Id1 Expression and Chromosome Instability in Immortalized Nasopharyngeal Epithelial Cells

George SW Tsao

Department of Anatomy, The University of Hong Kong

Professor George Tsao received his BSc degree from the Chinese University of Hong Kong in Biology and Biochemistry. He received the Shell Scholarhip to United Kingdom to pursue his PhD degree at the Institute of Cancer Research, University of London. Professor Tsao received postdoctoral training at the Dana Farber Cancer Institute, Harvard Medical School, USA. Before joining the University of Hong Kong, he was an Assistant Professor and the Laboratory Director of the Gynecologic Oncology, Brigham and Women's Hospital, Harvard Medical School. Professor Tsao's research interest is on cancer cell biology. Since returning to Hong Kong, he has focused his research interests in elucidating events involved in immortalization and malignant transformation of nasopharyngeal epithelial cells.

Our laboratory has been involved in the study events underlying immortalization and malignant transformation of nasopharyngeal epithelial cells. We have previously reported that Id1 (Inhibitor of Differentiation 1) expression could be induced by the EBV-encoded LMP1 protein. Elevated expression of Id1 is common in human cancer and is associated with tumour progression. The Id1 is a helix-loop-helix protein and has a well-defined role to dimerize with differentiation-specific basic HLH factors to regulate their transcriptional activities. Recently, it has been shown to co-localize and interact with centrosomes at interphase and mitosis suggesting a role in tumour progression through interfering with centrosome homeostasis. We have recently established an immortalized nasopharyngeal epithelial cells by telomerase. Long term expression of Id1 induced aneuploidy and polyploidy in this immortalized nasopharyngeal epithelial cell line. Overexpression of Id1 also induces multiple mitotic defects in multiple cell lines and is characterized by increases in centrosome numbers, multipolar spindles, mono-astral spindles, distorted microtubules. These abnormal phenotypes overlap with the mitotic defects induced by overexpression of Aurora kinase A, a crucial regulator of mitosis. Interestingly, expression of Id1 could induce Aurora A expression and NF-κB activation is involved. Suppression of expression of Id1 or overexpression of Aurora A could rescue centrosome homeostasis and restore microtubule integrity. These observations support a role of Id1 in centrosome homeostasis and microtubule integrity; and contribute to chromosome instability in premalignant cells where Id1 is often overexpressed and facilitate their transformation into malignant cells.