phosphorylation might be required for proper channel function.

So far, TRP-PLIK is the only example of an ion channel with kinase activity. What is the function of this molecule in the different organs where it is expressed? Are there other channels with dual activity? Does ion permeation reciprocally affect kinase activity? What is the evolutionary relationship between TRP-PLIK, TRP channels and α-kinases? Clearly, the discovery of TRP-PLIK puts forward many more questions than answers.

Juan Carlos López

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ENCYCLOPEDIA OF LIFE SCIENCES Calcium channel diversity

to normal levels by the time of birth, implying the existence of a compensatory Shh-independent signalling pathway. However, the origins of the *PDGFRα*-expressing cells were not established, and another possibility is that they had migrated from other parts of the brain where *Shh* expression was unaffected.

This work adds yet another role to the functional repertoire of Shh, but it also raises some important new questions. For example, what are the downstream effectors of oligodendrocyte specification that respond to the Shh signal? What additional factors are required for postnatal maturation of these cells? To answer these and other questions, the development of more refined conditional Shh knockout strategies and the identification of better oligodendrocyte differentiation markers should prove to be a great asset.

Heather Wood

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WEB SITE Gordon Fishell's lab

ENCYCLOPEDIA OF LIFE SCIENCES Neuronal subtype identity regulation

SYNAPTIC PHYSIOLOGY

Collisions in the dendritic tree

The relevance of backpropagating action potentials to synaptic integration is no longer in question. When a spike travels back into the dendritic arbour, it can affect the functional properties of active synapses in several ways. For example, backpropagating action potentials can lead to potentiation or depression of synaptic transmission depending on the exact timing of spikes and synaptic potentials. As the interaction between ongoing activity and backpropagating action potentials has profound implications for the integration of synaptic inputs, it is not surprising that the study of this phenomenon has gained significant notoriety. Three papers published over the past few weeks attest to the rapid development of this area.

Stuart and Häusser investigated the influence of excitatory postsynaptic potentials (EPSPs) on the amplitude of backpropagating spikes in cortical neurons. They found that an EPSP at distal dendritic sites can increase spike amplitude by three- to fourfold, but for this increase to occur, both EPSPs and backpropagating spikes must occur within a small time window. In other words, the distal dendrites can detect the coincidence of backpropagating spikes and EPSPs, a property that is likely to be involved in the induction of plastic changes at the synapse.

Whereas EPSPs can influence backpropagating spike amplitude in distal dendrites, Häusser *et al.* showed that the large conductances activated at the soma during spike firing reduce coincident EPSPs in a cell- and synapse-specific manner. This shunting effect of action potentials depends on both the duration and location of the synaptic input, providing a mechanism for distal and NMDA-receptor mediated inputs to contribute disproportionately to synaptic integration during spike firing.

Although the data obtained in brain slices are fairly compelling, it is important to know whether backpropagating action potentials also affect synaptic function *in vivo*. This is a difficult question to answer, but Quirk *et al.* have taken an important first step. They recorded extracellular spikes in the hippocampi of freely moving rats and observed that the amplitude of the spikes decreased with ongoing behaviour, a reduction that was countered by the rat's experience with the experimental environment. Extracellular spike amplitude seems to be related to backpropagation of action potentials, but the evidence that supports this idea remains indirect. However, this study is an initial attempt to link the abundant *in vitro* observations and the role of backpropagating spikes in the behaving animal.

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ENCYCLOPEDIA OF LIFE SCIENCES Dendrites

NEUROGENESIS

Keeping neurons in the family

It was recently shown that radial glial cells are able to generate neurons *in vitro* and, although there was no direct evidence, it was strongly suspected that they might behave similarly *in vivo*. According to Noctor *et al.* in a paper published in *Nature*, this evidence has finally arrived.

The authors transfected rat neocortex *in utero* at embryonic day 15 or 16 with a GFP-expressing replication-deficient retrovirus, which segregated randomly into one daughter cell with each division. Twenty-four hours after transfection, they identified single GFP-expressing cells with radial glial morphology. After a further 48 hours, they observed small clones of GFP-positive cells, consisting of up to four daughter cells attached to the process of a progenitor cell. Immunostaining and electrophysiological profiling identified the daughter cells as neurons and confirmed that the mother cells were radial glia. Using time-lapse photography, radial glia were seen to divide at the ventricular surface, followed by migration of the progeny along the radial fibre.

These findings confirm that radial glia can act as neuronal progenitors in the developing cortex and furthermore, that the newly born neurons seem to use their own progenitor cell to guide their migration. Noctor *et al.* also propose that, like many clonally related neurons, the glial-derived cells might form functional radial units in the adult cortex. This conjures up an appealing image where the radial glial mother cell guides her neuronal daughters throughout their development, and the whole family ends up working together.

Heather Wood

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