

Why is elastic energy storage important in muscle and tendon?

Elastic energy storage in muscle and tendon is important in at least three contexts (i) metabolic energy savings derived from reduced muscle work, (ii) amplification of muscle-tendon power during jumping, and (iii) stabilization of muscle-tendon force transmission for control of movement.

What is muscle and tendon energy storage?

Muscle and tendon energy storage represents the strain energy that is stored within a muscle-tendon complex as a muscle and tendon are stretched by the force developed by the muscle when it contracts. This energy may be subsequently recovered elastically when the muscle relaxes.

Which energy form can help reduce muscle work demands?

There is, however, another energy form which may help to reduce muscle work demands: elastic energy. When a material is subjected to a force,  $F$ , it deforms. During this deformation, the force moves over a finite displacement,  $x$ , and thus does work,  $F \cdot x$ . This work can be stored as elastic potential energy ( $E_{\text{elastic}}$ ).

Why is elastic energy stored within a muscle when it contracts?

Elastic energy that can be stored within a muscle when it contracts is generally associated with its passive force-length properties, because these depend on the amount of non-contractile connective tissue within the muscle.

Do parallel-fibered muscles have elastic energy storage?

For parallel-fibered muscles that have little or no tendon in series with the muscle's fibers, elastic energy storage is limited to parallel and series elastic elements within the muscle, which include the cross-bridges themselves.

How does a striated muscle produce energy?

Striated muscle uses chemical (metabolic) energy to produce force, to move this force over a distance to do work, and to do this work within some time to generate power. The metabolic energy consumed in producing these mechanical outputs is a major component of an organism's energy budget, particularly during repetitive, cyclical movements.

Most tissues, including the adipose tissue, skeletal muscle, pancreas, and liver express short and long forms of Ob-R. 19, 20, 21 Peripheral tissues in general express 10 ...

Changing the speed or vertical position of a body requires mechanical energy. This energy is typically provided by the biological motor, striated muscle. Striated muscle uses ...

Creatine phosphate is a high-energy storage compound in muscle that is derived from arginine, glycine, and SAM. Creatine spontaneously cyclizes to produce creatinine at a constant rate. ...

Soft tissues contribute significantly to the dynamics of running in terms of energy dissipation, storage, and return. Their deformations can help cushion the body, performing ...

Glycogen is a vital energy substrate; it is the primary storage form of glucose in the body, predominantly found in muscle and liver tissues. When the body requires energy, such ...

Therefore glycogen is the actual energy storage. However glycogen is not the only energy storage used in muscles. The muscle actually uses a quite clever energy management ...

Adipose tissue plays a central role in regulating whole-body energy and glucose homeostasis through its subtle functions at both organ and systemic levels. On one hand, adipose tissue stores energy in the form of lipid and controls the ...

We show the strain energy in the thick and thin filaments is less than one third the strain energy in attached cross-bridges. This result suggests the cross-bridges act as springs, storing energy ...

Actomyosin cross-bridges, actin and myosin filaments, titin, and the connective tissue scaffolding of the extracellular matrix all have the potential to store and recover elastic ...

This close localization of organelles is postulated to facilitate the efficient transfer of fatty acids from bulk storage in the lipid droplet to energy producing sites in the mitochondria. ...

We also acknowledge Jim Ziegler for his help with the jumping experiments. This work was supported by the Whitaker Foundation and NASA/Ames Research Center, Grant ...

Zhao and Karpac show that *Drosophila* muscle can systemically control lipid synthesis in fat body and the intestine. This inter-tissue communication is mediated by a Foxo-dependent myokine (Upd2) and ...

Adipose tissues have a central role in energy homeostasis, as they secrete adipokines and regulate energy storage and dissipation. 15 This role of energy balance is ...

As the second essential energy supply nutrient for organisms, fats serve as an energy storage workshop to prevent energy depletion. The subcutis is the largest and safest ...

Elastic energy storage in muscle and tendon is important in at least three contexts (i) metabolic energy savings derived from reduced muscle work, (ii) amplification of muscle-tendon power ...

At the same time, the soft tissue protection and vascularity of these two tendons are different . According to its functions, tendons can be classified as energy storage or positional tendons . In general, the muscles ...

Because connective tissue in muscles is used to transmit stress and store elastic energy, we investigated the contribution of elastic fibers to passive forces using step-stretch ...

For effective use of elastic recoil, the tuning of muscle and spring force capacity is essential. Although studies of invertebrate organisms that use elastic recoil show evidence of increased ...

During rapid energy-dissipating events, tendons buffer the work done on muscle by temporarily storing elastic energy, then releasing this energy to do work on the muscle. This elastic mechanism may reduce the risk of muscle damage by ...

J Physiol 591.18 (2013) pp 4405-4413 4405 The Journal of Physiology SYMPOSIUM REVIEW Muscle glycogen stores and fatigue Niels &#216;rtenblad 1,2,Hakan ...

Cyclical storage and release of elastic energy may reduce work demands not only during stance, when muscle does external work to supply energy to the center-of-mass, but ...

Hargreaves and Spriet review regulatory mechanisms of ATP resynthesis during exercise and summarize nutritional interventions that target muscle metabolism to enhance ...

White adipose tissue is specialized in the storage and release of fat, the balance of which is critical to maintain healthy energy homeostasis (Rohm et al, 2013) deed, in humans, a combination of excessive lipid storage and ...

Adipose tissue (AT), composed mainly of adipocytes, plays a critical role in lipid control, metabolism, and energy storage. Once considered metabolically inert, AT is now recognized as a dynamic endocrine organ that ...

The glycogenesis shunts G6P to glycogen for energy storage. The opposite reaction is the glycogenolysis, which breaks down glycogen back to G6P via two pathways. ... In nonhepatic tissues, including muscle and brain, G6P ...

Adipose tissue, colloquially known as "fat," is an extraordinarily flexible and heterogeneous organ. While historically viewed as a passive site for energy storage, we now appreciate that adipose tissue regulates many ...

Storage of molecules used in energy production is under hormonal control: glucagon, adrenaline and insulin all influence the storage of fatty acids and glycogen. ... These stores are mostly contained in cells of skeletal ...

Adipose tissue serves as the major storage area for fats in animals. A normal human weighing 70 kg contains about 160 kcal of usable energy. Less than 1 kcal exists as glycogen, about 24 ...

In the previous chapter we saw that jump which raises the center of mass of 65 kg person by 0.5 m already requires more power than the muscles alone can typically produce, so how do ...

Distinct mechanisms are in place to facilitate energy storage, and to make stored energy available during times of fasting and starvation. ... From the intestines, these systems transport them to the liver, adipose tissue, or muscle cells that ...

Originally classified as a simple energy storage organ, adipose tissue is now known to function as a major endocrine system that secretes adipokines, growth factors, cytokines, ... and affects the metabolic control of nutrient flow in ...

In vivo muscle force and elastic energy storage during steady-speed hopping of tammar wallabies (*Macropus eugenii*) J Exp Biol (1995) ... Tendon is an intricately organized ...

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