

Webinar

Local tissue mechanics ensures a left-right symmetric tissue size during development

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Vertebrates are characterized by a left-right symmetric muscle and skeletal system that emerges from bilateral somites during embryonic development. Left-right symmetry is vital for adult mechanical movements and a loss of symmetry is associated with debilitating skeletal disorders such as scoliosis. Symmetry is often assumed to be a default state in somite formation, however, it remains unknown how robust somite shapes and sizes at the same position along the body axis emerge on the left and right sides of the embryo. By imaging left-right somite formation in zebrafish embryos using light-sheet microscopy and by developing automated image analysis tools, we reveal that initial somite anteroposterior lengths and positions are imprecise and consequently many somite pairs form left-right asymmetrically in contrast to the textbook view. Strikingly, these imprecisions are not left unchecked and we discover a tissue surface tension-based error correction process that adjusts shapes and ensures precision and symmetry of somites in developing embryos.

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