Ca^{2+} signalling and early embryonic patterning during zebrafish development

Sarah E. Webb and Andrew L. Miller, Department of Biology, HKUST, Clear Water Bay, Hong Kong.

It has been proposed that Ca^{2+} signaling, in the form of pulses, waves and steady gradients may play a crucial role in key pattern forming events during early vertebrate development. With reference to the embryo of the zebrafish (*Danio rerio*), Ca^{2+} transients have been reported from the cleavage to segmentation periods. This time-window includes most of the major pattern forming events of early development, which transform a single cell zygote in to a complex multicellular embryo with established primary germ layers and body axes. Data support the proposition that Ca^{2+} transients are an essential feature of embryonic cytokinesis, and that propagating waves (both long and short range) of Ca^{2+} release, followed by sequestration, may play a crucial role in: (1) the establishment of the embryonic periderm; (2) the coordination of cell movements during epiboly, convergence and extension; (3) contribute to the establishment of the basic embryonic axes and germ layers; and (4) help to define the morphological boundaries of specific tissue domains and embryonic structures, including future organ anlagen. The potential down-stream targets of these Ca^{2+} transients might integrate with other known pattern forming signalling pathways known to modulate early developmental events.

Work supported by Hong Kong RGC grants: HKUST 6279/03M and 6241/04M.