated from a blastocyst, the scientific term for a fertilized egg around five to six days after fertilization. Cord blood stem cells are obtained from the umbilical cord and placenta. Adult stem cells can be found in numerous adult organs and tissues including bone marrow, muscle, and brain.

In addition, stem cells can be generated utilizing mature adult cells through somatic cell nuclear transfer (SCNT)—sometimes called “therapeutic cloning”—or reprogramming to create induced pluripotent stem (iPS) cells. SCNT is the process of removing the genetic material (nucleus) from an unfertilized egg and replacing it with genetic material from a normal, mature cell. iPS cells are created by deprogramming normal cells (such as a skin or liver cell) through the activation of specific genes that confer pluripotency. Although SCNT has not been successfully performed on human cells, both cell types (SCNT and iPS cells) could potentially create stem cell lines with donor-specific genes, thus allowing for the creation of patient- or disease-specific pluripotent stem cells. These pluripotent stem cells may alleviate serious immune rejection concerns during cell and organ transplantation, as well as help elucidate the progression of complex diseases like Parkinson’s and Alzheimer’s.

The vast potential of stem cell research and regenerative medicine has interested both scientists and patient groups alike over the past decade. Stem cells offer a new look at old problems and diseases such as diabetes, neurological disorders, and cancer. Although the field is relatively new, discoveries could profoundly impact medical treatments and therapies in the future.

**CURRENT STEM CELL RESEARCH**

During the workshop, six highly respected and world-renowned scientists gave presentations on their current areas of stem cell research. Dr. Irving Weissman started the research session with a keynote address in which he reviewed his work on blood-forming (hematopoietic) and brain-forming stem cells. Weissman’s lab was responsible for developing some of the earliest methods for identifying and isolating hematopoietic stem cells—those found in the bone marrow. Weissman continues to be engaged in efforts to isolate and characterize cancer stem cells.

Other experts made presentations from various perspectives on the status of stem cell science. Dr. Stephen Minger, senior lecturer at King’s College London, highlighted his group’s research using hESCs, as well as his efforts to get legislation passed that would allow U.K. researchers to create embryos utilizing animal eggs and human DNA through SCNT.<sup>2</sup> This technique could potentially enable researchers to make patient- or disease-specific hESC lines. Dr.

Ludovic Vallier, Medical Research Council senior non-clinical fellow at the University of Cambridge, presented his research looking into ways to selectively differentiate, in a controlled manner, hESCs or iPS cells into specific endodermal cell types such as pancreas and liver cells. Dr. Paul Simmons, director of the Center for Stem Cell Research at The University of Texas Health Science Center at Houston, summarized research on improving cord blood transplantation. His lab is attempting to expand and selectively specialize or differentiate cord blood stem cells to improve the survival rates of transplant patients compared to those using bone marrow. Dr. Margaret Elizabeth Ross, professor of neurology and neuroscience at Weill Cornell Medical College, described her work on the regulation of genes involved in brain development disorders. The final panelist, Dr. Nagy Habib, professor of surgery at Imperial College, discussed his clinical trial, which injects a patient’s bone marrow cells into his or her own diseased liver. He used this technique in a Phase I trial whereby a small group was treated to determine the side effects and efficacy of the treatment. He is currently embarking on a Phase II trial to determine optimal dosage, methods, efficacy, and safety.

**INTERNATIONAL STEM CELL POLICIES AND REGULATION**

Two speakers in the afternoon reviewed international stem cell policies and how they have impacted research. In his keynote address, Dr. Herbert Gottweis reviewed stem cell policies around the world. Timothy Caulfield, Canada Research Chair in Health Law and Policy at the University of Alberta, discussed the impact of policies and patents on research.

Today, hESC research is a highly regulated and politicized field of research, especially in the United States, stated Gottweis. Fundamental scientific, legal, social, and ethical uncertainties, as well as special interest groups, have influenced policymaking and, as a result, have impacted the quality and quantity of research. Globally, national governments remain the major players in terms of regulation and funding, while the private sector remains reluctant to heavily invest in such research. Striking differences exist between how each country governs and regulates hESC and SCNT (cloning) research: some permissive, some more flexible, and some quite restrictive

According to Gottweis, nation states have followed a variety of policy options regarding hESCs and SCNT, with five variations:

1. prohibiting the creation of hESCs from embryos
2. banning the creation of hESCs, but allowing importation
3. allowing creation of hESCs from leftover human embryos after in vitro fertilization (IVF)
4. restricting the creation of embryos for research
5. allowing the creation of embryos for research and SCNT

While many people assume that more developed countries would be more permissive, in actuality even Europe has seen highly divergent policies. The United Kingdom is known worldwide for its aggressive advocacy of hESC and SCNT research, and for supporting research (under strict regulation). On the other hand, Ireland and Austria have restrictive policies that block most research. In the past 10 years, there has been a slow progression globally of moving from restrictive to more flexible policies. This was seen recently in the United States, Brazil, and Australia. Policies allowing research performed with hESCs created from donated IVF eggs are the most common developments.

Caulfield suggested that the policies adopted by countries could directly impact their research performance. A 2008 paper by Dr. Aaron Levine found a link between supportive policies and improved stem cell research output.<sup>3</sup> The study determined that “overperforming countries typically had long-standing supportive policies, while underperforming countries have adopted a range of policies, but typically offer research environments characterized by protracted policy debates and uncertainty.” The United States was shown to be an underperforming country as a result of the lack of federal legislation or regulations on hESCs or SCNT, as well as restrictions on federal funding for hESC research. These findings, as expected, suggested that the policy (or the lack thereof) that a country adopts regarding stem cell research impacts the quantity of science conducted by stem cell researchers in that country.

But when testing this theory by examining the transfer of hESCs within the United States, Caulfield noted, the conclusions are less obvious.<sup>4</sup> Between 2004 and 2007, 1,662 vials with hESCs were shipped from the University of Wisconsin and Harvard University (the two major U.S. stem cell banks) to 26

different countries, but most (1,077) were distributed within the United States. The four states that received the most vials (California, Massachusetts, Maryland, and New York) all have supportive stem cell legislation, but the trend ends there. The fifth state, Texas, has an undetermined state policy on hESC research that is continually being challenged in the state legislature. The paper noted that “liberal policies may not be necessary to increase human ESC line demand” and that “actively restrictive policies may be sufficient to slow the field’s growth.”

Gottweis also observed that many countries with specific policies permitting research—including China, India, and South Korea—do not have the required oversight to regulate those policies. South Korea was embarrassed in 2005 by a series of ethical failures and research fraud when it was determined that the scientist Dr. Woo-Suk Hwang did not create the hESC lines his publications claimed and that he used eggs donated by members of his lab (which was prohibited by ethical guidelines).

Beyond the specific policies on hESCs and SCNT, traditional governance of medical research and approvals of human trials also apply to all stem cell research. Unfortunately, Gottweis believed that the pressure to deliver therapies or cures could influence and push regulatory agencies to begin human subject research too early. The only clinical trial using hESCs was approved in January 2009 by the U.S. Food and Drug Administration (FDA). Researchers will inject hESCs into patients with recent spinal cord injuries. Unlike many other clinical trials, where the patients have tried all other conventional therapies, these patients will be receiving treatment within days after their injury. Some researchers worry about the long-term effects, particularly decades after the procedure, when the hESCs could form tumors due to undifferentiated cells remaining in the body. Gottweis expressed the concern that, if unsuccessful, this trial could cripple the entire field. Thus, some scientists have questioned whether this is the best test for hESCs due to uncertainties surrounding possible side effects.

Caulfield also discussed the different approaches countries use in patenting hESCs. For example, the United States and the United Kingdom allow patents on cells, the European Union does not, and the situation is unclear in Canada. Preliminary research by Caulfield determined that patenting negatively impacted collaborations.<sup>5</sup> Individuals with a high number of patents were less likely to collaborate than those with only a few. This conclusion was

also upheld by Gottweis, who expressed the view that different intellectual property regulation approaches among nations “create potential barriers to transnational collaboration” with negative consequences for the research.<sup>6</sup>

The patenting of biological materials, such as hESCs, has opponents as well as supporters. Opponents contend that patents on hESCs make research more expensive and hinder access to care. Furthermore, patent-holding investigators often delay publication or withhold information when trying to obtain patents, impacting the dissemination of scientific knowledge. But supporters argue that patenting allows the researchers or their companies to protect ideas and products for commercialization. Without patent laws, companies would have little incentive to do research and even less reason to publish their findings.

In the Middle East, Israel stands out as a leader in stem cell research and derived one of the first hESC lines in the world. But Gottweis observed that, within the Muslim world, Iran is at the forefront of hESC research. There is no legal framework or regulation for stem cells in Iran, but the country’s grand ayatollahs and Shiite religious authorities have lent credence to the research through positive fatwas. Other countries in the region have begun stem cell initiatives but have not defined clear legal policies for hESC research.

## **ETHICAL AND RELIGIOUS CONSIDERATIONS**

The remaining three presentations focused on the ethics of stem cell research. Dr. Laurie Zoloth, director of the Center for Bioethics, Science, and Society at Northwestern University, gave the Jewish and various Christian perspectives, highlighting issues surrounding the use of embryos for research. Dr. Ilhan Ilkilic, doctor of ethics of medicine at the Institute of History, Philosophy, and Ethics of Medicine at the Johannes Gutenberg University Mainz in Germany, and Dr. Abdulhafez Helmy Mohammad, professor emeritus at Ain Shams University in Egypt, discussed the ethics of stem cell research from an Islamic perspective.

Religious views vary between different faiths, and even within different religious communities of a given faith, when discussing hESC research. Discussions about the use and destruction of embryos for research brings to the foreground deeply held beliefs about human reproduction and life in the

three major faiths reviewed. Each religion views the preservation of life with regard to hESC research differently, and each religion has a diversity of views within it. Christianity, Judaism, and Islam each have more conservative and moderate subgroups. Beyond the questions of human reproduction, religious discussions about hESC research also invoke “old arguments about our faith in science, progress, and technology,” concluded Zoloth. These arguments manifest largely due to the novelty of the research area combined with fears about the forbidden and violations of “Mother Nature.” According to Zoloth, these discussions lead to three types of ethical problems: what is the moral status of the embryo, what is the just way to conduct this research, and what sort of society is created by our research?

### ***Judaism***

Judaism is composed of Orthodox, Conservative, Reform, and Reconstructionist branches ranging from the more conservative to liberal practice of the religion. Contrary to conventional wisdom, there is no one set of “Jewish ethics,” Zoloth explained in her presentation; rather, there is a discourse that includes multiple, contentious voices. Despite this, Zoloth believes that there are some universal truths in Judaism that have particular relevance for the stem cell debate. The beliefs that healing is mandated, saving life is a priority, and no knowledge is forbidden help expound the position of the Jewish community, which permits hESC research, including SCNT, but not necessarily reproductive cloning or cloning a human being.

### ***Christianity***

Christianity is composed of Catholicism and multiple Protestant denominations. Within Christianity, there exist both restrictive and permissive views on the use of embryos for research.

The most populous religious body—and most influential in Zoloth’s opinion—is the Roman Catholic Church. In December 2008, the Roman Catholic Church restated its position on issues related to the beginning of life. The position that sex is only permitted in marriage for procreation, life begins at conception, and IVF, human cloning, and the creation and use of embryonic stem cells are prohibited were among the ideals stated in the document *Dignitas Personae* (The Dignity of the Person).<sup>7</sup> The philosophy and ideals presented

by the Roman Catholic Church impact people and communities beyond the Church's membership and indirectly influence other Christian denominations.

The Roman Catholic Church doctrine represents the most conservative side of Christianity. According to Zoloth, more liberal Christian academics assert that individual human life begins after twinning is impossible—around 14 days after fertilization—or when the primitive streak occurs (the beginnings of neural and brain development). Greek Orthodox Catholics agree with the Roman Catholic Church's stance on embryo destruction, but allow the use of hESCs already created.

Zoloth also noted that Protestant views that are conservative and liberal can both be found. Evangelical churches oppose the use of embryos for research, as well as research on hESCs. However, IVF is acceptable, as is freezing and adopting embryos. More liberal Protestant denominations accept IVF, as well as the use of leftover IVF eggs that have been donated for hESC research, as long as the dignity of the embryo is preserved.

### **Islam**

Islam consists of two major sects—Sunni and Shia—with the Sunni sect representing approximately 85 percent of Muslims. These sects are not easily labeled conservative or liberal. According to Mohammad, the primary sources for Islamic law, or shari'ah, are the Holy Qur'an, the Sunnah,<sup>8</sup> unanimous opinions of the Prophet's successors, and intelligent analogy to the three previous sources. Secondary sources include views of the Prophet's companions, current local traditions, and public welfare and ruling.

Both Mohammad and Ilkilic agreed that Islam places special emphasis on maintaining one's health, with scholars considering "medical research directed toward new treatments of diseases as a religious duty," according to Ilkilic. Mohammad saw no objection in Islam to IVF (between married couples) or the use of leftover IVF eggs for research. He also believed that there is no religious objection to creating a fertilized egg for research purposes. Islamic law states that there is a clear difference between biological life and "ensouled life." According to Mohammad, ensoulment occurs 40 days after conception, but other scholars might choose a later date of 120 days.

Ilkilic noted that Islamic scholar Isam Ghanem approved of embryonic research so long as the fetus was younger than 120 days old and both

parents consented. Other scholars at the 1991 First International Conference on Bioethics in Human Reproduction Research in the Muslim World and the Fiqh Council of North America suggested it was appropriate to use donated leftover IVF eggs for research.

Ilkilic also found that, as with Christianity, some individuals link embryonic research with abortion rights. Those who believe that abortion should be forbidden generally also reject hESC research. But unlike Christianity, this tends to be the minority opinion within Islam. Furthermore, Ilkilic observed that Islamic attitudes about hESC research are also linked to attitudes toward scientific research and technological developments. Those who have positive opinions of science and see it as ethically neutral generally support hESC research.

On the whole, Ilkilic perceived that opinions on hESCs and research using human embryos were heterogeneous, but in general the discourse was positive. Unlike the United States and parts of Europe, stem cell research is not discussed as thoroughly in the Muslim world due to the lack of resources—intellectual, financial, and scientific infrastructure—required to conduct research in this area.

### **Commonalities**

Overall, there were several common ideals from each of the three religions. All three faiths value life and generally appreciate and support medical research, as it helps members of society improve their lives. Each religion would regard making cures and treatments available and affordable to all people, including individuals in developing countries, as an important goal for biomedical research.

Furthermore, all three religions would support a strict informed-consent process. Only those individuals who freely choose should be allowed to donate to stem cell research. This includes hESCs (when the faith allows) as well as cord blood and adult stem cells. The consent should also apply to donating cells that will be deprogrammed into iPS cells.

### **CONCLUSIONS**

"The important partnership represented here today helps to realize both the Baker Institute's mission of bridging the gap between the theory and practice of public policy, and the further development of vital scientific research and education in Qatar," Baker

Institute Founding Director Edward Djerejian said in his opening remarks at the event.

The goal of the workshop was to expose scientists and doctors in Qatar to stem cell biology research, as well as policy and ethical considerations. Furthermore, it was an opportunity to explore what a stem cell policy could look like in Qatar. Currently, there is limited stem cell research being pursued in the Middle East, with most occurring in Israel, Iran, and Turkey. Outside of Israel and Turkey, no other Middle Eastern nation has legal policies regarding stem cell research.

Following the presentations, the Baker Institute’s International Stem Cell Policy Program Advisory Panel hosted a closed meeting to establish outcomes for the event. From those deliberations, it was determined that the Qatar Foundation would develop a center of excellence for stem cell research in Doha through partnerships with different elite institutions, starting with the Weill Cornell Medical College in Qatar. The center would focus on primary health issues relevant to the population in Qatar and the surrounding region—including diabetes, neurological disorders, cancer, and cardiovascular disease—with specific areas of research to be defined by the government. “Recognizing the importance and challenges, particularly ethical and policy challenges supporting an ambitious stem cell program, the unique opportunity offered by Qatar, and recognizing interpretive flexibility toward stem cell research by Islam, the International Stem Cell Advisory Panel will make every effort to assist and advise the national government agencies as appropriate,” said Dr. Abdelali Haoudi, vice president for research for the Qatar Foundation and co-chair of the panel.

Based on the understanding that Islam allows for the creation and use of hESCs for medical purposes, the advisory panel suggested that all forms of stem cells should be pursued in the new center. The center should also include both basic scientific research to understand the nature of the cells, as well as applied and clinical research with the goal of finding new and innovative therapies and treatments.

Before the center is created, the advisory panel recommended establishing outreach programs with religious scholars and the general public to help guide future decisions on research. This could be conducted through conferences and public discussions on the science and ethical considerations, as well as with meetings between key representatives from the Qatar Foundation and Islamic scholars.

In addition, the advisory panel recognized the importance and impact of stem cell research activities at the global level. Therefore, it was determined that the Baker Institute’s International Stem Cell Policy Program should coordinate its activities with international science organizations to maximize public exposure to scientists, including the International Society for Stem Cell Research (ISSCR).

### **Qatar**

Qatar is in a position unique in most developed countries. The population is overwhelmingly Sunni Muslim, creating a strong religious consensus. There is also strong government support for science and technology research and development. The Emir of Qatar, His Highness Sheikh Hamad Bin Khalifa Al-Thani, has promised to invest 2.8 percent of the gross domestic product on scientific research. This will be implemented through the Qatar Foundation through research grants and funding projects in Education City. Qatar could act as an example to the Muslim world for how scientific research can be used to advance human health while respecting religious tenets. The clarity of the religious beliefs is powerful, and few other places have this consensus or are willing to take on such an endeavor.

Education City was created in Qatar “to become the scientific hub of the Middle East and rekindle its history of knowledge,” stated Dr. Fathy Saoud, president of the Qatar Foundation, during his welcoming address. The ultimate goal of the foundation and the state of Qatar is to develop human capital through high-quality education. Education City is home to six major university campuses: Weill Cornell Medical College, Northwestern University, Virginia Commonwealth University, Texas A&M University, Carnegie Mellon University, and Georgetown University.

In addition to the international campuses in Education City, the Emir of Qatar also endowed Sidra Medical and Research Center—the first academic medical center created outside of North America. With the goals of excelling in patient care, medical education, and biomedical research, Sidra will have a special focus on women’s and children’s health. The center is scheduled to open in 2012, establishing one of the world’s largest medical centers in the region.

## REFERENCES AND ENDNOTES

1. Matthews, K.R. "Stem Cell Research: A Science and Policy Overview." Baker Institute, February 2008. <http://www.bakerinstitute.org/publications/stemcell-intro-0208.pdf>

2. While sometimes referred to as a chimera, Minger demonstrated to the U.K. government that the resulting fertilized egg would be almost identical to a human fertilized egg and should be treated as such. Therefore, the research should also be regulated through the Human Fertilization and Embryological Authority, the organization responsible for overseeing embryonic and hESC research in the United Kingdom.

3. Levine, A.D. "Identifying Under- and Overperforming Countries in Research Related to Human Embryonic Stem Cells." *Cell Stem Cell* (June 2008).

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5. Caulfield, T. et al. "Patent, Commercialization and the Canadian Stem Cell Community." *Regenerative Medicine* (July 2008).

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7. Congregation for the Doctrine of the Faith, Instruction *Dignitas Personae* on Certain Bioethical Questions. December 12, 2008. [http://www.vatican.va/roman\\_curia/congregations/cfaith/documents/rc\\_con\\_cfaith\\_doc\\_20081208\\_dignitas-personae\\_en.html](http://www.vatican.va/roman_curia/congregations/cfaith/documents/rc_con_cfaith_doc_20081208_dignitas-personae_en.html)

8. Sunnah of Mohammad refers to the traditions and actions of the prophet Mohammad, including specific words, actions, and practices.

## ACKNOWLEDGMENTS

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This report was written by:

- Kirstin Matthews, Ph.D., Fellow in Science and Technology Policy at the James A. Baker III Institute for Public Policy at Rice University, USA
- Neal Lane, Ph.D., (International Stem Cell Policy Program Advisory Board Co-Chair) Senior Fellow in Science and Technology Policy at the James A. Baker III Institute for Public Policy and Malcolm Gillis University Professor at Rice University, USA
- Abdelali Haoudi, Ph.D., (International Stem Cell Policy Program Advisory Board Co-Chair) Vice President for Research at Qatar Foundation for Education, Science and Community Development, Qatar

## APPENDIX A

### STEM CELLS: SAVING LIVES OR CROSSING LINES QATAR STEM CELL WORKSHOP

SUNDAY, MARCH 15, 2009

#### INTRODUCTION AND WELCOMING REMARKS

8:45 am

**Fathy Saoud, Ph.D.**

Member of the Board and President, Qatar Foundation for Education, Science and Community Development, Qatar

**Ambassador Edward P. Djerejian**

Founding Director, James A. Baker III Institute for Public Policy, Rice University, U.S.A.

**Abdelali Haoudi, Ph.D. – Moderator**

Vice President for Research, Qatar Foundation for Education, Science and Community Development, Qatar

#### SESSION 1 – KEYNOTE SESSION: OVERVIEW OF CURRENT RESEARCH ON STEM CELLS

9:00 am

**Sir Martin Evans, Ph.D. – Session Leader**

2007 Nobel Laureate in Medicine; Director of the School of Biosciences and Professor of Mammalian Genetics, Cardiff University, U.K.

**Günter Blobel, M.D., Ph.D. – The Long Road Ahead in Understanding Forward Programming from Stem Cells to Adult Cells and Reverse Programming from Adult Cells to Stem Cells**

1999 Nobel Laureate in Medicine; John D. Rockefeller, Jr. Professor and Head of Laboratory of Cell Biology, The Rockefeller University; Investigator at the Howard Hughes Medical Institute, U.S.A.

**Irving Weissman, M.D. – Normal and Neoplastic Stem Cells**

Director of the Institute for Stem Cell Biology and Regenerative Medicine, Director of the Ludwig Center for Cancer Stem Cell Research and Medicine, and Professor of Pathology, Developmental Biology and, by courtesy, Biology, Stanford School of Medicine, U.S.A.

#### SESSION 2 – STEM CELL RESEARCH: CURRENT STATUS, OPPORTUNITIES, AND FUTURE PROSPECTS

10:20 am

**Stephen Minger, Ph.D. – Embryonic Stem Cells**

Senior Lecturer, King's College London, U.K.

**Ludovic Vallier, Ph.D. – Similarities and Divergences Between Human Pluripotent Stem Cells of Different Origin**

Medical Research Council Senior Non-Clinical Fellow, University of Cambridge, U.K.

**Margaret Elizabeth Ross, M.D., Ph.D. – Cell Cycle Regulation and Control of Neural Progenitor Cell Expansion: It's Not Just Whether But Also How One Chooses to Divide**

Professor and Head, Laboratory of Neurogenetics and Development, Vice Chair for Research, Department of Neurology and Neuroscience, Weill Cornell Medical College, New York, U.S.A.

**Paul Simmons, Ph.D. – Graft Engineering of Cord Blood: Lessons from the Stem Cell Niche**

Director of the Center for Stem Cell Research, The University of Texas Health Science Center at Houston, U.S.A.

**Nagy Habib, M.D. – Clinical Application of Bone Marrow-Derived Stem Cell Progenitors**

Professor of Surgery, Imperial College, U.K.

**Javaid Sheikh, M.D. – Panel Moderator**

Interim Dean, Vice Dean for Research and Professor of Psychiatry, Weill Cornell Medical College in Qatar

**Ronald Crystal, M.D. – Discussion Moderator**

Chairman, Department of Genetic Medicine, Weill Cornell Medical College, New York, U.S.A.



### **SESSION 3 – RELIGION, ETHICS, AND CULTURE**

2:00 pm

**Herbert Gottweis, Ph.D. – Afternoon Address: Ethics and Politics of Stem Cell Research Issues**  
Professor of Political Science, University of Vienna, Austria

**Timothy Caulfield – The Translation of Stem Cell Research: The Impact of Policies and Patent Approaches**  
Canada Research Chair in Health Law and Policy, Professor of Law and Public Health, and Research Director of the Health Law Institute, University of Alberta; Health Senior Scholar, Alberta Heritage Foundation for Medical Research, Canada

**Ilhan Ilkilic, M.D., Ph.D. – Ethical Assessment of Stem Cell Research from an Islamic Point of View: Some Ethical and Philosophical Reflections**  
Doctor of Ethics of Medicine at the Institute of History, Philosophy, and Ethics of Medicine, Johannes Gutenberg University Mainz, Germany

**Abdulhafez Helmy Mohammad, Ph.D. – Stem Cells: Ethics of Donation, Reception, and Research—An Islamic Approach**  
Professor Emeritus, Ain Shams University, Egypt

**Laurie Zoloth, Ph.D. – The Ethical Issues in Human Stem Cell Research: A Perspective from Jewish and Christian Traditions**  
Director of the Center for Bioethics, Science, and Society, Northwestern University, U.S.A.

**Neal Lane, Ph.D. – Panel Moderator**  
Senior Fellow in Science and Technology Policy, James A. Baker III Institute for Public Policy, and Malcolm Gillis University Professor and Professor of Physics & Astronomy, Rice University, U.S.A.

**Montaz Wassef, Ph.D. – Discussion Moderator**  
Director, Department of Biomedical Research, Ministry of Public Health, Qatar

### **RECOMMENDATIONS AND FINDINGS DISCUSSION (PRIVATE MEETING ROOM)**

Members of the advisory board and all session moderators

### **CONCLUDING REMARKS**

5:20 pm

**Abdelali Haoudi, Ph.D.**  
Vice President for Research, Qatar Foundation for Education, Science and Community Development, Qatar

## APPENDIX B

### SPEAKER BIOGRAPHIES

#### **Günter Blobel, M.D., Ph.D.**

1999 Nobel Laureate in Medicine; John D. Rockefeller, Jr. Professor and Head of Laboratory of Cell Biology, The Rockefeller University; Investigator at the Howard Hughes Medical Institute, U.S.A.

Günter Blobel, M.D., Ph.D., was the 1999 recipient of the Nobel Prize in physiology or medicine for his discovery that proteins have intrinsic signals that govern their transport and localization in the cell. He was named the John D. Rockefeller, Jr. Professor at The Rockefeller University in 1992 and became an investigator at the Howard Hughes Medical Institute in 1986.

Blobel is a member of the U.S. National Academy of Sciences, the American Philosophical Society, the Pontifical Academy of Sciences, and the German Orden pour le Mérite. He graduated from the University of Tübingen in 1960 and, in 1967, received his Ph.D. from the University of Wisconsin–Madison, where he worked with Van R. Potter in the McArdle Laboratory for Cancer Research. He did postdoctoral work at The Rockefeller University in the laboratory of George Palade and has been at the university since then.

#### **Timothy Caulfield**

Canada Research Chair in Health Law and Policy, Professor of Law and Public Health, and Research Director of the Health Law Institute, University of Alberta; Health Senior Scholar, Alberta Heritage Foundation for Medical Research, Canada

Timothy Caulfield has been research director of the Health Law Institute at the University of Alberta since 1993. In 2001, he was named Canada Research Chair in Health Law and Policy. He is also a professor in the Faculty of Law and the School of Public Health. Over the past several years, he has been involved in a variety of interdisciplinary research endeavors that have allowed him to publish more than 150 articles and book chapters.

Caulfield is also a health senior scholar with the Alberta Heritage Foundation for Medical Research, the principal investigator for the Genome Canada project on the regulation of genomic technologies, the theme leader in the Stem Cell Network and the Advanced Foods and Materials Network (Networks of Centres of Excellence), and has several projects funded by the Canadian Institutes of Health Research.

Caulfield is and has been involved with a number of national policy and research ethics committees, including the Canadian Biotechnology Advisory Committee, Genome Canada's Science and Industry Advisory Committee, the Interagency Advisory Panel on Research Ethics, and the Royal Society of Canada's Expert Panel on the Future of Food Biotechnology (2001). He is a member of the Royal Society of Canada and the Canadian Academy of Health Sciences. He is the editor for the Health Law Journal and Health Law Review.

#### **Ronald Crystal, M.D.**

Chairman, Department of Genetic Medicine, Weill Cornell Medical College, New York, U.S.A.

Ronald G. Crystal, M.D., is professor and chair of the Department of Genetic Medicine at Weill Cornell Medical College, where he is also The Bruce Webster Professor of Internal Medicine, director of the Belfer Gene Therapy Core Facility, and chief of the Division of Pulmonary and Critical Care Medicine at the Weill Cornell New York–Presbyterian Hospital.

After earning a B.A. in physics from Tufts University, an M.S. in physics from the University of Pennsylvania and an M.D. from the University of Pennsylvania, Crystal completed his medical postgraduate training at Massachusetts General Hospital in internal medicine, and in pulmonary medicine at the University of California, San Francisco. In 1970, he joined the National Institutes of Health, where he served as chief of the Pulmonary Branch of the National Heart, Lung and Blood Institute until moving to Weill Cornell in 1993.

In recognition of his accomplishments as a basic and clinical investigator, Crystal has received numerous professional honors, including an honorary degree from the Johann Wolfgang Goethe University in Germany and an honorary fellowship from the Royal College of Physicians of Ireland. He serves on the editorial boards of numerous biomedical journals. He has published more than 700 scientific articles, edited several textbooks, and served on a number of advisory boards to government and industry. Crystal is responsible for numerous biomedical patents and was the founder of GenVec, a biomedical company focused on gene therapy applications.

### **Ambassador Edward P. Djerejian**

Founding Director, James A. Baker III Institute for Public Policy, Rice University, U.S.A.

The Honorable Edward P. Djerejian is the founding director of the James A. Baker III Institute for Public Policy. He served both President George H.W. Bush and President William J. Clinton as assistant secretary of state for Near Eastern affairs and Presidents Ronald Reagan and Bush as U.S. ambassador to Syria. He served President Clinton as U.S. ambassador to Israel before completing his foreign service career in 1994. He also served President Reagan as special assistant and deputy press secretary for foreign affairs. He has been awarded the Presidential Distinguished Service Award, the Department of State's Distinguished Honor Award, and numerous other honors, including the Ellis Island Medal of Honor and the Anti-Defamation League's Moral Statesman Award.

### **Sir Martin Evans, Ph.D.**

2007 Nobel Laureate in Medicine; Director of the School of Biosciences and Professor of Mammalian Genetics, Cardiff University, U.K.

Sir Martin Evans, Ph.D., is the 2007 Nobel laureate in medicine, as well as the director of the School of Biosciences and professor of mammalian genetics at Cardiff University. Evans was the first scientist to identify embryonic stem cells, which can be adapted for a wide variety of medical purposes. He was elected fellow of the Royal Society in 1993 and is a founding fellow of The Academy of Medical Sciences. In 1993, he was awarded the Walter Cottman Fellowship and the William Bate Hardy Prizes. He was also awarded the Albert Lasker Award for Basic Medical Research in the United States in 2001. In 2002, Evans was awarded an honorary doctorate from Mount Sinai School of Medicine in New York.

### **Herbert Gottweis, Ph.D.**

Professor of Political Science, University of Vienna, Austria

Herbert Gottweis, Ph.D., is a professor in the Department of Political Science at the University of Vienna, as well as a research associate at BIOS (the Centre for the Study of Bioscience, Biomedicine, Biotechnology, and Society) at the London School of Economics and Political Science. He also directs the Life Science Governance Institute in Vienna, an interdisciplinary research institute that studies the interface between life sciences and governance. Gottweis is also vice president of the Austrian Research Fund (FWF). Before moving to Vienna, he was a researcher at Massachusetts Institute of Technology and Harvard University. He also taught at the University of Salzburg, The Hong Kong University of Science and Technology, and Cornell University.

Gottweis was the coordinator of the PAGANINI (Participatory Governance and Institutional Innovation) project (2004-2007), funded under the EU's 6th Framework Program, and he is partner of a number of other EU projects, such as Regenerative Medicine in Europe: Emerging Needs and Challenges in a Global Context (REMDIE); Biobank and Biomolecular Resources Initiative (BBMRI), a coordination action of biobank projects in Europe that he advises on ethical governance issues; and in BIONET, a project dealing with ethical governance of research collaborations in the biomedical field between Europe and China.

**Nagy Habib, M.D.**

Professor of Surgery, Imperial College, U.K.

Nagy Habib, M.D., is professor of surgery at Imperial College, U.K. In June 2007 he was also appointed pro rector for commercial affairs at the university.

His major research focus is on the improvement of surgical technologies, as well as on the remediation and/or cure of diseases of the liver, with particular attention to gene therapy, the use of stem cells, and immunotherapy.

Since 2002, Habib has been working in the field of adult stem cells. He conducted the world's first phase I study of autologous adult bone marrow-derived stem cells in patients with liver disease and is about to embark on a phase II study of the therapy. The Medicines and Healthcare products Regulatory Agency (MHRA) has already granted approval to conduct clinical trials in patients with cardiac disease, stroke (acute total anterior circulatory ischaemic stroke), and diabetes.

**Abdelali Haoudi, Ph.D.**

Vice President for Research, Qatar Foundation for Education, Science and Community Development, Qatar

Abdelali Haoudi, Ph.D., vice president for research at Qatar Foundation for Education, Science and Community Development, holds a doctorate degree in cellular and molecular genetics and a master's degree in human, quantitative, and population genetics from Pierre and Marie Curie University and Orsay University (Paris, France).

Prior to joining Qatar Foundation, Haoudi was a professor of cancer biology and virology at Eastern Virginia Medical School and at the School of Medicine at the University of Virginia (U.S.A.). He also served as a visiting professor or visiting fellow at leading biomedical research institutes, including the Harvard Medical School and the Harvard Institute of Proteomics, Cambridge (U.S.A.), the National Institutes of Health (U.S.A.), and the Pasteur Institute (France). He was also an adjunct professor in the Department of Biological Sciences at Old Dominion University in Virginia.

Haoudi is the founder and president of the International Council of Biomedicine and Biotechnology. He is also the founder and editor-in-chief of the Journal of Biomedicine and Biotechnology and a fellow of the National Royal Academy of Sciences and Technology. He has been actively involved in various science advisory activities for various international organizations, including the United Nations Development Program (UNDP), United Nations Office for Project Services (UNOPS), the U.S. Department of Defense Medical Branch, and other private research foundations.

**Ilhan Ilkilic, M.D., Ph.D.**

Doctor of Ethics of Medicine at the Institute of History, Philosophy, and Ethics of Medicine, Johannes Gutenberg University Mainz, Germany

Ilhan Ilkilic, M.D., Ph.D., is currently doctor of ethics of medicine in the Institute for History, Philosophy, and Ethics of Medicine at Johannes Gutenberg University Mainz. He has studied medicine, philosophy, Islamic science, and oriental philology in Istanbul, Bochum, and Tübingen. He was also coordinator of the project "Public Health Genetics: Development, Conception, Normative Evaluation," supported by Germany's Federal Ministry of Science and Education. Ilkilic's special interests include genetics and ethics, transcultural bioethics, Islamic biomedical ethics, and ethical issues at the end of life.

**Neal F. Lane, Ph.D.**

Senior Fellow in Science and Technology Policy, James A. Baker III Institute for Public Policy, and Malcolm Gillis University Professor and Professor of Physics & Astronomy, Rice University, U.S.A.

Neal F. Lane, Ph.D., is the senior fellow in science and technology policy at the Baker Institute. He is also the Malcolm Gillis University Professor at Rice University and professor in the Department of Physics and Astronomy. Previously, Lane served in the federal government as assistant to the president for science and technology and director of the White House Office of Science and Technology Policy (OSTP) from August 1998 to January 2001, and he served as director of the National Science Foundation (NSF) and member (ex officio) of the National Science Board from October 1993 to August 1998. Before his post with NSF, Lane was provost and professor of physics at Rice, a position he had held since 1986. He first came to the university in 1966, when he joined the Department of Physics as an assistant professor. In 1972, he became professor of physics and space physics and astronomy. He left Rice from mid-1984 to 1986 to serve as chancellor of the University of Colorado at Colorado Springs. Lane received his Ph.D., M.S., and B.S. in physics from the University of Oklahoma.

**Stephen Minger, Ph.D.**

Senior Lecturer, King's College London, U.K.

Stephen Minger, Ph.D., is the director of the Stem Cell Biology Laboratory and senior lecturer at the Wolfson Centre for Age Related Diseases at King's College London. Minger received his Ph.D. in pathology (neurosciences) in 1992 from the Albert Einstein College of Medicine. From 1992 to 1994, he was a postdoctoral fellow at the University of California, San Diego, where he first began to pursue research in neural stem cell biology. In 1995, Minger was appointed assistant professor in neurology at the University of Kentucky College of Medicine. He moved his stem cell research program to Guy's Hospital, London, in 1996 and was appointed a lecturer in biomolecular sciences at King's College London in 1998. Over the past 16 years, his research group has worked with a wide range of tissue-derived stem cell populations, as well as mouse and human embryonic stem (ES) cells. In 2002, together with Susan Pickering and Peter Braude, Minger was awarded one of the first two licenses granted by the U.K. Human Fertilisation and Embryology Authority for the derivation of human ES cells. His group subsequently generated the first human ES cell line in the United Kingdom and was one of the first groups to deposit this into the U.K. Stem Cell Bank. They have gone on to generate a number of new human ES cell lines, including one that encodes the most common genetic mutation resulting in cystic fibrosis and another one that contains the Huntington's disease mutation.

Minger, together with Chris Mason of University College London (UCL), is also one of the co-organizers of the London Regenerative Medicine Network, a grassroots, research-led organization designed to stimulate clinical translation of cell- and gene-based therapies within London. He is also the stem cell expert and member of the U.K. Gene Therapy Advisory Committee (GTAC) at the Department of Health and is a member of the advisory panel of the California Institute of Regenerative Medicine.

**Abdulhafez Helmy Mohammad, Ph.D.**

Professor Emeritus, Ain Shams University, Egypt

Abdulhafez Helmy Mohammad, Ph.D., has been professor emeritus at Ain Shams University since 1988. Prior to this, he was professor of protozoology, vice dean, and dean of the faculty of science at Ain Shams. He was also professor of general zoology at Kuwait University.

Mohammad is also the president of the National Committee on the History and Philosophy of Science, the Zoological Society of Egypt, and the Egyptian Society for the Arabization of the Language of Science. He is the vice president of the IRCICA (Research Centre for Islamic History, Art, and Culture) Governing Board. Additionally, he is a member of the executive boards of the International Union of the History of Science and Technology; the Society of Protozoology, New York; and the British Society for the History of Science, London. Mohammad is a member of the Egyptian Academy of Sciences and the Academy of the Arabic Language.

Mohammad was granted the Ain Shams Prize of Merit in Basic Science in 1997 and the State Prize of Merit in Basic Science in 2001. Mohammad received his B.Sc. from Cairo University and his Ph.D. from London School of Hygiene and Tropical Medicine, University of London.

**Margaret Elizabeth Ross, M.D., Ph.D.**

Professor and Head, Laboratory of Neurogenetics and Development, Vice Chair for Research, Department of Neurology and Neuroscience, Weill Cornell Medical College, New York, U.S.A.

Margaret Elizabeth Ross, M.D., Ph.D., is a professor and head of the Laboratory of Neurogenetics and Development, and vice chair for research in the Department of Neurology and Neuroscience at Weill Cornell Medical College in New York, as well as an attending neurologist at the New York–Presbyterian Hospital. Ross received her M.D. and Ph.D. degrees from Cornell (now Weill Cornell Medical College) in Manhattan and her residency training in neurology at the Massachusetts General Hospital, Harvard Medical School in Boston. She pursued postdoctoral research in molecular neurobiology at Harvard Medical School and The Rockefeller University before building her own laboratory at the University of Minnesota, where she joined the faculty in 1991. She returned to Weill Cornell in 2002 in the Department of Neurology and Neuroscience, where she is a tenured professor and vice chair for research.

Ross serves on numerous review and advisory committees, including as associate editor of the journal *Neurobiology of Disease*; review panels for the National Institute of Health (current Neurogenesis and Cell Fate Study Section member and past chair of the Neurological Sciences and Disorders B Study Section); the Howard Hughes Medical Institute and the Tri Institutional Embryonic Stem Cell Research Oversight Committee (ESCRO) for Cornell, Sloan-Kettering Institute and The Rockefeller University; and as chair of the Conflicts Advisory Panel at Weill Cornell, which reviews issues concerning conflicts of interest in research.

**Fathy Saoud, Ph.D.**

Member of the Board and President, Qatar Foundation for Education, Science and Community Development, Qatar

Fathy Saoud, Ph.D., was appointed president of the Qatar Foundation for Education, Science and Community Development in November 2007. He has been a member of the board of directors since 2003 and previously served as higher education adviser from 1997 to 2007, during which he participated in the planning and development of Education City, one of the largest projects of the Qatar Foundation.

As a member of the Academic Team of the foundation, Saoud was engaged in the discussions that led to the agreement with Cornell University in 2001 to establish a branch campus of Weill Cornell Medical College in Education City. He also helped Virginia Commonwealth University, Texas A&M University, RAND, Carnegie Mellon University, and Georgetown University establish branch campuses in Education City. He has been also engaged in establishing a branch campus of the College of the North Atlantic and a University of Calgary Nursing Program in Qatar. He participated in the initial planning of the Science and Technology Park and Qatar National Research Fund (QNRF), together with a major project for reforming K-12 schooling in Qatar.

Additionally, Saoud is the vice chairperson of the board of governors for the Sidra Medical and Research Center. He chairs the executive committee of the Sidra Medical and Research Center and the steering committee of QNRF. He is a member of the steering committee of University of Calgary–Qatar’s nursing program and the executive committee of the College of North Atlantic–Qatar.

Saoud started his academic career as senior lecturer, assistant professor, associate professor and professor of parasitology at the University of Ain Shams in Egypt and the University of Khartoum in Sudan. He then joined the University of Qatar, where he became the founding dean of science in 1978. During his research career, Saoud established a school in medical and animal parasitology in Egypt, Sudan, and Qatar; more than 30 M.S. and Ph.D. students worked under his direct supervision.

An Egyptian citizen, Saoud graduated in 1959 from Ain Shams University in Cairo, Egypt, with an honors degree, and he earned a Ph.D. from the London School of Hygiene and Tropical Medicine, London University, in 1965. Saoud is a fellow of The Royal Society of Tropical Medicine and Hygiene and a member of the British, Japanese, and Egyptian Societies for Parasitology.

**Javaid Sheikh, M.D.**

Interim Dean, Vice Dean for Research and Professor of Psychiatry, Weill Cornell Medical College in Qatar

Javaid I. Sheikh, M.D., M.B.A, assumed the position of vice dean for research at Weill Cornell Medical College in Qatar in April 2007, took on the additional responsibilities for deputy dean in May 2008, and assumed the position of interim dean on Jan. 1, 2009. Sheikh comes from Stanford University School of Medicine, where he was a professor of psychiatry and behavioral sciences, as well as the Palo Alto Institute for Research and Education (PAIRE), where he was chairman of the board. He was also director of the cooperative studies program and research director for the National Center for Post-Traumatic Stress Disorder at the Stanford affiliate VA Palo Alto Health Care System (VAPAHCS).

Sheikh is an internationally renowned researcher in the area of anxiety disorders, chronic stress related conditions, and cognitive impairment. He has published more than 125 scientific articles and more than 70 abstracts from proceedings of scientific meetings. Over the years, Sheikh has consistently received research funding from multiple federal and private institutions in the United States, including the National Institutes of Health and the Department of Veterans Affairs.

Sheikh served as the chief of medical staff at the VAPAHCS and associate dean for veterans affairs at Stanford from 2001 to 2006. In this dual role, he had the responsibility for the overall direction, implementation and functioning of academic programs (education, research, program development, faculty recruitment and retention) based at the VAPAHCS, while overseeing all clinical care in the tertiary care health care system. As the chairman of the board of PAIRE, he also oversaw the substantial research endeavors of the approximately 100 Stanford faculty members based at the VAPAHCS.

**Paul Simmons, Ph.D.**

Director of the Center for Stem Cell Research, The University of Texas Health Science Center at Houston, U.S.A.

Paul Simmons, Ph.D., serves as professor and director of the Center for Stem Cell Research at The University of Texas Health Science Center at Houston. He was president of the International Society for Stem Cell Research (ISSCR) from 2006 to 2007.

Simmons graduated from Queen Elizabeth College, University of London, U.K., and received his Ph.D. from the University of Manchester, where his research focused on long-term bone marrow cultures. Postdoctoral research was initially conducted at the Terry Fox Laboratory, B.C. Cancer Research Centre, Vancouver, and subsequently (1986-1990) in the Department of Transplantation Biology, Fred Hutchinson Cancer Research Center, Seattle. In 1990, Simmons was appointed the inaugural R.L. Clifford Fellow in Experimental Haematology and a member (professorial equivalent) of the Hanson Centre for Cancer Research in Adelaide, Australia. In 1999, Simmons was recruited to the Peter MacCallum Cancer Centre in Melbourne as program head in Stem Cell Biology, and from 2003 also held the position of director of the Adult Stem Cell Platform of the Australian Stem Cell Centre (ASCC).

Simmons is or has served as associate editor on multiple journals in the field of stem cell biology, including Experimental Hematology, Cytotherapy and Stem Cell Research, and he is on the editorial boards of the journals Cell, Stem Cell, Blood and Stem Cells. Simmons serves regularly as a reviewer for Nature, Science, PNAS, and the Journal of Clinical Investigation, among others.

**Ludovic Vallier, Ph.D.**

Medical Research Council Senior Non-Clinical Fellow, University of Cambridge, U.K.

Ludovic Vallier, Ph.D., is a member of the Department of Surgery and junior principal investigator in the newly opened Anne McLaren Laboratory for Regenerative Medicine. Vallier has been recently awarded a Medical Research Council senior non-clinical research fellowship to study mechanisms controlling differentiation of pluripotent cells into the endoderm germ layer from which the pancreas, liver, lung, and stomach originate. These studies use human embryonic stem cells and human induced pluripotent stem cells as an in vitro model of development, in combination with functional analyses and large scale approaches that take advantage of the properties of proliferation and differentiation intrinsic to human pluripotent stem cells.

**Momtaz Wassef, Ph.D.**

Director, Department of Biomedical Research, Ministry of Public Health, Qatar

Momtaz K. Wassef, Ph.D., is the director of the Department of Biomedical Research at the Ministry of Health in Qatar. Wassef graduated with a B.Sc. (with honors) and an M. Sc. in biochemistry from Ain Shams University in Egypt, and a doctorate degree from the University of Ottawa in Canada. Before joining the National Health Authority in 2008 as director of the Department of Biomedical Research, he was the leader (chief) of the Atherosclerosis Research Group at the National Institutes of Health (NIH) in the United States. Wassef came to the NIH from academia. He was a postdoctoral fellow and held various positions, including adjunct professor, at New York Medical College, the University of Kentucky, Duke University, Baylor College of Medicine in Houston, and Washington University in St. Louis.

Wassef's areas of research interest are in chemistry and metabolism of lipids, with particular expertise in inflammation, atherosclerosis and vessel wall biology, diabetes, and angiogenesis. He has authored or co-authored 65 research papers that have appeared in peer reviewed journals, and also has authored or co-authored five books and review articles. During his 27 years tenure at the NIH, Wassef initiated, implemented and directed numerous large NIH landmark research programs, including the Specialized Centers of Research in Molecular Medicine and Atherosclerosis, the Pathobiological Determinants of Atherosclerosis in Youth, Characteristics of the Vulnerable Plaque, Pathogenesis of Abdominal Aortic Aneurysm and the Cardiovascular Complications of Diabetes.

Wassef belongs to many scientific societies, including the Federation of American Societies for Experimental Biology, and he is also a member of the executive committee of the American Heart Association Council on Atherosclerosis. He received numerous achievement and merit awards from the NIH and from the American Heart Association. He is on the editorial board of the Journal of the American College of Cardiology and reviewer for the journals Circulation; Circulation Research; and Atherosclerosis, Thrombosis, and Vascular Biology.

**Irving L. Weissman, M.D.**

Director of the Institute for Stem Cell Biology and Regenerative Medicine, Director of the Ludwig Center for Cancer Stem Cell Research and Medicine, and Professor of Pathology, Developmental Biology and, by courtesy, Biology, Stanford School of Medicine, U.S.A.

Irving L. Weissman, M.D., is the director of the Institute for Stem Cell Biology and Regenerative Medicine, director of the Ludwig Center for Cancer Stem Cell Research, as well as professor of pathology, developmental biology and, by courtesy, of biological sciences and neurosurgery at Stanford School of Medicine. Weissman was a member of the founding scientific advisory boards of Amgen, DNAX, and T-Cell Sciences. He co-founded several companies, including SyStemix, StemCells, and Cellerant Therapeutics, in 2001. He did his undergraduate work at Montana State University and was awarded his medical degree from Stanford University in 1965.

His current research encompasses the biology and evolution of stem cells and progenitor cells, mainly blood-forming and brain-forming. He is also engaged in a large effort to isolate and characterize the cancer stem cells from a wide variety of solid tumors and leukemia.



Weissman has received numerous prestigious awards during his career. He is a member of the U.S. National Academy of Sciences, the Institute of Medicine, the American Association of Arts and Sciences, and the American Academy of Microbiology.

**Laurie Zoloth, Ph.D.**

Director of the Center for Bioethics, Science, and Society, Northwestern University, U.S.A.

Laurie Zoloth, Ph.D., is a professor of medical humanities, bioethics, Jewish studies and religion. She is also the director of the Northwestern University Center for Bioethics, Science and Society, and director of the Brady Program for Ethics and Civic Life in the Weinberg College of Arts and Sciences. Zoloth is the former president of the American Society for Bioethics and Humanities as well as serving on its founding board for two terms and receiving the society's award for Distinguished Service to the Field in 2007. She is the chair of the Howard Hughes Bioethics Advisory Board and has served on the NASA National Advisory Council, receiving NASA's National Public Service award.

Zoloth received an M.A. from San Francisco State University and a second M.A. and Ph.D. from the Graduate Theological Union.

## APPENDIX C

### INTERNATIONAL STEM CELL POLICY PROGRAM

Human stem cell research—encompassing embryonic, adult, and induced pluripotent stem cell research—is viewed as a critical area of study by much of the science and medical community. While a significant amount of research is needed before embryonic or induced pluripotent stem cells can be used in therapy, these cells have the potential to cure or treat debilitating injuries and diseases such as spinal cord injury, Parkinson’s disease, and diabetes. Understanding stem cells can impact developmental biology, cancer biology, regenerative medicine, and other fields of biomedical research.

The mission of the Baker Institute International Stem Cell Policy Program is to bring together scientists, ethicists, policymakers, media experts, and community and business leaders to find new ways to engage the general public in a dialogue on international stem cell policies and the ethical use of stem cells for research. The program includes an international conference series titled “Stem Cells: Saving Lives or Crossing Lines.” The program also sponsors local events and lectures; workshops that bring together scholars and scientists from the international community, and conference reports on the workshops; and major public policy research. The program is part of the Baker Institute Science and Technology Policy Program, led by senior fellow Neal Lane and fellow Kirstin Matthews.

Support for this program has been generously provided by the State of Qatar and the Emir of Qatar, His Highness Sheikh Hamad Bin Khalifa Al-Thani, through the State of Qatar Endowment for International Stem Cell Policy.

### ADVISORY PANEL

#### **Neal Lane, Ph.D. (Co-Chair)**

Senior Fellow in Science and Technology Policy, James A. Baker III Institute for Public Policy;  
Malcolm Gillis University Professor and Professor of Physics & Astronomy, Rice University, U.S.A.

#### **Abdelali Haoudi, Ph.D. (Co-Chair)**

Vice President for Research, Qatar Foundation for Education, Science and Community Development, Qatar

#### **Ibrahim Ahmad Al-Hijji, M.D.**

Consultant for Hematology and SCT, Hamad Medical Corporation, Qatar

#### **Baruch Brody, Ph.D.**

Leon Jaworski Professor of Biomedical Ethics and Director of the Center for Medical Ethics and Health Policy, Baylor College of Medicine; Andrew Mellow Professor of Humanities in the Department of Philosophy, Rice University, U.S.A.

#### **Kirstin Matthews, Ph.D.**

Fellow in Science and Technology Policy, James A. Baker III Institute for Public Policy at Rice University, U.S.A.

#### **Stephen Minger, Ph.D.**

Senior Lecturer, King’s College London, U.K.

#### **Abdulhafez Helmy Mohammad, Ph.D.**

Professor Emeritus, Ain Shams University, Egypt

#### **Paul Simmons, Ph.D.**

Director of the Center for Stem Cell Research, The University of Texas Health Science Center at Houston, U.S.A.

#### **Momtaz Wassef, Ph.D.**

Director, Department of Biomedical Research, Ministry of Public Health, Qatar





RICE UNIVERSITY - MS40  
JAMES A. BAKER III  
INSTITUTE FOR PUBLIC POLICY  
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