

**EVOLUTIONARY AND DEVELOPMENTAL SURVEY OF
GENES INVOLVED IN CHORDATE PIGMENTATION**

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Sponsoring Establishment:

STAZIONE ZOOLOGICA ANTON DOHRN

NAPOLI, ITALY

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**EVOLUTIONARY AND DEVELOPMENTAL SURVEY OF
GENES INVOLVED IN CHORDATE PIGMENTATION**

A thesis submitted to the Open University of London for the degree

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DOCTOR OF PHILOSOPHY

By

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DEDICATION AND ACKNOWLEDGEMENTS

This thesis is dedicated to my father, my mother and Miriana: they are simply the most important people of my life.

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ABSTRACT

The pigmentation represents one of the most interesting topics in animal life because it is a decisive factor for the evolutionary success and the conquest of new ecological niches. Through the combination of developmental biology and comparative genomics, some aspects of pigmentary dynamics have been studied.

Given Rabs regulate a plethora of trafficking steps, the members belonging to this family are central to the transport of molecules involved in pigmentation. Moreover, comprehending the evolution of Rab family is relevant to understand the establishment of eukaryotic cellular organization and for its implication in many human pathologies. For the first time, I reconstructed the evolutionary scenario of Rab family in eleven species of metazoans, spanning from cnidarians to human. Phylogeny, intron code and synteny conservation prompted me to depict Rab evolution, with a special focus on chordates that exhibit a highly dynamic evolutionary pattern.

I clarified the evolution of Rab32/38 subfamily, fundamental in regulation of trafficking related to melanogenesis. It has been clarified the evolutionary history of Rab32/38 genes in deuterostomes and the expression pattern in key species as zebrafish and amphioxus, demonstrating how events as whole-genome duplications have influenced their role during embryogenesis.

In order to find new genes involved in pigmentation, I analyzed a Kelch-like member in ascidian *Ciona robusta* (*Cr-Klhl21*). My results point at this gene as a marker of pigmented cells, with a dynamic expression profile during embryogenesis: from middle tailbud stage, it is expressed specifically in the otolith. Moreover, *Cr-Klhl21* shows an intricate regulatory scenario with the possible intervention of a

transcription factors combination (*Cr-Mitf*, *Cr-msxb*, *Cr-Dmrt*). This work contains first data about a Kelch-like member in ascidians, providing new insights in pigmentation or pigment cell specification. This encourages further analyses on its gene regulatory network and possible function.