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A brief study about DNA polymerase

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DESCRIPTION

Ribonucleases (RNases) are key players of the host immunity and contribute to maintaining tissue homeostasis and body fluid sterility. Secreted upon a diversity of cellular injuries, they mediate signaling processes, and have been classified as alarmins. Recent literature reveals how the immune response system uses common strategies to fight both cancer and infection. RNases participate in immune system adaptation to cellular stress conditions. They can shape the metabolism of cellular RNA, specifically target the non-coding RNA population, or even induce signal transduction in a catalytically independent manner. This Research Topic gathers some of the latest research on two secretory RNase families, RNase A and RNase T2, which participate in the host immune response and share similar mechanisms of action.

The RNaseA family takes its name from bovine pancreatic RNaseA, one of the first and best enzymes characterized in the early 20th century. It is vertebrate-specific and includes eight functional members in humans. In turn, the RNaseT2 family is broadly distributed across all kingdoms and has a unique member in humans. Nonetheless, we find huge similarities in their catalytic mechanisms and biological properties. Interestingly, both proteins have catalytically dependent and independent immune-regulatory activities. In this issue, we include reviews and original research articles that focus on the immune defense role of the RNases in infection and cancer.

Within the RNase A family, we find several members with antimicrobial properties. Here, Boix et al.

identified the human canonical members that mediate the eradication of macrophage infection. Interestingly, the removal of intracellular dwelling bacteria is not dependent on the protein catalytic activity and is mediated by autophagy induction. The authors also observed how bacterial infection modulates the expression of endogenous RNases 3 and 6, suggesting a physiological role. In turn, the review by Spencer and co-workers highlights the enhanced expression of both RNases in urinary tract infection. The RNases participate together with other antimicrobial peptides in the bacterial clearance at the uroepithelial barrier. The authors propose a task specialization whereby RNases 3 and 6 are released by activated infiltrating eosinophils and macrophages, respectively, and two additional RNases, RNases 4 and 7, are constitutively produced by epithelial cells to reinforce the kidney and bladder protection. In addition, RNase7 is abundantly released by keratinocytes and can protect the skin from pathogens. Harder et al. explore the role of skin RNase7 during infection, with special attention to its immunomodulatory activities. The review includes the outlook of their very recent work, showing how RNase7 senses the host self-DNA as a skin damage signal and the subsequent activation of the cell antiviral response.

On the other hand, secretory RNases are also protecting our tissues against other cell injuries, such as cell cycle dysregulation in tumorigenesis. Indeed, RNases have long been known to be involved in the control of cancer growth. Several members of the RNase A family have been reported to carry out oncosuppressive activity and have been proposed for antitumor therapy Within this context, the review by Gotte and Menegazzi explores the potential of RNase A members to act as antitumor drugs. Secreted RNases can be cytotoxic when entering the cell. Fortunately, the vertebrate cell cytosol has a major protective shield against RNases, the proteinaceous ribonucleolytic inhibitor (RI). One way to evade RI is the intrinsic ability of RNases to oligomerize and form homo- and even heterodimers. The activities of RNase natural and artificial oligomers are analyzed in light of the development of RNase-based therapeutic applications.