Shockwave processing and sous vide cooking improve sensorial and nutritional qualities of beef
Feng Ming Chian, Lovedeep Kaur, Thierry Astruc, Annie Venien, Olivier Loison, Anna-Sophie Stubler, Kemal Aganovic, Suzanne Hodgkinson, Mike Boland

To cite this version:
Feng Ming Chian, Lovedeep Kaur, Thierry Astruc, Annie Venien, Olivier Loison, et al.. Shockwave processing and sous vide cooking improve sensorial and nutritional qualities of beef. Food Structure Digestion and Health congress, Sep 2019, Rotorua, New Zealand. 2019. hal-02289521

HAL Id: hal-02289521
https://hal.archives-ouvertes.fr/hal-02289521
Submitted on 16 Sep 2019

HAL is a multi-disciplinary open access archive for the deposit and dissemination of scientific research documents, whether they are published or not. The documents may come from teaching and research institutions in France or abroad, or from public or private research centers.

L’archive ouverte pluridisciplinaire HAL, est destinée au dépôt et à la diffusion de documents scientifiques de niveau recherche, publiés ou non, émanant des établissements d’enseignement et de recherche français ou étrangers, des laboratoires publics ou privés.
Introduction
In recent years, novel technologies have received extensive attention in the meat industry to effectively improve the organoleptic and nutritional properties of meat. Technologies such as shockwave processing and sous vide cooking have been investigated and are found to be effective in tenderingisation of meat [1, 2]. These processing methods have been reported to cause structural modification of muscle physical structure [1] which may potentially influence the bioaccessibility of digestive enzymes and in turn affects the digestive properties of meat [3].

Objective
The objective of this experiment was to study the effect of shockwave processing and subsequent sous vide cooking on meat tenderness, muscle structure and oral-gastro-small intestinal protein digestibility in vitro.

Materials and methods
Sample treatments
Vacuum packed beef brisket (11 days post-mortem)

Step 1: Shockwave (SW) processing
- Parameters:
  - DIL: 35 kV, 11 kJ/pulse
  - 50% conveyor belt speed
- Underwater electrical discharged method

Step 2: Sous vide (SV) cooking
- 60 °C, 12 hrs

Post-treatment analyses
- Transmission electron microscopy (TEM)
- Fourier-transform infrared spectroscopy (FT-IR)
- Warner Braitz (WB) shear force

Results and discussion
Figure 1. TEM micrographs showing the ultrastructure of beef brisket with and without processing. A and C: control untreated raw muscle; B and D: SW treated raw muscle; E: control untreated SV cooked muscle; F: SW treated SV cooked muscle. SW treatment has caused the formation of waxy and disoriented sarcomeres. Subsequent SV cooking led to the disruption of z-disk structure and coagulation of myofibrils in a greater extent when compared to the control untreated SV cooked meat.

Table 1. A significant reduction in WB shear force was observed for the SW cooked SV treated meat compared with the control, which might be due to the disruption of muscle fibre and collagen structure from the SW processing. In: C. 0.55

Conclusions
Shockwave processing followed by sous vide cooking improved meat texture and in vitro protein digestibility and thus could be an useful approach to enhance meat’s organoleptic and nutritional properties.

Acknowledgements
Funding from the Riddet Institute Centre of Research Excellence (CoRE) is gratefully acknowledged. The authors would also like to thank INRA and DIL for hosting Miss Chian as part of this study as well as Miss Claire Szczepaniak (Cellular Imaging Center of Health (CIClS) laboratory, Clermont Ferrand University, France) for helping with the TEM sample embedding process.

References