CDB SEMINAR

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16:00~17:00 Auditorium C1F

Gene and genome duplications, and vertebrate evolution

Summary

Gene and genome duplications are thought to be important events related to the appearance of new biological functions and genomic architectures. In this talk, I focus on both expansion and extensive loss of duplicated genes in vertebrate evolution. First, I introduce our latest finding of rapid genome evolution after whole genome duplication (WGD) in teleost fishes (Inoue et al. 2015). Duplicate gene evolution after WGD has been modelled within a same framework for single gene duplications. However, we found that loss of duplicate genes after WGD has proceeded rapidly mainly through simultaneous loss of multiple genes, resulting in an appearance of novel genome arrangement in relatively short periods of time. Our comparative phylogenomic pipeline for reliable estimations of orthology/paralogy of tetrapod and teleost genes showed that the rapid and extensive loss of genes have occurred before diversification of basal teleost lineages, and thus reflected to similar genome arrangements shared among teleosts. WGD may have contributed to generation of new genomic architectures, not only the production of new genes. Second, I focus on possible phenotypic changes by duplicate gene expansion without sequence evolution occurred in olfactory signal-transduction pathway of stickleback. In silico simulation of dosage effect by multiple phosphodiesterase genes found from our comparative genome analysis implied their contribution to behavioral evolution of stickleback related to their nest and territory building (Sato et al. 2009). I would like to discuss on possible experimental verification of this implication.

Jun Inoue, Yukuto Sato, Robert Sinclair, Katsumi Tsukamoto, and Mutsumi Nishida. 2015. Rapid genome reshaping by multiple-gene loss after whole-genome duplication in teleost fish suggested by mathematical modeling. PNAS, in press.

Yukuto Sato, Yasuyuki Hashiguchi, and Mutsumi Nishida. 2009. Evolution of multiple phosphodiesterase isoforms in stickleback involved in cAMP signal transduction pathway. BMC Syst Biol, 3: 23.

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