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Mighty mice hold key to muscle-wasting disease

THANKS to research on “mighty mice”, the lives of people suffering from muscle-wasting diseases such as muscular dystrophy could be transformed. Two treatments that block a protein called myostatin, which slows muscle growth, are now in the pipeline.

The first approach, announced this week, aims to use a drug to mop up myostatin. Meanwhile a second method, which is already in clinical trials in people with muscular dystrophy, uses antibodies to disable the protein.

In 1997, researchers led by Se-Jin Lee of Johns Hopkins University School of Medicine in Baltimore, Maryland, engineered mice in which the gene for myostatin had been “knocked out”. The animals grew muscles twice as big as normal. A defect in the myostatin gene was what caused a German patient, whose story was widely publicised last year, to develop prodigious muscles.

Now Lee has produced a soluble molecule called activin type IIB receptor (ACVR2B) that binds to myostatin in normal mice, causing their muscles to bulk up.

He hopes ACVR2B can be used to treat conditions such as Duchenne muscular dystrophy, a genetic disease that affects 1 in 3000 boys. Their muscles waste away because of a defect in the gene for the protein dystrophin, which is important in organising muscle structure.

“It is an exceptionally promising study,” says Kay Davies, who studies the genetics of Duchenne muscular dystrophy at the University of Oxford. “For the first time we have a real hope of treating the disease.”

Lee’s team gave different amounts of ACVR2B to 49 mice and measured muscle development after one to four weeks. The greatest impact on muscle growth was with two injections a week apart, at a dose of 50 milligrams per kilogram of body weight. These mice increased their muscle mass by up to 61 per cent (Proceedings of the National Academy of Sciences, DOI: 10.1073/pnas.0505996102).

The mice developed normally and appeared unchanged apart from their muscles. But the researchers want to do further checks to see whether the drug affects other tissues. One worry is that it might affect heart muscle, causing the organ to become dangerously enlarged. Another question is whether treatment with ACVR2B will work in the long term. Davies points out that, over time, the drug might exhaust the supply of the precursor cells that give rise to muscle.

However, the pharmaceutical company Wyeth in Cambridge, Massachusetts, is already performing clinical trials of another myostatin blocker on more than 100 patients with muscular dystrophy. Wyeth is testing an antibody that binds to myostatin and stops it working. The company hopes to have initial results by late 2006.

Another worry is that drugs like ACVR2B might be abused by athletes and body builders. Some websites already sell compounds that purportedly boost muscle strength by blocking myostatin. But it should be possible for anti-doping agencies to develop a test. ACVR2B is not usually present in the blood in large quantities. And the version used by Lee is a conspicuously artificial “hybrid” molecule containing part of another protein.

“If ACVR2B is abused, a test may be important not just to keep sport clean but also to stop supplies being diverted from patients who really need the drug. “People who abuse such technology are only depriving others who are truly in medical need,” says Lee.

Rowan Hooper

“Engineered mice in which the gene for myostatin had been ‘knocked out’ grew muscles twice as big as normal”

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December events

Wednesday 14 December
Dinner@Dana: What Darwin can’t explain
Time: 18.30–21.00
Evolution via natural selection was Darwin’s master theory, but can it tell us how exploding termites came about? Dinner@Dana shows us how to create cooperation from selfish genes. This event costs £13.00 per person. Includes a two-course meal and a drink.

Thursday 15 December
Cybersalon: The future of creativity and innovation
Time: 19.30–22.30
Join Cybersalon and NMK for the annual Christmas Lecture. Speculate about how media and communications technologies are interacting and impacting on society, economics, politics and culture. Please e-mail bookings@cybersalon.org for details. This event costs £5 per person.

Our events are open to anyone aged 18 or over. Most events are free. Please pre-book.

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e-mail tickets@danacentre.org.uk
Check Website www.danacentre.org.uk

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165 Queen’s Gate, SW7 5HE
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This is a smoke-free environment. Disabled parking only.
Residents’ parking restrictions apply until 22.00.

No need for a workout