中央研究院生物多樣性研究中心
Biodiversity Research Center, Academia Sinica
biodiv@gate.sinica.edu.tw
02-2789-9621

Evolutionary Genetics and Genomics

Conserved Regulatory Switches for the Transition from Natal Down to Juvenile Feather in Birds

Dr. Chih-Kuan Chen
陳志冠博士

Research Associate
Keck School of Medicine, Dept. of Pathology
University of Southern California

Time: 2024. 06. 18 Tue. 10:30

Venue: Auditorium, 1st Floor
Interdisciplinary Research Building
跨領域科技研究大樓1樓演講廳

Host: Dr. Meiyeh Jade Lu 呂美曄研究技師

中央研究院生物多樣性研究中心
Biodiversity Research Center, Academia Sinica
biodiv@gate.sinica.edu.tw
02-2789-9621

Evolutionary Genetics and Genomics

Abstract

The transition from natal downs for heat conservation to juvenile feathers for simple flight is a remarkable environmental adaptation process in avian evolution. However, the underlying epigenetic mechanism for this primary feather transition is mostly unknown. Here we conducted time-ordered gene co-expression network construction, epigenetic analysis, and functional perturbations in developing feather follicles to elucidate four downy-juvenile feather transition events. We report that extracellular matrix reorganization leads to peripheral pulp formation, which mediates epithelial-mesenchymal interactions for branching morphogenesis. α-SMA (ACTA2) compartmentalizes dermal papilla stem cells for feather renewal cycling. LEF1 works as a key hub of Wnt signaling to build rachis and converts radial downy to bilateral symmetry. Novel usage of scale keratins strengthens feather sheath with SOX14 as the epigenetic regulator. We show that this primary feather transition is largely conserved in chicken (precocial) and zebra finch (altricial) and discuss the possibility that this evolutionary adaptation process started in feathered dinosaurs.