

Researchers make gains in understanding epigenetic muscle memory

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Video Abstract

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Abstract

Does skeletal muscle have a memory? That's the question researchers from the UK set out to answer in one of their most recent studies. Their finding: Yes, muscle memory is real. But it's not quite the same type of memory you might be thinking of. This is memory of previous muscle growth—even after a period of muscle loss. The implications for athletes looking to bulk up is clear. But the results could also clue clinicians in on how to help patients retain muscle mass into older age. The researchers analyzed more than 850,000 sites on human DNA, discovering distinct patterns in how genes in these regions were chemically marked or unmarked during periods of exercise or no exercise. One cluster of genes lost its tags during muscle growth following exercise, kept them off after a period of no exercise, and lost even more during a second exercise period. Known as an epigenetic modification, this “untagging of DNA” is associated with switching gene expression on. And that's precisely what the team of researchers observed: genes promoting muscle growth remained activated even through periods of muscle loss, suggesting that the muscle “remembers” previous phases of growth. What's more, this memory could make later gains easier to achieve. The findings have important implications for how athletes train and recover from injury. For example, an individual might respond more quickly to a specific exercise protocol after injury, if the type of training reflects the exercise undertaken prior to injury, due to the muscle retaining a memory at the DNA level. Understanding muscle memory could also help regulators make tough decisions on the use of performance-enhancing drugs. That muscle might remember periods of illicit enhancement long after the fact could make the case for indefinite bans on athletes caught using illegal drugs or for the development of new DNA tests to confirm when athletes should return to competition. However, more work on the effects of performance-enhancing drugs rather than exercise alone is required. Beyond athletics, understanding the genes that control muscle memory could enable researchers to create a longer-lasting memory in the elderly. That would allow individuals to better retain muscle mass, making for a healthier, possibly longer lifespan.