Seminar/Talk

A Left-Right differential cell migration drives heart looping in vertebrates

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The establishment of a left-right asymmetric pathway is a central event during embryo development for proper positioning, morphogenesis and function of internal organs. In vertebrates, activation of Nodal-Pitx2 axis specifically within the left lateral plate mesoderm confers left identity during organ positioning and differentiation. The epithelial-mesenchymal transition (EMT) inducer Snail1 represses Pitx2 on the right. Whether in addition to the repression of the left cascade an informative right-derived information operates in the embryo has remained elusive. Here we show that in zebrafish, BMP signaling activates another EMT inducer, Prrx1a, preferentially on the right that promote differential L/R cell movements and heart looping through an actomyosin-dependent mechanism. Downregulation of Prrx1a prevents heart looping leading to mesocardia, one of the most severe congenital heart defects. This indicates that a right-handed informative cascade also exists in vertebrates and therefore, that two parallel and mutually repressed left and right pathways, respectively driven by Nodal and BMP integrate left and right information to govern the morphogenesis and positioning of the heart. This mechanism is conserved in the chicken embryo, and in the mouse SNAIL1 acts in a similar manner to Prrx1a in zebrafish and PRRX1 in the chick. Thus, a differential L/R EMT produces asymmetric cell movements and forces, more prominent from the right, that drive heart laterality in vertebrates.

Monday, November 13, 2017 11:00am - 12:00pm
Meeting room 2nd floor / Bertalanffy Bldg. (I04.2OG - LAB)

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