

Dendritic Cells: Migration



Simon Milling, University of Glasgow, UK

Introduction

Dendritic cells (DCs) (*see footnote*) can be found in three types of location within the body. They are present as 'immature' cells in **peripheral tissues**, especially tissues that are exposed to the external environment, including the **skin, lungs** and **intestine**. They are also present in **lymphoid tissues**, including the **lymph nodes** and **spleen**. To migrate to these locations, DCs travel via the blood or in lymph vessels. The primary function of DCs is to interact with **lymphocytes** and stimulate them, either to initiate or maintain an immune response against a pathogen, or to prevent responses against harmless foreign proteins (e.g. food or commensal intestinal bacteria). In the lymphoid tissues DCs may exist in either the immature state, or as mature cells. Unlike **T-** or **B cells**, very few DCs migrate out of lymph nodes or the spleen; the vast majority of DCs die in the lymphoid tissues within a few days of their arrival. To understand DC migration, and the functions of the migrating DCs, it is helpful to consider the behaviour of the cells both in the absence of inflammation, and after the immune system has been stimulated by an infection or other pathological event.

Migration of DCs in the steady state

In the absence of inflammation many DCs migrate via the blood, as precursors, directly to the spleen and lymph nodes. The DC precursors can also migrate to peripheral tissues, where they may reside for many days, before travelling via the lymph to the local lymph nodes (**Figure 1**). DCs migrating through this latter pathway are able to carry proteins, acquired in the tissues, and 'present' them to T cells in the lymph nodes, to stimulate or tolerise. Tolerised T cells are prevented from responding to these antigens when they re-encounter them subsequently, through peripheral tolerance mechanisms.

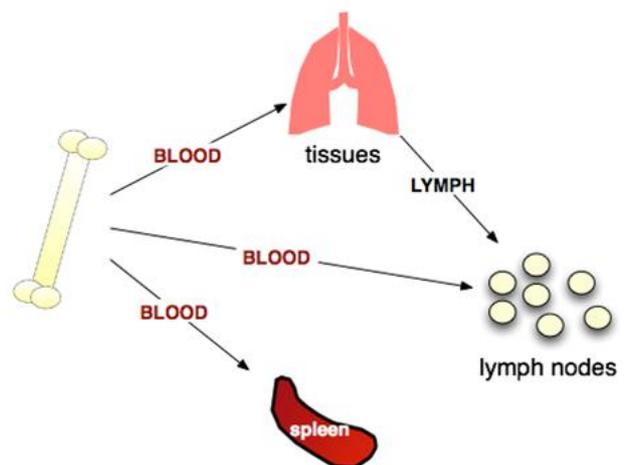


Figure 1. Migration routes of steady-state DCs and their precursors

Migration of DCs in inflammation

When the immune system is activated, by an infection or other inflammatory stimulus, the functions of DCs change. Additional DCs are driven to migrate from the blood and tissues, and the DCs undergo a process of 'maturation'. Mature DCs express higher levels of **costimulatory molecules** on their surface, and are able to activate naïve T cells. These mature DCs play a central role in the initiation of T and B cell responses, and are therefore extremely important for defence against pathogens, and for the generation of immunological memory. Mature DCs may also express cytokines, including IL-12 and IL-23 that contribute to the polarisation of naïve T cells.

Note: This article concerns 'conventional' DCs, not plasmacytoid DCs, follicular DCs, or monocyte-derived DCs.