PRESS RELEASE:

For immediate release

**Singapore scientists lead human embryonic stem cell study to advance the field of regenerative medicine research**

Researchers from A*STAR Singapore took lead roles in a study that identified a portion of the genome mutated during long-term culture of human embryonic stem cells (hESCs). The study was a worldwide collaboration, led by Drs Peter Andrews of the University of Sheffield (UK), Paul Robson of the Genome Institute of Singapore (GIS), Steve Oh of Singapore’s Bioprocessing Technology Institute (BTI), and Barbara Knowles and others in the international stem cell community. The GIS, IMB and BTI are research institutes under the umbrella of the Agency for Science, Technology and Research, (A*STAR), Singapore.

Involving 125 ethnically diverse hESC lines originating from 38 laboratories globally, and now identified to represent multiple ethnic groups from different parts of the globe, the study is the largest to be conducted on the genetic stability of cultured hESCs. The findings are published today in the journal *Nature Biotechnology*.

Research into the variability of hESCs is very important as these cells may lead to future cell therapy and regenerative medicine. During long-term culture, however, these cells can acquire genetic changes (mutations), some of which could compromise the cells’ utility for regenerative medicine. It is believed that mutations that arise and endure over long-term culture provide a selective advantage for the cells, such as a greater propensity for self renewal.

The study re-emphasized that many chromosome changes occur repeatedly, resulting in increased copies in specific areas of the genome. Interestingly, through molecular karyotyping performed in Dr Robson’s laboratory at the GIS, about 20% of
the karyotypically normal cell lines exhibited subkaryotypic amplifications of a specific region in chromosome 20. This is also one of the karyotypically defined areas of change. The minimal region common to these cells contains three ES-cell expressed genes, and one of them, \textit{BCL2L1}, is a strong candidate for driving hESC culture adaptation. The data generated in this study will be useful for understanding the frequency and types of genetic changes affecting cultured hESCs, an important issue in evaluating the cells for potential therapeutic applications.

Dr Paul Robson, Senior Group Leader of the Developmental Cellomics Laboratory, GIS, said: “Not only does this work provide important information for evaluating human embryonic stem cell genetic integrity, it also highlights the general utility of these cells in understanding human biology and disease. This same region has recently been identified to repeatedly occur in numerous human cancer cell types, this likely indicative of similar selection pressures at play in stem cells and cancer cells. Interestingly, we found the propensity for mutation at this location is associated with a relatively recent chromosomal rearrangement that occurred in the last common ancestor of the human, chimp, and gorilla thus pointing to the value of having a comparative perspective for understanding human biology.”

Dr Barbara Knowles, Principle Investigator at IMB added: “This is a prodigious piece of community work comparing the genome of cell lines from around the world that were sampled after they had been grown in cell culture for a short period of time to samples from the same cell lines taken after they had been in culture for a longer period of time. Scientists at GIS used these globally obtained samples to pinpoint an area of the genome that contains a gene(s) that affects the cell’s ability to control its own growth.”

Dr Steve Oh, Principal Scientist at BTI said: “This study took over three years to complete and is a great testimony of the international stem cell community working persistently together as a force for good. A special thanks goes to Prof Peter Andrews for his leadership! The fact that of the 125 cell lines tested, over 65% of them exhibited normal karyotypes in long term culture bodes well for the use of human embryonic stem cells for cell therapy in the future.”
Notes to the Editor:

Research publication:
The research findings described in the press release can be found in the 27 November, 2011 advanced online issue of Nature Biotechnology under the title “Screening a large, ethnically diverse population of human embryonic stem cells identifies a chromosome 20 minimal amplicon that confers a growth advantage”.

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About the Genome Institute of Singapore
The Genome Institute of Singapore (GIS) is an institute of the Agency for Science, Technology and Research (A*STAR). It has a global vision that seeks to use genomic sciences to improve public health and public prosperity. Established in 2001 as a centre for genomic discovery, the GIS will pursue the integration of technology, genetics and biology towards the goal of individualized medicine.

The key research areas at the GIS include Systems Biology, Stem Cell & Developmental Biology, Cancer Biology & Pharmacology, Human Genetics, Infectious Diseases, Genomic Technologies, and Computational & Mathematical Biology. The genomics infrastructure at the GIS is utilized to train new scientific talent, to function as a bridge for academic and industrial research, and to explore scientific questions of high impact. www.gis.a-star.edu.sg

About the Institute of Medical Biology
IMB is one of the Biomedical Sciences Institutes of the Agency for Science, Technology and Research (A*STAR). It was formed in 2007, the 7th and youngest of the BMRC Research Institutes, with a mission to study mechanisms of human disease in order to discover new and effective therapeutic strategies for improved quality of life.

IMB hosts 20 research teams of international excellence in stem cells, genetic diseases, cancer and skin and epithelial biology, and works closely with clinical collaborators to target the challenging interface between basic science and clinical medicine. Its growing portfolio of strategic research topics is targeted at translational research on the mechanisms of human diseases, with a cell-to-tissue emphasis that can help identify new therapeutic strategies for disease amelioration, cure and eradication.
About the Bioprocessing Technology Institute

Bioprocessing Technology Institute (BTI) is a member of the Agency for Science, Technology and Research (A*STAR). Established in 1990 as the Bioprocessing Technology Unit, it was renamed the Bioprocessing Technology Institute (BTI) in 2003. The research institute's mission is to develop manpower capabilities and establish cutting-edge technologies relevant to the bioprocessing community. Some of the key research areas include expression engineering, animal cell technology, stem cell research, microbial fermentation, downstream purification and analytics.

For more information about BTI, please visit www.bti.a-star.edu.sg.

About the Agency for Science, Technology and Research (A*STAR)

The Agency for Science, Technology and Research (A*STAR) is the lead agency for fostering world-class scientific research and talent for a vibrant knowledge-based and innovation-driven Singapore. A*STAR oversees 14 biomedical sciences and physical sciences and engineering research institutes, and six consortia & centres, located in Biopolis and Fusionopolis as well as their immediate vicinity.

A*STAR supports Singapore's key economic clusters by providing intellectual, human and industrial capital to its partners in industry. It also supports extramural research in the universities, and with other local and international partners. www.a-star.edu.sg

About the International Stem Cell Initiative (ISCI)

The International Stem Cell Initiative (ISCI) is supported by the International Stem Cell Forum (ISCF; http://www.stem-cell-forum.net/ISCF/). The ISCF is made up of funders of stem cell research from around the world. It was founded in January 2003 to encourage international collaboration and funding support for stem cell research, with the overall aim of promoting global good practice and accelerating progress in this vitally important area of biomedical science.