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学位論文の題名	Characterization of Multiciliated Ependymal Cells That Emerge in the Neurogenic Niche of the Aged Zebrafish Brain （老齢ゼブラフィッシュ脳のニューロン新生領域において出現する多繊毛を持つ上衣細胞の同定） The Journal of Comparative Neurology, 524:2982-2992 (2016)
論文審査担当者	主査： 齊藤 貴志 副査： 飛田 秀樹，松川 則之

Abstract

In mammals, ventricular walls of the developing brain are covered with radial glial cells, which generate new neurons in the embryo (Malatesta et al., 2000; Miyata et al., 2001; Noctor et al., 2001). In the postnatal stage, radial glial cells transform into astrocytic neural stem cells and multiciliated ependymal cells (Merkle et al., 2004; Spassky et al., 2005). In the adult mammalian brain, the neurogenic niche is maintained only in two restricted regions, the ventricular-subventricular zone (V-SVZ) of the lateral wall of lateral ventricles and subgranular zone of the hippocampal dentate gyrus (Alvarez-Buylla and Garcia-Verdugo, 2002; Kempermann, 2002; Taupin and Gage, 2002; Kaneko and Sawamoto, 2009). On the other hand, in zebrafish, radial glial cells cover the entire surface of the adult telencephalic ventricle, and maintain a higher neurogenic potential even in the adult stage (Adolf et al., 2006; Grandel et al., 2006; Lam et al., 2009; Ganz et al., 2010; Marz et al., 2010; Kishimoto et al., 2011). Previous study has shown that the neurogenic potential decreases with aging in the telencephalic VZ of zebrafish (Edelmann et al., 2013). However, it has been unknown whether the cell composition of the neurogenic niche changes with aging in fish as reported in mammals.

In the present study, we revealed that multiciliated ependymal cells emerge in the restricted region of telencephalic VZ of the aged zebrafish. Scanning electron microscopy showed that multiciliated cells appear in the dorsal part of ventral telencephalic VZ, where new neurons migrate forming cell aggregates. Live imaging analysis in slice cultures from aged fish indicated that these multiple cilia exhibit coordinated beating and generate constant fluid flow within the ventral telencephalic ventricle. Analysis of the cell composition by transmission electron microscopy revealed that the neurogenic niche in the aged zebrafish contains different types of cells, with similar characters of radial glial cells, ependymal cells and migrating neuroblasts in other spieces. Our study suggest that the transformation capacity of radial glial cells is conserved but its timing is different between fish and mammals.