

# Researchers say supplement cuts muscle loss in knee replacements

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Hans Dreyer, professor of human physiology at the University of Oregon, is collaborating with orthopedic surgeons on the use of essential amino acids to reduce muscle losses and speed recovery in patients requiring total knee replacement surgery. Credit: University of Oregon

Twenty grams of essential amino acids taken twice daily for a week before and for two weeks after knee-replacement surgeries helped 16 patients, mean age 69, recover faster and with much less muscle atrophy than a control group ingesting a placebo.

The approach—detailed in a paper now online ahead of print in the Nov. 13 issue of the *Journal of Clinical Investigation*—could spell relief and speed recovery for a growing population of aging adults who face total knee-replacements because of loss of mobility and pain problems. An estimated 3.48 million Americans are projected to need the [surgery](#), known as [total knee arthroplasty](#) (TKA), by 2030.

The findings are part of an ongoing collaboration led by Hans C. Dreyer, a professor of [human physiology](#) at the University of Oregon, with the Eugene-based Slocum Research & Education Foundation and the Oregon Research Institute.

Atrophy in the quadriceps, a group of four muscles on the front of the thigh, has been a long-running problem following knee-replacement surgeries, Dreyer said.

In the study, 12 members of a control group receiving 40 grams a day of a non-essential amino acid supplement, a placebo, averaged an 18.4 loss in quadriceps muscle mass in their operated leg six weeks after surgery; those getting the supplement of eight [essential amino acids](#) (EEA) averaged a 6.2 percent loss. Eighty percent of atrophy occurred in the first two weeks after surgery. Atrophy in non-operative legs was about 50 percent of that in the operative leg in both groups. Muscle mass changes were seen with magnetic resonance imaging done at two and six weeks after surgery.

"We've learned that the essential [amino acids](#) were able to mitigate the amount of muscle loss," Dreyer said. "The functional measures that we

looked at—getting up out of a chair, going up a flight of stairs and going back down the stairs—were all back to baseline in the treatment group, whereas in the placebo group those times on all of the functional measures were much longer. That suggests that this is a means at which we can accelerate functional recovery."

Faster recovery is a big plus for patients, because most of them have been dealing with pain for a long time, said Dr. Brian A. Jewett, a surgeon at the Slocum Center for Orthopedics & Sports Medicine.

"Walking and being physically active are difficult for them pre-operatively and post-operatively, but for different reasons," he said. "Surgery removes the pre-operative pain and disability, and physical therapy helps restore range of motion and strength post-operatively. EAA appear to facilitate this process, presumably by reducing muscle loss. In the end, if I can get my patients able to go up and down stairs and get up from a chair sooner then this is much better for their overall health, and we saw this occur 6 weeks after surgery in the EAA group. This also suggests a durability-of-treatment effect because EAA treatment was stopped two weeks after surgery and functional mobility measures were recorded four weeks later, or six weeks after TKA. This is clinically very important to me and my patients."

Six weeks after surgery, patients in the control group took 32 percent more time to rise from a chair, walk three meters (about 10 feet), turn around and sit back down, compared to before surgery. Patients receiving essential amino acids took about the same amount of time as before surgery. Control patients took even longer to maneuver stairs after surgery. Again, times remained the same for the EEA group pre- and post-operatively.

"As we've measured it," Dreyer said, "many who have this surgery experience significant and rapid loss of muscle mass despite the fact that

their activity level does not change dramatically relative to pre-surgery, which is low to begin with because of their knee pain."

The essential amino acid supplement contained rapidly absorbed raw amino acids—a mix of histidine, isoleucine, leucine, lysine, methionine, phenylalanine, threonine and valine. Essential amino acids, which are not naturally produced by the body and must come from food sources, help the body in many ways, including tissue repair.

The placebo was alanine, a non-essential amino acid. Both supplements were mixed into pudding, cereal or carbonated beverage based on patient choice. Supplements were consumed an hour after physical therapy to take advantage of optimum protein synthesis after resistance exercises.

Researchers hope to expand their work to see how a longer duration of supplementation affects patients at six months and a year after surgery. Another potential benefit, Jewett said, is that combined with technological improvements in the components used in knee-joint replacement surgeries, such supplementation with essential amino acids may allow for the possibility of patients who elect to undergo surgery earlier in life to return to work and daily activities faster, which are important outcomes for patients.

"If this supplementation can accelerate recovery and reduce muscle loss, then that represents an advancement in TKA that has not received as much attention as component development and survivorship," Jewett said. "In other words, essential amino acids supplementation represents a major advancement on the rehabilitation front. I think about EAA supplementation as a potentially low-cost opportunity to jump-start the rehab process. We know that patients who are more engaged participants in their post-operative therapy often have better outcomes. Our ability to mitigate [muscle atrophy](#) may lead to earlier achievement of functional mobility, which gets our patients out of the hospital, back in their homes,

to work and enjoying recreational activities faster, and that's my goal as their surgeon."

Dreyer's group is pursuing a grant for a five-year, single-site clinical trial to follow patients for up to a year to explore longer-term impacts of EAA supplementation on muscle volume and functional mobility. Also included are studies designed to identify the mechanisms of action, the durability of effect and the safety and potential benefits of longer dosing times. The group also plans to assess the impacts of treatment on the quality of life of patients and their engagement, or patient activation, in their own health-care needs.

"Researchers at the University of Oregon and their collaborators are making important discoveries that promise to improve people's lives and benefit human health," said Kimberly Andrews Espy, vice president for research and innovation and dean of the graduate school at the University of Oregon. "This study may result in better outcomes for the millions of people who undergo knee replacement surgeries and represents the tremendous value of these kinds of innovative research-industry partnerships."

Provided by University of Oregon

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