

Preface

The field of classical neonatal immunology has been dominated over the past 50 years by two theories. The first theory is that lymphocytes specific for self-antigens are deleted during fetal development. Current research carried out in transgenic mice supports this hypothesis, with continual evidence of the deletion of self-reactive clones during fetal development. The second long-held theory is that the immune system of neonates is highly susceptible to developing immune tolerance, leading to unresponsiveness to immunization. This theory became a paradigm based on an experiment performed in mice showing that the injection of newborns with allogeneic bone marrow cells prevented the rejection of an allogeneic skin graft.

Commonly, a paradigm built on a widely accepted finding becomes an eternal truth; an established paradigm generally leads to its temporal dominance and an apparent intellectual rigor. Scientists frequently differentiate into several groups with respect to a given paradigm. One group of scientists searches for new findings aimed at strengthening the paradigm, and these findings sometimes result in a beneficial practical application. For example, the paradigm of neonatal tolerance was instrumental in advancing our knowledge of the mechanism of tolerance. Currently, the reconstitution of the immune system of immune-deficient patients with cord blood stem cells is considered less harmful than reconstitution with bone marrow. A second group of scientists continues to look for new findings that cannot always be explained by the current paradigm. The accumulation of new findings that do not fit within the currently accepted paradigm leads to an intellectual crisis. This is a critical point in the evolution of science in which the competition between old and new findings may then lead to the formulation of a new paradigm. The cycle paradigm–crisis–paradigm is repeated until a new theory or a universal model is formulated or accepted.

In the last several decades there has been remarkable progress in our understanding of neonatal immunity. Advances in cellular immunology, molecular biology, recombinant DNA and proteins, and the function of cytokines and chemokines have changed our understanding of the immunity of neonates and infants. New discoveries have revolutionized the study of neonatal immune responsiveness, facilitating the development of efficient vaccines for newborns, a greater understanding of impaired immune response in neonates afflicted by immunodeficiency or genetic defects, and a clearer knowledge of the developing immune system. New experimental findings and clinical observations have shown that neonates, and in some species fetuses, respond to

foreign antigens in a manner consistent with the existence of both quantitative and phenotypic differences between newborn and adult lymphocytes.

The aim of *Neonatal Immunology* is to present classical and current information and discuss cutting-edge discoveries that will hopefully lead to new horizons in biological research and result in scientific progress in such areas as vaccination of infants, stem cells, gene therapy, and transplantation.

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