Patients with chronic heart failure develop a parallel skeletal muscle myopathy, leading to increased fatigability. Alterations have been found in regulatory proteins involved in the intracellular calcium (Ca)-homeostasis, in the cytosolic Ca transients and subsequent force production during fatiguing isometric contractions. This study investigates whether the Ca-sensitivity of force production by the actin-myosin complex is altered in CHF, both in resting and fatigued muscle.

CHF was induced in male Wistar rats by coronary artery ligation. Six weeks after primary surgery, one soleus muscle was prepared in situ. The muscle was stimulated to contract isometrically (5Hz, 6s on and 4s off) for 30 minutes. The contralateral muscle served as resting control. Following the fatigue-protocol, the muscles were excised and pinned in a Petri-dish under paraffin oil and kept on ice. From the muscle, single fibers were dissected, and mechanically skinned. The fibers were attached to a force transducer, and the actin-myosin complex directly activated by transferring the fibres sequentially into solutions with strongly buffered [Ca\(^{2+}\)] (range 0-20µM free Ca\(^{2+}\)). From the force-Ca curves the calcium-sensitivity and the maximum Ca-activated force were obtained.

In resting muscles, no differences were found in maximum Ca-activated force or the Ca-sensitivity between SHAM operated animals and CHF. In fatigued muscle, the Ca-sensitivity was unaltered compared to resting contralateral in both SHAM and CHF. Maximum Ca-activated force as expressed per fibre cross-sectional area was reduced less in CHF than in SHAM (11% in CHF, 33% in SHAM). However, the cross-sectional area had increased significantly in the SHAM fibers (44%) during the fatiguing contractions, whereas in CHF it was unchanged.

Taking into consideration cell swelling in SHAM fibers and the lack of cell swelling in CHF, the maximum Ca-activated force was reduced in fatigued muscle in CHF whereas in SHAM it was not.