

# A Comparative Observational and Microbiological Analysis of Mechanical Hide Pulling

## Techniques in an Irish Cattle Abattoir.

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# Introduction



- Food borne disease and carcass contamination
- Epidemiology of hide borne pathogens
- Hide removal
- Aims of study
- Materials and Methods
- Results
- Conclusions and Recommendations
- References

# Food borne Disease



- Human enteric disease – food of animal origin
- Raw Beef – 1<sup>o</sup> vehicle
- VTEC – 73,000 illnesses in USA (Rangel et al, 2005)
- 52% were food borne
- 48% were associated with beef and beef products
- EU – VTEC present – 1.3% of carcasses and 0.1% of beef products (SCVMPH, 2003)

# Carcass Contamination



- From three major sources
  - *The hide*
    - The gastrointestinal tract
      - » The abattoir environment
  - Most VTECs detected on carcasses at pre-evisceration phase (Elder et al, 2000)
  - 30 – 60% carcasses have visible faecal contamination post dehiding (Tergney and Bolton, 2006)

# Epidemiology



- TVC animal hide ~  $9 \log_{10} \text{cfucm}^{-2}$  (Bolton et al, 2000)
- Hide carcass contact ~  $3 \log_{10} \text{cfucm}^{-2}$  (Bolton et al, 2000)
- VTEC prevalence (Buncic et al, 2004)
  - 5.5% of cattle are faecal shedders
  - 23.6% of hides at slaughter
  - 8.9% carcasses during dressing
- Brisket area VTEC (22%) – Salmonella (10%) (Reid et al, 2002)
- Correlation between hide and carcass VTEC levels (Small et al, 2005)
- Pathogens demonstrated on visually clean cattle (Small et al, 2005)

# Dehiding



- Carcass contamination results from:
  - Hide flaps and hide in-roll
  - Through the opening incisions
  - Alternate touching of hide and carcass by slaughtermen
- Hide Pullers were developed:
  - Commercialisation
  - To increase throughput
  - Reduction in contamination by reducing the incidence of hide carcass transfer of contamination by slaughtermen's hands

# Literature



- SVC (1997) as part of their review of HACCP in abattoirs advocated the *'use of hide pulling equipment which avoids transferring contamination for hide to carcass'*
- Hurr (2004) states *'skinning should be conducted in such a way that will decrease the cross-contamination from hide to carcass, which can be accomplished by pulling the hide down and away from the carcass (rather than up and away'*
- Mackey and Roberts (1990) report that the use of an automatic downward hide puller is an important measure to reduce contamination

# Aims of the project



- To
- Determine the extent of usage of each technique in Irish Abattoirs
  - Outline the rationale for employing one method over the other
  - Highlight differences and similarities between the upward and downward techniques
  - Identify any differences in level or in the distribution of carcass contamination post hide removal by each method

# Methods



- **The Abattoir**
- **Observational Audit**
- **Abattoir Survey**
- **Laboratory Analyses**
  - **Sampling**
  - **Microbiological Analyses**
  - **Statistical Analyses**

# Laboratory Analyses



- Each method – 36 carcasses
- Cat03 clipped animals selected
- Wet and Dry swab technique
- 8 carcass sites – 100cm<sup>2</sup>
- Immediate post hide removal
- Serial 1:10 dilutions
- Pour Plate methods
- TVC – PCA/30°C/72hrs
- TEC – VRBGA/37°C/24hours
- TVC – SPSS (p < 0.05)
- LogN > 1 – TEC (McEvoy et al, 2004)

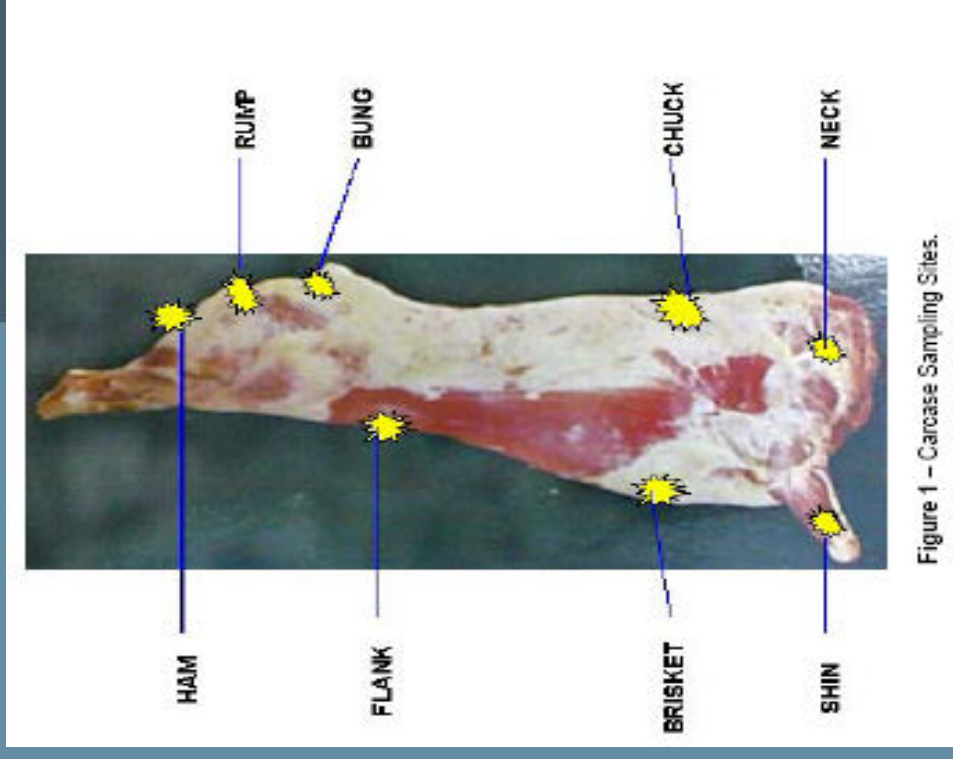


Figure 1 – Carcass Sampling Sites.

# Results - Survey



- Usage (n = 37)

- 59% use UHP
- 41% use DHP
- 29% changed from UHP to DHP since 1998
- 12% intended to change from UHP to DHP in 2006

- Rationale for choice

- Reduction in carcass contamination – 41%\*
- Cost – 35%
- Plant design – 12%
- No reason given – 12%

*\*87% of those that changed from UHP to DHP did so on the basis of a reduction in carcass contamination*

# Results



## TVC and TEC from sites on beef carcasses after hide removal by HP and

### DHP

LogA = log mean TVC CFUcm<sup>-2</sup>

LogN = Log of the total number recovered cm<sup>-2</sup>

%Neg = samples from which Enterobacteriaceae could not be detected at a level of 0.5CFUcm<sup>-2</sup> expressed as a percentage of the total number of samples analysed

	Total Viable Counts (TVC)		Total Enterobacteriaceae Counts (TEC)			
	UHP	DHP	UHP		DHP	
	LogA	LogA	%Neg	LogN	%Neg	LogN
Whole carcass	1.24	1.27	83.2	0.87	94.4	0.78

P<0.05

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Carcass Site	Total Viable Counts (TVC)		Total Enterobacteriaceae Counts (TEC)			
	UHP	DHP	UHP		DHP	
	LogA	LogA	%Neg	LogN	%Neg	LogN
Ham	1.80	1.98	91.6	1.11	88.8	1.15
Bung	1.84	2.08	83.3	1.64	80.5	1.48
Rump	0.81	0.89	94.4	0.85	100	0.00
Flank	2.99	0.68	69.4	1.73	94.4	0.30
Brisket	1.98	2.48	91.6	0.60	94.4	0.70
Neck	2.40	1.97	83.3	1.00	97.2	0.78
Chuck	1.40	0.76	100	0.00	100	0.00
Shin	0.70	2.09	100	0.00	97.2	1.15
Whole carcass	1.24	1.27	83.2	0.87	94.4	0.78

# Reg. 2073/2005



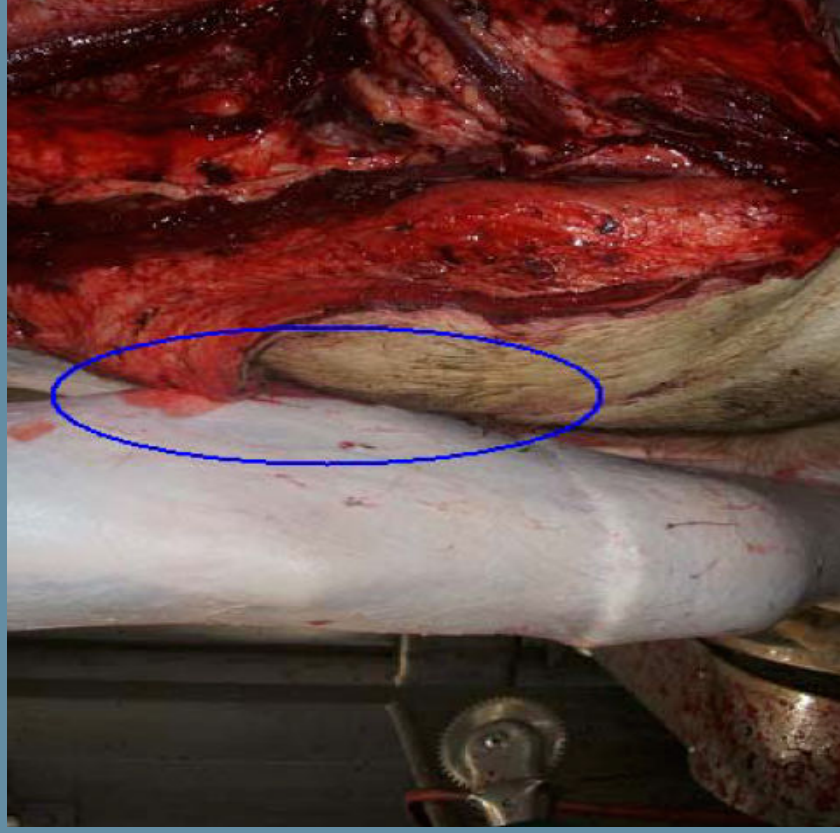
- CD 2001/471 – sites prescribed
- 2073/2005 – Annex I Chapter 3.2 – ‘Sample sites should be selected taking into account the slaughter technology used in each plant’.
- Select sites by risk assessment
- Change in process –  
Art 5(2)
  - review HACCP –  
risk characterisation
- ? enforcement

Commission Decision	UHP	DHP
2001/471		
Rump		
Flank	Flank	
Neck	Neck	
Brisket	Brisket	Brisket
	Bung	Bung
		Shin
		Ham

# Distribution



- Shin

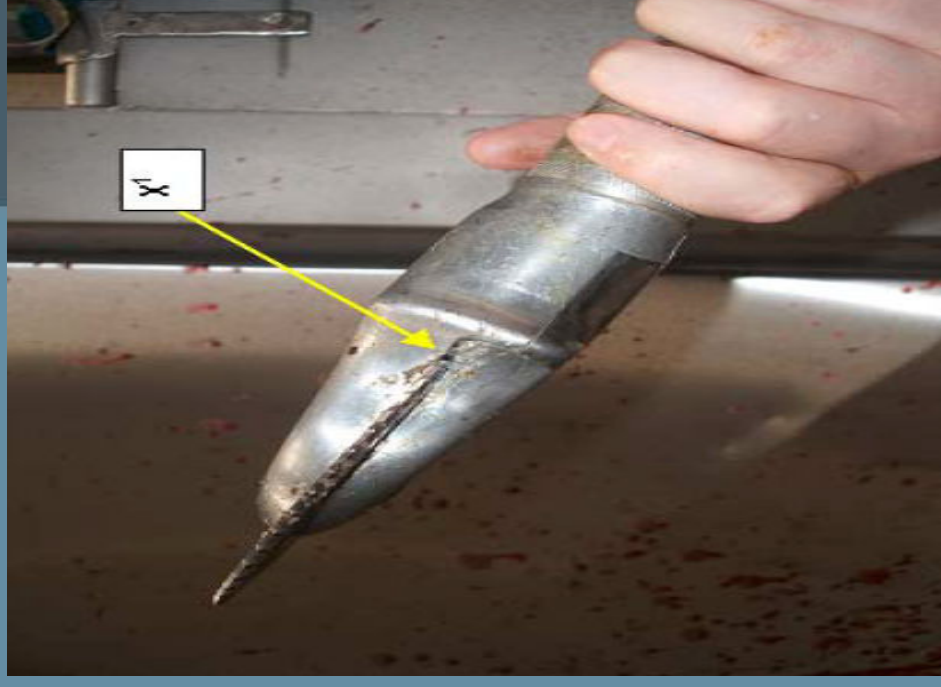


- Flank
- Operator error
- Flaying knife swapped from clean hand to hand previously holding hide
- Hand washing not taking place

# Shin versus Ham



- Hide contact noted at shin
- Ham equally contaminated
- No obvious hide contact
- Motorised air powered disk knives????
- Gill and McGinnis (2004)
  - TVC and Coliforms – 6 and 4 log<sub>10</sub> CFU/knife respectively



# Conclusions



- With reference to Reg. (EC) No. 2073/2005 – process hygiene by each method is good
- No significant difference in level of contamination
- Significant differences in distribution
- UHP – flank and chuck
- DHP – shin and brisket
- DHP – Ham = Shin
- Incorrect application of Regulation (EC) No. 2073/2005 – fall out from Commission Decision 2001/471
- Relevance of Article 5(2) of 852/2004

# Recommendations



- FBO
  - HACCP Pre-requisite programmes e.g.
    - Operational hygiene and staff training – hand washing
    - Sanitation of equipment - knives
    - Equipment design and maintenance
  - Identification of most appropriate carcass sites for sampling
  - Review HACCP plan
- Competent Authority
  - Enforcement of Article 5(2) Reg. 852/2004
  - Enforcement of Reg. 2073/2005
- Researchers
  - Extend research to animals with different hide scores
  - Use of invasive/destructive sampling techniques may be considered
  - Sanitation of air knives