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Initial work on developing a cooking protocol for producing re-structured meat under controlled conditions

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Abstract

Restructured meat is made by binding individual pieces of meat together. To study the effect of mechanical work on the meat binding process, a standard cooking protocol must be established. This paper details the establishment of a standard cooking protocol for the cooking process using untreated beef *semitendinosus* muscle. The effect of different cooking temperatures and applied loads during cooking were investigated. Meat samples were cut in 20 mm cubes size from beef *semitendinosus* muscle and two pieces were held together with the muscle fibre parallel to each other by wrapping them with a plastic food wrap. Then the samples were placed inside square steel tubes, that act as a mold for cooking, and different weights (0, 250, 500, 750 and 1000 g) were placed on top of the meat cubes during cooking. The temperatures used for cooking were 60, 70 and 80 °C. There was a significant temperature effect, with increases noted between 60°C and 70°C and between 70°C and 80 °C. At 60 °C neither myosin nor collagen has gelatinized, leading to low binding strengths. At 70 °C the myosin component will have gelatinized. At 80 °C the collagen component will be contributing to the bond. To keep the collagen effect to a minimum the meat should be cooked at 70 °C. The effect of applied cooking load was significant at all cooking temperatures once sufficient load had been applied against no load to ensure good contact at the joint. There was a significant effect of applied load noted at 80 °C with increases up to 750 g and a drop occurring between the 750 and 1000 g loadings. The drop has been attributed to collagen being squeezed out of the joint as a bead of white material was noted around the joint.

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Keywords: restructured meat; reformed meat; tensile strength; cooking; beef

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1. Introduction

In production of reformed or restructured meat, pieces of meat undergo physical treatment via a tumbler or massager, and with the aid of salt and phosphate [1], the myofibrillar proteins, mainly myosin, are extracted [2]. Further processing, which includes applying an appropriate pressure to the meat pieces and cooking [3, 4], coagulate the myosin thus binding the meat pieces into reformed meat.

The tumbling and massaging processes impart impact and friction forces to the meat. Products made from diverse type of meat require different level of forces. These physical treatments variations have been qualitatively determined previously through many trial and error procedures of tumbling and massaging to produce the most acceptable product. The parameters for tumbling or massaging processing that have been studied extensively are the time [5, 6], speed [7, 8] and intermittent or continuous method [9, 10].

There is no quantitative information on the effect of the physical forces on the meat pieces. In order to initiate such a study, a protocol for the cooking temperatures and applied load during cooking to the meat pieces needs to be established. This paper presents the result of the effect of different applied load on the meat pieces while cooking at different temperatures against the Tensile Adhesive Strength (TAS) of the bound meat pieces.

2. Materials & Methods

The meat samples were from beef *semitendinosus* (eye of round) bought from Taylor Preston Limited (Palmerston North, New Zealand). The meat was cut into 20 mm cubes with the fibre direction parallel to the cutting point. One meat cube was placed on top of another meat cube with the fibre direction of both meat cubes perpendicular to the joining junction. The combined meat pieces were wrapped with plastic food wrap (Glad) and stored at 4 °C overnight.

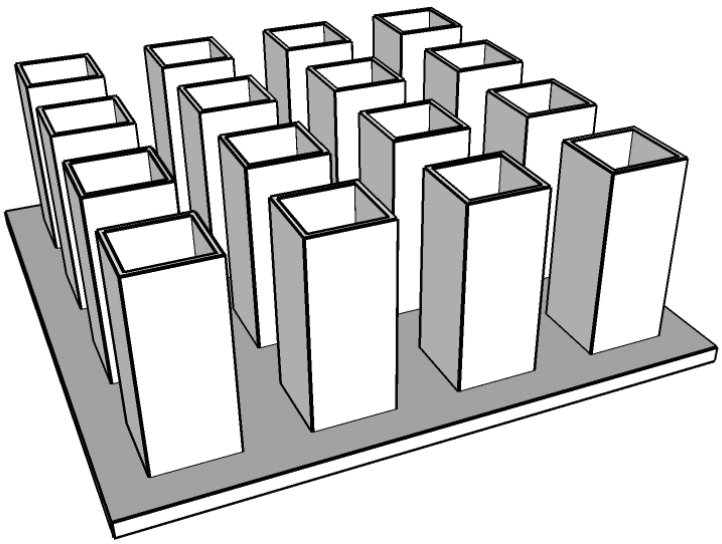

Fig. 1. The mold made of steel to put meat cubes and cook

Figure 1 shows a mold consisting of 16 steel square tubes with an opening of 22x22 mm and height of 60 mm attached to a steel plate (185x185x2 mm). The mold was used to retain the shape of the meat