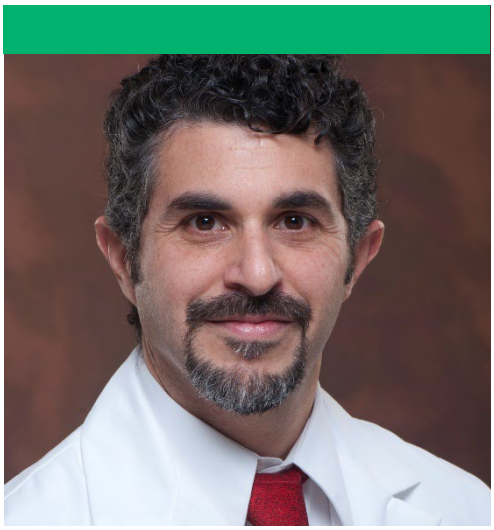
RUSH

Nadim J Hallab, PhD

The Crown Family Professor of
Orthopedic Surgery



Advancement of Medicine

In 2023, we advanced our work as the leading national experts in research and testing for adverse immune responses to implant metal(s), specifically metal sensitivity. This testing is at the forefront of patient-centered care. It allows patients and clinicians to make informed decisions pre- and post-operatively about which type of implant material would be best for optimal clinical outcomes.

We were invited to discuss our most recent findings, “Risk factors associated with increased metal sensitivity: A retrospective analysis among 25,081 pre- and post-operative orthopaedic patients,” at both the Orthopedic Research Society and American Academy of Orthopaedic Surgeons 2024 international meeting for clinicians, researchers and students. These findings are clinically meaningful because they identify for the first time specific patient characteristics associated with a higher risk of implant-associated metal sensitivity, including being female; a self-reported history of cutaneous metal allergy; and patients with a total knee arthroplasty experiencing a high level of implant-referable pain. Additionally, these results are significant because understanding which patient populations have a higher risk of metal sensitivity is essential to mitigate implant complications associated with metal sensitivity and would be expected to contribute to greater patient satisfaction over the long term.

Recently we published “Establishing clinically meaningful ranges of metal hypersensitivity in orthopaedic patients using COVID-19 vaccine-induced adaptive immune responses from fully vaccinated adults” in the *Journal of Orthopaedics*. In this analysis, we found that specific levels of immune reactivity to clinically relevant implant metal(s) correspond to robust, specific immune protection against an unwanted pathogen such as COVID-19. These data provide new clinical alarm

thresholds for implant-associated metal sensitivity levels and adjusted benchmarks for predicting poor implant performance among metal-sensitive orthopaedic populations.

Research

Funds from the endowment have gone towards developing publications in peer-review journals and supporting our engagement in the immunology and orthopedic field by attending national conferences to present our research.

Grants

Endowment funds continue to support our grant submissions to the National Institutes of Health with the goal of advancing patient-centered care for orthopedic patients and the continued success and ranking of Rush orthopedics.

Presentations

Orthopedic Research Society (ORS) and American Academy of Orthopaedic Surgeons (AAOS) International Annual Meetings, 2023 and 2024:

- Comparative Immune and Neurotoxicity Effects of Orthopedic Implant Metal Debris, poster, (ORS).
- A Novel Use of the Particle Induced Osteolysis Murine Model to Study CoCrMo Trafficking to Brain Tissue, poster, (ORS).
- Risk Factors Associated with Increased Metal Sensitivity: A Retrospective Analysis Among 25,081 Patients with A Total Knee Arthroplasty, presentation, (ORS).
- Risk Factors Associated with Increased Metal Sensitivity: A Retrospective Analysis Among 25,081 Patients With A Total Knee Arthroplasty, presentation, (AAOS).

Publication Highlights — Abbreviated

- "Characterization of residual debris on packaged hip arthroplasty stems demonstrates the dominance of less than 10 μ m sized particulate: Updated USP788 guidelines for orthopedic implants," *Journal of Biomedical Materials*, 2024.

- "Establishing clinically meaningful ranges of metal hypersensitivity in orthopaedic patients using COVID-19 vaccine-induced adaptive immune responses from fully vaccinated adults," *Journal of Orthopaedics*, 2023.
- "Translational characterization of macrophage responses to stable and non-stable cocrmo wear and corrosion debris generated in-situ for total hip replacement," *Biotribology (Oxf)*, 2023.

The Year Ahead: 2024 and Beyond

We will continue translational and clinical research in the orthopedic-immunology therapeutic area and mentor students.

With Gratitude

I want to thank you for your generosity, which continues to support our research and our goal to provide meaningful solutions for patients with orthopedic complications. Our leadership role in the orthopedic-immunology field is mainly due to the support provided by your endowment funds.