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Connecting stem cell self renewal and the maintenance of adult sexual identity in the testis stem cell niche

Erika Matunis, Ph.D.

Department of Cell Biology and the Institute for Cellular Engineering, Johns Hopkins University School of Medicine, Baltimore, MD, USA

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山手 3 号館 2 階 共通セミナー室

Stem cells reside in specific local microenvironments, or niches, where signals from nearby cells and substrates promote stem cell maintenance. Spermatogonial stem cells in the testis provide a lifetime supply of sperm, making this organ an excellent model for studying stem cell biology. We focus on the Drosophila testis, as it contains a single morphologically distinct niche that can be probed with sophisticated genetic tools. This niche is comprised of a cluster of quiescent somatic cells called the hub, to which spermatogonial (or germline) and somatic stem cells (called cyst stem cells, or CySCs) adhere. We previously found that genetic ablation of germline stem cells prompts differentiating germ cells (spermatogonia) to enter the niche and revert to functional germline stem cells [1]. Dedifferentiation was subsequently shown to occur in the mouse testis, underscoring its generality [2]. More recently, we found that hub cells can act as a reserve pool of somatic stem cells that are activated upon damage to the niche [3]. Here, we find that the *sexual* identity of adult stem cells must also be maintained. Local Jak-STAT signaling was known to promote somatic cyst stem cell (CySC) renewal through several effectors, including the putative transcription factor Chronologically inappropriate morphogenesis (Chinmo). Unexpectedly, we find that Chinmo also prevents sex transformation of CySCs. Chinmo promotes expression of the canonical male sex determination factor DoublesexM (DsxM) within CySCs and their progeny, and ectopic expression of DsxM in the CySC lineage rescues the *chinmo* sex transformation phenotype, placing Chinmo upstream of DsxM. The Dsx homologue DMRT1 prevents the male-to female conversion of differentiated somatic cells in mammals, but its regulation is not well understood [4, 5]. Our work indicates that sex maintenance occurs in adult somatic stem cells, and that this highly conserved process is governed by novel effectors of niche signals.

References

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連絡先：生殖細胞研究部門　吉田松生（5865）
shosei@nibb.ac.jp