

# Preface

Streptococcal superantigens are a fascinating group of proteins that have evolved to modulate and thence evade host immune system. These molecules are exceptional in a way that they can stimulate adaptive immune response (activation of T-cells) in addition to the innate immune response. As a result, superantigens have ability to stimulate a large number of immune cells and cause release of inflammatory cytokines and chemokines that can baffle the host. These inflammatory markers, if unchecked, could lead to serious health issues and even death.

It is interesting to note that these set of molecules can trigger massive T-cell proliferation like a mitogen, but its MHC class II dependency remains a pre-requisite. Unlike the conventional antigens, superantigens (SAg) do not require pre-processing and display onto Antigen presenting cells (APC). They form MHC class-II/SAg/TCR complex by binding to the Variable  $\beta$  ( $V\beta$ ) subunit of T-cells and thus lead to non-specific proliferation of sub set of T-cells. Furthermore, it is seen that SAgS bring different sub-types of cells closer, thus compelling them to exchange signals that lead to biochemical changes and thus triggering inflammatory cytokines release. But, it must be kept in mind that even if every superantigen has similar structure and function, they vary significantly based on host genetics and environmental factors. Studying one does not mean studying them all. The fact that *Streptococcus pyogenes* has eleven different kinds of superantigens suggests the non-redundancy in functioning of these proteins.

There have been many studies done about superantigens, thus pointing to the fact that this is indeed an advancing field that still lures a lot of scientists all over the world. Sophisticated techniques and bioinformatics have also deciphered new aspects to the study and have aided in understanding the role of these small yet potent molecules in pathogenesis of *S. pyogenes*. These new findings have paved new ways for in-depth studies in mechanisms and functionality of these proteins.

This book starts with a basic knowledge about *S. pyogenes* as a pathogen. It elucidates briefly about the array of virulence factors possessed by *S. pyogenes*. These help in evading host immune responses such as by the activation of non-specific T-cell subpopulations, cleaving of IgG, degradation of chemokines and inactivation of complement system. It also releases DNases to chop down

neutrophil entrapments (NETs) and proteases for cleaving antimicrobial peptides and proteins. Out of all the virulence factors, this book mainly targets superantigens and explains how they are different from conventional antigens. It is interesting to see that despite having differences in amino acids, these proteins form similar structure to carry out their functions. Moreover, this book also elaborates those diseases in which superantigens are actively involved. In addition, useful aspects of superantigens and different therapeutic interventions to eradicate superantigens induced diseases have also been discussed. Overall, this book is an attempt to provide ample knowledge and better understanding about *S. pyogenes* and their superantigens for readers. To develop easy understanding, many illustrative figures have also been used to explain the text.

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Babbar, A.

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