

## New trends in spleen research: Introduction

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The spleen is a lympho-reticular organ having unique morphological and functional features. It serves as a selective filter interposed in the blood vascular system for the removal of abnormal or senescent blood cells, particulates and antigenic materials from the circulation. The spleen also sequesters, stores and releases blood cells and platelets, its lymphoid tissue participates in immune responses, and it can serve as a hemopoietic organ. In spite of the fact that the spleen participates significantly in host defense mechanisms, it is not essential for life. Nevertheless, its removal puts the host 'at risk' during overwhelming infections; the post-splenectomy infection rate is especially high in children but is also significant in adults.

Considerable controversy about splenic structure and function can be found in the literature of this century. In large part this is due to the wide variations in splenic morphology that exist between different species and the inadequacies of the methods used to evaluate the organ. During the past 25 years, however, considerable new knowledge has been obtained about splenic structure and function. These advances are the direct result of the advent of transmission and scanning electron microscopy, high resolution *in vivo* microscopy, improved immunocytochemical, histochemical and pharmacophysiological techniques, and a rapid expansion in knowledge about immuno-cellular biology.

The newer techniques have helped to resolve some of the controversies about splenic angio-architecture, as well as the dynamics and regulation of the microcirculation of blood through the organ in selected species of mammals. For example, it has helped to determine whether the intrasplenic circulation is contained within channels continuously lined by endothelium ('closed' circulation), flows through channels lacking endothelium ('open' circulation) or a combination of both. Structural and functional differences between 'sinusal' and 'nonsinusal' spleens have been determined relative to blood cell sequestration, storage and release. Some knowledge about intrasplenic innervation and lymphatic drainage also has been obtained. Furthermore, knowledge about the complex cellular composition of both the red and white pulp has been rapidly expanding, so that distinct compartmentalization of various types and subtypes of lymphocytes and macrophages have been topographically localized. The migration and interaction of these cell types and their participation in the immunobiology of the host is just now beginning to be understood. An important role for the stroma in these processes also is now recognized, particularly as it relates to establishing microenvironments conducive for

lymphopoiesis, and in some species for granulopoiesis, erythro- and megakaryocytopoiesis.

In spite of these recent advances in knowledge about the spleen, considerable has yet to be learned, particularly concerning the pathways and regulation of cellular traffic through the organ and the molecular biology of cellular interactions within both the white and red pulps. While much undoubtedly will be gleaned from continued investigations using rodents which have provided the basis for much of our current knowledge, the wide diversity of splenic structure and function exhibited between various species potentially provides many models to aid in developing a better understanding of structural-functional relationships in this unique organ. Although such comparative studies to date are limited in number, further investigations should be encouraged. Finally, the study of pathologic conditions which affect the spleen also deserve increased study as a means to better understand splenic morphology and physiology in health.

In order to review some of the more recent advances in our knowledge about the spleen and to stimulate others to investigate yet unresolved mysteries concerning this unique organ, Professor Mislin asked a number of students of the spleen to provide manuscripts that would encompass a broad overview of splenic structure and function in vertebrates. Both Professor Weiss and I are honored to have been asked to contribute and, in addition, to introduce and summarize this collection of papers on the spleen by distinguished authors. We have made no attempt to impose any particular style or format upon the authors. As a result, the authors have contributed definitive manuscripts in whatever style best suited their goals. The papers that follow are the result; they embrace a wide range of topics including splenic evolution and development (Tischendorf), comparative morphology (Tischendorf; Fänge and Nilsson), structure and function of various regional and cellular components, (Hartwig and Hartwig; Faller; Eikelenboom et al.; Weiss et al.), microvasculature (Fujita et al.; McCuskey and McCuskey; Reilly; Weiss et al.) innervation (Reilly), hematopoiesis (Seifert et al.), cellular traffic (van Ewijk et al.), pathology (Maurer; Sinzinger and Firsbas), and a summary (Weiss). It is hoped that, as a collection of information, these papers will point the way for future exciting breakthroughs in our knowledge about the spleen in health and disease.