



**THE CHINESE UNIVERSITY OF HONG KONG
FACULTY OF MEDICINE
SCHOOL OF BIOMEDICAL SCIENCES**

SBS PI Seminar Series 2023-2024

Prof. SO Kam Hei Karl

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will present a seminar entitled

“Understanding neurosensory lineage specification in cranial placode development using single-cell multiome inferred gene regulatory networks”

The inner ear, olfactory epithelium, lens, adenohypophysis, and cranial ganglia are neurosensory lineages in the vertebrate head. Formation of these neurosensory organs requires induction and specification of two cranial ectoderm derivatives: placode and neural crest. For the neural crest, there have been numerous studies on the stepwise progression and transcription regulation by comparison of different vertebrate species. However, the induction and specification of placode remain largely unknown. Using publicly available whole-embryo single-cell multiome data (scRNA-seq, scATAC-seq, and scHi-C) and in-house deep-sequenced scRNA-seq data, we reconstructed the lineage trajectories for induction and specification of cranial placode. I will introduce the pipeline (scTimeX) designed for the temporal study of single-cell multiome data. This pipeline produces high-resolution lineage structures for the identification of rare populations and subtle lineages. Using scTimeX, we have **1)** identified the role of *Grhl2* as a candidate placode induction gene in the transcription regulation of *Six1/4/6* gene family through distal chromatin interactions. We will discuss the genetic loss-of-function and evolutionary evidence related to the role of *Grhl2* for placode induction; **2)** identified *Tbx1* as a gene for specification of posterior placode, which develops into the inner ear, cochleovestibular and cranial ganglia of the VIIth, IXth, and Xth cranial nerves. *Tbx1* mouse mutant demonstrates a reduced gene expression level of posterior placodal signature. Altogether, our single-cell multiome analysis dissects the molecular mechanisms for cranial placode induction and specification in vertebrate head development.

4 January 2024, Thursday, 4:00 pm– 5:00 pm

Room G02, Lo Kwee-Seong Integrated Biomedical Sciences Building,
Area 39, The Chinese University of Hong Kong