

Biological & Biomedical Sciences category

Dr Xue Shifeng

Senior Research Fellow

Institute of Molecular and Cell Biology, A*STAR

“For her research on gene regulation in developmental biology”

Dr Xue is interested in understanding how animals develop from a single cell into complicated organisms of multiple cell and tissue types, focusing on gene expression during cell fate change. While most previous studies focused on transcriptional regulation, Dr Xue’s work has found a new layer of regulation at the translation level conferred by the ribosome. She found that a single ribosomal protein was able to confer specificity to the ribosome, directing the ribosome to specifically translate a subset of mRNAs necessary for patterning the embryo. Her work further identified multiple regulatory elements on mRNAs that allow for such specificity. Together, these findings identify a new important layer of regulation in embryogenesis and transform our understanding of gene expression.

More recently, she has moved on to study human diseases of embryological origins. She found a novel gene that is responsible for arthrogyrosis, a disease affecting the development of joints. She is now focusing on Bosma arhinia microphthalmia syndrome (BAMS), an extremely rare disease where patients are born without a nose. Although described since 1980s, its genetic basis remained unknown. Through exome sequencing, she discovered unique mutations in a single gene as the cause of this phenomenon in all patients studied. She showed that these mutations are gain of function mutations, in contrast to the loss of function mutations in the same gene that are responsible for a more common muscle degeneration disorder, facioscapulohumeral dystrophy (FSHD). As BAMS is an embryological disease with little deleterious effects in adulthood, the gain of function mutations in BAMS may be used to inform drug development approaches in FSHD. Her work has the potential to unlock novel insights in craniofacial development as well as muscle biology.

Dr Xue’s work has published in internationally acclaimed journals such as Nature, Cell and Nature Genetics. She has received multiple local grants and was a recipient of the Harold M. Weintraub Graduate Student Award (2015) and the National Science Scholarship (2005).