



Genome Institute
of Singapore

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PRESS RELEASE

**Embargoed until: April 19, 2010 (Monday), 1200 hrs, Eastern Time, US
April 20, 2010 (Tuesday), 0000 hrs, Singapore**

Singapore scientists' finding on early embryonic development has direct impact on regenerative medicine and assisted reproduction

Scientists at the Genome Institute of Singapore (GIS) have recently generated significant single cell expression data crucial for a detailed molecular understanding of mammalian development from fertilization to embryo implantation, a process known as the preimplantation period. The knowledge gained has a direct impact on clinical applications in the areas of regenerative medicine and assisted reproduction.

This study, published in *Developmental Cell* on April 20, 2010, is the first of its kind to apply single cell gene expression analysis of many genes to hundreds of cells in a developmental system.

Using the new BioMark microfluidic technology and the mouse preimplantation embryo as a model, the scientists were able to study the expression of 48 genes from individual cells and applied this to analyze over 600 individual cells from the 1-cell to the 64-cell stage of preimplantation development. This high throughput single cell research methodology provides the scientists with the ability to detect dynamic patterns in cellular behaviour, which is unprecedented in the field. Significantly, the findings of the study resolves some of the arguments pertaining to cellular differentiation events and places fibroblast growth factor signalling as the primary event in the later cell fate decisions.

Executive Director at the GIS, a biomedical research institute of the Agency for Science, Technology and Research (A*STAR), Professor Edison Liu said, "This remarkable work by Guoji Guo, Mikael Huss, Paul Robson and colleagues uses new microgenomic technologies to map, over time, how a single cell decides to permanently become different parts of an embryo. Within one division, cells commit to



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specific developmental lineages by expressing defined sets of genes. This research now opens the possibility of assessing the genetic triggers for fate determination of individual cells in developmental time. On another level, this work highlights the importance of new microtechnologies in advancing the understanding of early embryonic events. “

Professor Davor Solter, Senior Principal Investigator of the Institute of Medical Biology, A*STAR, added, “This is a real technological tour de force. The authors investigated changes in expression of multiple genes on the single cell level during preimplantation mouse development. They clearly demonstrated gradual and stochastic lineage allocation and absence of predetermination. These results conclusively resolved one of the hotly debated issues in mammalian development and provided important new insight into the mechanism which regulates early development in mammals.”

“These are important findings. The team at GIS provided a new look into the complex and little-understood process of early embryo development. It also demonstrates the power of single cell gene expression. It is clear that individual cells and small groups of cells behave differently than the aggregate population, and these differences are key to understanding the biology of the system as a whole.” said Gajus Worthington, president and chief executive officer of Fluidigm. “It always provides a special thrill when researchers use the capabilities of Fluidigm's technology to bring insight to the body of scientific knowledge.”

The Preimplantation period involves the first cellular differentiation events in mammalian development including the formation of pluripotent cell from where embryonic stem (ES) cells are derived. Being one of the simplest mammalian developmental systems to study, it can provide comprehensive understanding of the complex molecular control of reprogramming and cell fate decisions.



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Notes to the Editor:

Research publication:

The research findings described in the press release can be found in the April 20, 2010 print issue of **DEVELOPMENTAL CELL** under the title "Resolution of cell fate decisions revealed by single cell gene expression analysis from zygote to blastocyst".

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About the Genome Institute of Singapore

www.gis.a-star.edu.sg

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.



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

www.a-star.edu.sg

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 nine consortia & centres, which are 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, hospitals, research centres, and with other local and international partners.

For more information on A*STAR, please visit www.a-star.edu.sg.

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