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Analyzing μ -Calpain induced proteolysis in a myofibril model system with vibrational and fluorescence spectroscopy

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ABSTRACT

Degree of post-mortem proteolysis influences overall meat quality (e.g. tenderness and water holding capacity). Degradation of isolated pork myofibril proteins by μ -Calpain for 0, 15 or 45 min was analyzed using four spectroscopic techniques; Raman, Fourier transform infrared (FT-IR), near infrared (NIR) and fluorescence spectroscopy. Sodium dodecyl sulfate polyacrylamide gel electrophoresis was used to determine degree of proteolysis. The main changes detected by FT-IR and Raman spectroscopy were degradation of protein backbones manifested in the spectra as an increase in terminal carboxylic acid vibrations, a decrease in CN vibration, as well as an increase in skeletal vibrations. A reduction in β -sheet secondary structures was also detected, while α -helix secondary structure seemed to stay relatively unchanged. NIR and fluorescence were not suited to analyze degree of proteolysis in this model system.

Keywords

Myofibrils; proteolysis; proteins; vibrational spectroscopy; fluorescence

1. INTRODUCTION

The degree of post-mortem proteolysis in meat has been linked to important quality parameters of fresh meat, such as water holding capacity (Calvo, Toldra, Aristoy, Lopez-Bote, & Rey, 2016; Huff-Lonergan & Lonergan, 2005; Hughes, Oiseth, Purslow, & Warner, 2014; Kristensen & Purslow, 2001; Melody et al.,

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