Chapter 13

Tissue Biology of Proliferation and Cell Death Among Retinal Progenitor Cells

Rafael Linden, Rodrigo A.P. Martins, Mariana S. Silveira, Helena L. Borges, Alfred Sholl-Franco, Lucianne Fragel-Madeira, and Ana Carolina Dudenhoeffer-Carneiro

Contents

R. Linden (✉)
Instituto de Biofísica, Universidade Federal do Rio de Janeiro, Cidade Universitaria, Rio de Janeiro, Brazil
e-mail: rlinden@biof.ufrj.br

Abstract The retina is a complex network of various molecularly and neurochemically distinct cell types. These heterogeneous and highly interactive neurons and glia are stratified in rather precisely organized layers, and often distributed in regular arrays, surrounded by rich, laminated extracellular matrix, as well as a dual vascular system. All components of retinal tissue affect the proliferation and survival of retinal progenitor cells through a combination of tightly regulated genetic and microenvironmental mechanisms. The latter are provided for by a variety of extrinsic modulators, including neurotrophins, interleukins, neurotransmitters and neuropeptides, acting through numerous types of plasma membrane receptors, and cross-talking intracellular signaling pathways. This chapter reviews some of the major determinants of retinal cell population dynamics, which are a pre-requisite for the design of tissue engineering applied to retinal degenerations.

Keywords Cell cycle · Growth factors · Neurotransmitters · Programmed cell death · Stem cells

Abbreviations

5-HT	5-hydroxytryptamine, serotonin
AC	adenylyl cyclase
ACh	acetylcholine
AIF	apoptosis-inducing factor
AMPA	α-amino-3-hydroxy-5-methyl-4-isoxazole propionic acid
Apaf-1	apoptotic protease-activating factor-1
ATM	ataxia and teleangiectasia mutated
ATP	adenosine triphosphate
ATR	ATM and Rad3-related

H. Ulrich (ed.), *Perspectives of Stem Cells*,
DOI 10.1007/978-90-481-3375-8_13, © Springer Science+Business Media B.V. 2010