Study of leaping toads reveals muscle-protecting mechanism (w/ video)

December 19 2012

(Phys.org)—Most people are impressed by how a toad jumps. UC Irvine biologist Emanuel Azizi is more impressed by how one lands.

An assistant professor of ecology & evolutionary biology who specializes in muscle physiology and biomechanics, Azizi found that nature's favorite leapers possess a neuromuscular response that's specific to the intensity of a landing – a mechanism that protects muscles from injury upon impact.

The research is helping reveal how the nervous system modulates motor control patterns involved with jumping and landing. Azizi's findings on the underlying function of muscle control, he said, could one day improve rehabilitation programs for people with neuromuscular deficiencies.

In all vertebrates – from toads to humans – muscles contract to provide jumping power. Landing, however, requires that muscles stretch to dissipate energy and slow the body. But if muscles become overstretched during landing, injury can occur.

For a study appearing online today in *Biology Letters*, Azizi and UC Irvine graduate student Emily Abbott measured toads' muscular responses to leaps of different lengths. They discovered that during landing, toads' muscles adapt to the varying intensity of impact. As the creatures hop over longer distances, their landing muscles increasingly shorten in anticipation of larger impacts.

This pattern indicates that rapid and coordinated responses of the nervous system can act to protect muscles from injury, said Azizi, who added that future efforts will be aimed at understanding what sensory information is used to modulate these responses.

"Toads are ideal for studying jumping and landing because they're so good at it," he noted. "This work is providing the basic science on how muscles respond during high-impact behaviors like landing or falling."

Provided by University of California, Irvine