Introduction

The second edition of Immune Response and the Eye was originally conceived to be an update to the first edition, which was published in 1999 and was edited by the late J. Wayne Streilein. At the time of his death, Wayne had set into motion plans to update the first edition and to introduce exciting new developments in the field of ocular immunology to the readers of this book. He recognized the enormous number of advances that had occurred since the publication of the previous edition and it was with great enthusiasm that he enlisted the authors of this edition to prepare their respective chapters. His untimely death in 2004 not only put this project on hold but robbed the world of a remarkable mentor, scientist, and role model. It has been a bittersweet experience for us to resume what Wayne started and to try to mold this edition of Immune Response and the Eye into a fitting tribute to his vision. We have attempted to retain the original roster of authors. It is noteworthy that, with only a few exceptions, each of the authors is a former trainee of J. Wayne Streilein, and thus his influence is felt throughout this edition of Immune Response and the Eye.

The purpose of this volume, like its predecessor, is to illuminate the remarkable nature of immune responses in the eye. Unlike many organs, the eye makes unique demands on the immune system and cannot tolerate the full array of immune responses that are available to the rest of the body. In the final analysis, the eye has only one known function – the unfettered transmission of light from the external environment to the photoreceptors of the retina and, from there, onto the visual cortex. Although the eye is only a few centimeters in diameter, it is composed of almost every type of tissue found in the rest of the body, as well as additional cellular and noncellular elements found nowhere else. This remarkable organ is an extension of the brain and, like the brain,
conducts enormously complex neurological functions. The million ganglion cells of the retina transmit 500 electrical signals along the optic nerve each second, which in computer terms is roughly equivalent to $1.5 \times 10^9$ bits of information per second. This remarkable neurological system is paralyzed if the single cell layer that forms the corneal endothelium is damaged by inflammation or if immune-mediated injury is inflicted upon any of the cellular elements of the retina. Yet, a robust immune response and inflammation are necessary to control life-threatening infections. Wayne Streilein recognized this almost 30 years ago and characterized the immune response in the eye as a ‘dangerous compromise’ in which certain immune functions were downregulated to protect tissues of the eye from immune-mediated injury, while preserving a unique spectrum of immune responses that inflicted minimal damage to innocent bystander cells, yet simultaneously provided a degree of protection against pathogens that confronted the eye. This, accordingly to Wayne, was ‘the way of immune privilege’. This concept has been widely adopted by vision and ophthalmology researchers and has found its way into mainstream immunology circles that have ignored the eye in the past, but now recognize that there are many immunological lessons to be learned from this remarkable organ.

This volume is not just about immune privilege in the eye, but also embraces the broad spectrum of immune functions that are uniquely expressed in the eye. The eye is continuously exposed to the external environment and as a result, it must adopt a specialized pattern of immune responses to protect against an array of pathogens that assault the ocular surface, as well as the interior of the eye. The immunological provisions that are made for such infectious diseases are discussed in this volume of *Immune Response and the Eye*. Other chapters highlight the occasional failures of immune regulation in the eye and the types of blinding, immune-mediated diseases that can ensue. The field of ocular immunology has made enormous advances, some of which offer glimmers of hope and potential therapeutic application ranging from corneal and retinal transplantation to the management of immune-mediated inflammation by re-imposing immune privilege onto an inflamed eye.

Many of the contributors to this volume of *Immune Response and the Eye* were profoundly influenced by J. Wayne Streilein, either as a trainee or collaborator. Wayne began his career as a research fellow with the eminent transplantation immunologist, Rupert Billingham. On the occasion of Billingham’s death, Wayne sent his current and former fellows the following note to express his philosophy of science and mentoring: ‘Throughout our lives, we experience losses through the deaths of individuals whom we know well and love. In my advancing maturity, I have come to realize that these are not merely irreplaceable losses. They can also be bittersweet opportunities to ponder the connectivities among individual lives, and the growth and evolution of shared ideas. I am
cognizant of the flow of ideas that have passed to and through me, and I am fortunate to have found trainees willing to receive these ideas and able to fashion them into discoveries that bring truth closer and closer….’

This volume of *Immune Response and the Eye* is a manifestation of this philosophy that is now transmitted through each of the authors who must now carry on this tradition as scientist, mentor, and role model for the next generation of scientists.

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