Gene Editing Offers Hope for Treating Duchenne Muscular Dystrophy, Studies Find

By NICHOLAS WADE  DEC. 31, 2015

Three cross-sections of muscle tissue from mice. From left, normal, healthy tissue; tissue with Duchenne muscular dystrophy; and tissue after gene-editing treatment. Christopher Nelson

After decades of disappointingly slow progress, researchers have taken a substantial step toward a possible treatment for Duchenne muscular dystrophy with the help of a powerful new gene-editing technique.
In vivo genome editing improves muscle function in a mouse model of Duchenne muscular dystrophy

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Postnatal genome editing partially restores dystrophin expression in a mouse model of muscular dystrophy

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In vivo gene editing in dystrophic mouse muscle and muscle stem cells

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The CRISPR/Cas system

- **CRISPR**: Clustered Regularly Interspaced Short Palindromic Repeats
  - Originally identified in bacterial genomes
- **CAS** (CRISPR-associated system) genes
- **Cas9**: nuclease (protein that cuts DNA)
- Nuclease is targeted to a specific sequence by a guide RNA (gRNA)
- Cellular mechanisms exist to repair cuts in DNA
- Therapeutically those cuts are targeted so that repair results in a functional gene
Challenges for DMD therapy

• Targeting muscle – 40% of muscle mass – efficiently and specifically
• Delivery of the Cas9 and the guide RNA
  – Viral (AAV) using one or two vectors
  – Nanoparticles (gold)
• Relatively low efficiency of gene correction
• Avoiding off-target DNA cutting
“CRISPR” isn’t a single treatment, but is a platform for therapeutic approaches – one that holds enormous promise.

Somatic gene editing still faces pre-clinical efficacy, safety, and regulatory challenges before it will reach the clinic.

One can’t forgo standard of care therapies “waiting for CRISPR”.

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Highly engaging and informative look at the science and ethics of CRISPR, intended for the interested lay reader.
Thank you!