Biomarker and Treatment for Muscle Wasting

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Technology description

Market Summary

There are many diseases and conditions that can lead to a reduction in muscle mass including congestive heart failure, rheumatoid arthritis, and cancer. Currently there are no non-invasive biomarkers for directly testing loss of muscle. Expensive CT scans and whole body dual x-ray absorptiometry can estimate the amount of muscle tissue in the body or lean body mass. Physicians may also perform muscle biopsies to estimate muscle loss in patients with suspected myopathy, but this procedure can cause pain, bleeding, bruising, damage to muscle tissue and surrounding area, and infection.

Technical Summary

Skeletal muscle wasting occurs from protein loss and degradation by the ubiquitin-proteasome and autophagy-lysosome pathways. Muscle atrophy results from increased activity of the Forkhead box O (FoxO) signaling pathway through upregulation of FoxO3, which activates the ubiquitin-proteasome and autophagy-lysosome pathways. However, suppressing FoxO3 reduces activity of these pathways and thus decreases muscle protein degradation. In in vitro studies, Emory scientists have shown that microRNA-182 (miR-182) targets and inhibits FoxO3, thereby attenuating the protein degradation pathways. Treating muscle cells with glucocorticoids - an in vitro model of muscle atrophy - increased FoxO3 activity and decreased miR-182 expression. However, overexpression of miR-182 had a protective effect by reducing FoxO3 expression in muscle cells treated with glucocorticoids. Earlier work by these Emory investigators demonstrated that diabetes causes skeletal muscle atrophy. Therefore, they measured miR-182 in urine from control and mice with streptozotocin-induced diabetes and found a dramatic decrease in miR-182 during diabetes. These results indicate miR-182 is a potential biomarker and treatment of muscle wasting and is relatively stable in bodily fluids that can be obtained non-invasively.

Application area

A genetic biomarker for the detection and treatment of muscle atrophy.

Advantages

Remains stable in body fluids including urine and blood to enable non-invasive detection.

Is simpler and less expensive than CT/MRI scans for detecting muscle wasting.
Identifies skeletal muscle atrophy without the need for muscle biopsy.

Institution

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