

# Chapter 16

## Visualizing the Immune Response to Infections



Ulrich H. von Andrian

The immune system is tasked with detecting and responding to infections anywhere in the body. To accomplish this task requires the coordinated migration of immune cells and highly dynamic interactions of the migrating cells with their environment. Lymph nodes play a central role in this process by acting as local filter stations that prevent the spread of invading microbes and by providing a sophisticated environment to initiate and regulate innate and adaptive immune responses to antigens derived from pathogens, malignant cells and vaccines. To this end, lymph nodes harbor specialized antigen presenting cells and constantly recruit diverse lymphocyte subsets that engage in continuous immune surveillance and mount protective effector and memory responses.

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**Electronic Supplementary Material** The online version of this chapter ([https://doi.org/10.1007/978-981-13-7908-6\\_16](https://doi.org/10.1007/978-981-13-7908-6_16)) contains supplementary material, which is available to authorized users.

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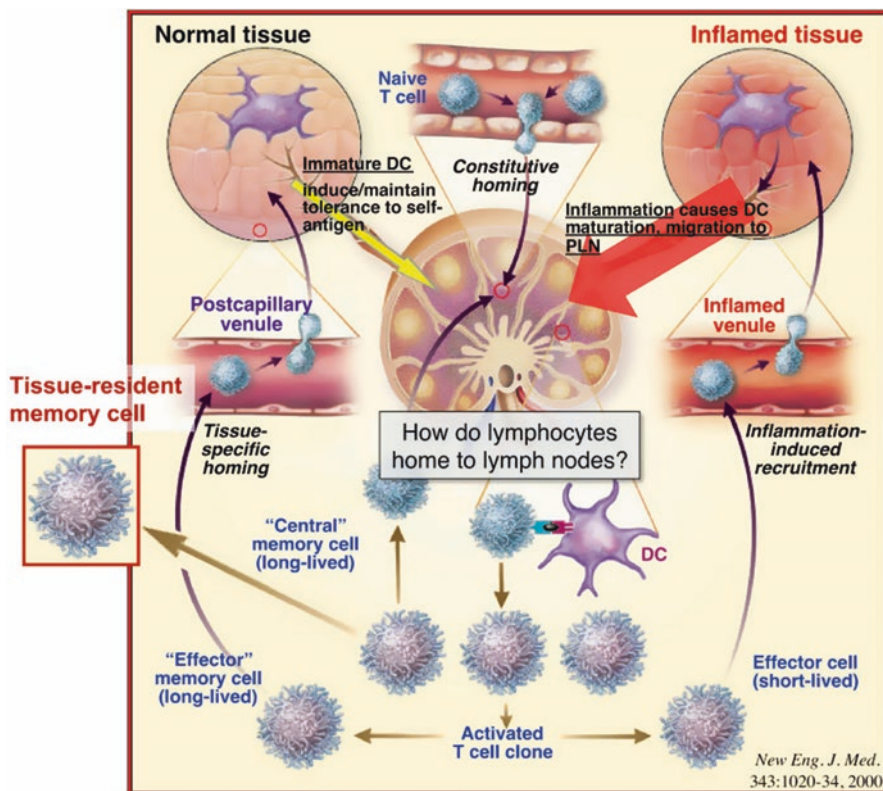
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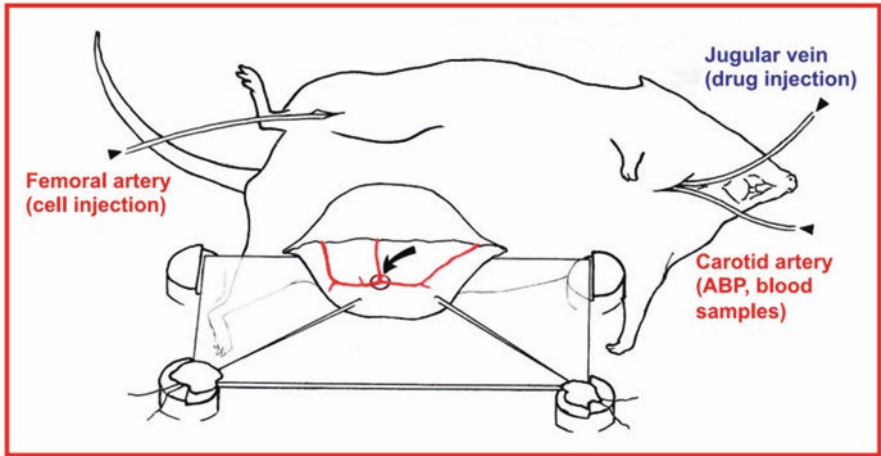
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Y. Toyama et al. (eds.), *Make Life Visible*,  
[https://doi.org/10.1007/978-981-13-7908-6\\_16](https://doi.org/10.1007/978-981-13-7908-6_16)

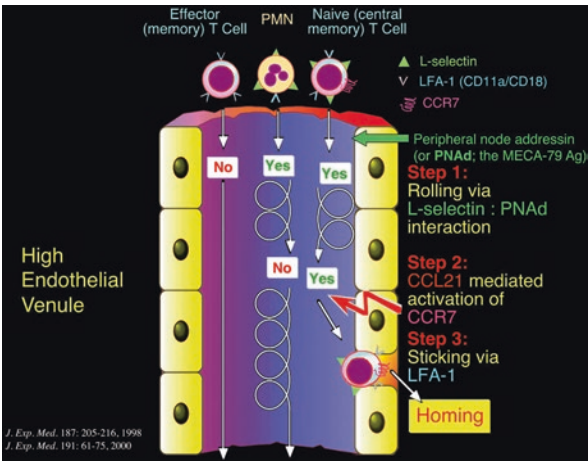


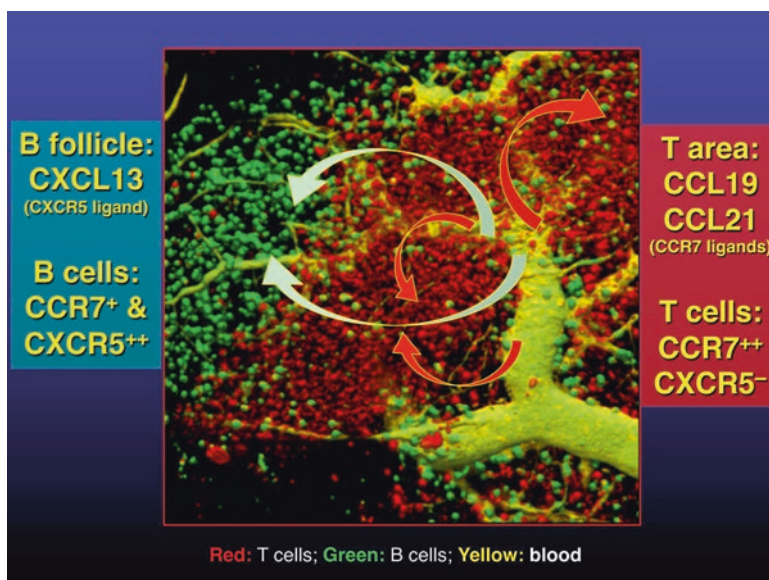
Our laboratory has developed intravital microscopy techniques that allow us to identify and track the intra- and extravascular trafficking and dynamic interactions of different immune cell subsets within lymph nodes of anesthetized mice. Using fluorescence imaging strategies, we have traced the dissemination of invading bacteria and viruses via the lymph and analyzed how lymph-borne pathogens are handled upon entering a lymph node. We have characterized how pathogen-derived antigens are presented to T and B lymphocytes and how the *in vivo* kinetics of antigen recognition impact anti-microbial immunity and the formation and quality of immunological memory.

Intravital Microscopy of Murine Subiliac (Superficial Inguinal) Lymph Node



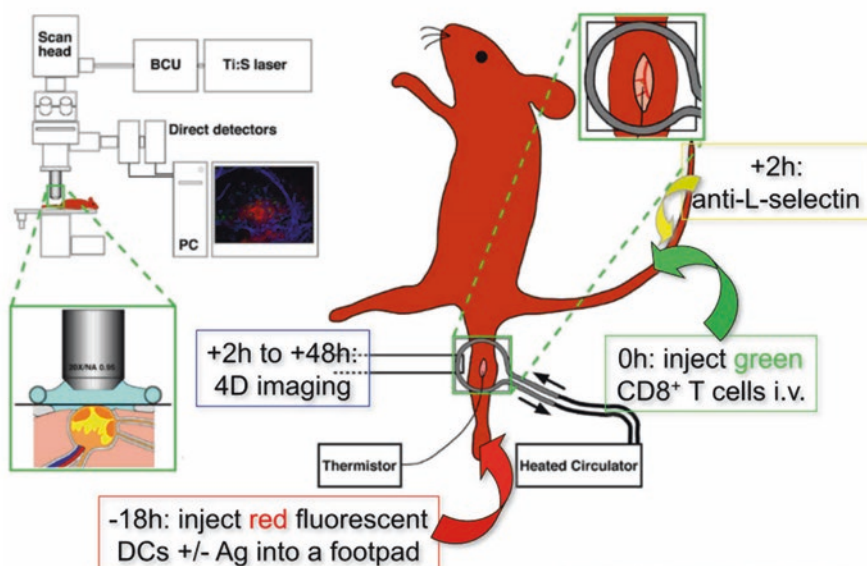
Microcirculation, 1996

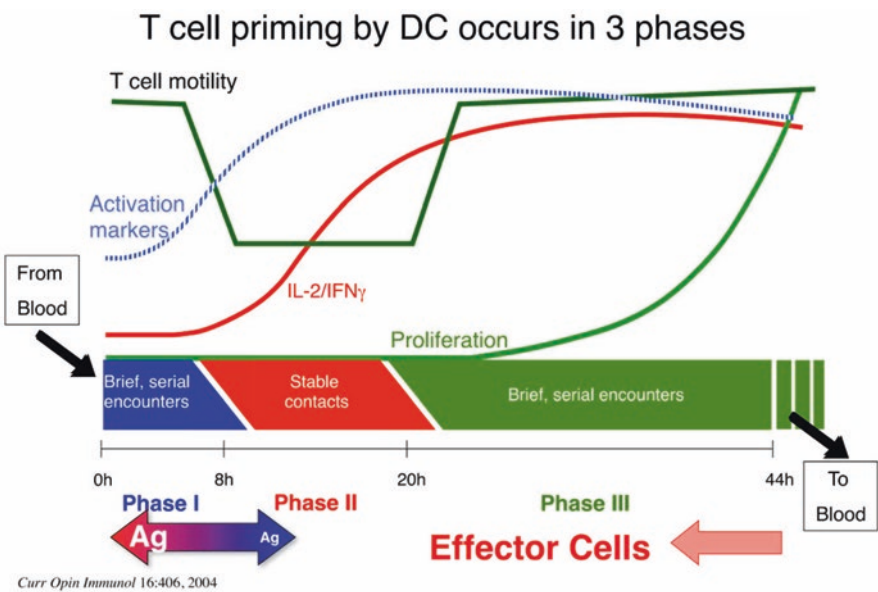




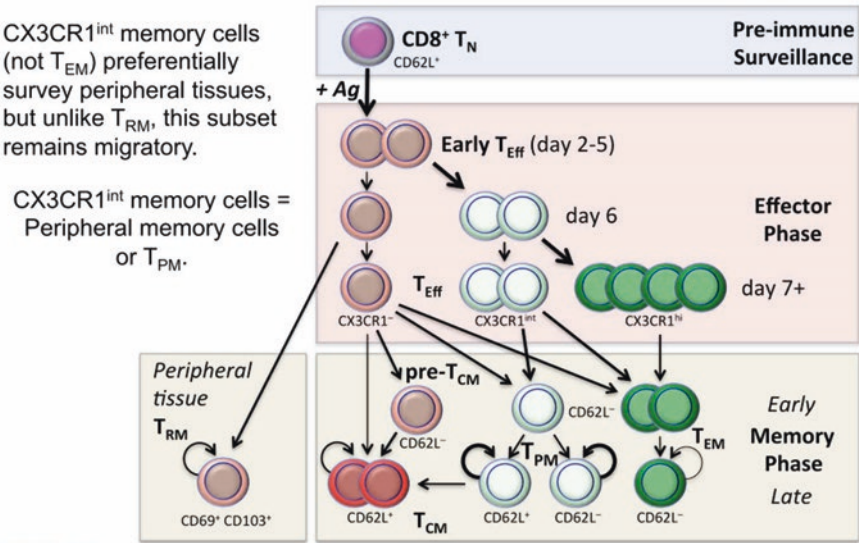
This lecture will provide an overview of our lymph node imaging strategies and summarize key insights that have been gained from their use to dissect the mechanisms and consequences of the multi-faceted immune responses to infections.

## The Popliteal Lymph Node Model for Multi-Photon Intravital Microscopy





### Antigen-experienced CD8 T cell subsets defined by differential expression of CX3CR1



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