## Study Maps Prenatal Cells

A research team led by Dr. Pao-Yang Chen, an Assistant Research Fellow at the Institute of Plant and Microbial Biology, Academia Sinica, and Dr. Amander Clark, an Associate Professor and Vice Chair of the Department of Molecular, Cell and Developmental Biology in the Life Sciences, UCLA, recently published a paper that furthers the understanding of human germline cells (the cells that create eggs or sperm in humans during prenatal development in the womb). These highly specialized cells are the only cell type in the body capable of passing parental genes on to their biological children. The study looks at how the genetic information of prenatal germ cells is shielded from harm during the prenatal period, showing that these important cells lack protection during a phase of development, leaving them vulnerable to damage. The research was published in the journal *Cell* on May 21, 2015.

It is known that the genetic information for the next generation is formed in germ cells during the pregnancy of the previous generation. However, very little is known about how prenatal germline cells are made in the body. A biochemical process that is crucial for protecting human genetic information is called methylation. All healthy cells in the human body are methylated. Methylation acts as a protective coat on the genome that safeguards cells from mutations. If cells are not methylated, the genome is vulnerable to damage. Methylation removal, called demethylation, happens very infrequently in the human body. One such time is during a short period of time in prenatal life during pregnancy. This period of germ cell demethylation was the focus of this research, which mapped the amount, duration and location of demethylation in prenatal germ cells from 53 to 137 days of development. The study found that the human germline erases almost all evidence of genome methylation by 113 days of prenatal development. Importantly, while a large amount of demethylation did occur, some areas of the germ cells retained a small amount of methylation.

The research team collected human germ cells and performed whole genome sequencing to conduct the research, and Dr. Pao-Yang Chen’s team was particularly involved the computational analysis of genome wide DNA methylation pattern.

The research shows from this delicate model of demethylation the quality of a person’s germline cells, which are created before they are born, is going to have a huge effect on that person’s ability to have children as an adult, and the removal of methylation from the germline during prenatal life leaves the germline cells vulnerable to damage. The result implies that living in a healthy life environment is extremely important for the development of germ cells during the pregnancy, particularly during the first 3 to 4 months.

"The research shows an excellent collaboration between biomedicine and computational biology. Our team members worked professionally to ensure the purification of germ cells, and to perform high throughput DNA sequencing followed by comprehensive analysis of genome wide DNA methylation patterns," said Dr. Pao-Yang Chen, who received a Ph.D in Statistics and Computational Biology from Oxford University, England. "We maintained a close dialogue with Clark's laboratory to perform statistically sound analysis for the identification of changes of methylation across the time course germ cells. Mr. Wen-Wei Liao in my lab contributed significantly to the profiling of these methylomes". Dr. Chen said there are only a few labs in the world that can conduct both this type of experiments and the computational analysis of DNA methylation – one of which is ours in Taiwan – and we are delighted to collaborate with the top biologists".

"This powerful methylation analysis will no doubt bring even more exciting insights when it extends to the plants and cancer research," he added.

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The complete article entitled "DNA Demethylation Dynamics in the Human Prenatal Germline" can be found at the *Cell* journal website at: http://www.cell.com/cell/abstract/S0092-8674(15)00560-7