Disruption of spinal cord white matter and sciatic nerve geometry inhibits axonal growth in vitro in the absence of glial scarring

ABSTRACT
The findings indicate that glial scar-related factors are not required to prevent axonal growth at injury sites. However, disruption of fiber tract geometry, possibly through myelin-associated neurite-growth inhibitors, may be adequate to create regrowth barriers in spinal cord white matter and peripheral nerves.

INTRODUCTION
Until recently, it was widely accepted that axonal growth within white matter could not occur. This belief was based on the failure of injured asteroids to regenerate within the CNS, which was further supported by research indicating that neurons attach poorly to white material in vivo. The findings of these studies partially affirmed the idea that myelin in the CNS contains molecules that inhibit growth of axons. Further research revealed that various myalin-related molecules, such as Nogo, NI-35/250, Myelain–associated glycoprotein (MAG), and chondroitin sulfate proteoglycans, hinder neurite growth. The hypothesis that transplanted embryonic neurons extended parallel axons within white matter was initially dismissed as incorrect in early research. Nevertheless, the likelihood of successful growth was linked to the absence of receptors for myelin-associated inhibitors. White matter was found to support significant parallel axonal growth from adult neurons that have been transplanted. Recent tissue section culture experiments and neurite growth experiments confirmed this finding. Given the growing evidence that white matter supports axial growth, we sought to identify the properties that contribute directly to its parallel orientation. Axonal growth can be guided by physical edges and contours (haptotactic cues) without the need for biochemical composition. Physical edges placed in parallel within white matter, such as astroglial processes and axilla, might also guide parallel neurite growth. The manipulation of cryostat sections of rat brain, which deactivated biochemical guidance cues but maintained haptotactic cuings, resulted in cultured neurons being used as substrata. Neurite growth that was not parallel was observed in both cases on white matter, as biochemical cues were required for parallel growth. Additional experiments examined the role of myelin in neurite orientation and prior fixation or mounting on culture dishes. We measured the placement of neurites on a myelin-deficient corpus callosum and cultured them with cAMP analogs or nerve growth factor (NGF), which has been shown to attenuate the overall inhibitory effects of myE. Myelin is believed to have a role in parallelising neurite growth on white matter, as shown by experiments in which it inhibited the proliferation of neurons on myelian-deficient corpus callosum or preincubated with NGF or treated with cAMP analogs.

CONCLUSION
A pediatric porcine model of independent lung mechanical ventilation with severe methacholine-induced bronchospasm demonstrated that heliox improved pulmonary mechanics when used as a substitute for nitrogen gas in the same ventilator mixture. The authors conclude that heliox may be useful for critically ill children with small endotracheal tubes, severe bronchospasm, high airway resistance, and low compliance, as demonstrated by the fact that most subjects responded to pharmacotherapy within the first 4min of therapy and maintained this

response for at least 20min. The improvement of tidal volume, lung compliance and resistance, as well as the potential decrease in ventilator barotrauma, may be achieved through heliox in patients who are waiting for etical targeted therapies to take effect.