**How do proteins in our body achieve muscle movement?**

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At ANU’s John Curtin School of Medical Research, we study proteins involved in muscle movement and contraction. In particular, we are trying to establish the crucial molecular interactions between these proteins, with the aim of better understanding of physiological processes that take place in our muscle cells under normal conditions and in disease states. The outcomes of our research might pave the way for the treatment of pathological conditions, associated with skeletal and cardiac muscle disorders.

**Muscle contraction**

Muscle contraction is initiated by a signal generated in the brain. This stimulus is detected by a voltage-sensing protein called dihydropyridine receptor (DHPR), but it is unknown how the signal is communicated to ryanodine receptor (RyR1), a protein that initiates muscle contraction. This cascade of events is known as the excitation-contraction coupling.

**Excitation-contraction coupling**

- **Nuclear Magnetic Resonance (NMR)**
  - A solution of protein is placed in a strong magnetic field, causing atomic nuclei to align with the field and emit signals upon radio-frequency pulse excitation.

**Muscle contraction**

- **Contraction of cardiac muscle** is non-voluntary, but it is realised via a similar mechanism.

**Molecular structures of proteins**

- **Interactions of Ahnak and DHPR-β**

**Protein mutations might cause diseases**

A mutation of a single amino acid in STAC3 causes Native American Myopathy (NAM) disease [1]. It is important to understand the structural implications of such mutations.

**NMR spectrum of STAC3**

NMR spectrum of STAC3, where each 2D peak corresponds to one amino acid. Spectra like this one help us to investigate structure and interactions of proteins.

**Interactions of Ahnak and DHPR-β**

Perturbations in positions of the peaks in NMR spectra allow to study molecular interactions. These spectra indicate binding of a protein Ahnak with the β-subunit of DHPR.