Neurovascular unit: The role of pericytes in brain disorders

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INTRODUCTION

- The neurovascular unit (NVU) couples neuronal activity to vascular function, controls brain homeostasis, and maintains an optimal brain microenvironment for neuronal survival.
- The NVU is a heterogeneous structure constituted by different cell types that includes pericytes.

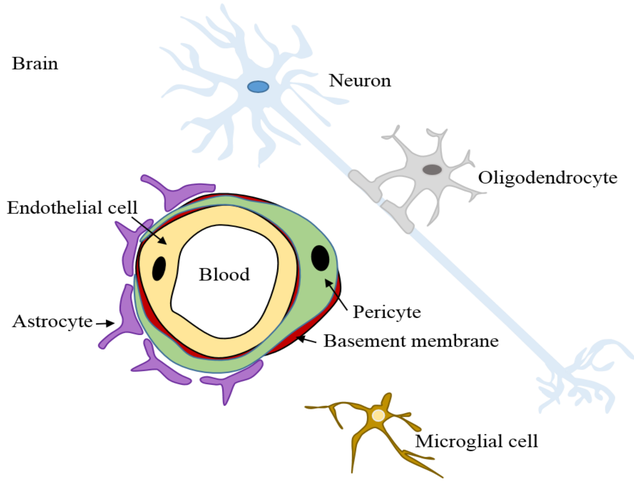
OBJECTIVES

- The aim of this review is the study of central nervous system (CNS) pericyte origin and functions, with a special focus as part of the blood-brain barrier (BBB) in the health and disease.
- This review describes the current knowledge about pericytes and their functions, their role in NVU remodeling and their potential as targets for NVU repair strategies.

NEUROVASCULAR UNIT

- The NVU is constituted by specialized endothelial cells, which form the BBB, the basal lamina, perycites, astrocyte-endfeet, glial cells and neurons. They actively interact to maintain brain homeostasis for neuronal survival.

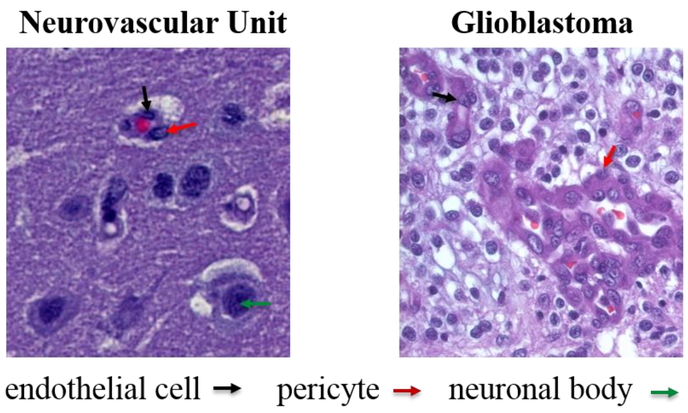
- The BBB is a complex interface between the blood and the brain that allows the uptake of nutrients, metabolites and required molecules in to the CNS microenvironment and shields the CNS from toxic and harmful substances in the blood.



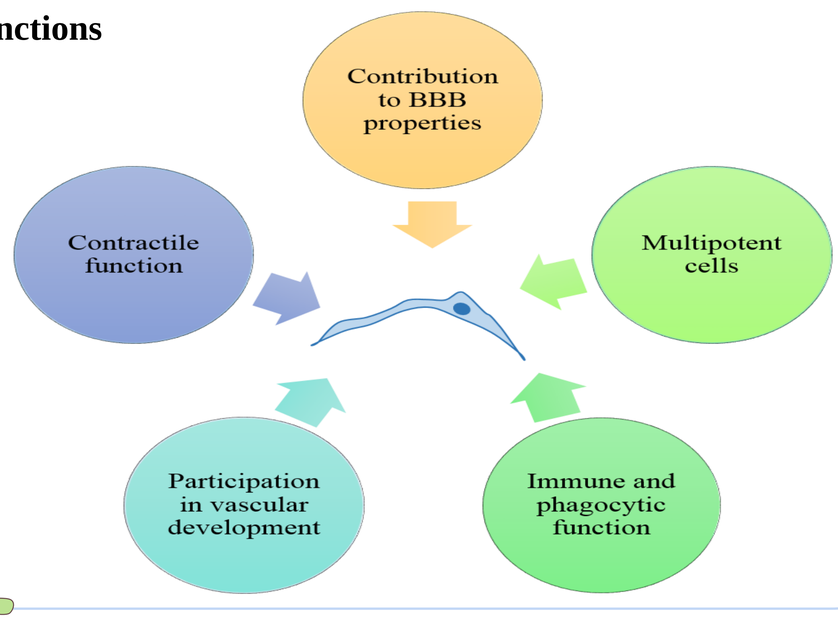
PERICYTE

Pericytes are specialized mural cells located at the abluminal surface of capillary blood vessels, embedded within the basement membrane.

- **Origin** CNS pericytes are a heterogenic cell population derived from mesodermal and neuro-ectodermal germ layers.
- **Morphology, Identification and Characterization** The study of pericytes is hampered by the lack of pericyte-specific markers.

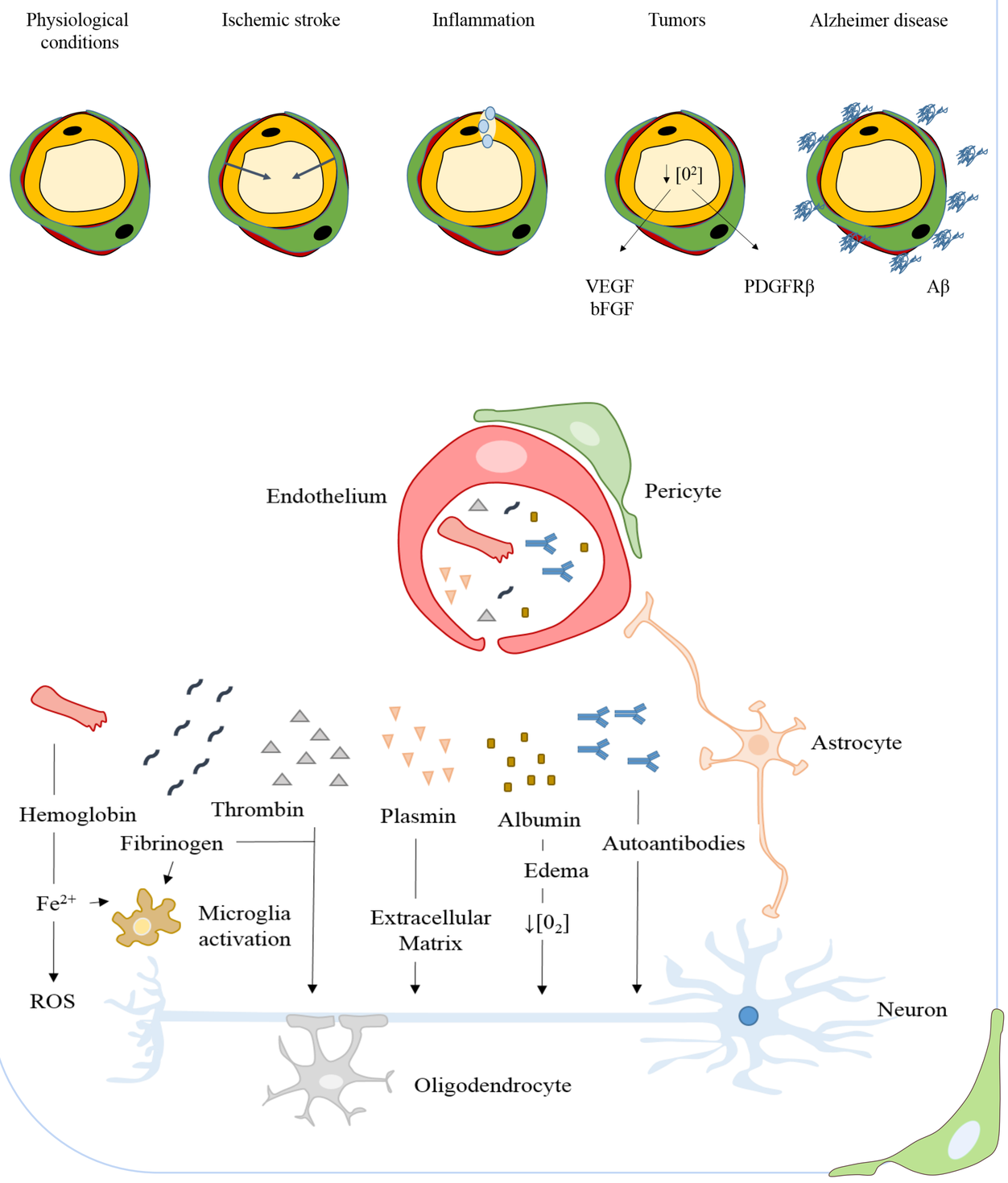


- **Connections within the Neurovascular Unit** Pericyte–endothelial cross-talk is through peg-and-socket junctions, gap junctions, adherent junctions and adhesion plaques.
- **Functions**



PERICYTES IN BRAIN DISEASES

Pericytes have a crucial role in brain homeostasis. Altered pericyte coverage and BBB breakdown have been described in diverse CNS disease.



CONCLUSIONS

- CNS capillaries differ from the vasculature of other organs through the presence of the BBB, which is critically regulated by the NVU.
- Pericytes play a crucial role in maintaining tissue homeostasis, and pericyte dysfunctions as well as a decrease in number lead to different pathologies.
- The dog is an interesting model for human glial tumors, therefore it could be a great model to study the role of pericyte in tumor vascularization.
- Neurodegenerative disorders, such as Alzheimer's disease are rising in our society. Pericytes may be therapeutically targeted to stabilize vascular lesions.
- The involvement of pericytes in numerous diseases and their multipotency qualifies them as promising targets for future therapeutic regenerative approaches.