Genomic analysis suggests that moderate IGF signaling can be involved in the longevity of giant tortoises

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Giant tortoises constitute one of the longest-lived vertebrate animals, whose longevity, according to some estimates, can exceed 100 years. Multiple works have used comparative genomic analyses with the genomes of long-lived mammals to shed light on the signaling and metabolic networks that might play a role in regulating age-related conditions. Here, we describe a global analysis of the genomes of Lonesome George –the iconic last member of Chelonoidis abingdonii- and the Aldabra giant tortoise (Aldabrachelys gigantea). Unsupervised and supervised comparative analysis of these genomic sequences led us to add new genetic information on the evolution of turtles, and to detect lineage-specific variants affecting DNA repair genes, inflammatory mediators and genes related to cancer development. Our study has also provided novel candidate genes that might underlie the extraordinary lifespan of giant tortoises, and has expanded our understanding of the genomic determinants of ageing. In this context, we have annotated a specific variant in IGF1R, which is expected to affect the interaction between this receptor and the IGF1/2 growth factors. The IGF signaling pathway has been associated with longevity in different species, which suggests that this unique change in IGF1R may constitute an attractive candidate to study the cellular mechanisms underlying the exceptional lifespan of these animals. Previously published in: Quesada V et al. (2019). Nat Ecol Evol 3(1):87-95.