New knowledge of the muscular system important for future treatment of diseases

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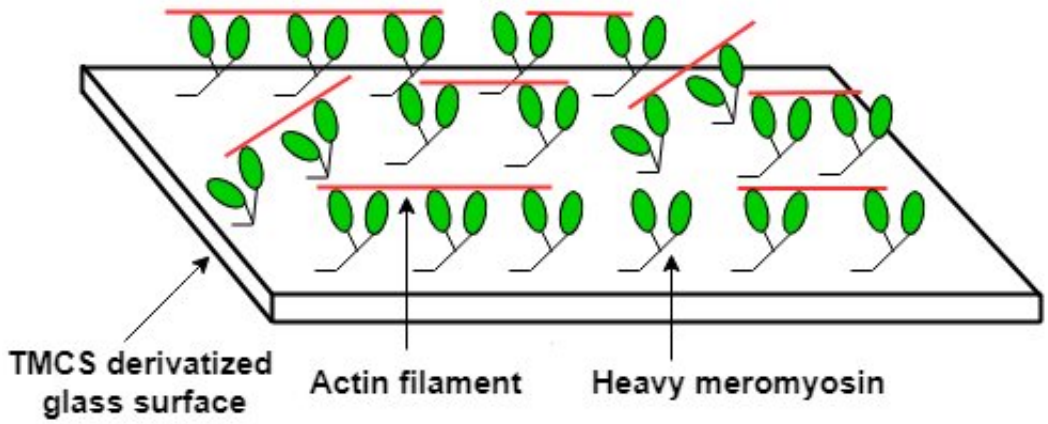

Credit: Linnaeus University

When a muscle is activated, it is the proteins myosin and actin that go to work. Myosin molecules take hold of actin molecules and pull, like rope pulling, in a process that gets energy from the use of the cellular fuel ATP. In his dissertation, Mohammad Ashikur Rahman has conducted extensive studies of the mechanical actin and myosin process at the molecular level. These studies have provided new basic scientific knowledge, but the insights are, however, also of value for developing future treatment of diseases of the skeletal muscle and heart, and for counteracting muscle weakness in the elderly.

Skeletal muscles are the muscles that are stuck in the skeleton and that allow us to move. They make up about 40 percent of body weight and contain 50-75 percent of all different types of proteins found in the body. When a muscle is activated, the proteins myosin and actin are central. Therefore, knowledge of the mechanism of effective interaction between actin and myosin is of utmost importance in understanding the process.

In the dissertation, Mohammad Ashikur Rahman studies the mechanical properties of actin, but also details of the power development mechanism that includes both actin and myosin.

"The thesis has provided new basic scientific and medical insights, but also laid the foundation for more efficient nanotechnological utilization of both actin and myosin," says Mohammad Ashikur Rahman.

In his dissertation, Mohammad Ashikur Rahman investigated actin and myosin at the molecular level, both to understand how they function normally, but also to understand certain diseases in which they are involved. Experimental methods have also been improved or refined in the dissertation.

The most important method used in the dissertation is the so-called in vitro motility test system where myosin motors bound to a modified glass surface move actin filaments that can be observed in a microscope by labeling them with a fluorescent molecule. The method is the basis for the development of nanotechnological applications.

In the thesis, Mohammad Ashikur Rahman has also developed an approach that makes it possible to reuse nanostructured chips for myosin-driven actin transport. This is important as nanofabrication is expensive and time-consuming, while energy consumption is significant for certain nanofabrication methods.

In summary, Mohammad Ashikur Rahman's dissertation provides new insights on how actin and myosin work individually and together. It is of both basic scientific and medical value, as well as for optimal utilization of the proteins in nanotechnological applications. In addition, new methodology and new techniques are described that are of particular importance for nanotechnological applications in the actin and myosin process.

More information: Biophysical studies of the actin-myosin motor system and applications in nanoscience. urn.kb.se/resolve?urn=urn:nbn:se:lnu:diva-87498

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