

for a primary research article related to study of the cytoskeleton in a cell type of your choosing

- 1) The cell type you chose,
- 2) The name of the primary research publication you found interesting,
- 3) The research question being asked in the publication,
- 4) The cellular model that was used to try to answer the research question, and
- 5) How many review articles resulted from a search of this specific topic? Be sure to include citations.

1- **Cell type: glia cells and more specifically: the myelinating cells: oligodendroglia and Schwann cell.**

Myelin sheath is an insulating layer that forms around nerves, allowing electrical signal to transmit quickly along the axon (saltatory conduction). In the central nervous system (CNS), the myelin is formed by oligodendroglia cells and in the peripheral nervous system (PNS) by Schwann cells [1].

- **Oligodendrocytes** (OLGs) originate from oligodendrocyte progenitor cells (OPCs) after distinct developmental stages. Then they extend to provide insulation to many axons. They also provide metabolic axonal support.
 - **Schwann** cells, have diverse functions, including clustering of ion channels at the nodes of Ranvier, promotion of neuronal survival, and regulation of axonal diameter and typically myelinate only a single axon [2].
- 2- **The actin cytoskeleton in myelinating cells** – Tanya L. Brown, Wendy B. Macklin [3]
- 3- In **myelinating cells**, the cytoskeleton acts as a scaffold to mediate cell-to-cell interactions and exhibits specific activity patterns. The paper describes cytoskeletal molecules which regulate these patterns during cell differentiation and myelination.
- 4- In-vitro experiments and various animal models (rats, mice, knockout mice) have been used in this research topic, and identified:
- Actin polymerizing proteins (WAVE1, WAVE2), and signal transduction molecular switches, Rho GTPases, which regulate cell proliferation and myelination.
 - Major actin depolymerizing molecules: *cofilin*, *gelsolin*
 - PAK molecules which regulate oligodendrocyte development.
 - In the PNS, *in vitro* inhibition of the Rho/ROCK pathway in Schwann cells lead to shorter and sometimes thicker myelin internodes, while *in vivo* deletion of N-SWAP in the same cells has similar effect in damaged sciatic fiber.
 - Experiments with various animal models (Trembler J mouse, Shiverer mouse, hereditary neuropathy with liability to pressure palsy (HNPP) mouse) show that diseases could cause cytoskeletal changes in CNS and PNS and changes in cytoskeletal regulators can lead to disease states.
- 5- Within the last 5 years, 6 review articles on the “actin cytoskeleton in myelinating cells”, were published:
- Evolvability of the actin cytoskeleton in oligodendrocytes during central nervous system development and aging [4]
 - Cytoskeletal Signal-Regulated Oligodendrocyte Myelination and Remyelination [5]
 - WIP, YAP/TAZ and Actin Connections Orchestrate Development and Transformation in the Central Nervous System [6]

- The oligodendrocyte growth cone and its actin cytoskeleton: a fundamental element for progenitor cell migration and CNS myelination [7]
 - Direct effects of Ca²⁺/calmodulin on actin filament formation [8]
 - Galectin-3-Mediated Glial Crosstalk Drives Oligodendrocyte Differentiation and (Re)myelination [9].
- [1] P. Morell and R. H. Quarles, "The Myelin Sheath," *Basic Neurochemistry: Molecular, Cellular and Medical Aspects*. 6th edition, 1999, Accessed: Feb. 02, 2022. [Online]. Available: <http://www.ncbi.nlm.nih.gov/books/NBK27954/>
 - [2] A. Balakrishnan *et al.*, "Insights Into the Role and Potential of Schwann Cells for Peripheral Nerve Repair From Studies of Development and Injury," *Frontiers in Molecular Neuroscience*, vol. 13, 2021, Accessed: Feb. 02, 2022. [Online]. Available: <https://www.frontiersin.org/article/10.3389/fnmol.2020.608442>
 - [3] T. L. Brown and W. B. Macklin, "The actin cytoskeleton in myelinating cells.," *Neurochem Res*, p. 10.1007/s11064-019-02753-0, Mar. 2019, doi: 10.1007/s11064-019-02753-0.
 - [4] A. I. Seixas, M. M. Azevedo, J. Paes de Faria, D. Fernandes, I. Mendes Pinto, and J. B. Relvas, "Evolvability of the actin cytoskeleton in oligodendrocytes during central nervous system development and aging," *Cell. Mol. Life Sci.*, vol. 76, no. 1, pp. 1–11, Jan. 2019, doi: 10.1007/s00018-018-2915-8.
 - [5] S. Miyata, "Cytoskeletal Signal-Regulated Oligodendrocyte Myelination and Remyelination," in *Myelin: Basic and Clinical Advances*, K. Sango, J. Yamauchi, T. Ogata, and K. Susuki, Eds. Singapore: Springer, 2019, pp. 33–42. doi: 10.1007/978-981-32-9636-7_3.
 - [6] I. M. Antón and F. Wandosell, "WIP, YAP/TAZ and Actin Connections Orchestrate Development and Transformation in the Central Nervous System," *Front Cell Dev Biol*, vol. 9, p. 673986, Jun. 2021, doi: 10.3389/fcell.2021.673986.
 - [7] E. J. Thomason, M. Escalante, D. J. Osterhout, and B. Fuss, "The oligodendrocyte growth cone and its actin cytoskeleton: a fundamental element for progenitor cell migration and CNS myelination," *Glia*, vol. 68, no. 7, pp. 1329–1346, Jul. 2020, doi: 10.1002/glia.23735.
 - [8] M. Izadi, W. Hou, B. Qualmann, and M. M. Kessels, "Direct effects of Ca²⁺/calmodulin on actin filament formation," *Biochemical and Biophysical Research Communications*, vol. 506, no. 2, pp. 355–360, Nov. 2018, doi: 10.1016/j.bbrc.2018.07.159.
 - [9] L. Thomas and L. A. Pasquini, "Galectin-3-Mediated Glial Crosstalk Drives Oligodendrocyte Differentiation and (Re)myelination," *Front Cell Neurosci*, vol. 12, p. 297, Sep. 2018, doi: 10.3389/fncel.2018.00297.

<https://pubmed.ncbi.nlm.nih.gov/34287056/>

<https://pubmed.ncbi.nlm.nih.gov/28390425/>

<https://pubmed.ncbi.nlm.nih.gov/30847860/>