

# Troponin-C

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## Introduction

Troponin C is a protein found in skeletal and cardiac muscle that helps control the initiation of contraction of the muscle fiber. Troponin C makes up a regulatory complex of troponin proteins (troponin 1, C and L) which all act to modulate the binding of tropomyosin to actin filaments in the muscle. The function of the troponin complex, and by extension the function of troponin c, is critical to the proper timing, strength, and frequency of muscle contraction in both skeletal and cardiac muscle. Troponin is also used as a biochemical marker of heart health during potential instances of acute cardiac damage such as a myocardial infarction, as it is released into the blood when cardiomyocytes are damaged. Troponin C is a type of calcium binding protein with two distinct conformations that are stabilized by different concentrations of calcium. This allows troponin C to regulate muscle contraction (in conjunction with the rest of the troponin/tropomyosin complex) in a calcium dependent manner. Changes to troponin C are implicated in several disease processes, particularly of cardiac troponin C which plays a role in some forms of cardiomyopathy. Several pharmacological treatments of this disease state target troponin C.

## Structure and Function

Troponin C is a 18 KDa protein of the EF-hand family of calcium binding proteins. There are several variants of this structure depending on the type of muscle it is found in, but all play a similar role in the regulation of calcium induced contraction of muscle fibers. Generally troponin-C is composed of two main domains, each with two calcium binding EF-hand motifs. The two domains are connected by a flexible linker region with a dynamic structure in solution. Troponin C exists in two main conformational shapes, open and closed, and the transition is dictated by the binding of calcium ions to the binding motifs. Calcium binding drives the protein towards the open confirmation inw hich a “sticky” hydrophobic region becomes exposed. This hydrophobic region then binds to the regulatory switch region of troponin-I, removing an adjacent inhibitory region of troponin-1 from its binding site on actin. The now free actin can participate in the binding cycle associated with contraction of the sacomere, and thus the muscle fiber as a whole. Falling calcium oncentrations (cuased by calcium uptake into the sarcoplasmic reticulum and efflux fromt he cell via pumps) causes troponin-C to unbind and return to its closed conformation, allowing troponin-1 to rebind to actin inhibiting further contraction.

**Homology and Structural Similarity**

**Isolation and Purification**

**Solution Studies**

**Interfacial Studies**

**Predictions**

**Calculations**

**Conclusion**