Priscila de Souza Rothier Duarte
Kavanagh Lab, University of Massachusetts Dartmouth

Morphological evolution of the autopodium in Squamata: are geckos an exception of phalanges development bias or the rule for ecological constraints?

Visit narrative

Phalangeal size evolution in tetrapods consists in predictable relative proportions given to a deeply conserved modular development (Kavanagh et al., 2013). Geckos, however, exhibit a great diversity in phalanges proportions that may be associated with a characteristic and peculiar locomotor trait. My internship proposal had two main goals: 1) analyze the unusual morphology of geckos' phalanges testing the developmental model hypothesis of predictable proportions; 2) modify and test protocols of developing autopod cultures used for chicks' embryos so that they can be applied to lizards.

Previously to my internship I have provided phalangeal data using x-rays of gecko specimens from Brazilian collections. This dataset was even improved during the internship with more species from the Museum of Comparative Zoology at Harvard University. I measured and analyzed phalanges proportions of 24 species and noticed that most geckos follow the morphological rule of predicted proportions, excepting for *Hemidactylus* genus. This genus exhibits a reduced intermediated phalange (Russell, 1977) that is morphologically unusual for modular development. After the internship we will investigate developmental patterns associated to this morphological divergence by performing autopod explant culture experiments using a Brazilian specie (*H. mabouia*). However, there are no available descriptions of autopod explant culture method using lizards. In order to supply this information we modified chick protocol of limb culture and applied it to bearded dragon (*Pogona vitticeps*) embryos (we chose this specie due its large egg clutch and availability in American herpetological pet stores).

Bearded dragons limb cultures were successfully administrated - 75% cultivated autopods grew and survived at least until the fifth day of culture without media change. Although limb growth was evident, some autopods acquired a deformed shape after few days in culture and cartilage differentiation could not be clearly observed. To obtain the expected growth patterns in future experiments it would may be ideal replace the media with fresh pre-warmed culture media every day and add into it higher concentrations of Transforming Growth Factor Beta (TGF-β).

This method of lizard autopod culture can now be experimented using *Hemidactylus mabouia* embryos.

EDEN's internship was a great opportunity for me to strengthen my scientific education in the field of Evo-Devo-Eco. This experience provided me the theoretical and methodological bases necessary for consolidating a Masters project and contributed for a more mature perspective of the scientific process when I attend grad school. My training as an undergrad at Dr. Kavanagh's lab also strengthened the scientific collaboration between her research group and Dr. Kohlsdorf's lab (home lab at University of Sao Paulo, Brazil) and significantly contributed for my education as a researcher working on Integrative Biology.

Kavanagh, K. D.; Shoval, O.; Winslow, B. B.; Alon, U.; Leary, B. P.; Kan, A.; Tabin, C. J. (2013). Developmental bias in the evolution of phalanges. PNAS Early Edition. 1-6.

Russell, A. P. (1977). The phalangeal formula of *Hemidactylus* Oken, 1817 (Reptilia, Gekkonidae): a correction and a function explanation. Zentralblatt fur Veterinarmedizin Reihe C-Journal of Veterinary Medicine Series C- Anatomia Histologia Embryologia. 6: 332-338.