

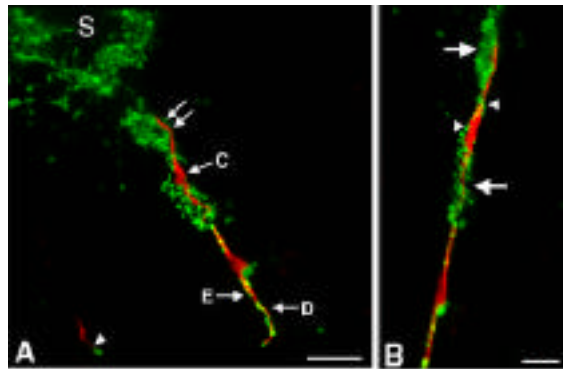


Application Note

Dr Stephen Back, Department of Pediatrics, Oregon Health Sciences University

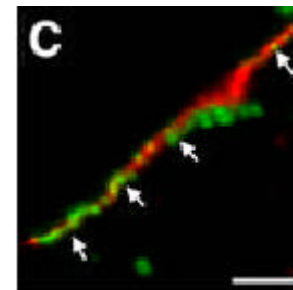


Axon Development in Preterm Neonates

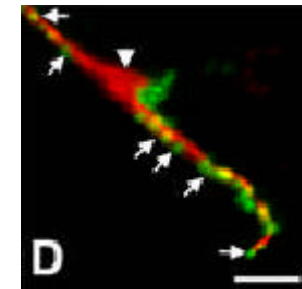


Axonal ensheathment of a region of the optic radiation (red) from a case at 30 weeks post-conceptual age by an immature oligodendrocyte (green)

Scale bar:
A= 10 μm ; B=3 μm



Scale bar = 5 μm



Scale bar = 5 μm

Dr Stephen Back works in the Department of Pediatrics at Oregon Health Sciences University. The focus of Dr. Back's research program is perinatal brain injury with a particular focus on the preterm neonate and the biological factors that predispose to Periventricular Leukomalacia (PVL). PVL is the predominant form of brain injury in the premature infant but currently the target cell in PVL is unknown. Since death of oligodendrocyte (OL) precursors could explain the impaired myelination that characterizes PVL, Dr Back and his team are testing the hypothesis that the cellular basis for PVL is a maturation-dependent susceptibility of OL precursors to death from hypoxia-ischemia (H-I). His long term objectives are to understand the mechanisms that predispose OL precursors to death from H-I and to establish whether there is a causal relationship between OL death and the genesis of myelination disturbances in the developing white matter.

The images here show the morphological features of axonal contact and initial axonal ensheathment by an immature OL. It has been a subject of debate as to whether the initiation of axonal ensheathment occurs by the OL process traveling along one surface of the axon, or by wrapping itself around the axon in a spiral form.

Dr Back has used **Volocity** to produce a 3D rendered volume from a Z series of images through the sample in order to fully understand the interaction between the axon and the OL. The contact with the axon appears to be initiated from a thickened proximal process (double arrow in panel A; upper arrow in panel B) adjacent to the soma (S) and to progress distally along the axon.

In both the lateral view of the axon in (C) and the top-down view in (D), the OL process makes multiple points of discontinuous contact along the surface of the axon supporting the notion that the distal OL process wraps around the axon as it travels along it. By using **Volocity** to view the Z series of images interactively from all directions, Dr Back has been able to see the structures in detail never possible before.

For further details of this study, done in collaboration with Dr. Hannah Kinney in the Departments of Pathology and Neurology at Children's Hospital, Boston, see the Journal of Neuropathology and Experimental Neurology, February 2002. Fig B reproduced with permission of the Journal of Neuropathology and Experimental Neurology