PPI

Commercialisation of warm boning and mould chilling of primal cuts for case ready retail packs M.827

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MEAT & LIVESTOCK
AUSTRALIA

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EXECUTIVE SUMMARY

Warm boned carcasses and mould chilling primal for further processing has been developed by Castricum Brothers in an effort to improve efficiency and to reduce the cost of processing through to retail packs.

The meat industry is facing increasing competition from many areas including retail ready pasta, prepared meals, fresh and frozen and the ever increasing centrally retail ready poultry range. These products are sold as a direct competitor to meat in the supermarket and are sold in many convenience stores and non-traditional meat retailers.

Retail ready centrally produced meat is developing in Australia, although the cost associated initially due to the low volumes makes the process expensive a definite cost improvement will be achievable with a warm boning program.

* improved productivity of approximately 30 percentage has been achieved through similar programs both in Australia and New Zealand.

* energy saving through the 30 percentage of product, fat and bone that is discarded at boning.

* reduced shrink, although the shrink reduction on warm boned product versus cold boned product is approximately 1 percentage. The total shrink loss of a vacuum packed product is accepted at 3 percentage over a four/six week period, 4 percentage loss to the meat industry.

The project was carried out over a period of four months commencing with 10 cows that had been fed a combination of grower and feeder rations for a period of 40 days.

5 cattle were slaughtered with 5 sides boned four hours post slaughter into primal cuts and stored at -1°C for a period of eighteen - twenty hours. To reach an internal primal temperature of 0°C to -2°C.

Primals were then needle tenderised (Ross Needle Tenderiser), sliced and packed in retail modified atmosphere packs, cartoned and returned to the chiller -1°C to +1°C for ageing for three weeks.

The corresponding 5 sides were boned approximately twenty four hours post slaughter with a deep butt temperature in the range of 10°C. Primal cuts were further chilled to a temperature of 0°C to -2°C then processed using a similar procedure to the warm boned sides.

1 yearling carcase was processed using identical procedures. 1/2 warm, 1/2 cold as experimental control.

This procedure also took place for cattle that had been fed for 50 and 60 days.

Samples were taken from the hot and cold product for microbiological analysis at a period of day of slaughter, 10, 23 and 43 days.

Product was sold through Campbells' Cash & Carry store Nunawading, Victoria, four weeks post slaughter with steak from selected muscle subjectively accessed by a consumer panel.

A survey was also undertaken in store to assess consumers acceptability of presentation and colour. Consumers general quality perceptions are associated with colour and presentation.

* Eating quality of product was at least equal to traditional method because of the introduction of feeding techniques and needle tenderising. This only being achievable through the central processing which allows the product to be tenderised immediately prior to slicing and packing.

* Microbiological status of product is improved significantly due to the handling process associated with the system and correct temperature regimes in place.

Extensive work has been carried out on both hot warm boning around the World. Although the majority of this has been in the area of manufacturing meat with very few plants commercially producing warm boned primals of quality product in a vacuum pack. This in the main is due to the unacceptable shape and appearance.

Extensive scientific reports have been written on the topic. Although not relevant to this project as the aim was to achieve a product that was of:-

* acceptable eating qualities and presentation

* financially viable after lot feed of cattle compared to similar finished quality product.

* microbiological sound four week post slaughter.

Approval to undertake the program was required by Australian Quarantine Inspection Service. The major requirement is that the time for the warm boned meat to fall from its initial temperature to 7°C is less than that specified in the regulations and of equivalent microbiological status of traditional methods.

Warm boned product four hours post slaughter was of similar colour to that of traditional boned product with acceptable shape and appearance.

Muscles were seam boned where possible to eliminate excessive weep loss.

Yield of warm boned product was almost 1 percentage improved over the traditional cold boned process.

Previous studies have shown product requires a minimum of two weeks ageing even with the use of electrical stimulation, especially when older cattle are being processed.

THE OBJECTIVES

1. To commercialise warm boning and mould chilling of primal cuts for case ready pack into an extended shelf life pack with acceptable eating qualities.

2. Evaluate cow product that has been fed for a period of 40, 50 and 60 days slaughtered warm boned, chilled needle tenderised, sliced and packed in case ready extended life consumer retail pack and vacuum pack full primal.

3. Carry out customer survey work in retail outlets, Davids Stores.

THE PROJECT

Background

Commercial applications have shown that substantial productivity improvement of between 30 to 40 percent can be achieved with a hot boning program of beef carcases. Further productivity gains are likely with a case ready program as primals can be pre-trimmed and mechanically sliced after chilling.

Retail ready meats in long life controlled atmosphere or vacuum packaging will enable the meat industry to develop new market opportunities both at domestic and export levels. A number of advantages can be achieved from central production of retail cuts, including improved standards and productivity, reduced shrinkage, consistency of product and most importantly, the ability for retailers to sell meat without cost of back room operations.

An earlier study (M570) showed that chilling hot boned primal cuts in moulds achieved a better cut shape, also, that hot boning/hot preparation/mould chilling can be combined with a packaging, chilling and ageing regime to prepare a consumer product of suitable table quality. The optimum process parameters in the preparation of retail ready packs from hot boned meat were investigated and guidelines prepared for implementation of a successful warm bone consumer pack process. From the subjective taste tests on the cattle tested, the flavour and moisture of the cooked product was superior in the warm boned product compared to the traditional method of cold boning. The M570 study demonstrated that, it the correct guidelines were followed (time, temperature and carcase quality), a consistent quality product can be produced at reduced cost.

Guidelines recommended for preparation of retail ready packs of meat from warm boned product included:-

1. Stimulation of carcase;

2. Boning to commence four hours post slaughter, temperature must not be reduced too quickly;

3. Removal of primals at seams where possible;

4. Ultimate pH range.

Protocol for Proposed Warm Boning of 30 Cows Fed for 40-50 and 60 Days at Castricum Brothers Dandenong

Background

Previous studies carried out on warm boning of carcases by John K. Whyte, Warringah Consulting and Marketing in conjunction with Peter Castricum, Chief Executive Officer, Castricum Brothers Pty Ltd, have proven considerable savings can be achieved in energy, improved productivity and shrink loss.

In the previous studies, the focus has been on both eating qualities and microbiological status and showed excellent results in both areas when compared to traditional cold boning.

The evaluation was carried out independently, microbiological studies by Micro Tech, Box Hill, Victoria. Tenderness studies by, Warner Bratchler Testing F.R.I., Werribee, Victoria.

This exercise will concentrate on commercialisation of warm boning of cow product that has been fed a combination of grower and feeder ration over a period of 40, 50 and 60 days at I.C.M. Pechalbar feedlot. The evaluation will assess warm boned and cold boned product of each group of cows and using yearling cold boned product as the experimental control. The Ross Needle Tenderiser will be used on all product with the exception of the yearling (EC) and some cow product (to be used as a comparison). All product will be electrically stimulated.

After chilling to the required temperatures, product will be packed in a combination of consumer and vacuum packs.

Protolcol for Proposed Warm Boning of 30 Cows Fed for 40-50 and 60 Days at Castricum Bros Dandenong

PROTOCOL

10 cows that have been fed for a period of 40 days at I.C.M. feedlot will arrive at the plant for slaughter on Monday 2 October 1995 (Stuart Castricum to arrange). Cows to be first up Monday 2 October 1995 at approximately 6.00am. The 10 cows are to be dressed and marked in the normal way and placed in chiller.

At approximately 10.30am four hours post slaughter 5 sides are to be boned warm, with the corresponding sides held for Tuesday's boning.

The 5 warm boned sides will be held in chiller 18 in primal form to be further processed into retail packs the following day, Tuesday 3 October 1995.

1 side of yearling (experimental control) will be processed in identical fashion.

Tuesday 3 October 1995 the corresponding sides are to be boned with all product retained, weighed and chilled in primal form in chiller 18 and further processed into retail packs after reaching required temperature.

1 side of yearling (experimental control) will be processed in identical fashion.

The remaining 10 sides will be vacuum packed as Ausmeat (A) product as normal procedure.

All primals will be weighed both after boning and after further processing as will all fat and bones.

All product will be cartoned and marked accordingly in chiller 18 until required for analysis. The eating quality analysis will take place at Castricum's using a panel of 12 staff over a three week period.

The second group of cows that have been fed a ration of both grower and feeder ration for 50 days at I.C.M. will be slaughtered on Wednesday 11 October 1995 (Stuart Castricum to arrange). A similar format for chilling, boning and packing will be used as that in the cows that have been fed for 40 days.

The quality analysis will take place also using a similar approach as in the previous trial.

The third assessment will commence on Monday 23 October 1995 and again will take a similar approach two studies and will also include a quality analysis.

A full report will be presented at the completion of the program.

WEEP

Minimal weep was experienced in primal cuts with total loss less than 5% over the 20 hour initial chilling period. With regard to the packaged sliced product although not recorded, was not excessive. 2 Drilock pads were used per 850 gram average pack. This is normal procedure at retail level for traditional packed product. Modified atmosphere packaging was used to achieve the extension of shelf life of 5 weeks.

COLOUR

Meat colour is a critical factor in consumer perceptions of quality and therefore of initial purchase even though there is little correlation between colour and eating qualities. To maintain colour in control or modified atmosphere packaging the importance of time, temperature and hygiene are critical.

* TIME

The time taken to manufacture the product to a case ready pack ie trim, slice and pack and return to chiller.

* TEMPERATURE

Preparation room temperature and product temperature must be maintain at low levels. Ideal the preparation room less than 7° and product temperature less than 3o. Holding chillers -1° - 0°C.

* Approved cleaning procedure including sanitation must be in place with regular dry cleans hourly, cutting boards turned mid shift.

YIELD

The accepted weight loss of overnight chilling of sides is between 1.5 - 2% of their weight. A further 3% is expected with primals that have vacuum pack for a period of 4 weeks. The warm boned product is achieved from two areas.

* Removal of more meat from bones in the warm boning process.

* The improved chilling of primals compared to side chilling.

It is expected that further yield improvements could be achieved as boners become more competent with the warm boned method. This has been achieved in overseas boning rooms after a period of approximately 6 months.

Further yield is achieved by packing directly into consumer packs after chilling with correct chilling regime in place. Minimal weep in consumer packs was detected (see notes on weep).

SHAPE

All product was carefully packed directly after boning in an effort to retain expectable shape and minimise excess trimming and squaring up prior to slicing. All primals were cartoned with approximately $^{2}/_{3}$ the normal amount per carton 15-20 kg and chilled with lid in place.

Slicing commenced 18 hour post slaughter. The shape on all primals were considered to be very good with minimal excess trimming required to produce case ready packs of a high standard.

CONSUMER SURVEY

Both meat and fat colour were subjectively assessed by a selected group of 15 panel members using yearling product as the experimental control. Both meat and fat colour of product were assessed as well above average. The panel were each given identical samples of both hot and cold boned product. Both yearling and cow all product had been aged for 4 weeks at -1° - +1°C.

The panel scored each sample for :-

Flavour
Tenderness
Meat Colour
Using the following criteria :-

1. Poor
2. Fair
3. Good
4. Very Good
5. Excellent

COW PRODUCT

The overall assessment by the panel indicated no difference between the warm and traditional boned product after 4 weeks ageing.

COW

Tenderness	rated at 3.5 on both warm/cold product
Colour	rated at 4 on both warm/cold product
Flavour	rated at 4 on both warm/cold product

YEARLING

Tenderness	rated at 4.5 on both warm/cold product
Colour	rated at 5 on both warm/cold product
Flavour	rated at 4 on both warm/cold product

Consumers were also surveyed at point of purchase and ask to assess packs of striploin from both product groups. Consumers could not detect any difference between the product that had been warm boned and product traditionally boned. All consumers surveyed commented on the excellent quality. Consumer perceptions of colour/quality as previously mentioned.

TENDERNESS

The overall tenderness of product both warm boned and traditional cold boned product assessed by panel members was a similar standard after a 4 week ageing period with no significant differences with respect to tenderness. Both products were assessed at 3.5 rating for cow product and 4.5 for yearling.

Previous trials carried out at Food Research Institute Werribee using Warner Bratzler Test Cell.

To objectively determine tenderness values showed that yearling is more tender than cow with a big gap between them after 4 weeks storage. Both yearling and cow become more tender at week 4 although the yearling is still significantly more tender at week 4 the difference is smaller than previous. At week 0 the cold boned product is significantly more tender than hot boned product after 4 weeks of storage at -1° - 0°C. Both the hot and cold boned product become more tender there is no significant difference between the hot and cold product after 4 weeks storage.

CONCLUSIONS

1. Meat product tested become more tender with storage time.

2. Minimum storage time of hot boned product is recommended a minimum of 2 weeks with 4 weeks recommended.

3. It is likely that yearling will be more tender than cow product even after ageing.

FEEDING OF STORE COWS

50 cows were fed a combination of grower and feeder rations over a period of 40, 50 and 60 days. The majority of cattle were well finished with acceptable meat and fat colour weight gain was at an acceptable rate.

MICROBIOLOGICAL ANALYSIS

As with previous trials all Microbiological Analyses were carried out by Micro Tech Laboratories, Box Hill, Victoria.

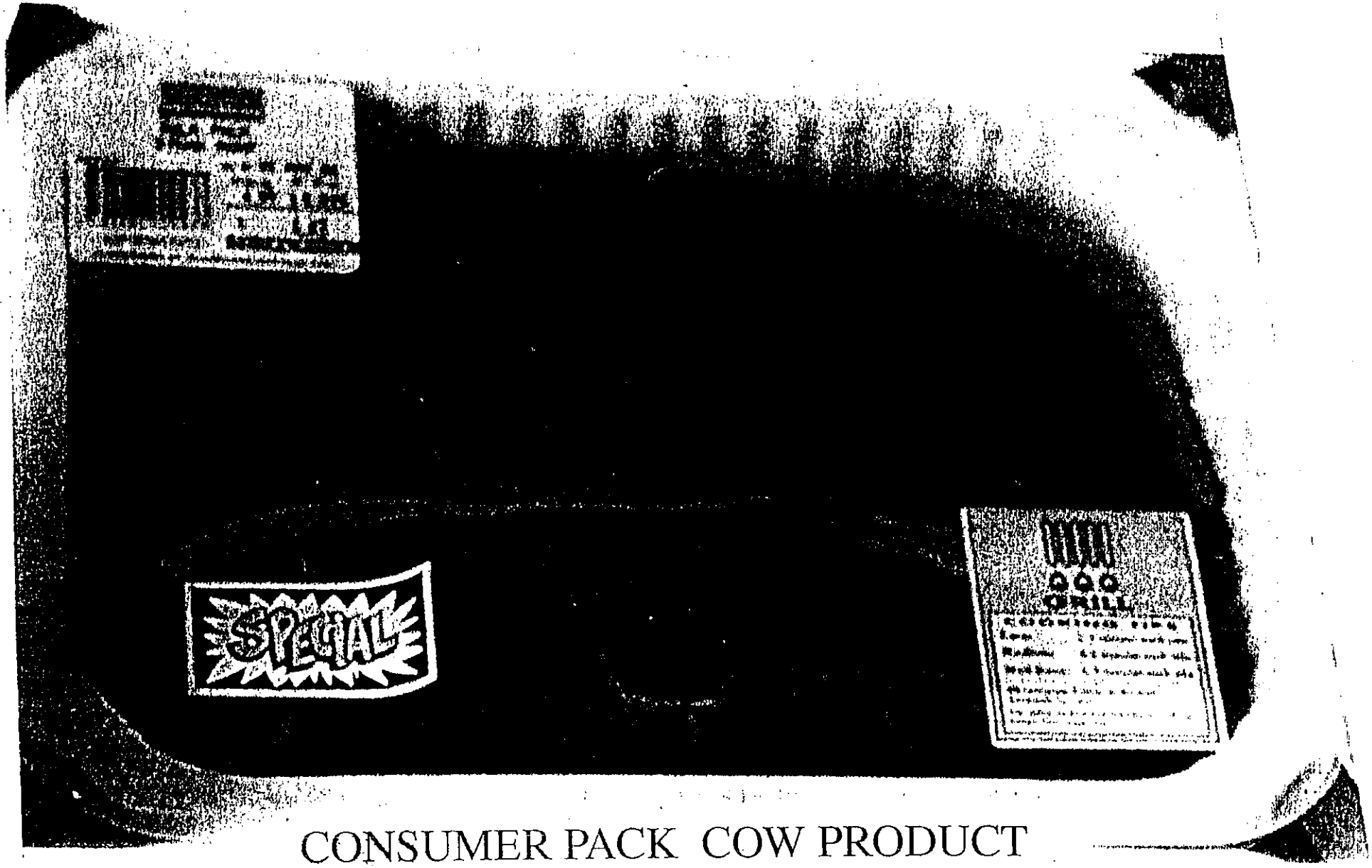
All samples analysed over the six week period from day of slaughter, 3rd October, 1995, were found to be of a sound microbiological quality, and indicative of good keeping qualities up to the day tested.

Samples were supplied at day of slaughter.

03/10/95	Warm Boned Sample
12/10/95	Warm Boned Consumer Pack
	Cold Boned Consumer Pack
25/10/95	Warm Boned Consumer Pack
	Cold Boned Consumer Pack
14/11/95	Warm Boned Consumer Pack
	Cold Boned Consumer Pack

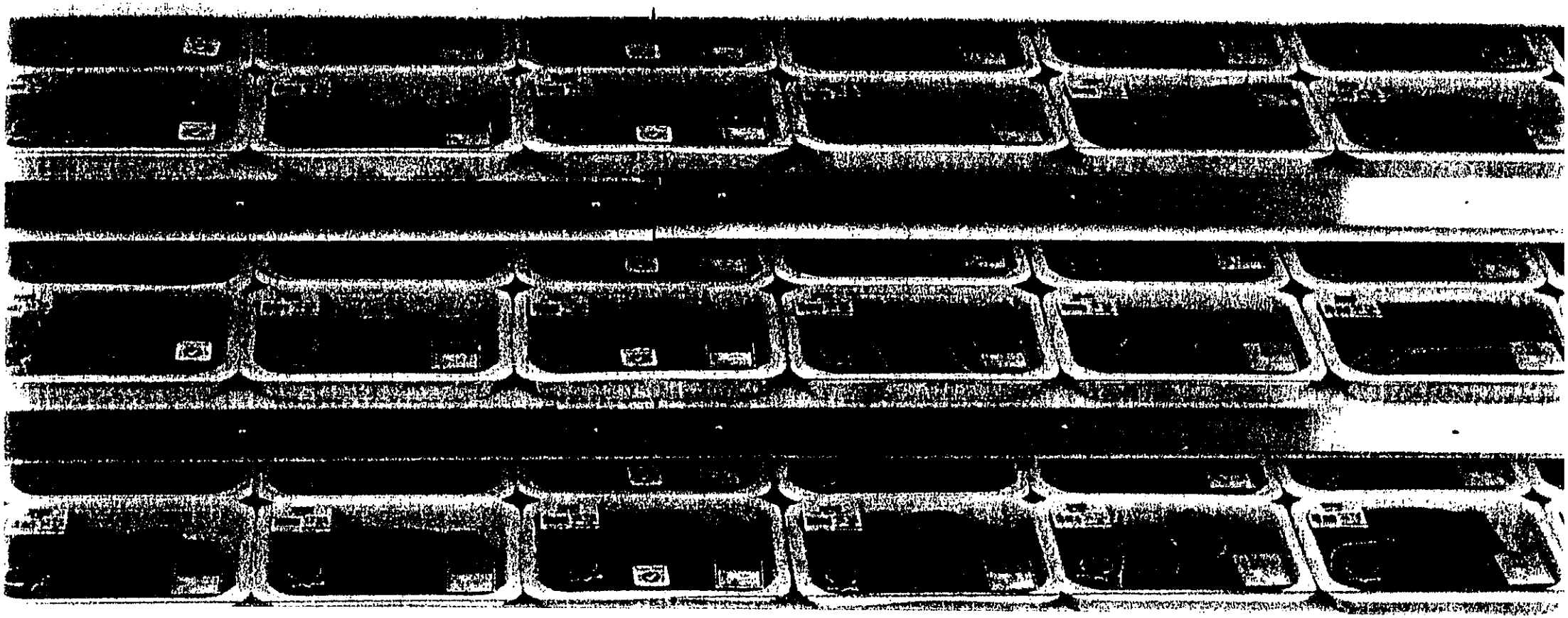
Laboratory Report, Attachment 4.

ATTACHMENT 1.



CONSUMER PACK COW PRODUCT
WARM BONED AGED FOR 4 WEEKS

ATTACHMENT.2.



CONSUMER PACKS WARM AND COLD
BONED AGED FOR 4 WEEKS

ATTACHMENT .3.

Figure 1. Category and Tenderness

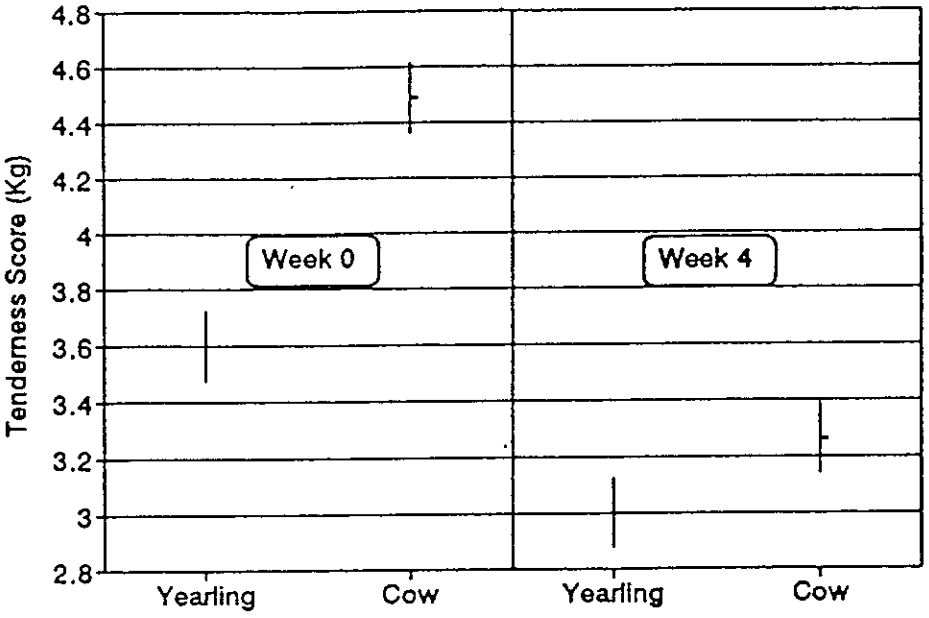
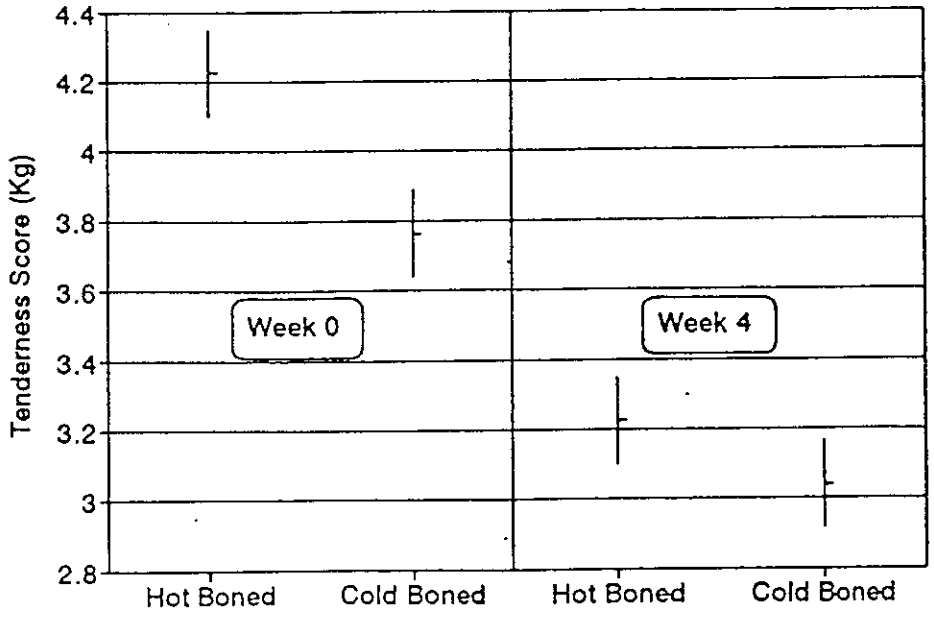


Figure 2. Boning and Tenderness



MELBOURNE • SYDNEY

Our Ref: 96.113 WAR.SR/a

5th January 1996

Warringah Pty Ltd
405-411 Reynolds Road
ELTHAM VIC 3095

018 103 032
039 437 0451

ATTENTION: MR JOHN WHYTE

Dear Sir,

RE: MICROBIOLOGICAL ANALYSIS SUMMARY REPORT

Meat samples received at our laboratory between October and November 1995 were analysed as directed with the following results.

Date Received	Sample	Standard Plate Count CFU per cm^2 25°C/3 days	Standard Plate Count CFU per cm^2 5°C/ 14 days	Coliforms MPN per cm^2	*E. coli* MPN per cm^2
12/10/1995	Sample AC 4/10/95	30	30	<2	<2
25/10/1995	Sample AC1 4/10/95	160	130	<2	<2
14/11/1995	Sample AC Packed 4/10/95	15,000	7,900	<2	<2
12/10/1995	Sample AH 3/10/95	1,000	1,300	2	<2
25/10/1995	Sample AH2 3/10/95	1,500	1,500	2	<2
14/11/1995	Sample AH Packed 3/10/95	70,000	44,000	7	<2
12/10/1995	Sample YH 3/10/95	11,000	13,000	13	<2
12/10/1995	Sample YC 3/10/95	2,000	2,400	5	<2

Note: '<' indicates less than.

All samples analysed over this period were found to be of a sound microbiological quality and indicative of good keeping qualities up to the day tested.

The total bacteria levels are significantly below spoilage levels of 1,000,000-10,000,000 organisms per gram and Coliform/*E. coli* levels which are indicators of faecal contamination were found at insignificant levels in all samples.

Yours faithfully,

DERRO COMAR BSc(HONS),FRACI,AAIFST,MASM
DIRECTOR

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75 Lexton Road, Box Hill, Victoria 3128 Australia
Phone (03) 9899 6285 Fax (03) 9898 8820
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ATTACHMENT 5.

PRODUCT EVALUATION SURVEY

The packs of meat you have received are part of the ongoing assessment of our product.

The portions are to be cooked in an identical manner, e.g. grill, fry, BBQ.

Each pack is identified by a code for assessment and we ask that the four portions be cooked at the same time and assess each of the four potions.

DATE:	TRIAL NO:				
	MEAT COLOUR				
	Excellent	Very Good	Good	Fair	Poor
AH					
AC					
YH					
YC					
	MEAT TENDERNESS				
	Excellent	Very Good	Good	Fair	Poor
AH					
AC					
YH					
YC					
	MEAT FLAVOUR				
	Excellent	Very Good	Good	Fair	Poor
AH					
AC					
YH					
YC					

PLEASE RETURN COMPLETED FORMS TO SUE BY _____

Thank you for your support.

Con Castricum

\WHYTE\T-SURVEY