



CDB SEMINAR

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Thursday, December 11, 2014

16:00~17:00 Seminar Room A7F

How birds create diverse feather colors – Avian melanocyte stem cells and regulation of feather pigment patterns

Summary

The diversity of feather pigment patterns has amazed many, but the identity of feather melanocyte stem cell (McSC) and the mechanisms regulating pigment patterns have been unveiled little. We show that McSCs are arranged as a ring around the proximal collar bulge epithelium, continuously sending out progeny distally to paint the differentiating keratinocytes in growing stage. In resting stage, this circular niche descends to the lowest tips of feather follicle ectoderm and McSCs become quiescent. The unique cylindrical plane formed by McSCs and their progeny yields new dimensions of regulatory possibilities that are constrained by the highly localized McSC niche topology in mammalian hair follicles. For pigment switch, all whites observed in feathers are not equal. They are created by several basic cellular mechanisms including McSC removal, suppressed melanocyte emigration or inhibited differentiation. Variation in temporal and spatial employment of these cellular mechanisms helps to create pigment patterns. We also found an unexpected role of feather mesenchymal pulp cells in regulating pigment patterns by inhibiting melanocyte differentiation through patterned expression of agouti signaling protein. Feather pulp mesenchymal cells are also able to respond to physiological changes, such as sexual maturity, to change pigment patterns in regenerating feathers through varying temporal and spatial agouti expression patterns. Hence, the complex feather pigment patterning on the cylindrical epithelial canvas is achieved by multiple-dimensional co-option of basic cellular mechanisms during evolution.

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