EVOLUZIONE 2017

# *7° Congresso della Società Italiana di Biologia Evoluzionistica*

# Abstracts book

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**Molecular evolution of light-dependent DNA repair mechanism in the cavefish *Phreatichthys andruzzii***

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DNA damage arising from endogenous and exogenous sources constantly threaten genomes integrity. To avoid fixation of detrimental mutations in genomes, DNA needs to be repaired. DNA integrity is provided by multiple repair pathways evolved to correct specific types of errors and lesions. The crucial role of these mechanisms in sustaining life is supported by their presence in all living organisms, their redundancy and their extreme phylogenetic conservation. Regressive evolution predicts that evolutionary events may trigger the loss of a specific function. For example, the loss of UV photoprotection in eutherian mammals would be related to the occupation of a prevalently nocturnal niche by the ancestors of this group during the Mesozoic era. Besides mammals and other few exceptions, a wide spectrum of organisms are UV-protected by photolyases, light-dependent enzymes that directly reverse UVB-induced pyrimidine dimers. Here we test the hypothesis that the isolation in perpetual darkness for several million years led to the loss of UV photoprotection in the Somalian cavefish *Phreatichthys andruzzii*, similarly to what has been observed in placental mammals. The results of experiments based on biochemical and biomolecular assays showed that *P. andruzzii* lacks direct photoreactivation. As for the genes coding photolyases proteins, 6-4 and dash photolyases are prematurely truncated, and thus lack nuclear localization and DNA-repair activity. Conversely, cpd photolyase gene is full- length and therefore the protein is translocated into the nucleus, but its photorepair activity measured by in vitro experiments is not efficient in cavefish. By means of interspecific analysis of molecular evolution and structure prediction, we infer the evolutionary pattern of 6-4, dash and cpd photolyases genes involved in direct DNA photoprotection, testing the hypothesis that natural selection is no longer actively maintaining the photoreactivation pathway in this cave-dwelling organism.