

Editorial

In recent years, hopes have been raised, not only by the scientific community, that stem cells might be a therapeutic alternative for the treatment of degenerative diseases like Alzheimer's or osteoarthritis. In this issue, we have combined a series of reviews to elucidate various aspects of stem cell biology that may be applicable to our understanding of the pathogenesis of osteoarthritis and development of novel therapeutic approaches.

The synovial joint is a complex organ that is composed of tissues other than cartilage, and we must consider the whole joint when considering therapeutic options. Although cartilage is the most obvious tissue undergoing destruction during the course of osteoarthritis, the synovium, the meniscus, and the subchondral bone are also involved in the disease process.

Chisa Hidaka and Mary Goldring introduce this review series with a profound essay on the mechanisms underlying chondrogenesis and chondrocyte homeostasis. In general, the knowledge of developmental processes provides a basis for the understanding of disease processes; this is particularly true for osteoarthritis. This leads a concise summary by Franz Jakob *et al.* on the current developments in mesenchymal stem cell biology. Following the elegant introductory reviews is the article by Denitsa Docheva *et al.* describing the various cell surface receptors of mesenchymal stem cells and emphasizing the need to understand the role of cell surface markers, especially in the light of scaffold-based approaches in tissue engineering of cartilage defects. Faye H. Chen and Rocky S. Tuan present a broad review on the role of adult stem cells for cartilage tissue engineering and set the stage for the subsequent reviews dealing with more specialized aspects of stem cells and osteoarthritis. Rolf E. Brenner and Jörg Fiedler highlight the role of migration processes for stem cell recruitment as one of the cornerstones for future cell based therapies for osteoarthritis. Christopher B. Little and Margaret Smith write about the importance of the selection of the appropriate animal model to answer questions related to stem cells as means to treat osteoarthritis. Large animal models will be essential in the evaluation of the safety of new treatment options. Aurelia Raducanu and Attila Aszódi remind us of the wealth of information derived from transgenic and knock-out mice. Hans-Michael Klinger and Mike H. Baums provide a concise, critical overview of clinical aspects of autologous chondrocyte transplantation, perhaps one of the few examples of cell-based therapeutic approaches already integrated into medical practice. Anja Drengk *et al.* describe current concepts of meniscus tissue engineering, a still highly experimental procedure with broad implications for future regenerative therapies, as osteoarthritis is a disease that affects tissues other than the articular cartilage tissue of the synovial joint. Heide Siggelkow describes the role of osteoblast and adipocyte differentiation and Norbert Schütze provides a concise review on the role of angiogenesis for the pathogenesis of osteoarthritis. Finally Jenny Kruegel *et al.* report on the role of chondrogenic progenitor cells found in the diseased tissue itself as a promising starting point for interventions in late-stage osteoarthritis.

Overall, this section highlights interesting developments in the field of stem cell biology and stem cell based treatment possibilities that will lead in the first place to a better understanding of the pathophysiology of osteoarthritis and eventually towards cell biological therapies for this disease. However, a large amount of additional knowledge is necessary before we can apply any cell-based therapeutic approach to degenerative joint diseases in general and osteoarthritis in particular.

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