

THE PROSPECTS OF SELECTIVE JAK INHIBITORS IN HEMATOPOIETIC STEM CELLS TRANSPLANTATION

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Introduction. Hematopoietic stem cell transplantation (HSCT) represents a life-saving therapy for hematological malignancies, but its efficacy is often compromised by graft-versus-host disease (GVHD). GVHD remains a major challenge, as it results from an alloreactive immune response mediated by donor-derived T cells. The janus kinase (JAK-STAT) pathway plays a critical role in immune cell activation, cytokine signaling, and the development of GVHD. This study aims to explore the potential of selective JAK inhibitors in alleviating GVHD, improving transplantation outcomes and balancing immune suppression with graft-versus-leukemia (GVL) effects.

Materials and Methods. The scientific articles ranging from 2017-2025 published in PubMed, NCBI, BioMed Central databases, describing the preclinical and clinical studies on JAK inhibitors in HSCT, the biochemical mechanisms and physiological effects in evaluating the efficacy of ruxolitinib and itacitinib.

Results. JAK inhibitors have demonstrated efficacy in both preclinical and clinical settings by reducing T-cell activation, suppressing inflammatory cytokines, and enhancing regulatory T-cell expansion. In trials, ruxolitinib a JAK1/2 inhibitor, has shown significant improvements in steroid-refractory GVHD, with increased response rates and prolonged survival. Itacitinib, a selective JAK1 inhibitor, has demonstrated a favorable safety profile while preserving GVL effects. Emerging data suggest that post-transplant combining of JAK inhibitors and cytostatics, such as cyclophosphamide or other immunomodulatory strategies may further optimize transplant outcomes.

Conclusions. Selective JAK inhibition represents a new area of treatment, offering a targeted approach to immune modulation while maintaining the beneficial aspects of HSCT. In recent years, selective JAK inhibitors have emerged as promising alternatives for modulating immune responses, reducing GVHD severity, and improving transplantation outcomes. Future research is focused on refining dosing strategies, minimizing side effects and exploring combination therapies to enhance transplant tolerance. With ongoing clinical trials and advancements, JAK inhibitors have the potential to redefine post-HSCT immunosuppression, improving both survival and quality of life for transplant recipients.

Keywords: JAK inhibitors, hematopoietic stem cell transplantation, graft-versus-host disease, immunosuppression, cytokine signaling, ruxolitinib, itacitinib.