Further elucidation of impact of aged/frozen treatment on meat quality

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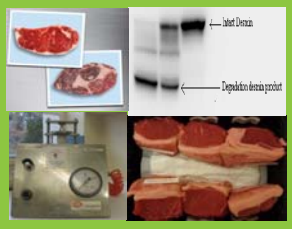

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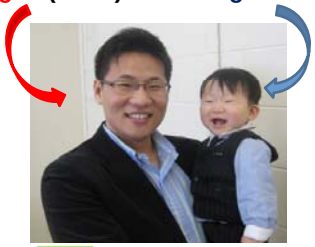
Conventional ideas on Fresh vs. Frozen meat

MEAT					
	High Quality	Tender	Juicy	Prep Variety	Flavor
Fresh	67%	62%	62%	61%	65%
Frozen	22%	24%	20%	34%	25%

Aged (fresh) vs. Not aged much (frozen)

Sealed Air CRYOVAC



In general, it is thought that frozen meat **is of a lower eating** quality than fresh meat.

(Lagerstedt et al., 2008)

Is it fair to compare?

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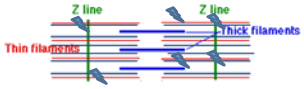
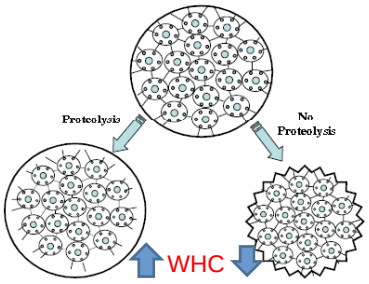
During ageing….

The concept for "aged then frozen" is simply giving a sufficient ageing time prior to freezing meat so as to utilise its "ageing effect".

Post mortem tenderization & Water-holding capacity (WHC)



Proteolysis of key myofibrillar and cytoskeletal proteins



Huff-Lonergan and Lonergan (2005)

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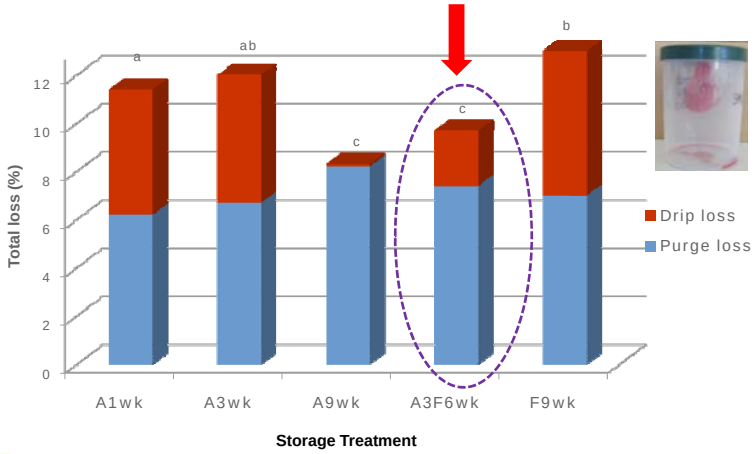
Effect of aged/frozen on water-holding capacity (WHC) of lamb loins

Aged/frozen significantly improved WHC of loins



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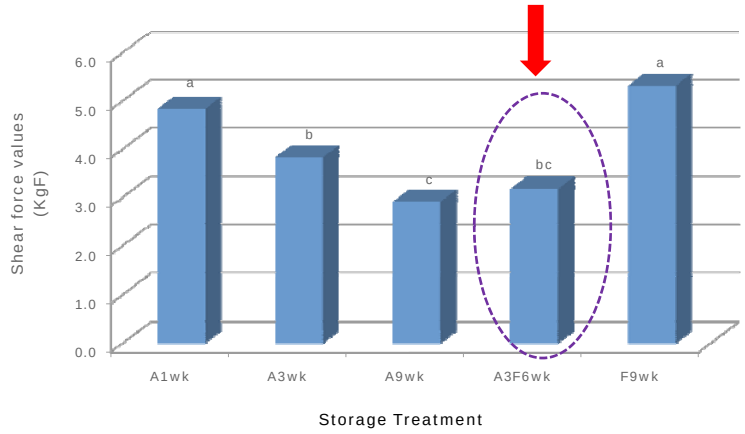
abc Different letters indicate significant difference (P < 0.05)

Effect of aged/frozen on shear force values of lamb loins

Aged/frozen significantly improved tenderness of loins



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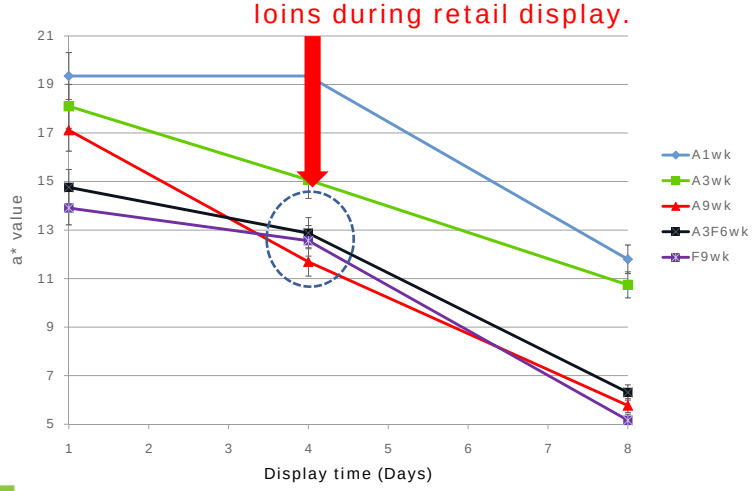
Effect of aged/frozen on colour stability of lamb loins

Aged/frozen improved colour stability of loins during retail display.



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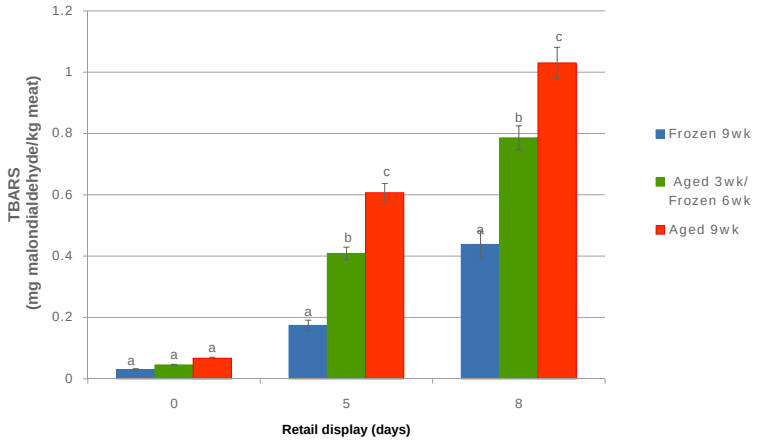
Effect of aged/frozen on lipid oxidation of lamb loins

Aged/frozen improved lipid oxidation stability of loins during retail display.



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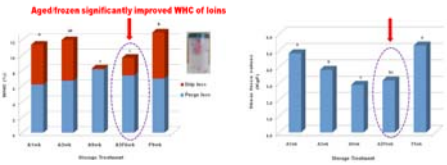
Kim et al. (2011) Meat Sci. 88:332

Research question?

Aged/frozen can provide beneficial impacts on meat quality attributes such as *tenderness, WHC, colour and lipid stability*.

Will different slaughter/meat processing conditions from different plants impact the efficacy of the aged/frozen treatment?



Aged/frozen lamb loins from

Plant A & Plant B

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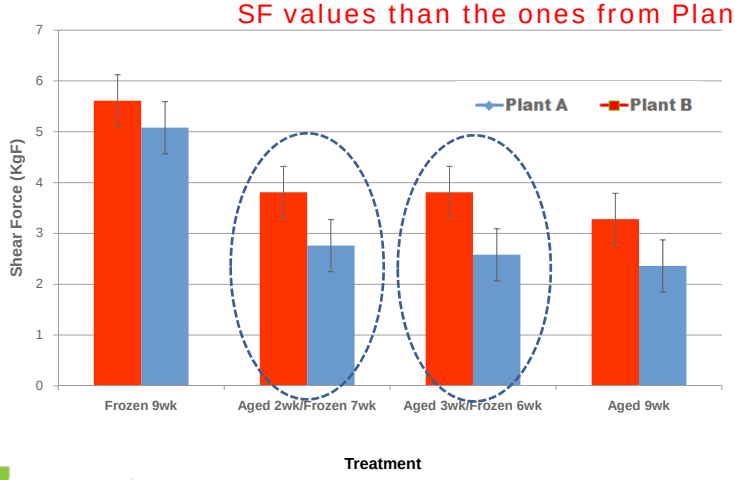
Effect of aged/frozen on shear force values of lamb loins from different plants

Lamb loins from Plant B had higher SF values than the ones from Plant A



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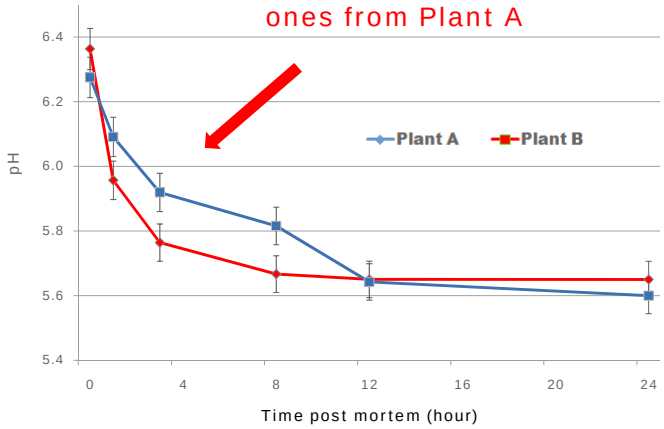
Lamb carcass pH decline trend during a chilling period

Lamb carcasses from Plant B had more sharp decline in pH than the ones from Plant A



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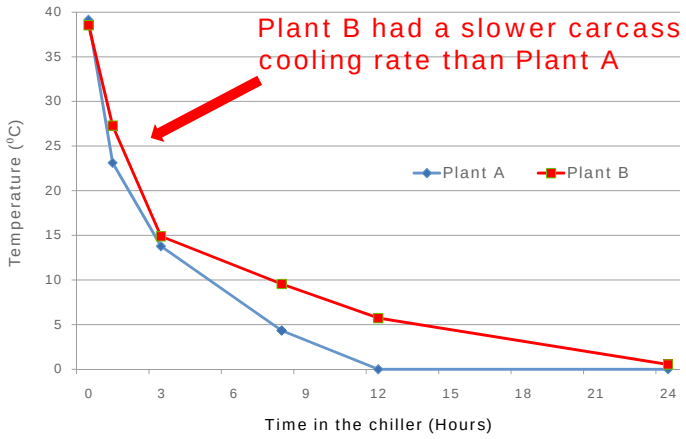
The initial time (0 hour) in chiller was approximately 30 min after slaughter.

Lamb carcass temperature decline trend during a chilling period



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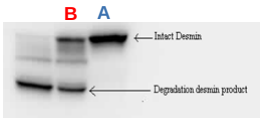
The initial time (0 hour) in chiller was approximately 30 min after slaughter.

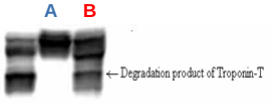
Impacts of different processing conditions on proteolytic activity of lamb loins at 1 day post mortem

Plant B had faster μ-calpain autolysis (indicating more μ-calpain activity) of loins at 1 day P.M.

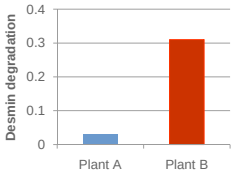
μ-Calpain autolysis @ 1d P.M.

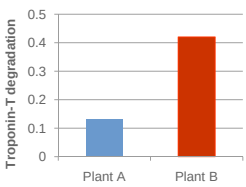


Desmin degradation @ 1d P.M.



Troponin-T degradation @ 1d P.M.





Resulted in greater protein degradation of loins from Plant B at 1 day P.M.

Too early μ-calpain activation can cause early exhaustion of μ-calpain activity (losing ageing potential).

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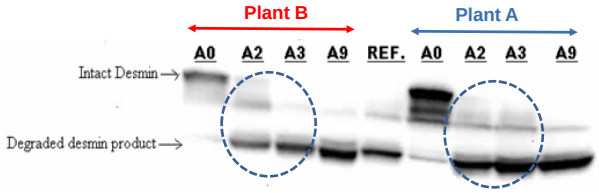
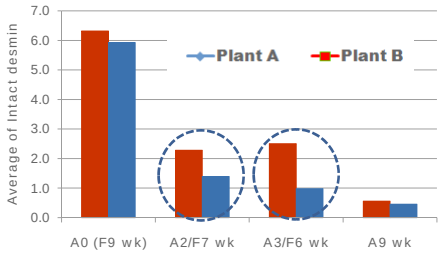
Impacts of different processing conditions on protein degradation of lamb loins after 9 weeks of storage

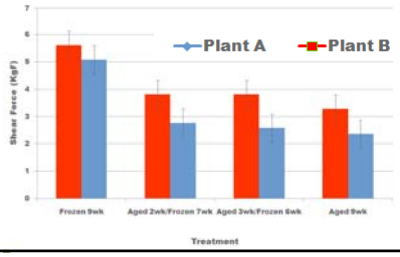
Too early μ-calpain activation can cause early exhaustion of μ-calpain activity (losing ageing potential).



Desmin degradation @ 9 weeks P.M.

Plant B had less aged/frozen impacts on tenderness development





Summary

- **Ageing** meat (>2 weeks) prior to freezing can substantially improve WHC, meat tenderness, lipid oxidation and colour stability.
- **Efficacy** and impact of the aged/frozen can be influenced by different slaughter/processing conditions of plants.
- Slower chilling and rapid pH decline can adversely impact the tenderness development of aged meat (early exhaustion of μ-calpain).

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Conclusions

- **Efficacy of the aged/frozen treatment could be best optimised when optimal slaughter processing conditions are implemented.**

- **Applying different periods of aged/frozen storage of meat depending upon the processing conditions of a specific plant should be considered to maximise the benefits of the aged/frozen effect.**

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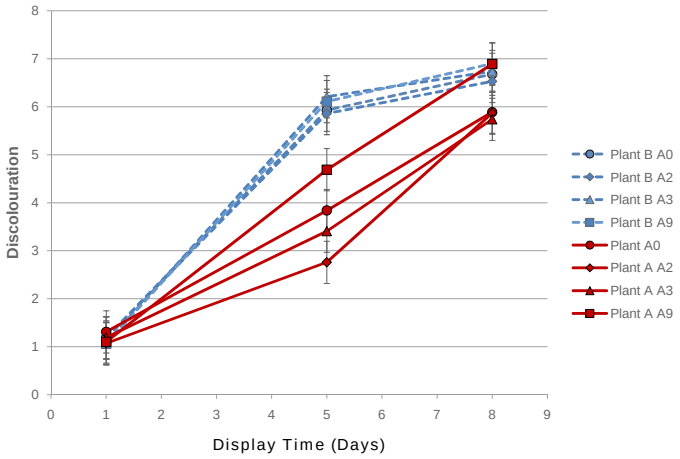
Further studies & Questions?

- Effects of freezing/thawing conditions (freezing/thawing rates, frozen duration, temperature and its fluctuation etc..) on aged/frozen meat quality characteristics?
- Functional properties of aged/frozen meat for processed meat?

Impacts of different processing conditions on meat colour stability of aged/frozen lamb loins



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