DEVELOPMENT

Class distinction

In the developing spinal cord, the dorsal neural tube gives rise to two populations of somatosensory interneurons — association and relay neurons. Little is known about the factors that specify these different neuronal subtypes, but two groups now report in *Neuron* that the transcription factor Lbx1 seems to have an important role.

Two classes of neuronal progenitors, which Müller *et al.* designate as class A and class B, emerge from the dorsal spinal cord. The class A cells are initially positioned dorsal to the class B cells, although the two populations swap positions later in development. The class A cells, which do not express Lbx1, give rise to relay interneurons. The class B cells, which express Lbx1, give rise to association interneurons that go on to colonize the substantia gelatinosa.

Gross *et al.* and Müller *et al.* used loss- and gain-of-function approaches to examine the role of Lbx1 in dorsal interneuron specification. They found that knocking out the *Lbx1* gene causes respecification of the class B cells to a class A identity, which is manifested in a loss of dorsal horn association interneurons. Misexpression of Lbx1, on the other hand, causes class A progenitors to adopt a class B fate. The authors conclude that Lbx1 is required for the generation of dorsal association interneurons through the specification of class B progenitors.

The authors also gained an insight into when Lbx1 acts during neurogenesis. Lbx1 expression appears in class B cells only after they have left the proliferative ventricular zone, indicating that it acts on postmitotic neurons. This implies that neuronal progenitor cells in the dorsal spinal cord retain some developmental plasticity after they have stopped dividing, and that their fate can be altered by manipulating the expression of Lbx1.

It has been known for some time that the dorsal neural tube consists of several progenitor domains, each of which expresses a distinct combination of transcription factors. However, Lbx1 is the first factor to be assigned a specific role in the specification of dorsal neuronal subtypes.

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References and links

ORIGINAL RESEARCH PAPER Gross, M. K. *et al. Lbx1* specifies somatosensory association interneurons in the dorsal spinal cord. *Neuron* **34**, 535–549 (2002) | Müller, T. *et al.* The homeodomain factor Lbx1 distinguishes two major programs of neuronal differentiation in the dorsal spinal cord. *Neuron* **34**, 551–562 (2002)

WEB SITES

Encyclopedia of Life Sciences: http://www.els.net/neuronal subtype identity regulation

CELL BIOLOGY OF THE NEURON

Curling the curl in coincidence detection

The inositol-1,4,5-trisphosphate ($Ins(1,4,5)P_3$) receptor ($InsP_3R$) is a calcium channel of the endoplasmic reticulum. It is well known that this channel opens in response to $Ins(1,4,5)P_3$ and calcium, but new data indicate that signalling through this pathway might be more complex than we previously thought; Yang *et al.* have identified a family of proteins that can directly activate the channel in the absence of $Ins(1,4,5)P_3$.

The authors looked for proteins that bind to the $InsP_3R$ and singled out a group of molecules that are known as calcium-binding proteins (CaBPs). CaBPs belong to a larger family of proteins known as neuronal calcium-binding proteins, which includes molecules such as recoverin, frequenin and calsenilin. Yang *et al.* found that CaBPs interact with the three different isoforms of the $InsP_3R$, and that the interaction depends on the ability of the CaBPs to bind calcium. Crucially, binding of the CaBPs to the $InsP_3R$ led to channel opening in the absence of $Ins(1,4,5)P_3$, indicating that CaBPs can act as ligands of this receptor. They also showed co-localization of CaBPs and the $InsP_3R$, and obtained evidence that the two proteins interact in brain lysates.

$InsP_3R$ channel opening requires both $Ins(1,4,5)P_3$ and calcium. For this reason, this molecule has been thought of as a coincidence detector that can sense the activation of separate synaptic inputs that might independently increase the levels of those two small signalling molecules. The data of Yang *et al.* complicate this view because they raise the possibility that the $InsP_3R$ is activated simply as the result of an elevation in calcium. As coincidence detection by the $InsP_3R$ has been invoked, in particular, to explain cerebellar long-term depression, Purkinje cells might be a good system in which to explore the implications of the new findings.

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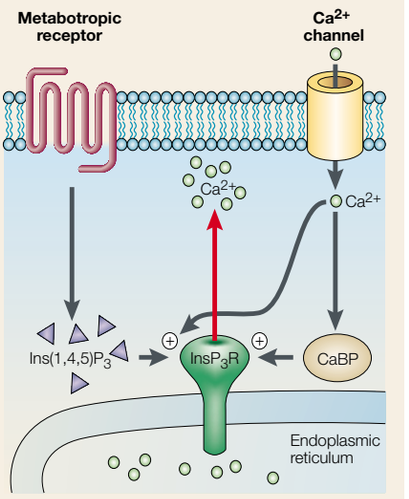

References and links

ORIGINAL RESEARCH PAPER Yang, J. *et al.* Identification of a family of calcium sensors as protein ligands of inositol trisphosphate receptor Ca^{2+} release channels. *Proc. Natl Acad. Sci. USA* **99**, 7711–7716 (2002)