Amphibian Immune Genes: Molecular Characterization and Functional Implication of Interferon and Interleukin-17 Gene Families

Abstract

Amphibians, pivotal in the evolutionary tree of vertebrates, offer unique insights into immune system evolution. While significant research has explored the roles of interferons (IFNs) and interleukin-17(IL-17) gene families in mammals and other amniotes, investigations into these immune genes in amphibians have been conspicuously limited. IFNs and IL-17s play crucial roles in orchestrating immune responses against infections and hold promise for antimicrobial therapeutics. Through bioinformatics and genomics, we shed light on IL-17 cytokines and receptors while providing updated insights into the functions and molecular complexity of IFNs in amphibians. Notably, our analysis of IFN genes in amphibians has revealed the coexistence of intron-containing and intron less IFN genes in some amphibian species, and cross-species diversity of the IFN gene composition to remark the key position of amphibians in molecular evolution of IFN genes as previously unveiled. Additionally, we uncovered various IL-17 gene variants within amphibians, including IL-17A-like, IL-17B-like, IL-17C, IL-17D, and IL-17F-like variants. These revelations significantly enhance our understanding of the genetic diversity in amphibians and offer essential insights into the molecular evolution and functional comparison of these key cytokine molecules in immune responses. Amphibians, characterized by their unique immune features and shared homology with amniotes in critical domains, have emerged as a promising frontier for the exploration of immune evolution. This research serves as a foundational step, paving the way for future investigations into the mechanisms governing immune regulation within this taxonomic group. By unraveling the molecular characteristics of IL-17 genes and receptors in amphibians, along with previous characterization of IFN complex during bacterial and viral infections, we make a substantial contribution to the broader understanding of vertebrate immunity, shedding light on its understudied evolutionary intricacies. Keywords: Amphibians, Antimicrobial immunity, Inflammation, Interferons, Interleukin-17