

PRESS RELEASE



北海道大学
HOKKAIDO UNIVERSITY



Temasek Life Sciences Laboratory (Singapore)
Hokkaido University (Japan)
Ehime University (Japan)

Discovering a new mechanism for sex control in zebrafish:

Reduction of germ cells yields more males

[27 November 2014] 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.

The research article can be accessed via the following web link:

[http://www.cell.com/stem-cell-reports/abstract/S2213-6711\(14\)00333-6](http://www.cell.com/stem-cell-reports/abstract/S2213-6711(14)00333-6)

About Temasek Life Sciences Laboratory (TLL)

TLL, a beneficiary of Temasek Trust, was established in 2002 to undertake cutting-edge research in molecular biology and genetics utilising a broad range of model organisms. It is affiliated with the National University of Singapore and Nanyang Technological University. The research institute aims to create an environment, which can attract the brightest young minds worldwide, support their research and challenge them to be leaders in their own fields. For more information, please visit www.tll.org.sg

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About Hokkaido University

Hokkaido University was founded back in 1876 as Sapporo Agricultural College and is an advanced research institution, with strong links to industry, community and government, today. The Faculty of Fisheries Sciences conducts the research and higher education for the sustainable production and efficient use of marine and aquatic resources. The Nanae Fresh-Water Laboratory belongs to the Field Science Center for Northern Biosphere, one of the research centers of Hokkaido University, and conducts aquaculture-oriented basic biotechnology.

About South Ehime Fisheries Research Center (SEFREC) in Ehime University

South Ehime Fisheries Research Center (SEFRC) was founded in 2008 as an advanced research center of Ehime University to promote fisheries research and cooperation with local communities. This Center is located in Ainan Town in the southern part of Ehime Prefecture, one of the largest fisheries and aquaculture districts in Japan. The Center has three major research areas: Life Sciences, Environmental Sciences, and Sociology. For more information, please visit <http://nansuiken.jimdo.com>.

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