



The Chinese University of Hong Kong  
Department of Biomedical Engineering



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Venue: Rm. 513, William M.W. Mong Engineering Building, CUHK

## Epithelial ion channels in health and diseases

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### **Abstract**

The transport of ions (e.g. Na<sup>+</sup>, Ca<sup>2+</sup> and Cl<sup>-</sup>) by ion channels in epithelial cells is essential to epithelial secretion and absorption and therefore electrolytes/fluid/pH homeostasis in the human body. In particular, the epithelial sodium channel (ENaC) is a key player responsible for Na<sup>+</sup>/fluid absorption, and the cystic fibrosis transmembrane conductance regulator (CFTR) for Cl<sup>-</sup>/fluid secretion, in a variety of epithelia throughout the body. Additionally, new roles of these epithelial ion channels are being identified to sense and transduce environmental/extracellular cues into cellular events including dynamics in genes' expression; however, the underlying mechanisms remain elusive. We have discovered a novel role of ENaC in endometrial epithelial cells to transduce signals from the implanting embryo into a series of uterine changes including alterations in microRNAs resulting in upregulation of COX-2/PGE<sub>2</sub>, a key signalling pathway required for embryo implantation. Our studies on CFTR have revealed that by regulating tight-junction associated transcription factor, CFTR actively participates epithelial differentiation and development of male reproductive system. Also, we have demonstrated that CFTR in pancreatic islet beta cells is sensitive to glucose and mediates glucose-induced insulin secretion. Given these identified roles, CFTR and ENaC have been implicated in reproductive, development and metabolic health and diseases. As ENaC and CFTR are also known to be sensitive to mechanical stimuli, which are commonly found in various biological events (e.g. muscle contractions, physical interactions), we are currently exploring whether and how these epithelial ion channels can transduce mechanical signals into cellular responses and whether they can be diagnostic or therapeutic targets for reproductive, metabolic and other diseases.

### **Biography**

Dr Sharon (Ye Chun) Ruan did her PhD study through a research collaborative program between Sun Yat-Sen University (SYSU) and the Chinese University of Hong Kong (CUHK), and received her Ph.D. degree from SYSU in 2009. Afterwards, she went for postdoctoral study at Harvard Medical School (USA) for 4 years. In 2013, she was recruited as a Research Assistant Professor at CUHK. Recently, Dr Ruan has been appointed as Assistant Professor in the Department of Biomedical Engineering (BME) at PolyU starting from February, 2017. Dr Ruan's research has focused on ion channels, a group of membrane proteins, and their related signaling transduction in reproduction/development and associated human diseases. Her work has yielded important findings including identifying the epithelial sodium channel as an essential player in embryo implantation (published in *Nature Medicine*, 2012); and CFTR, another epithelial ion channel, in organ development (*J Cell Sci.*, 2014) and metabolic diseases (*Nature Communications*, 2014). Recently, she has extended the research into new roles of ion channels in bone-associated regenerative medicine and made a major breakthrough for the mechanistic study on Mg<sup>2+</sup>-induced osteogenic effects (*Nature Medicine*, 2016). In addition, for the recent years, Dr Ruan has won a couple of major awards such as "National Science and Technology Award in Women and Children's Health" and successfully obtained funding support from RGC (Hong Kong) and NSFC (China). Joining BME at PolyU, Dr Ruan aims to continue her research on ion channels with a particular interest in developing ion channels into molecular targets for biomedical engineering approaches in the diagnosis/treatment of human diseases.

**\*\*\*ALL ARE WELCOME\*\*\***

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