



OPEN ACCESS

EDITED AND REVIEWED BY
Yannick Poitelon,
Albany Medical College, United States

*CORRESPONDENCE

Bo He
✉ hebodoc@aliyun.com

SPECIALTY SECTION

This article was submitted to
Non-Neuronal Cells,
a section of the journal
Frontiers in Cellular Neuroscience

RECEIVED 22 December 2022

ACCEPTED 23 December 2022

PUBLISHED 09 January 2023

CITATION

He B, Hu J and Zhu Z (2023) Editorial:
The function of Schwann cells in
peripheral nervous system.
Front. Cell. Neurosci. 16:1129560.
doi: 10.3389/fncel.2022.1129560

COPYRIGHT

© 2023 He, Hu and Zhu. This is an
open-access article distributed under
the terms of the [Creative Commons
Attribution License \(CC BY\)](#). The use,
distribution or reproduction in other
forums is permitted, provided the
original author(s) and the copyright
owner(s) are credited and that the
original publication in this journal is
cited, in accordance with accepted
academic practice. No use, distribution
or reproduction is permitted which
does not comply with these terms.

Editorial: The function of Schwann cells in peripheral nervous system

Bo He^{1*}, Jifan Hu^{2,3} and Zhaowei Zhu⁴

¹Joint and Orthopaedics Trauma, Department of Orthopedics, The Third Affiliated Hospital of Sun Yat-sen University, Guangzhou, China, ²VA Palo Alto Health Care System, Stanford University Medical School, Palo Alto, CA, United States, ³Key Laboratory of Organ Regeneration and Transplantation of Ministry of Education, Cancer Center, The First Hospital of Jilin University, Changchun, Jilin, China, ⁴Department of Plastic Surgery, The First Affiliated Hospital of Sun Yat-sen University, Guangzhou, China

KEYWORDS

Schwann cells, Schwann-like cells, peripheral nerve, nerve regeneration, nerve injury, stem cells, tissue engineering

Editorial on the Research Topic

The function of Schwann cells in peripheral nervous system

It is generally believed that the decline in the capacity of peripheral nerve regeneration relies on the slow regeneration of neuronal axons. However, Painter et al. believed that the key factor that affects mammalian peripheral nerve regeneration was not the neuron itself. Instead, Schwann Cells (SCs) played an important role in the process of nerve regeneration after peripheral nerve injury. First of all, SCs are necessary for successful nerve regeneration. After injury, they become partially de-differentiated, with increased expression of nerve regeneration genes and secretion of neurotrophic factors, including GDNF, NGF, BDNF, and CNTF. The proximal ends of peripheral nerves formed growth cones facilitating regeneration of nerve fiber. Secondly, SCs guide the orderly extension of nerve axons by organizing suitable scaffolds. Thirdly, SCs clear the myelin sheath fragments produced by Wallerian degeneration of injured nerves, thus removing obstacles on the regeneration channels. In order to solve shortage of primary SCs, researchers also explored the substitutes of SCs by inducing stem cells into Schwann-like cells (SLCs). Both SCs and SLCs are indispensable and ideal seed cells for tissue engineering.

Our Research Topic aimed to investigate the regulatory roles of Schwann Cells and Schwann-like cells in peripheral nervous systems. We are very grateful to the 145 contributors from 15 different countries participating in current Research Topic with six abstracts, four review articles and six original research papers. These publications discussed from different angles of the current challenges to the field. It could be summarized into the following three aspects: (1) Important genes or proteins of SCs during peripheral nerves regeneration; (2) Scaffolds or stem cells exploration in peripheral nerves; (3) SCs related Reviews.

After peripheral nerve injury, SCs, vascular endothelial cells and blood derived macrophages reacted and conducted Wallerian deformation process. He et al. performed transcriptome sequencing and qPCR verification on the sciatic nerves of rats 4 and 7 days after the clamp injury. They found that Notch1 might act as a coordinator among the processes of vascular endothelial cell regeneration, macrophage recruitment and nerve regeneration.

Shen et al. transfected CD146 siRNA into primary rat SCs, and found that cell proliferation rate decreased significantly with increased migration. These results implied that CD146, as an important cell adhesion molecule, might have a significant impact on regulating biological behavior of SCs.

Ulrichsen et al. found that Sortilin could affect Remak bundle formation. When they cultured Sort1^{-/-} Schwann cells *in vitro*, they found SCs lost the ability to migrate and myelination.

Chen et al. combined mesenchymal stem cell transplantation and electric acupuncture to treat acute sciatic nerve contusion in rats. After assessment of MRI, they found that the neural function recovery speed of the experimental group was much faster than that of control group.

Zhong et al. collected numerous transaction figures of peripheral nerves and established mathematical models to reproduce the contour of functional bundles inside nerves. What's more, they attempted to predict the spatial continuity of axons to the distal. Fang and Zou found that Col6, as component of extracellular matrix in nerves, could promote the formation of axon bundles. Considering safer clinical application, Col6 α 2 seemed able to promote orderly axon formation through NCAM1 guided pathway with lower immunogenicity than Col6 complex *in vivo*.

Manganas et al. reviewed relevant literature about how SCs adapted to mechanical properties of their external micro-environment. Rao et al. compared the survival of SCs and/or SLCs when repairing peripheral nerve injury, and their performance changes when encountering different biomaterials used in tissue engineering nerve grafts. Wei et al. summarized outcomes of transplantation of SCs and SLCs in different peripheral neuropathies, and importance of SCs in the process of repairing nerves. Su et al. discussed construction of tissue engineering nerve grafts with SCs. They compared not only the advantages of nerve scaffolds loaded with SCs, but also the related problems of SCLs induced by stem cells. In conclusion,

all these publications largely enriched theoretical knowledge of importance of SCs and nerve regeneration, and proposed a new treatment strategy for better application of SCs and SLCs to peripheral nerve injury repair in the future.

In recent years, many studies have been focused on understanding the process of PNS repair and reconstruction after injury and aim to find novel clinical therapeutical methods. The advancement of genomics, epigenomics and proteomics research methods has made it possible to study the regulation of transcription, post-transcriptional modification and translation in SCs and SLCs derived from stem cells, as well as the biological roles of these cells in PNS regulation, but many cellular and molecular mechanisms are still unclear and need to be farther investigated. We hope these precious achievements could bring greater breakthroughs in the future.

We, as the guest editors group, appreciate all authors once more for their valuable contributions. It is our honor that all readers of this Research Topic will enjoy these expert opinions and excellent research results.

Author contributions

BH, JH, and ZZ have connected them all within the editorial. All authors have contributed to this editorial and writing comments to the different articles.

Conflict of interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

Publisher's note

All claims expressed in this article are solely those of the authors and do not necessarily represent those of their affiliated organizations, or those of the publisher, the editors and the reviewers. Any product that may be evaluated in this article, or claim that may be made by its manufacturer, is not guaranteed or endorsed by the publisher.