Preface: Innate Immune Sensors in Joint Diseases

In October 2013, at the Combined Meeting of the Orthopaedic Research Societies in Venice Italy, Drs. Takagi and Goodman organized a symposium entitled “Innate Immune Sensors in Joint Diseases.” The innate immune system plays a crucial role in many aspects involving diseases of the joints, and the outcome of surgical procedures, such as total joint replacement. The innate immune system is a complex arrangement of cells, receptors, and signaling molecules that comprise an organism’s first line of defense to combat potentially injurious stimuli. The events triggered by the innate immune system are nonspecific to any particular stimulus, and therefore not antigen specific. Thus, there are no capabilities for memory of the particular adverse stimulus, as there is in the adaptive, antigen-specific immune system. The innate immune system helps ensure survival of the organism by mechanisms that attempt to deal with the potential threat quickly and efficiently in order to reestablish homeostasis.

In this symposium, Professor Gallo and colleagues first provide basic knowledge of the innate immune system and its relevance to joint diseases including the cellular components, mechanisms, and signaling molecules; outcomes of acute inflammation are discussed including resolution and potential maladaptive responses, chronic inflammation, and tissue damage. The biological reaction to wear particles from total joint replacements is used as an example of how the innate immune system is involved in dealing with byproducts from orthopedic implant materials.

The second paper, written by the moderators of this symposium, specifically addresses the important interactions between wear particles from joint replacements and the innate immune system.

The third paper, written by Nich and colleagues, focuses on the key role played by macrophages, which orchestrate the acute and chronic inflammatory responses to particulate biomaterials for joint replacement. The interactions among different cellular components and signaling molecules are outlined.

The fourth paper, by Konttinen and colleagues, outlines groundbreaking concepts and information concerning macrophage activation and polarization, danger signaling, and the biological mechanisms constituting cellular cross talk involving the innate and adaptive immune systems. Metallic wear particles and ion disease are discussed in relation to the adverse events associated with some metal-on-metal implants for joint replacement.

The fifth paper, by Pajarinen and colleagues, describes the similarities and differences in the innate immune responses in tissues retrieved from joint replacements revised for aseptic loosening versus infection.

Finally, Takakubo and colleagues outline the role of the innate immune system in tissues retrieved from patients with rheumatoid arthritis versus osteoarthritis.

The guest editors of this special section of the Journal of Long-Term Effects of Medical Implants are grateful to all of the authors for providing new insight into the role of the innate immune system in musculoskeletal diseases, and total joint replacement. We are also extremely grateful to the editor-in-chief, Professor Subrata Saha, and to the publisher, Begell House Inc., for helping to organize this special section and see it to fruition.
Guest Editors:

Stuart B. Goodman  
Department of Orthopaedic Surgery  
Stanford University Medical Center  
Redwood City, CA

Michiaki Takagi  
Department of Orthopaedic Surgery  
Yamagata University School of Medicine  
Yamagata, Japan