

Preface

These past few years have witnessed a revolution in our understanding of microglial cells, since their roles in the healthy central nervous system have just started to be revealed. These resident macrophages were shown to actively contribute to maintaining health, in cooperation with neurons, glial cells, and other types of immune cells, throughout the life-span, prompting reinterpretation of their long known involvement with diseases.

To share with the broader scientific community the recent discoveries on some of the most relevant topics in microglia research, from a diverse perspective, we propose a collection of 19 chapters from 52 specialists, working in 11 countries (Australia, Canada, Chile, China, France, Germany, Japan, Spain, Switzerland, the UK, and the USA) across 5 continents (Asia, Australia, Europe, North America, South America), and presently at the graduate, postdoctoral, assistant, associate, or full professor stages of their career.

To set microglia on the stage, we begin by explaining briefly who they are and what they do: their origin, history, physiology, and immune functions, the recent development of noninvasive methodologies to study microglia, and the ongoing controversy about their neurotoxic versus neuroprotective implication in disease.

In the first section, we describe in more detail their physiological roles in the maturation, function, and plasticity of the central nervous system, across normal development, adolescence, adulthood, and aging. Doing so, we also address their crucial involvement in neuropathic pain and drug addiction.

In the second section, we discuss their implication in pathologies impacting on the quality of life: neurodevelopmental and neuropsychiatric disorders, AIDS, and multiple sclerosis; and their contribution to leading causes of death: ischemia and stroke, neurodegenerative diseases, as well as trauma and injury.

The chapters strictly discriminate between experimental data, hypotheses, and speculations, so that the open questions are presented clearly to newcomers in this young and vibrating field. Outdated terminologies such as “resting” and “activated” microglial cells are replaced by a more thorough description of their actual phenotype, comprising concerted changes in morphology, gene expression, and functions. The distinction between *in vivo* and *in vitro* data is also emphasized throughout the

book, considering the importance of studying microglia in their normally prevailing behavior, without inadvertently causing their reactive transformation during experimental procedures. Contextual differences between central nervous system regions and stages of the lifespan are also covered, whenever data is available.

As a result of this book, hopefully engaging the scientific community in a lively discussion about microglial involvement in many more contexts of health and disease, we can envision an explosion of discoveries that will translate into the development of better targeted and more efficient therapies in the near future.

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Québec, QC, Canada
Zamudio, Bizkaia, Spain

Marie-Ève Tremblay
Amanda Sierra

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Tremblay, M.-È.; Sierra, A. (Eds.)

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