

Researchers identify factor essential for tendon growth

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Insulin-like growth factor 1 (IGF1) is essential for allowing tendons to adapt to physical activity and grow properly, according to basic science research by investigators at Hospital for Special Surgery (HSS). The findings provide a strong rationale for pursuing clinical trials to explore IGF1 as a new target for treating tendon injuries in humans.

Tendons connect muscles to bone, allowing the body to move. They respond and adapt to the demands of specific activities such as walking, running or playing sports. For example, leg tendons become more spring-like in basketball players, allowing them to jump higher and with more explosive force. Tendon injuries such as Achilles tendon rupture can occur through overuse or repetitive strain and are common among athletes.

"Ruptured tendons can be catastrophic. About 30 percent of athletes with an Achilles tendon rupture are not able to return to play, and those who do return regain about 75 percent of their pre-injury ability," said senior author Christopher Mendias, Ph.D., ATC, an associate scientist in the Orthopaedic Soft Tissue Research Program at HSS. "There has been a lot of discussion in the NBA and other professional sports leagues about the recent increase in Achilles tendon ruptures and [tendon injuries](#). We are also seeing an increase in tendon ruptures in the general population."

In the basic science study, published September 19, 2019, in *The FASEB Journal*, the HSS researchers used advanced genetics techniques to

remove the IGF1 gene in cells and then monitored tendon growth. They found that without IGF1, tendons were smaller and didn't adapt like they normally would.

Next, the researchers added IGF1 to tendon cells in culture to study precisely how IGF1 affected the cells' growth processes. "Two of the ways that IGF1 affected tendon cells was through increasing cell division and stimulating the synthesis of new proteins.," said first author Nathaniel Disser, BS, a research fellow at HSS. Making new protein, such as collagen, is an important process the body uses to form [tendons](#) and other connective tissues.

In humans, growth [hormone](#) drives childhood growth and helps preserve tissues throughout adult life by maintaining adequate IGF1 levels.

Human growth hormone (somatropin) is already available by prescription for treating children with growth failure due to growth hormone deficiency or adults with growth hormone deficiency. There is also another available drug called mecasermin (Increlex), which is a form of IGF1. It is used to treat children with a severe growth hormone deficiency, such as the absence of a gene to produce growth hormone.

"Overall, our study has identified that IGF1 plays an essential role in tendon growth and paves the way for future research to test whether targeting IGF1 is useful for treating painful and debilitating tendon injuries," Dr. Mendias said. "Clinical trials are required before drawing conclusions about the ability of human growth hormone to repair tendon injuries better than is possible today."

Dr. Mendias and colleagues are also currently completing a [clinical trial](#) testing the ability of [human growth hormone](#) to increase IGF1 levels to see whether that may prevent muscle atrophy in people recovering from anterior cruciate ligament (ACL) tears.

More information: Nathaniel P. Disser et al, Insulin-like growth factor 1 signaling in tenocytes is required for adult tendon growth, *The FASEB Journal* (2019). [DOI: 10.1096/fj.201901503R](https://doi.org/10.1096/fj.201901503R)

Provided by Hospital for Special Surgery

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