UNIVERSITY OF DELAWARE

CENTER FOR BIOINFORMATICS & COMPUTATIONAL BIOLOGY

BIOINFORMATICS SEMINAR

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SYSTEMS BIOLOGY REVEALS MECHANISM OF BMP SIGNALING GRADIENT FORMATION

A morphogen gradient of Bone Morphogenetic Protein (BMP) signaling patterns the dorsoventral (DV) embryonic axis of vertebrates and invertebrates during early embryonic stages. Though the regulation of the BMP gradient across space and time is fundamental to proper tissue patterning, the gradient shape and the molecular mechanisms regulating it were largely unknown. We report on the differential roles of BMP antagonists and two metalloproteases that modulate BMP activity in shaping the gradient in the zebrafish. To address their functions, we examined a direct readout of BMP signaling, nuclear phosphorylated Smad1/5 using a quantitative immunofluorescence assay. We combined experimental studies with multiple iterative mathematical modeling and computational screens, which surprisingly dispelled the decades-long-held counter-gradient model and instead revealed a source-sink paradigm for BMP gradient formation.

BIOGRAPHY

Dr. Mary Mullins is a Professor and Vice Chair of the department of Cell and Developmental Biology at the University of Pennsylvania Perelman School of Medicine. She graduated summa cum laude from the University of Wisconsin, Madison with a B.S. in Biochemistry and earned her PhD in Biochemistry from the University of California, Berkeley. She spent her postdoctoral years in Germany at the Max Planck Institute in Tübingen, Germany, under the advisory of 1995 Nobel Prize awardee Dr. Christiane Nüsslein-Volhard. She began her independent career at the University of Pennsylvania thereafter. Her lab is studying the molecular mechanisms by which a BMP (Bone Morphogenetic Protein) signal transduction pathway establishes different aspects of the vertebrate body plan and the role of maternal factors in oocyte polarity and embryonic development.

http://www.med.upenn.edu/mullinslab/

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