NEURAL DEVELOPMENT

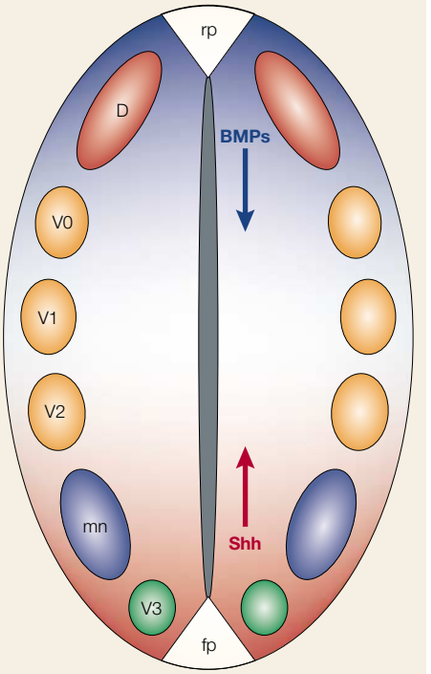
BuMPing oligodendrocytes in the cord

A new study published in *Development* by Mekki-Dauriac *et al.* shows that bone morphogenetic proteins (BMPs) are negative regulators of oligodendrocyte precursor specification in the spinal cord. Although such a role for BMPs had been proposed on the basis of previous *in vitro* experiments, the new data provide solid evidence for the involvement of these proteins in oligodendroglial development *in vivo*.

In the embryonic spinal cord, oligodendrocyte precursors are localized to a ventral domain that expresses Nkx2.2 and Olig2, two transcription factors that are essential for oligodendroglial development. The morphogenic protein sonic hedgehog (Shh) induces precursor specification and the expression of these transcription factors. By contrast, the dorsal spinal cord, an important source of BMPs, lacks oligodendrocyte precursors, raising the possibility that these proteins have a negative influence on the specification of precursor cells. By applying BMP4 to ventral cord explants, or by grafting BMP2-producing cells into the developing spinal cord, the authors were able to inhibit oligodendrocyte development. In addition, ablation of the dorsal cord or transplantation of cells that produced noggin (a BMP-signalling inhibitor) had the opposite effect: an increase in the number of oligodendrocyte precursors.

Mekki-Dauriac *et al.* found that BMP4 repressed the expression of Olig2, but not of Nkx2.2, indicating that BMPs might exert their inhibitory effect by directly antagonizing some of the effects of Shh. So, as is the case for other cell populations in the spinal cord, a fine balance between the opposing actions of BMPs and Shh controls the specification of oligodendrocyte precursors.

Juan Carlos López



Different cell types can be identified along the dorsoventral axis of the spinal cord. Patterning is controlled by a dorsal gradient of BMPs that arises from the roof plate (rp), and by a ventral gradient of the Shh that arises from the floor plate (fp). The cell population that gives rise to oligodendrocytes is localized in the ventral blue domain. D, dorsal sensory neurons; V0–V2, interneurons; mn, motor neurons; V3, ventral neurons.

References and links

ORIGINAL RESEARCH PAPER Mekki-Dauriac, S. *et al.* Bone morphogenetic proteins control oligodendrocyte precursor specification in the spinal cord. *Development* **129**, 5117–5130 (2002)

INVERTEBRATE NEUROPHYSIOLOGY

Snails with rhythm

Central pattern generators (CPGs) are networks of interneurons that produce rhythmic outputs, controlling motor activities such as feeding and locomotion. Studying how the rhythms of activity are produced can be difficult, because it is hard to distinguish between intrinsic properties of individual neurons and properties that depend on the rest of the network. Straub *et al.* have isolated the neurons that make up the feeding CPG of the snail *Lymnaea*, and have found that the cycles of firing are initiated by the intrinsic properties of one key interneuron.

There are three main classes of interneuron in the *Lymnaea* CPG — N1, N2 and N3 — and each is active during a different phase of the feeding cycle. Each class has two subtypes, and recordings from the intact network have indicated that several of the subtypes have endogenous properties, such as bursting or generating plateau potentials, that might contribute to pattern generation. However, when Straub *et al.* studied each type of interneuron in isolation, they found that only one — the N1M interneuron — could generate plateau potentials intrinsically. Another, the N2v interneuron, generated plateau potentials in the presence of acetylcholine, and the rest showed no significant patterns of intrinsic activity. Instead, it seems that the rhythmic firing of these interneurons is driven by synaptic inputs from the rest of the CPG network.

These synaptic inputs could be mimicked in the culture system by the application of glutamate or acetylcholine, the two main neurotransmitters found in the CPG. By studying the electrical and pharmacological properties of the interneurons, both in isolation and *in situ*, the authors were able to present a new model of the generation of the feeding pattern by the circuit. Similar studies in crustacean CPGs have indicated that, in these networks, most interneurons have intrinsic properties that contribute to pattern generation. The *Lymnaea* feeding CPG seems to offer a different way of doing things, in which almost all of the interneurons rely on network interactions for their rhythmic activity.

Rachel Jones

References and links

ORIGINAL RESEARCH PAPER Straub, V. A. *et al.* Endogenous and network properties of *Lymnaea* feeding central pattern generator interneurons. *J. Neurophysiol.* **88**, 1569–1583 (2002)

WEB SITES

Encyclopedia of Life Sciences: http://www.els.net/oscillatory neural networks