Venison eating quality
&
Food safety

Meat Industry Workshop 2007

Eva Wiklund & Robyn Clemens

agresearch Farming, Food and Health. First
Te Ahuwhenua, Te Kai me te Whai Ora. Tuatahi

DEEResearch

MEAT & WOOL NEW ZEALAND

Venison eating quality

agresearch

Is the "Meat of Kings" also the King of Meats?

Venison is unique – special attributes to mention:

- Tenderness
- Drip loss
- Colour stability

Other consumer appealing qualities are low fat content, favourable fat composition and high levels of minerals.

Tenderness and ageing

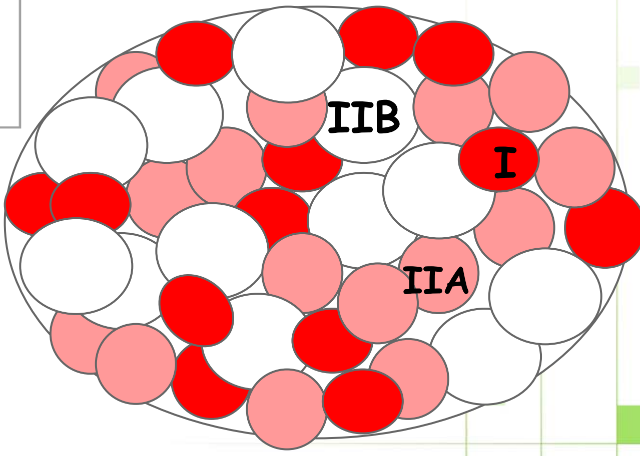
No electrical stimulation

agresearch

	Shear force (kg/cm^2) 1-3 days after slaughter in LD	Shear force (kg/cm^2) 1 week after slaughter in LD
Beef (n=8)	11.7	9.8
Red deer (n=7)	11.4	8.2
Fallow deer (n=8)	5.4	Not analysed
Reindeer (n=8)	2.9	2.6

No need for ageing reindeer meat.

- High proteolytic activity
- Small muscle fiber size



Pelvic suspension (tender-stretch) of carcasses

agresearch

Pelvic suspension

Achilles hung

<u>Reindeer:</u> Tenderness ↑ in topside and striploin. No effect in shoulder.

<u>Fallow deer:</u> Tenderness ↑ in topside, silverside, striploin and knuckle. No effect in shoulder.

Trained panel

Tenderness evaluated by 2 methods.

Shear force

Recent AgResearch results

Why fast growing deer?

- NZ deer industry set up to produce most slaughter animals at 9-11 months of age (early spring) to supply market demand. Seasonal growth depression during winter makes this a challenge
- A small proportion of deer reach slaughter weight already before winter
- The purpose of this pilot study was to compare quality attributes in meat from fast growing young red deer stags slaughtered in late June (winter) with that of slower growing animals slaughtered in early December (spring)

Meat quality measurements

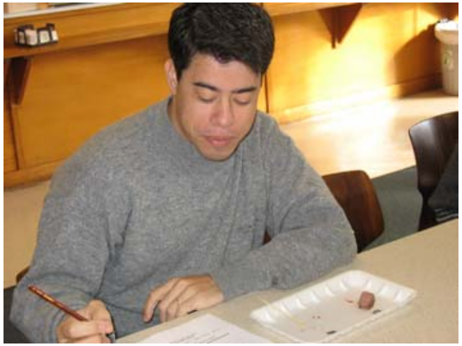
LD, electrically stimulated carcasses

Trait	Fast growing (n =7)	Slower growing (n =7)
Live weight, kg	95.4[a]	97.8[b]
Carcass weight, kg	49.6	52.3
Dressing %	52.0	53.4
Sarcomere length, µm	1.8[a]	1.5[b]
<u>1 day *post mortem*</u>		
Meat pH	5.51[a]	5.66[b]
Shear force, kg	3.4[a]	5.6[b]
Thaw loss, %	3.1	2.9
Cooking loss, %	22.4[a]	25.7[b]
<u>3 weeks *post mortem*</u>		
Meat pH	5.72[a]	5.83[b]
Shear force, kg	2.5[a]	2.7[b]
Purge, %	5.1	4.8
Cooking loss, %	22.0	22.2

Fast growing deer = longer sarcomere length, lower pH and slightly more tender meat.
NOTE: ALL MEAT IS VERY TENDER WITHOUT AGEING.

agresearch

Consumer preference test



	Fast growing	Slower growing
1. Which of these samples is **most tender**?	77[a]	98[b]
2. Which of these samples is **most juicy**?	89	86
3. Which of these samples has **best flavour**?	107[a]	62[b]

Consumers (n=176) judged meat from slower growing deer to be more tender, but preferred the flavour of the meat from fast growing deer

Food safety – Clostridia and Blown Pack spoilage

History : 1989

- An unusual spoilage of vacuum-packed chilled meat
- But normal microflora?
- Spoiled after 4 to 6 weeks storage
- Copious gas present
- Stored at -1.5 to 1°C, no temperature abuse

Cause of Blown Pack Spoilage

- Clostridia that grow and produce gas at temperatures below 0°C
- Unable to grow at body temperature
- Obligately anaerobic spore formers
- *Cl. estertheticum* and *Cl. gasigenes* are main species responsible

Characteristics of Blown Pack Spoilage

agresearch

- Abundant gas
- Gross pack distension
- Large amount of drip
- 'Sulphurous', 'faecal' or 'cheesy' odour
- Meat proteolysis
- Meat discoloration

Blown-pack causing Clostridia - facts

agresearch

Where found?

On Farm - soil, water, vegetation, manure

Processing - enter on slaughter animals

- enter through air intake - dust/pollen

Present on hides – transferred onto carcasses when opening cuts are made

Pre-skinning interventions proposed : Hide washing

Kill or remove spores from carcasses

Identify positive carcasses - rapid test - send frozen

Prevent growth of spores - best practice chilled storage

Deer Hide Model Trial

agresearch

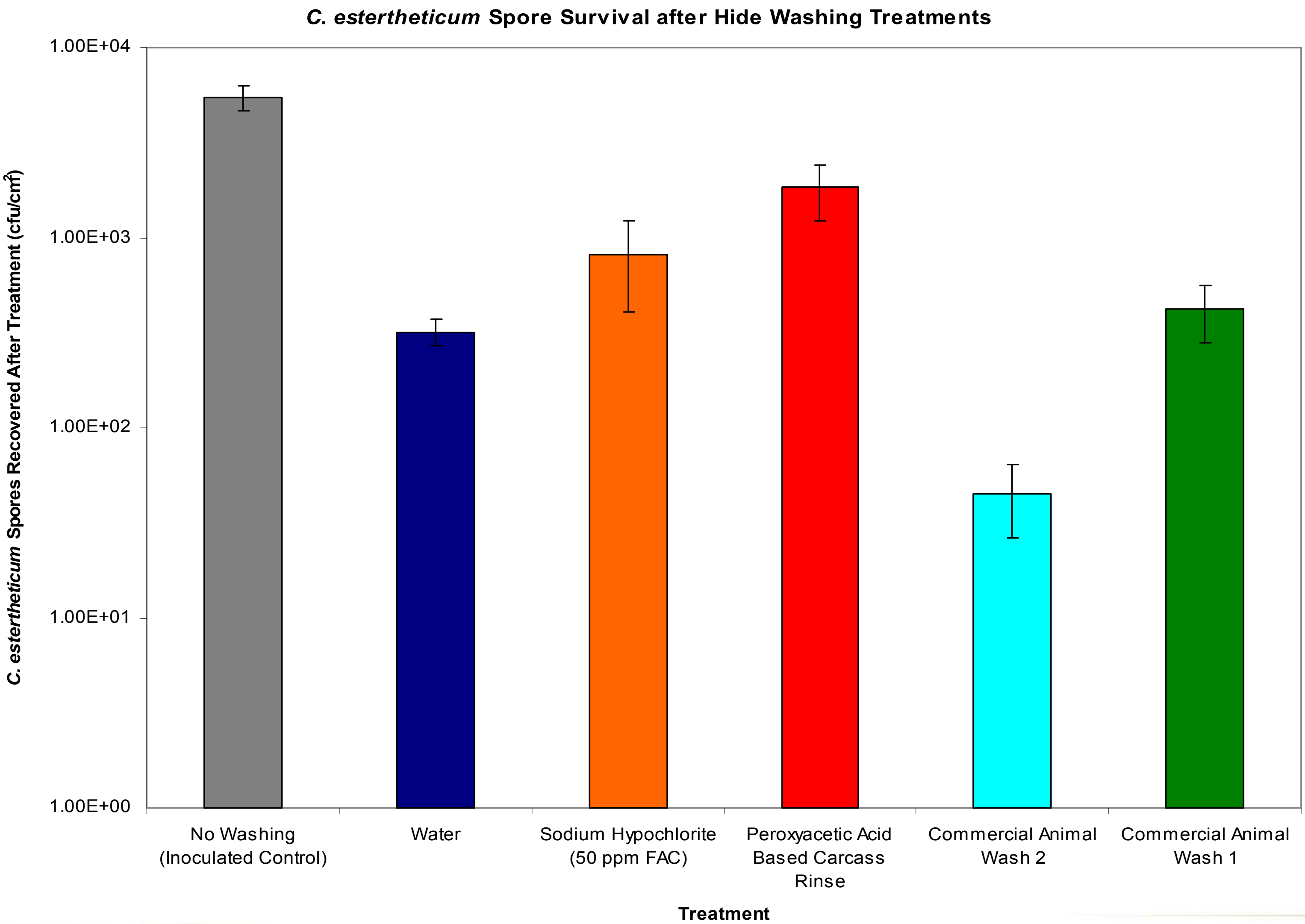
Investigate use of pre-slaughter wash to inactivate or remove clostridial spores

Applied spores to 100 cm^2 pieces of deer hide (5×10^3 spores/cm^2)

Treatments:

- 50 ppm (free active chlorine) sodium hypochlorite
- 1:40 Commercial Animal Wash 1
- 1% Commercial Animal Wash 2
- 180 ppm peroxyacetic acid-based carcass rinse
- Water (control)

Results of Deer Hide Model Trial



Initial cooling rates of vacuum-packed Venison

agresearch

Study Parameters:

3 Initial Cooling Regimes

Best practice

Moderate practice

Abusive practice

2 Storage temperatures

-1.5°C and 2°C

Inoculated - *Cl. estertheticum* spores

Results:

- The initial cooling regime had less impact on the potential for pack-blowing than the subsequent storage temp.
- Best Practice: quick overnight chill to below 0°C then continued storage at -1.5°C

Carcass wash - Peroxyacetic acid

agresearch

Study Parameters:

- 2 levels of *Cl. estertheticum* spores (0 & 260 spores/cm^2)
- 3 storage temps (-1.5°C, 0°C & 2°C)
- 2 pre-packaging rinses (water & Inspexx^{200})

Result:

Treatment with Inspexx^{200} delayed the onset of pack blowing in packs with high initial inoculum stored at -1.5°C, but not those stored at 0°C or 2°C.

Threshold for Blown pack spoilage

Important parameters

1. Low level of initial contamination i.e Clostridial spores
2. Control air flow in processing
3. Good heat shrinking - prevent ‘kick-start’ spore germination- Recommended limit exposure of product to 78°C for less than 4s.
4. Efficient initial cooling of vacuum-packed product
5. Storage temperature: -1.5°C