

Recent advances in understanding of the innate and adaptive immune responses have shown that these two systems are intricately intertwined. Finally, leveraging advanced technologies like single-cell multiomics and CRISPR-based gene editing can dissect the complexities of immune interactions and identify novel therapeutic targets. Although imperfect, it is a system that provides a remarkable degree of flexibility and responsiveness, providing the best possible defense against a changing world. We then show the crosstalk between innate and adaptive immunity, which focus on the participation of innate immunity in adaptive immunity, the cytokine signaling, and the maintenance of immune homeostasis. Targeting innate immune pathways and enhancing adaptive immune responses are crucial in immunomodulatory drug development, and innovative vaccine strategies leverage these interactions for better efficacy. Furthermore, it is important to investigate the potential of immunomodulatory agents to enhance the efficacy of existing treatments and overcome resistance mechanisms, especially in the context of the TME and chronic infections. Understanding the interaction between innate and adaptive immunity is vital.