High pressure assisted meat tenderisation by papain and ficin

**Identification**

<table>
<thead>
<tr>
<th>Key words</th>
<th>meat tenderisation, papain, high pressure</th>
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<td>Latest version</td>
<td>2012/05/23</td>
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<tr>
<td>Completed by</td>
<td>FRIP</td>
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**How does it work?**

**Primary objective**
Injection of papain into meat to enhance structure and increase tenderness after high pressure processing. This technique can also be used without high pressure treatment.

**Working principle**
Papain and ficin are general non-specific plant thiol proteases applied in food processing [1]. These enzymes have high thermal and pressure stability requiring intense process conditions for adequate inactivation. Injection of papain and pressurization to 100 MPa leads to significant increase of meat tenderness [2]. The amount of enzymes relative to the mass of the meat and used pressure are the important parameters that can affect the meat tenderness [3].

**Images**
- Additional effects: Color changes during high pressure treatment are not under control.

**Important process parameters**
- Level of the high pressure, holding time on pressure, processing temperature

**Important product parameters**
- Dose of papain and ficin

**What can it be used for?**

**Products**
- Meat

**Operations**
- Pressurization

**Solutions for short comings**
- Tenderization of the meat.

**What can it NOT be used for?**

**Products**
- Not sufficient quality of the meat slice due to tenderization of meat is out of the requested range tenderization.

**Operations**
- Low pressure level operations (pressure below 100 MPa).

**Other limitations**
- Quality of papain and ficin, temperature of the processing. Low value of the tenderization due to low dose of papain or insufficient high pressure treatment. However, to high doses or to long resting times gives over-tenderization.
Risks or hazards

Preliminary experiments of the processing are necessary to predict the optimum enzyme doses and processing parameters (mainly pressure and holding time on pressure).

Implementation

Maturity
The know how is currently in research area. High pressure units are applied in industry but not for tenderization of meat slices.

Modularity/Implementation
It can be easily applied in modern high pressure unit. Producers have to invest high level of currency into the high pressure unit.

Consumer aspects
The quality of high pressure treated meat is excellent and safety is also guaranteed under control of chilled storage temperatures.

Legal aspects
‘Novel Foods Regulation’ (Regulation (EC) No 258/97)

Environmental aspects
Lower consumption of energy during high pressure treatment compared to heat treatment.

Facilities that might be interesting for you

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<thead>
<tr>
<th>Title</th>
<th>Institute/company</th>
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<tr>
<td>HP FRIP unit</td>
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<td>HP Industrial scale IRTA</td>
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Further Information

Institutes
FRIP, NTU Athens, Institute of Chemical Technology Prague, University of Reading, AFRC Institute of Food Research

Companies
Hiperbaric

References