HOW IS TIME CONTROLLED DURING VERTEBRATE EMBRYO SKELETAL DEVELOPMENT?

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Segmentation is the process by which the vertebrate antero-posterior embryonic axis becomes progressively subdivided into metameric structures, the somites. Somites arise in a highly coordinated way both in space and time and, latter on, give rise to the adult axial skeleton, skeletal muscles and dermis of the back. Ten years ago, the first molecular evidence for the existence of an intrinsic cellular molecular clock coupled to somite formation was provided, giving biological support to a theoretical prediction made 25 years before[1]. It is now known that a molecular clock operates in all vertebrate groups studied and an increasing number of genes belonging to the FGF, Notch and Wnt signalling pathways were found to have cyclic expression in the presomitic cells[2]. Moreover, we have recently evidenced that a similar molecular clock is also operating during proximal-distal limb outgrowth, with a specific time period that can be correlated with the time required to form an autopod skeletal element[3]. Since time control is essential to coordinate cells during all developmental processes, our work raises the exciting possibility that temporal control exerted by cyclic gene expression can be operating in many embryonic tissues, with tissue-specific time periods, controlling the formation of various morphological units.

References:
1 - Palmeirim *et al.*, 1997 Cell *91*, 639-648)
2 - Andrade *et al.*, 2007 Birth Defects Res C Embryo Today, Jun 28; *81(2):*65-83.
3 - Pascoal *et al.*, 2007 J. Mol. Biol., Apr 27; 368(2):303-9)