Introduction

Recent advances in the development of molecular-targeting drugs have changed the concept of treatment for various diseases including immune-mediated and non-immune mediated disorders. In particular, immunobiological agents have exhibited significant effects on the control of disease activity and preventing the progression of autoimmune disorders as well as inflammatory diseases. The targets of biological drugs include: 1) cytokines and their receptors; 2) molecules that regulate lymphocyte circulation; 3) co-stimulatory or co-inhibitory molecules that control T cell activation; and 4) specific molecules expressed on target cells that induce their depletion. The blockade of tumor necrosis factor and its receptor is one of the most successful biological targets to date, and is widely used for the treatment of various diseases including rheumatoid arthritis, inflammatory bowel diseases and Bechet’s disease. Inhibition of lymphocyte trafficking by anti-VLA-4 agents or a sphingosine 1-phosphate receptor antagonist is effective at preventing relapse in multiple sclerosis patients. More recently, checkpoint inhibitors have emerged as novel immunotherapeutic drugs for cancer treatment. T cell activation is controlled by co-stimulatory or co-inhibitory molecules such as cytotoxic T-lymphocyte antigen-4 (CTLA-4) and programmed cell death-1 (PD-1). Inhibition of these molecules by monoclonal antibodies is effective for the treatment of various types of advanced cancers. Currently, increasing numbers of novel antibodies related to these molecules as well as other co-inhibitory molecules have been developed and are being investigated in many clinical trials. These drugs are important both for the treatment of disease but also helping us understand the pathogenic mechanisms involved in these inflammatory diseases. Molecular targeted drugs have opened the door to studying and understanding the pathogenesis underlying human diseases and will help reveal the characteristics of each disease.

For this research topic, five experts were invited to provide reviews on the current status and future perspectives of immunotherapy for various diseases. Dr. Tamura and Dr. Tada review the advances in treatment strategies of rheumatic diseases using biological agents. This field has been leading the development of therapeutic biologics for the last twenty years. Dr. Yokoyama and Dr. Hattori have focused on multiple sclerosis, for which several unique molecular-targeting drugs have recently been developed. Dr. Osada and Dr. Watanabe review the current treatment for inflammatory bowel diseases, this incidence of which have recently been reported to be increasing and thus are likely to emerge as serious health problems in the future in Japan. Dr. Takai provides an overview of the advances and future prospects for allergen immunity. In the last section, Dr. Kato reviews the recent advances in cancer immunotherapy which is currently the “hottest” area of research due to the promising results of the recent clinical trials using check point inhibitors to enhance the activation of the immune system against malignant cells. This review series will provide up to date information regarding the use of immunotherapy for various diseases and hints for their future potential for both immune-mediated and non-immune-mediated disorders such as cancers.