

Microbial Flora of Commercially Produced Vacuum Packaged, Cooked Roast Beef



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Abstract

Commercially produced vacuum packaged, fully cooked, microwaveable beef roasts from 4 producers were purchased from local retail markets. Salt concentration, a_w , pH, and moisture, fat and protein content were determined. Samples of package juice and homogenized beef and juice were analyzed for the presence of aerobic, anaerobic and lactic acid bacteria and clostridia type organisms. The cooked beef products had pH values from 5.82 - 6.19, a_w of 0.992 - 0.997, and contained 0.34 - 1.07% salt, 61.89 - 72.39% moisture, 4.29 - 18.21% fat and 15.92 - 20.62% protein. No growth was detected in beef juice for aerobic, anaerobic or lactic acid bacteria or clostridia type organisms. Combined beef and juice had <2 CFU/g for aerobic, anaerobic or lactic acid bacteria or clostridia type organisms. This would indicate that cooking and chilling schedules used in the manufacture of these 4 products limited survival and outgrowth of microorganisms evaluated in this study.

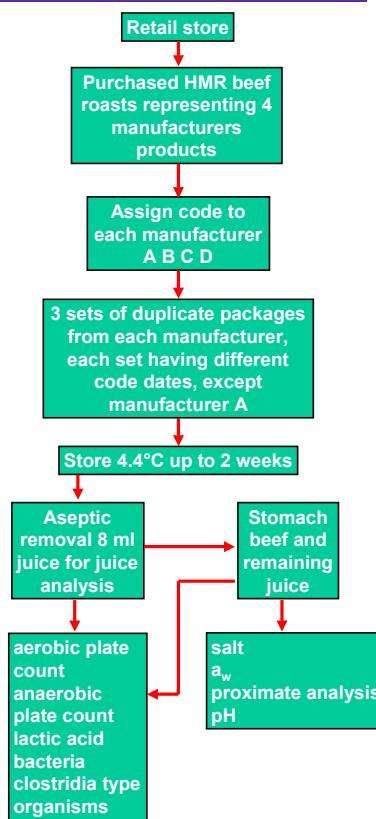
Introduction

- Consumer desire for convenient, high quality fresh meals that require minimal preparation time is driving the trend toward refrigerated, ready-to-reheat foods (Johnson 1997).
- Microwaveable beef roast (pot roast) is the most common retail refrigerated home meal replacement (HMR) product in the U.S. (Danler 2001).
- Foods that are vacuum packed, cooked, then chilled in the package have the advantage of extended shelf life since cooked product is not re-exposed to spoilage organisms (DeMasi and Deily 1990).
- Heat treatment for extended shelf life refrigerated foods is less than that required for commercial sterility (Unda and others 1991, Marth 1998).
- Potential temperature abuse, along with vacuum packaging, which creates an anaerobic environment, makes these types of foods a potential risk for spore forming bacteria such as *Clostridium botulinum* and *Clostridium perfringens*.

Objective

To determine the microbial flora and compare pH, salt concentration, a_w , moisture, fat and protein content of commercially available beef roast HMR products from 4 manufacturers.

Materials and Methods



Mean separation using Fishers LSD ($p<0.05$)

Combined Ingredient List for 4 Commercially Prepared Beef Roast Products and Number Who Used Each

Ingredient	Number of Products Containing Ingredients
Salt	4
Sweeteners	4
Caramel Color	4
Hydrolyzed protein	3
Onion	3
Spices or extracts	3
Garlic	2
Flavoring	2
Starch	2
Sodium phosphate	2
Beef tallow	2
Disodium guanylate	2
Disodium inosinate	2
Monosodium glutamate	1
Gums	1
Sodium lactate	1

Results

pH, salt concentration, a_w and proximate analysis of commercially available vacuum packaged, cooked beef roasts from 4 manufacturers

Company	pH	Salt (%)	a_w	Fat (%)	Moisture (%)	Protein (%)
A	6.19 ^a	0.34 ^c	0.994	18.2 ^a	61.9 ^a	18.6 ^c
B	6.00 ^b	1.07 ^a	0.997	4.3 ^b	72.4 ^b	15.9 ^d
C	5.82 ^c	0.54 ^b	0.996	5.4 ^b	70.8 ^b	20.6 ^a
D	6.04 ^b	0.43 ^c	0.992	6.3 ^b	71.0 ^b	19.6 ^b

^{a,b,c,d} Means in the same column with a different superscript differ ($p<0.05$)

Microbial Counts (CFU/g) for Commercially Available Vacuum Packaged, Cooked Beef Roasts from 4 Manufacturers

Company	Aerobic Plate Count	Anaerobic Plate Count	Clostridia Type Organisms	Lactic Acid Bacteria
Juice				
A	NG ¹	NG	NG	NG
B	NG	NG	NG	NG
C	NG	NG	NG	NG
D	NG	NG	NG	NG
Beef and Juice				
A	<2 est. ²	<2 est.	<2 est.	<2 est.
B	<2 est.	<2 est.	<2 est.	<2 est.
C	<2 est.	<2 est.	<2 est.	<2 est.
D	<2 est.	<2 est.	<2 est.	<2 est.

¹NG=no growth, ²est.=estimate

Conclusions

Manufacturing, chilling, distribution and retail display of cooked beef roast products from all 4 manufacturers resulted in less than 2 CFU/g of aerobic, anaerobic and lactic acid bacteria and clostridia-type organisms. This indicates that the cooking and chilling protocols used limited survival and outgrowth of the microorganisms evaluated. These results are consistent with the good safety record for products of this type.

References

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