

Susu M Zughaier, MSc, PhD



Biography: Currently Acting Professor of Microbiology and Immunology and the Chair of Infectious Diseases Research Network at Qatar University College of Medicine. Trained as a clinical microbiologist at University College London (1990) and MSc & PhD at Cardiff University (1994-1999), Postdoc at Harvard (2000) and faculty appointment at Emory University till 2017. My laboratory integrates molecular immunology, nanotechnology, and artificial intelligence to dissect host-pathogen interactions, elucidate vitamin-D-mediated modulation of innate immunity, and advance rapid diagnostics and precision nanovaccines targeting antibiotic-resistant *Neisseria gonorrhea* bacteria. These efforts have yielded 120 peer-reviewed publications (H-index 39), four patents, and placement among the world's top 2% most-cited scientists. Additionally, I serve as an associate editor, editorial-board member, grant reviewer, and mentor.

Research Statement:

- **Innate Immunity:** My research on leukocytes (macrophage/ monocyte and dendritic cells) places it at the heart of translational immunology. Our seminal research defined how *Neisseria meningitidis* LPS engages TLR4 to drive cytokine release, uncovered dual TLR2/4 sensing of meningococcal capsular polysaccharide, and revealed that the host-defense peptide LL-37 attenuates this activation. These findings advanced understanding of macrophage pattern recognition and vaccine design. We next linked nutrition to innate immunity by showing vitamin D down-regulates hepcidin and frees ferroportin, thereby reprogramming macrophage iron handling and restricting intracellular pathogens, which is a paradigm now cited across anemia-of-inflammation. More recently, we demonstrated that soluble uric acid enhances autophagy flux and curbs inflammasome activation in infected macrophages, illuminating metabolic checkpoints that temper leukocyte inflammation.
- **Nanovaccines:** Through collaborative research I utilized my expertise in host-pathogen interactions to develop microneedle nanovaccines that optimize antigen delivery, presentation and T-cell proliferation, providing cold-chain-free solutions to combat AMR pathogens.
- **Artificial intelligence:** Through collaborative research, we pioneered AI-enabled precision tools such as surface-enhanced Raman spectroscopy coupled to machine-learning algorithms for rapid bacterial detection (AI-enabled sepsis sensor), AI predictive analytical models for healthcare and, most recently, digital-twin frameworks that model host physiology to personalize surgical and therapeutic decisions.

Statement of interest

For more than two decades my career has centered on deciphering and leveraging leukocyte biology to combat infectious diseases. My research integrates macrophage biology, micronutrient immune metabolism, nanotechnology and artificial intelligence, therefore, I can help in advancing leukocyte science while mentoring an increasing diverse cadre of leukocyte biologists. As a Palestinian-American Muslim woman scientist who has worked across three continents, I bring a pluralistic perspective, strategic leadership, advocate for diversity and a proven record of building interdisciplinary networks. As a Counselor, I would be privileged to guide SLB programs, engage in trainee development, and expand the society's global reach.

Thank you again for the nomination; I look forward to hearing about the voting results.

Sincerely,

Susu Zughaier, PhD
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