Featured Publication Note
Dr. Fauquier and colleagues
National Institute of Medical Research, London, UK

Multipotent progenitor/stem cells in the adult pituitary gland

Tissue specific stem cells have been identified in several adult organs, particularly those with a high cell turnover. The adult anterior pituitary has a low steady-state cell turnover, yet it can adapt the proportion of each of its endocrine cell types to meet changing hormonal demands. There is some limited evidence that multipotent adult progenitor cells contribute to this plasticity. Several minor cell populations in the pituitary are candidates for multipotent adult pituitary stem/progenitor cells, including marginal cells (MCs) which line the pituitary cleft (the adult remnants of the embryonic Rathke's pouch) and folliculostellate (FS) cells. In this study, Dr. Fauquier and colleagues describe a small population (0.03 - 0.05 %) of progenitor cells in the adult pituitary gland that express SOX2, a marker of several early embryogenic progenitor and stem cell types.

Samples were imaged using confocal microscopy. Images were captured in a Z-series with an interslice gap of between 0.2 - 1.0 µM and were rendered in 3D using the interactive, high resolution volume rendering capabilities of Volocity® 3D Image Analysis Software. Using Volocity, the $SOX2^+$ sub-population was shown to form pituispheres in culture which grow and differentiate to all endocrine cell types (figure). Differentiation was associated with the expression of S100 (a marker of MCs and FS cells), and SOX9. SOX9 is expressed by multipotent progenitor cell types with stem cell properties in some areas of the CNS.

Cells expressing SOX2 and E-cadherin (a marker of MCs and FS cells) are found throughout the embryonic Rathke's pouch but also persist in the adult gland. The conclusion to this study was that the $SOX2^+/SOX9^+$ population represents actively dividing progenitors committed toward differentiation, whereas the sub-population of $SOX2^+/SOX9^-$ cells are proposed to be multipotent progenitor/stem cells that persist in the adult pituitary, capable of differentiating into all of the pituitary cell types.

By increasing knowledge of the neuroendocrine system in both normal and pathological models, much of this research can be directly applied to a better understanding and treatment of human diseases such as hypopituitarism.

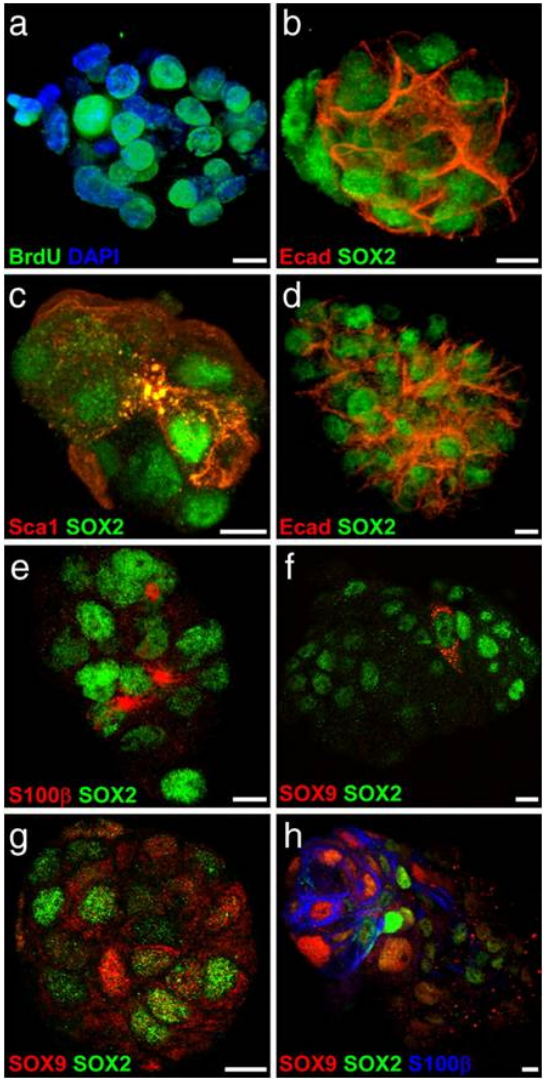

Figure: Pituisphere formation: BrdU labeling showed that pituispheres grow by cell division (a). SOX2, E-cad and Sca-1 (a marker of stem cell and embryogenic progenitors) are highly expressed in 4 day-old pituispheres (b, c). After 7 days, SOX2 and E-cad are still highly expressed, and an FS cell-like population appears as shown by S100β (a marker of MCs and FS cells) staining (d, e). SOX9 expression was detected in the cytoplasm after 7 days (f) and then in the nucleus as expression increased (g). When pituispheres were grown in differentiating conditions, SOX9 became nuclear more quickly (h). Scale bars: 5 µm.

Fauquier T, Rizzoti K, Dattani M, Lovell-Badge R, Robinson I C A F (2008). SOX2-expressing progenitor cells generate all of the major cell types in the adult mouse pituitary gland. PNAS 105 (8): 2907 – 2912.