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Single point mutation of a gene creates mirror-image animals in fresh water gastropod

Body handedness of gastropod *Lymnaea stagnalis* is determined by a single gene locus that functions maternally. We have previously shown that the gene dictates the cytoskeletal dynamics at the third cleavage (from the fourth to the eight-cell stage), and only the embryos of dominant chirality exhibit SD (spiral deformation) and SI (spindle inclination) at this stage. Further, we could create fertile snails of mirror-image body plan by altering the chirality of blastomeres through mechanical manipulation at this stage. In this talk, the identification of the handedness-determining gene will be discussed. Using pure dextral (DD) and sinistral (dd) strains as well as its F2 through to F10 backcrossed lines, the single handedness-determining-gene locus was mapped by genetic linkage analysis, BAC cloning and chromosome walking. We have identified the actin related diaphanous gene *Lsdia1* as the candidate. There are tandemly-repeated highly-homologus genes, *Lsdia1* and Lsdia2. Although the cDNA and derived amino acid sequences of the genes are very similar, we could discriminate the two genes/proteins in our molecular biology experiments. The *Lsdia1* gene of the sinistral strain carries a single point mutation which causes a frameshift mutation abrogating full-length *LsDia1* protein expression. In the dextral strain, it is already translated prior to oviposition. Expression of *Lsdia1* (only in the dextral strain) and Lsdia2 (in both chirality) decreases after the 1-cell stage, with no asymmetric localization throughout.

Biography

Reiko Kuroda obtained her PhD in Chemistry from the University of Tokyo, and carried out her Post-doctoral studies at King's College London. Her research focuses on chirality, both in the field of Chemistry and Biology: chirality recognition, transfer and amplification in the solid state, development of chiroptical spectroscophotometers to enable condensed-phase measurements, and the molecular basis of snail body handedness. She has published 328 peer-reviewed papers.

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