Research Report

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JSPS Number – SP09110

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I undertook my research in Japan at Iwate Medical University under the guidance of professor Tohyama. The focus of my study was on the role of a protein called numb in both the development of the peripheral nervous system and its ability to regenerate following injury. Numb is a cell fate determinant that was initially shown to be important in the formation of the Drosophilia nervous system and more recently has been demonstrated to play a critical function in mammalian neurogenesis.

In my study I used the technique of immuno electron microscopy to visualize numb and its known binding partners in the peripheral nerve at different developmental ages. This technique enables cells in the nerve to be observed at very high magnification and labeled proteins can easily be localized to intracellular components such as the nucleus, ribosomes and plasma membrane.

Due to technical difficulties successful staining was only achieved at one age. Despite this however several important findings were made. Firstly it was found that numb localized specifically to the Schwann cells in the nerve (Figure 1). Schwann cells are the peripheral glia, they wrap around the axons and form the myelin sheaths necessary for rapid propagation of nerve impulses. Numb was also found to be present in only one domain of the Schwann cell at the basal membrane which contacts the extracellular matrix. This is also the known location of the numb binding protein integrin and their co-localization provides some insight into numbs function in the nerve.

Figure 1

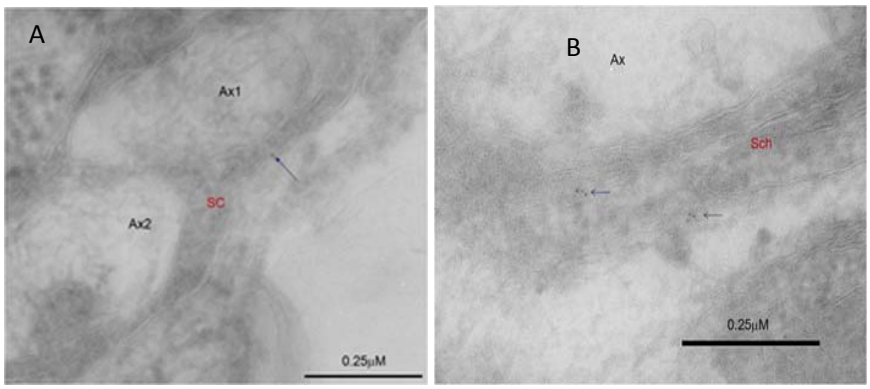

Figure1 A and B: Ultra cryosections of postnatal day 0 rat sciatic nerve stained with an antibody to numb. Arrows indicate numb location in the nerve. Ax = axon, SC = Schwann cell

Alongside this research I also carried out an investigation to determine if Numb plays a role in the response to peripheral nerve injury. Previous studies in my laboratory have shown that while Numb is expressed at high levels during development it is absent from the adult nerve. However using a model of nerve injury and the technique of immunohistochemistry I was able to demonstrate with Confocal microscopy that Numb expression is increased after nerve cut at sites distal to the nerve injury and that it can be localized to Schwann cells (Figure 2).

Figure 2

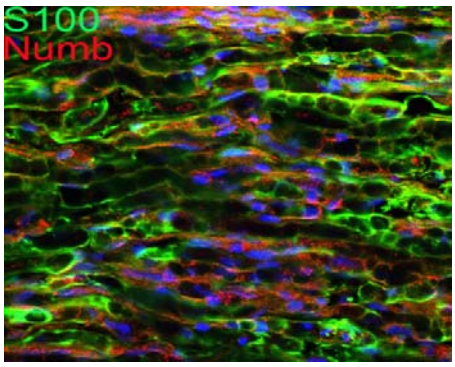

Figure 2: Cryosection of the distal stump adult rat sciatic nerve 1 week post nerve cut stained with antibodies to Numb and S100. S100 is a marker for Schwann cells, please note the overlap between the two stains.

I would like to take this opportunity to thank Professor Tohyama and all of the members of his laboratory for aiding me in carrying out this research. Without their tireless effort and advice I would not have been able to obtain these results. Also without their good humor and friendship my stay here would have been considerably less enjoyable.

I thoroughly enjoyed my time in Japan and I am very grateful to JSPS and Professor Tohyama for making this visit possible. During my research I had some time to explore around Iwate. I visited several museums, travelled to the coastal town Miyako, experienced a Japanese onsen and had the opportunity to go hiking in the mountains. I was also able to join the Univeristy karate team which enabled me to interact and make friends with students from a range of different academic backgrounds. They showed me several aspects of Japanese culture including karaoke and made my time in Japan very enjoyable. Outside of my studies I had the opportunity to learn more about Japanese culture and history when I visited Tokyo, Kyoto, Osaka and Hiroshima.

My research group at Iwate Medical University

Iwate Medical University Karate Club