ARMI EXTERNAL SEMINAR SERIES 2023

MONASH University | ARMI AUSTRALIAN REGENERATIVE MEDICINE INSTITUTE

Reactive astrocytes: genetic regulation and functions in neural repair

Dr Joshua Burda –

Assistant Professor in the Dept. of Neurology and the Dept. of Biomedical Science – Cedars Sinai Medical Center Los Angeles

Abstract

In response to central nervous system (CNS) damage and degeneration, astrocytes undergo graded, context-dependent changes in their morphological, molecular, and functional profile collectively referred to as *reactivity*. Reactive astrocyte heterogeneity has important implications for the regulation of CNS inflammation, neuroprotection, degeneration and repair. Yet, relatively little is known regarding the cell-intrinsic mechanisms through which astrocytes achieve disorder context-specific states of reactivity. Here, Burda will discuss his recent work aimed at the dissection of astrocyte-intrinsic gene regulatory programs behind distinct states of reactivity observed in mice and humans. Results discussed will demonstrate how context-specific combinatorial activity of transcriptional regulatory molecules governs alterations in astrocyte chromatin accessibility and reactive changes in astrocyte gene expression that impact on CNS disorder outcome. After spinal cord injury (SCI), scar-border-forming, reactive astrocytes surrounding lesions are indispensable regulators of inflammation. The functions of non-scar-forming, lesion-remote reactive astrocytes in spared spinal cord regions are not well defined, but potential roles include regulation of regenerative synaptic circuit plasticity, neural tissue remodeling and repair via interactions with neighbouring neurons and glia. Here, Burda will share results from recent work aimed at the spatiotemporal molecular and functional dissection of SCI lesion-remote reactive astrocytes and evidence for their role in regulating white matter inflammation and repair after CNS injury.

Bio

Dr. Burda received his PhD in molecular neuroscience from Mayo Clinic under direction of Dr. isobel Scarisbrick and carried out his postdoctoral training at UCLA with Dr. Michael Sofroniew. In 2019, Burda started his independent research program at Cedars Sinai in Los Angeles, where he currently serves as Assistant professor in the Dept. of Neurology and the Dept. of Biomedical Sciences.

The overarching objective of Burda's research is to elucidate molecular mechanisms through which glial cells regulate neural tissue inflammation, remodeling and repair after central nervous system (CNS) injury and in disease. To examine and manipulate complex, multi-cellular neurobiological systems, the Burda Lab applies several experimental and analytical approaches, including *in vivo* and cell type-specific genetic manipulations in multiple pre-clinical mouse models of CNS injury, single-cell and spatial transcriptomics and epigenomics, bioinformatics and behavioral evaluations.

Important results of Burda's research include: i) the determination of an important supportive role for astrocytes in the regulation of CNS axon regeneration after SCI, which facilitated a critical conceptual shift in the functional understanding of how astrocytes govern axon regeneration; ii) identification of a multi-factorial biological repair strategy that exploits three neurodevelopment-associated biological factors to induce robust spinal axon regeneration after SCI; iii) comprehensive characterization of context-specific gene regulatory programs underlying reactive astrocyte molecular heterogeneity across diverse CNS disorders in mouse and human. Burda's research has garnered support by the NIH, as well as private research foundations for over 8 years, and has been published in numerous high-impact peer reviewed scientific journals, including *Nature, Neuron, PNAS and JCI.*

EVENT DETAILS

DATE:
Tuesday June 6th 2023

TIME: 11:00am

VENUE:
Online – via Zoom.

The zoom link will be sent out to all prior to the event on Tuesday 6th June

HOST:
A.Prof Jan Kaslin

@ARMI_Labs
/AustralianRegenerativeMedicineInstitute
/australian-regenerative-medicine-institute
@regener8au

MONASH University | ARMI AUSTRALIAN REGENERATIVE MEDICINE INSTITUTE

The Australian Regenerative Medicine Institute (ARMI) acknowledges the generous support of Monash University and the Victorian State Government.