

Hox Proteins and the Evolution of Vertebrates

Project: Develop an Expression System for Protein Structure Determination

Background:

Hox genes encode a family of transcription factors, which play a conserved role in the anterior-posterior (A/P) body axis formation. They have been linked to the development of morphological characters (e.g. development of wings in insects, fins in fish and vertebrae and ribs in vertebrates), but how the evolution of these characteristics was mediated by the evolution of *Hox* genes is still unclear. In the last years scenarios have been proposed, which suggest that changes in the regulation of *Hox* genes or evolution of their target genes is responsible for the evolution of morphological characters. Only recently evidence was found that also changes in the function of *Hox* proteins lead to morphological changes. In our lab we showed that *Hoxa-11* is involved in the origin of mammalian features like the uterus and the endometrium. This project is about the role of *Hox* protein function in the origin of mammalian uterus development and function.

Goals:

In this project we want to determine the three dimensional protein structure by means of NMR (Nuclear Magnetic Resonance). The goal is not just to show how functional domains and protein-protein interaction sites are organized but how the overall architecture changed during the course of evolution.

Specific Aim:

The first step of the project consists of making constructs, that encode for HIS tagged *HoxA-11* protein, and optimizing the expression conditions. This project is ideal for skilled undergraduates as it offers a range of well-defined research opportunities for undergraduates interested in molecular biology and evolution.

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