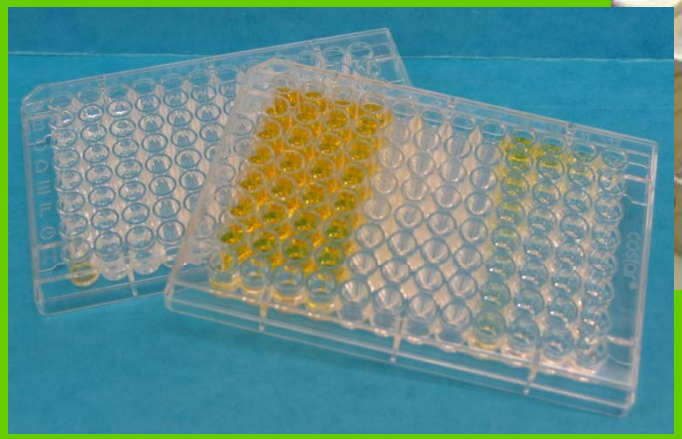
THE BIOCHEMICAL BASIS OF TOUGHNESS IN BULL BEEF



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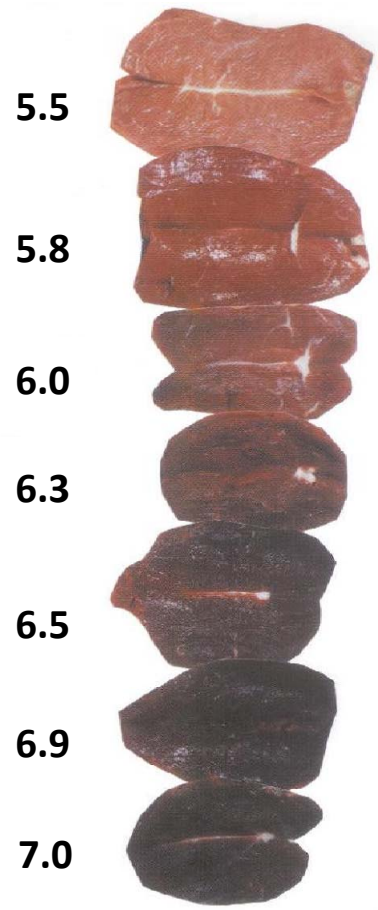
Ultimate pH (pH_u) and Meat Quality

pH_u Value	Quality	Colour
5.4 – 5.8 (normal pH)	Tender meat	
5.8 – 6.2 (intermediate pH)	Inconsistently tender	
> 6.2 (high pH, DFD meat)	Tender meat Microbial spoilage Dark Less flavour	



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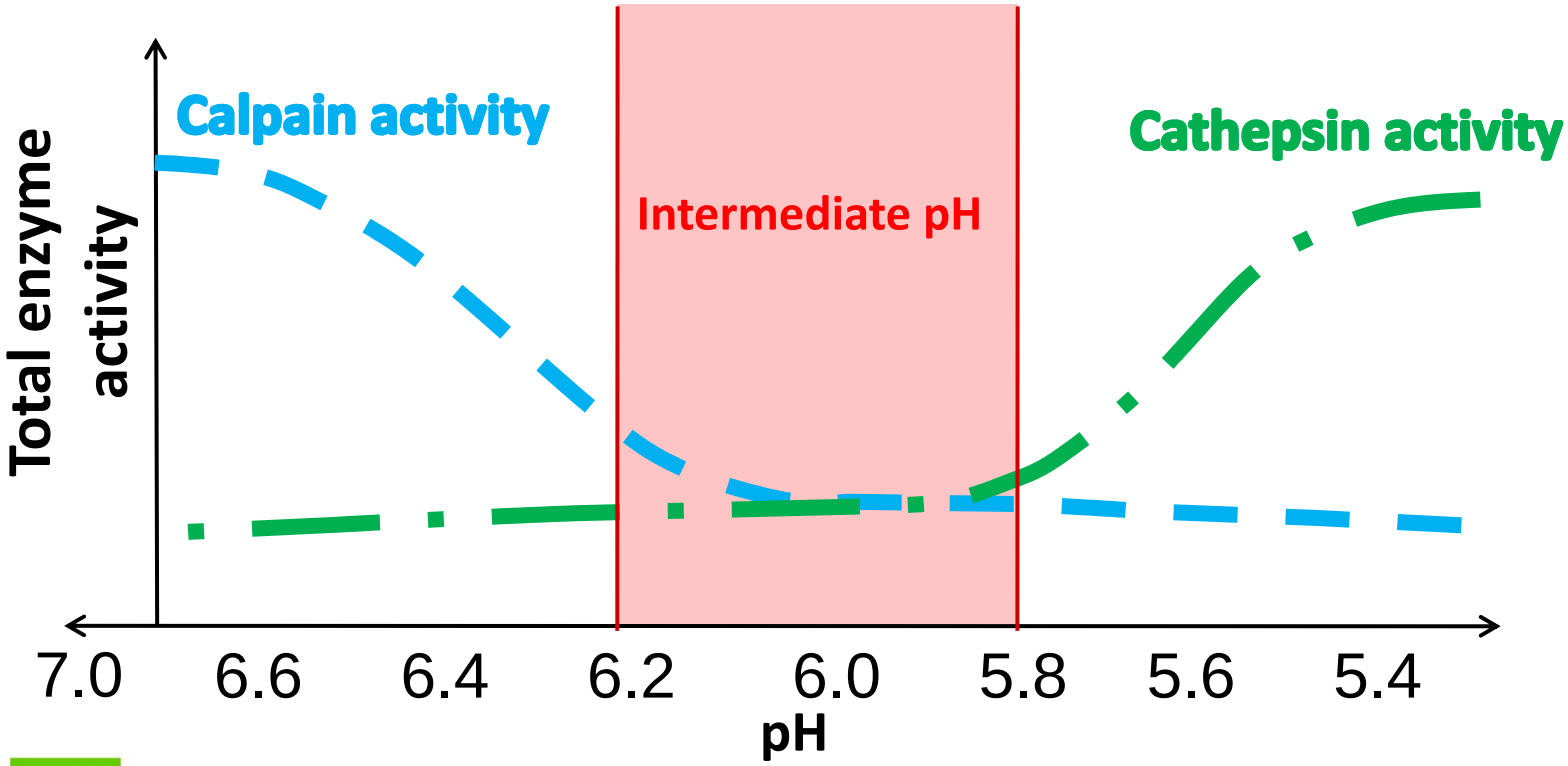
Calpains and Cathepsins

- Calpains optimal at near neutral pH (pH ≈ 7.0)
- Cathepsins optimal at more acidic pH levels



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So far we know that…

1. Intermediate pH_u notorious for being inconsistently tender

2. Breakdown of muscle proteins by enzymes such as calpains and cathepsins result in meat tenderness

3. Calpains and cathepsins are <u>least optimal</u> in the intermediate pH range

BUT…

Still no explanation as to why some intermediate pH meat is tender and why some is tough!

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Meat and Apoptosis

After slaughter, muscle cells experience stress…

- **Loss** of **oxygen supply**
- **Loss** of **nutrient supply**
- **Drop** in **pH**

…and inevitably engage towards apoptosis

- To combat apoptosis and maintain cell homeostasis, **small heat shock proteins** are synthesised

- Small heat shock proteins (sHSP)
  - Expression of sHSP amplified where cells are exposed to adverse conditions
  - Protein repair
  - Protein assembly and conformation

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Project Aim

To determine the role of small heat shock protein dynamics on meat quality variation as observed in intermediate pH beef.

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Project Hypothesis

The combination of sHSP shield and low enzyme activity in intermediate pH meat maintains the integrity of the muscle structure and explains the inconsistency in tenderness as observed in intermediate pH beef.

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Results so far show that…

- There is a correlation between muscle sHSP, pH_u and meat tenderness
- It is possible that mechanisms causing tenderness in beef is compartmentalised.
- Understanding the mechanisms causing tenderness in bulls will allow processors to tailor their process to reduce the variation in tenderness seen in intermediate pH_u beef.
- Manipulating inputs (electrical and chilling) to optimise and reduce variation in meat tenderness

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