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The two simultaneously occurring processes in one immune response: The positive immune reaction and immune tolerance

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Summary The immune response is tightly shaped by both positive and negative signals on different levels. Based on the accumulating data, we hypothesize that, both immune reaction and immune tolerance processes were potentially and simultaneously triggered after antigen challenging. The actual outcome of immune response is dependent on the sum of these two reactions. The hypothesis, if proved to be correct, will significantly improve our understanding the immunity and its related pathological effects. It will influence our choice on immunosuppressive drugs for patients with transplant grafts, autoimmune diseases. As the immunosuppressive drugs may also block the potential immune tolerance process which is beneficial to the patients. Therefore, we should try to develop novel immunosuppressive medicines that selectively inhibit immune reaction but no effects on immune tolerance for patients with allo-grafts or autoimmune diseases. On the other hand, it will impact the immunotherapy for tumors and the development of vaccines.

Background

The immune response to antigen challenging was regulated in multiple levels by various immune cells (e.g. helper T cells and regulatory T cells (Treg cells), etc), positive and negative co-molecules on the immune cell surface, as well as the intracellular signaling networks. The comprehensive regulating network will ensure the immunity against pathogens in a proper degree as well as keep the immune system self tolerant. Recent studies have shown that Treg cells (especially $CD4^+CD25^+$ Treg cells) play a critical role in immune tolerance to self or allogeneic antigens [1]. In addition to the development of Treg cells in the thymus, they can also be induced in the peripheral tissues or in vitro culture systems [2]. Surprisingly, the induction of Treg cells seems dependent on T cell activation as we observed in the effector T cell induction in some ways [3]. The immunosuppressive function of Treg cells also requires the activation of Treg cells [4,5]. Thus, the activation of Treg

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cells might be essential for the induction and the immunosuppressive action of Treg cells.

Presentation of the hypothesis

Based on the accumulating data, we hypothesize that, both immune reaction and immune tolerance processes were potentially and simultaneously triggered after immunization. The actual outcome of immune response is dependent on the sum of these two reactions which could be influenced by antigen challenging, the microenvironments and so on.

Testing the hypothesis

The hypothesis we presented herein will be significantly supported by the observation that the co-occurrence of both effector and regulatory T cell activations as well as detect the intensity of immune reaction and immune tolerance after the pathogen or foreign antigen challenging in vivo.

Implications of the hypothesis

The most implications of the hypothesis will significantly influence our choice on immunosuppressive drugs whenever they are needed to block immune reaction in patients with transplant grafts, autoimmune diseases. As the immunosuppressive drugs may also block the potential immune tolerance process which is beneficial to the patients while we try to block the positive immune response. Therefore, we should try to develop distinct immunosuppressive medicines that selectively inhibit immune reaction but no effects on immune tolerance for patients with allo-grafts or autoimmune diseases. On the other hand, we should develop medicine to overcome immune tolerance state and promote immune response in patients with tumors and infections.

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