

Deciphering Molecular Mimicry Between Spermatozoa and Bacteria: A Potential Trigger for Immune-Mediated Infertility



VIJAY PRABHA and DEEPAI THAPER

Department of Microbiology, Panjab University, Chandigarh, India

Infertility, affecting approximately 48.5 million couples worldwide, is a multifaceted reproductive health challenge with profound physiological and psychological ramifications. While genetic, hormonal, structural, and environmental etiologies are well-documented, immune-mediated infertility has emerged as a pivotal area of research. Among these, antisperm antibodies (ASAs) have been extensively studied for their detrimental impact on sperm function; however, their occurrence in prepubertal children raises compelling questions regarding their origin. Emerging evidence suggests that prior microbial infections may trigger ASA production through molecular mimicry, a mechanism wherein bacterial antigens structurally resemble sperm proteins, eliciting an immune response that compromises fertility. To explore this phenomenon, the present study investigated bacterial receptors that mimic sperm receptors in response to a common Sperm Immobilization Factor (SIF). SIF, isolated from a clinical strain of *Staphylococcus aureus*, exhibited 100% sperm immobilization. SIF exposure led to sperm motility and viability loss, morphological abnormalities, and infertility in female BALB/c mice. Notably, FITC-labeled SIF demonstrated binding not only to mouse spermatozoa but also to various motile and non-motile bacteria, supporting the presence of shared SIF-binding receptors (SBRs) and thereby, reinforcing the hypothesis of molecular mimicry. Purified SBRs from mouse spermatozoa (MS-SBR), *Escherichia coli* (E-SBR), and *Streptococcus pyogenes* (S-SBR) were found to ameliorate SIF-induced sperm impairment in-vitro and infertility in-vivo, confirming their protective role. Further, polyclonal antibodies raised against MS-SBR exhibited cross-reactivity with bacterial proteins, providing definitive evidence of antigenic overlap between bacteria and spermatozoa. Collectively, these findings substantiate the role of molecular mimicry in immune infertility, highlighting its potential implications in the pathogenesis of ASA-mediated reproductive dysfunction.

Biography:

She is former Professor in Department of Microbiology, Panjab University, Chandigarh, India. She has 32 years of teaching and 42 years of research experience. Her area of expertise is "Role of microorganisms in male and female infertility, exploitation of microbial factors as male and female contraceptive agents, molecular mimicry between bacteria and spermatozoa, understanding bacteria sperm interaction at the receptor ligand level to develop immunocontraceptives, Protein profiling in unlocking the basis of microorganisms' associated infertility". She has 107 publications in reputed journals. She has also presented her work in various national and international conferences as an invited and keynote speaker.