Myofibrillar protein oxidation affects filament charges, aggregation and water-holding

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Myofibrillar protein oxidation affects filament charges, aggregation and water-holding

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Abstract: Hypochlorous acid (HClO) is a strong oxidant that is able to mediate protein oxidation. In order to study the effect of oxidation on charges, aggregation and water-holding of myofibrillar proteins, extracted myofibrils were oxidized by incubation with different concentrations of HClO (0, 1, 5, and 10 mM). Loss of free thiols, loss of histidine and formation of carbonyls were greater with increasing oxidation level and the particle size increased. Water-holding in the 5 and 10 mM HClO groups were greater than in the non-oxidized control. Isoelectric focusing (IEF) showed that the isoelectric point (pI) of oxidized proteins were lower compared to non-oxidized ones. The lower pI values of oxidized proteins suggests that oxidation increased the overall net negative charge of myofibrillar proteins solubilized for IEF. Here we propose a hypothesis that oxidation-induced increase in net negative charges is the driving force for improved water-holding in myofibrils, whereas protein cross-linking and aggregation have an opposing effect by decreasing the water-holding.

Keywords: carbonyls, free thiols, isoelectric point, particle size, histidine

1. Introduction