

discovery. The major activity is in the industrial sector where >200 companies are involved, and the conference provided a forum for exchange of information between the industry and academia. Of the numerous genomic technologies, only a handful can be presented at a conference, but the con-

ference was successful in providing a fair sampling of the state-of-art in genomics. Sequencing of the human genome is expected to be complete early in the next century. In the post-genomic era, drug discovery and development will be based on functional genomics and this will have an impact

on healthcare in the form of reclassification of diseases, personalized rational medicines and the combination of therapeutics with diagnostics.

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## Paralysis prevention drug

**A**n anticancer compound that blocks blood vessel formation could soon be used to help patients with paralyzing spinal injuries to regain feeling and even to walk again.

In a paper dedicated to actor Christopher Reeve who was paralysed in a riding accident, Carl Hellerqvist of the Department of Biochemistry at Vanderbilt University (Nashville, TN, USA) describes how mice paralysed by spinal cord injury (SCI) and then treated with the angiogenesis inhibitor CM101 – a polysaccharide-type molecule composed of GalNAc/GlcNAc/Gal/Gly – showed a dramatic recovery in walking ability within 2–12 days [*Proc. Natl. Acad. Sci. U. S. A.* (1998) 95, 13188–13193].

### Natural anticancer agent...

CM101 (produced by Carbomed, Brentwood, TN, USA) is an exotoxin produced by group B *Streptococcus* bacteria. The molecule has the ability to disrupt angiogenesis and as such it has potential as a therapy in several disease conditions. It is currently being investigated as an anticancer agent. When the supply of nutrients from the blood is cut off, a tumour shrinks and dies, and in tests with mice, angiogenesis inhibitors have indeed been shown to stop tumour growth.

### ...Applied to paralysis

Hellerqvist and his team, in work supported by Carbomed, figured that an angiogenesis inhibitor such as CM101 might also prevent the growth of scar tissue (gliosis), which also requires new blood vessel growth, following SCI. It is the growing scar tissue that blocks the path of severed nerve cells as they try to reconnect, so halting scar formation might allow damaged nerves to repair themselves.

The team tested their theory by using intravenous administration of CM101 to treat mice with hind limbs paralysed as a result of SCI. They found that 24 out of 26 mice treated with the drug survived at least 28 days, but importantly all of them recovered their ability to walk. By contrast, in the control group, only three of 14 untreated mice survived for the same period, and none of them regained limb function.

Magnetic resonance imaging and microscopy of spinal-cord samples from the mice showed a significantly reduced area of scarring in the treated mice, according to the researchers. The team also found that CM101 helps restore nerve cell connectivity not only by preventing scarring, but also by protecting damaged nerve cells from degeneration and death. Electrophysiological measurements on isolated CNS and neurones in culture

using intracellular microelectrode recordings showed that CM101 protected axons from degeneration and reversed  $\gamma$ -aminobutyrate (GABA)-mediated depolarization of traumatized neurones. An improvement in the recovery of neuronal conductivity of isolated CNS in culture was also observed by the team. 'Restored conductivity would be the equivalent to recovery of walking in adult animals,' Hellerqvist says.

### Major clinical challenge

Recovery from SCI in people is 'a major clinical challenge', says Hellerqvist. SCI causes immediate mechanical damage and subsequent tissue degeneration due to ischaemia, haemorrhaging and oedema which all lead to nerve cell death. However, various studies have shown that CNS neurones are capable of regrowth along their length, which means, under certain conditions, severed nerves can regrow – surgical methods are being investigated to open up this possibility.

Interestingly, the team also noted that the mice treated with CM101 in this study experienced rapid healing of their wounds from the surgical incisions and without scar formation. This additional discovery could be useful in controlling scar tissue in facial injuries to lessen the long-term cosmetic impact of a wound.

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