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Stem cells

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The story of stem cells is one of potential. Like a talented young student, or a canvas awaiting the first stroke of an artist's brush, these cells are not yet the finished article, and still have the capacity to follow many paths. It has long been thought that these self-renewing, shape-shifting cells could be the key to regenerating all manner of tissues damaged by injury or disease. So far, the dream has outpaced reality – only a handful of therapies involving stem cells have shown definitive efficacy. But researchers are starting to learn what makes stem cells tick (see page S6), leading to clinical trials of therapies for various diseases.

In Parkinson's disease, for example, scientists are investigating whether replacing lost neurons in the brain can relieve symptoms (S8). Stem-cell therapies to restore sight are also advancing – researchers are using the cells to restore the cornea's ability to heal itself and to replenish the light-sensing retina (S24). And trials of stem-cell therapies in people with spinal cord injuries are gradually leading scientists towards techniques that could restore movement and sensation (S11).

Stem cells also have the potential to be powerful research tools. The ability to make human embryo-like structures – and the relaxation of guidance on how long such structures can be cultured for – provides a window onto human development (S15). Researchers are also getting better at coaxing stem cells to form 3D structures containing more than one cell type, which could lead to an improved understanding of how organs develop (S22). It is even hoped that stem-cell technology could be used to bring extinct animal species back to life (S18).

But before these promised applications become a reality, there are issues for the field to address. Manufacturing stem-cell therapies on a commercial scale, rather than on a laboratory bench, is one challenge that several firms are working to overcome (S20). And it is of course impossible to discuss stem-cell technology without debating where ethical lines should be drawn – not least when it comes to the production of human–animal hybrids to provide transplantable organs (S12).

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Richard Hodson
Senior supplements editor

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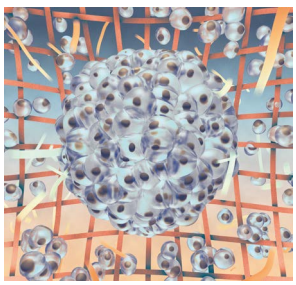

On the cover
Clusters of stem cells known as spheroids help to model human development. Credit: Markos Kay

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