

Reduction of germ cells yields more zebrafish males

December 4 2014, by Cheryl Chng

Temasek Life Sciences Laboratory, Hokkaido University and Ehime University are pleased to announce that their researchers have discovered that the reduction of gonadal stem cells will yield more male zebrafish. The article reporting this finding has been published online in *Stem Cell Reports* today.

These results indicate that a certain number of these specialized gonadal [stem cells](#) (primordial germ cells or PGCs) is required for ovary formation. Reduced PGC numbers result in more males, as some of the females are forced to change their sex permanently without affecting their fertility, indicating that PGC count plays a regulatory role during sexual differentiation in zebrafish. The findings suggest that a stem cell counting mechanism in the zebrafish gonad is important for determining sexual development, which provides new insight in vertebrate germline biology.

The sex ratio of cultured stocks is an important aspect of aquaculture, as there are distinct differences (e.g. size, colour, maturation, etc.) between the two sexes in several fish species. This discovery may provide potential tools for improved sex control of fishes in farms in the future.

Brief Summary of Research

There are more fish species on Earth than all other vertebrates combined. Fishes are very diverse not only in their external appearance,

but also in the way their sexual development is controlled. Zebrafish are small-bodied ornamental fish that have become an important model for vertebrate biology over the past four decades. Every zebrafish individual starts to develop as an immature female, and future males must undergo a 'gonadal transformation' to produce functional testes. The molecular regulation of this process appears to be complex and poorly understood.

In an article that appears online in *Stem Cell Reports* (Cell Press), researchers from Temasek Life Sciences Laboratory (Singapore) – in collaboration with Japanese scientists from Hokkaido University and Ehime University – reveal that the number of PGCs plays a regulatory role during sexual differentiation in zebrafish. Using different methods and zebrafish lines, they demonstrate that a reduction in the number of PGCs results in more males presumably by forcing some of the females to change their sex permanently without affecting their fertility.

"These data show that a PGC counting mechanism in the gonad determines sexual development, giving rise to the hypothesis of PGC dosage-dependent sex differentiation. This provides a novel perspective to research on [sexual development](#) of fishes and a new insight in vertebrate germline biology" – said Associate Professor Rie Goto at Ehime University.

"Better understanding of this 'gonadal switch' in zebrafish might eventually lead to improved tools for sex control in cultured [fish species](#), especially in 'sex changing' food fishes, such as the groupers or Asian seabass, and improvements in their farm-based culture" – commented Professor László Orbán, Senior Principal Investigator at Temasek Life Sciences Laboratory.

More information: "Early Depletion of Primordial Germ Cells in Zebrafish Promotes Testis Formation." DOI: [dx.doi.org/10.1016/j.stemcr.2014.10.011](https://doi.org/10.1016/j.stemcr.2014.10.011)

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