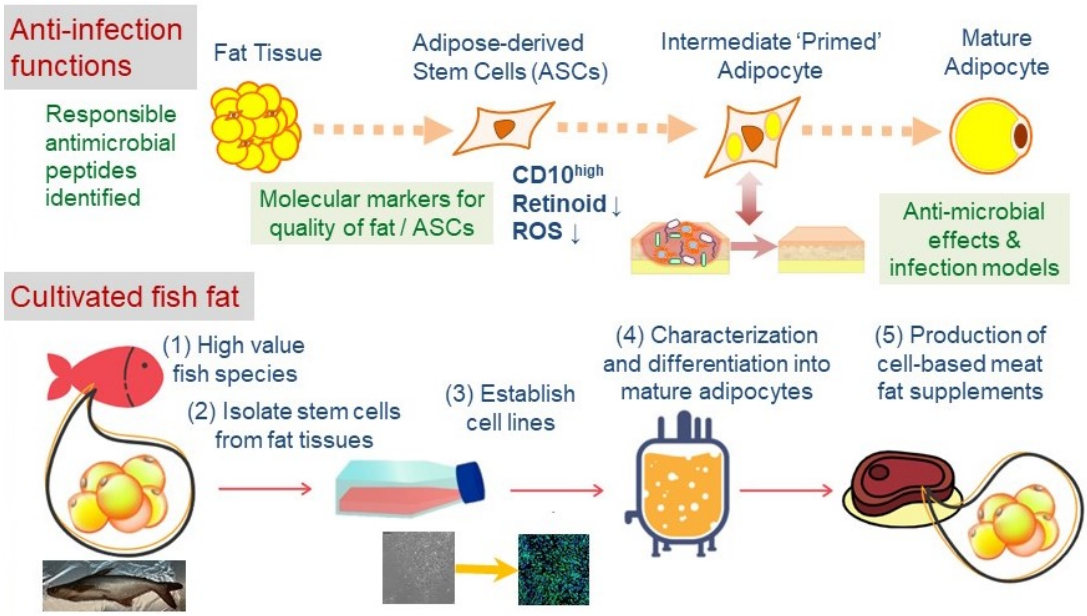
**PI: Shigeki Sugii**

## Research

The Laboratory of Fat Metabolism and Stem Cells is led by Shigeki Sugii and studies molecular basis of adipose-derived cells. Our lab focuses on two novel aspects of adipose cell biology: 1) anti-microbial effects of adipogenic differentiating stem cells, and 2) development of cell-based healthy fat from fish species for alternative meat. We then explore how our molecular and cellular understanding of adipose cells can be applied to therapeutic or commercial products so that they can improve human lives.




## Projects

i) Anti-microbial effects of differentiating adipose-derived stem cells
*[Project leads] Smarajit Chakraborty, Vikashini Ravikumar, Shigeki Sugii*
Adipose-derived stem cells (ASCs) exhibit various biological functions and hold great therapeutic potentials. We have performed comprehensive characterization of human ASCs with whole genome gene expression, secretome, cell surface markers screening and metabolomics, and identified novel factors that regulate stem cell and differentiation capabilities of ASCs. Our current focus is the potent anti-microbial property of ASCs, especially during differentiation into mature adipocytes. We have identified novel anti-microbial peptides that also exhibit anti-biofilm activities and work against bacterial strains resistant to standard antibiotics. The peptides are currently investigated in wound associated infection models (*in vitro*, *ex vivo*, and *in vivo*), which will pave the way for a new therapeutic approach.

ii) Cell-based healthy fat from fish species for alternative meat
*[Project leads] Lamony Jian Ming Chew, Cheryl Yeh Qi Wong, Shigeki Sugii*

Cultured meat production is an emerging field of cellular agriculture. Fat is an important but often neglected component of meat. With support of grants from Singapore Food Story R&D Programme, we have successfully derived adipogenic cell lines from edible fish species. We developed protocols that efficiently culture and differentiate stem cells into mature adipocytes. The best cell lines exhibit doubling time as fast as ~12 hours and near 100% differentiation efficiencies. The resultant fish adipocytes may be enriched in nutritional components such as omega-3 fatty acids. We currently work to establish serum-free and 3D culture system to produce healthy fish cell-based fat that can complement taste, flavour, texture, and nutrition of existing alternative meat.