

Appendix Two

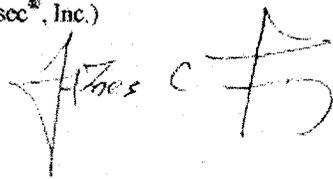
S & J Laboratories, Inc.

Report To: Dr. Don Berdahl/Mr. Greg Reynhout (Kalsec[®], Inc.)

From: James C. Lin, Ph.D. (S & J Laboratories, Inc.)

Date: June 1, 2006

Title: Microbial profiles of commercial packaged ground beef – a comparison of different MAP packaging technologies using replicates.



SUMMARY

Commercially available MAP ground beef packages including high oxygen (Hi-Ox) samples and low oxygen / carbon monoxide (CO-pk) samples were purchased by Kalsec personnel and transported to S&J Labs in coolers and analyzed for aerobic and anaerobic plate count using standard methods. Where possible 5 replicate samples with the same "use or freeze by" or "sell by" date were tested for each commercial sample. The results confirm an earlier study for Kalsec (dated May 15, 2006) which showed high plate counts in commercial CO-pk samples relative to Hi-Ox samples.

MATERIALS & METHODS

Samples representing Hi-Ox and CO-pk packaging forms were purchased and immediately analyzed for plate count. All investigations were carried out on the premises of S&J Laboratories, Inc., Portage, MI. Microbiological analyses, including aerobic plate count and anaerobic plate count, were performed by S & J Laboratories personnel. Oxygen and carbon dioxide levels in the atmospheres of certain packages were measured by Kalsec[®] personnel using a Dansensor Checkmate 9900.

Micro analysis was conducted under aseptic sampling procedures (USDA Microbiological Guide Book, 3rd ed., 1998). Samples were first physically divided into six portions. Half of the sample (1st, 3rd, & 5th, or 2nd, 4th & 6th portions) was collected and mixed thoroughly inside a sterile bag. Eleven (11) grams of mixed sample was withdrawn into a filtered stomacher bag and 99 mL of sterile phosphate buffer was added to provide a 10-fold dilution. A further dilution protocol was followed to dilute up to 1,000,000 times. Petrifilm[®] was used in this study (AOAC official methods 990.12).

RESULTS AND DISCUSSION

Various samples of ground beef were purchased by Kalsec[®] personnel and transported to S&J laboratories in coolers. The samples were analyzed for microbial count the same day they were purchased. The coded identity of the samples and the associated bacteria counts of freshly-purchased ground beef samples in various types of packaging are shown in the attached table. In all cases but one (Samples 51-55), five replicates with the same "use or freeze by" or "sell by" dates were purchased and analyzed. Additional instances of very high plate counts in CO-pk meat samples have been found – within the "use or freeze by" dates. The highest plate count seen for the CO-pk samples was 27,000,000 cfu/g, with many samples exceeding 10⁵ cfu/g. No Hi-Ox samples exceeded 13,000 cfu/g, and most were much lower than that. All the samples had a bright red and fresh appearance.

Page -1-

4669 Executive Dr. • Portage, MI 49002
Phone: (269) 324-7383 • Fax (269) 324-7384

Research
Consultation
Microbiology
Chemistry

S & J Laboratories, Inc.

CONCLUSION

Freshly purchased Hi-Ox and CO-pk ground beef packages show different levels of bacterial contamination. This study supports the conclusion of a preliminary survey of meat available to consumers, that very high microbial plate counts are observed more often in CO-treated meat than in the other forms available.

Research
Consultation
Microbiology
Chemistry

Page -2-

4669 Executive Dr. • Portage, MI 49002
Phone: (269) 324-7383 • Fax (269) 324-7384

Table 1. Plate Counts for Commercially Available Ground Beef Samples

Sample #	Purchase Date	Analysis Date	Sell By Date	% Fat	Location Purchased	CO ?	Head Space %O2/%CO2	Aerobic Plate Count (cfu/g)	Anaerobic Plate Count (cfu/g)
1	5/22/2006	5/22/2006	5/24/2006	10	A	No	80.7/11.4	1,000	2,000
2	5/22/2006	5/22/2006	5/24/2006	10	A	No	81.5/11.6	6,000	13,000
3	5/22/2006	5/22/2006	5/24/2006	10	A	No	67.7/10.6	3,000	3,000
4	5/22/2006	5/22/2006	5/24/2006	10	A	No	82.4/11.7	10,000	3,000
5	5/22/2006	5/22/2006	5/24/2006	10	A	No	80.4/11.7	6,000	6,000
6	5/22/2006	5/22/2006	5/29/2006	20	A	No	84.3/10.3	500	600
7	5/22/2006	5/22/2006	5/29/2006	20	A	No	83.8/10.5	700	800
8	5/22/2006	5/22/2006	5/29/2006	20	A	No	84.1/10.6	900	1,200
9	5/22/2006	5/22/2006	5/29/2006	20	A	No	82.6/10.1	700	300
10	5/22/2006	5/22/2006	5/29/2006	20	A	No	82.7/10.3	900	700
11	5/22/2006	5/22/2006	5/28/2006	4	A	No	84.6/12.3	2,100	700
12	5/22/2006	5/22/2006	5/28/2006	4	A	No	83.2/12.5	3,100	2,600
13	5/22/2006	5/22/2006	5/28/2006	4	A	No	80.9/12.4	2,000	1,400
14	5/22/2006	5/22/2006	5/28/2006	4	A	No	82.9/13.0	1,100	1,800
15	5/22/2006	5/22/2006	5/28/2006	4	A	No	82.8/12.7	2,600	2,700
16	5/23/2006	5/23/2006	6/1/2006	7	B	Yes	0.024/17.4	160,000	290,000
17	5/23/2006	5/23/2006	6/1/2006	7	B	Yes	0.003/18.0	39,000	120,000
18	5/23/2006	5/23/2006	6/1/2006	7	B	Yes	0.001/17.7	220,000	290,000
19	5/23/2006	5/23/2006	6/1/2006	7	B	Yes	0.000/18.0	99,000	180,000
20	5/23/2006	5/23/2006	6/1/2006	7	B	Yes	0.000/18.6	61,000	120,000
21	5/23/2006	5/23/2006	5/31/2006	15	B	Yes	0.000/18.1	12,000	58,000
22	5/23/2006	5/23/2006	5/31/2006	15	B	Yes	0.000/18.5	19,000	28,000
23	5/23/2006	5/23/2006	5/31/2006	15	B	Yes	0.000/19.2	9,000	40,000
24	5/23/2006	5/23/2006	5/31/2006	15	B	Yes	0.000/18.4	11,000	78,000
25	5/23/2006	5/23/2006	5/31/2006	15	B	Yes	0.000/19.0	35,000	48,000
26	5/23/2006	5/23/2006	5/31/2006	4	B	Yes	0.000/19.1	120,000	210,000
27	5/23/2006	5/23/2006	5/31/2006	4	B	Yes	0.000/18.6	130,000	330,000
28	5/23/2006	5/23/2006	5/31/2006	4	B	Yes	0.000/18.8	120,000	330,000
29	5/23/2006	5/23/2006	5/31/2006	4	B	Yes	0.000/18.4	140,000	380,000
30	5/23/2006	5/23/2006	5/31/2006	4	B	Yes	0.000/18.6	180,000	300,000
31	5/23/2006	5/23/2006	5/30/2006	8	B	Yes	0.000/18.4	110,000	220,000
32	5/23/2006	5/23/2006	5/30/2006	8	B	Yes	0.000/19.0	79,000	220,000
33	5/23/2006	5/23/2006	5/30/2006	8	B	Yes	0.000/18.5	70,000	180,000
34	5/23/2006	5/23/2006	5/30/2006	8	B	Yes	0.000/19.4	100,000	190,000
35	5/23/2006	5/23/2006	5/30/2006	8	B	Yes	0.000/20.2	14,000	54,000
36	5/24/2006	5/24/2006	5/29/2006	4	C	No	73.2/17.6	100	200

37	5/24/2006	5/24/2006	5/29/2006	4	C	No	70.0/17.2	100	300
38	5/24/2006	5/24/2006	5/29/2006	4	C	No	71.5/17.3	100	200
39	5/24/2006	5/24/2006	5/29/2006	4	C	No	74.8/17.6	100	200
40	5/24/2006	5/24/2006	5/29/2006	4	C	No	73.9/17.3	300	200
41	5/24/2006	5/24/2006	5/29/2006	20	C	No	78.9/12.0	1,100	1,000
42	5/24/2006	5/24/2006	5/29/2006	20	C	No	77.5/13.1	900	1,000
43	5/24/2006	5/24/2006	5/29/2006	20	C	No	79.1/12.4	500	700
44	5/24/2006	5/24/2006	5/29/2006	20	C	No	80.1/12.5	600	900
45	5/24/2006	5/24/2006	5/29/2006	20	C	No	81.5/12.3	1,200	800
46	5/24/2006	5/24/2006	5/29/2006	17	C	No	79.7/12.6	800	100
47	5/24/2006	5/24/2006	5/29/2006	17	C	No	79.4/12.9	1,000	500
48	5/24/2006	5/24/2006	5/29/2006	17	C	No	80.3/12.9	600	500
49	5/24/2006	5/24/2006	5/29/2006	17	C	No	79.3/13.0	900	800
50	5/24/2006	5/24/2006	5/29/2006	17	C	No	81.0/12.4	500	300
51	5/25/2006	5/25/2006	5/28/2006	10	D	Yes	0.002/26.9	2,900,000	27,000,000
52	5/25/2006	5/25/2006	5/28/2006	10	D	Yes	0.000/22.0	1,400,000	4,600,000
53	5/25/2006	5/25/2006	5/28/2006	10	D	Yes	0.000/21.9	940,000	3,700,000
54	5/25/2006	5/25/2006	5/28/2006	10	D	Yes	0.000/22.6	1,800,000	9,200,000
55	5/25/2006	5/25/2006	6/3/2006	10	D	Yes	0.000/24.1	1,000	1,000
56	5/25/2006	5/25/2006	6/5/2006	20	D	Yes	0.000/22.4	170,000	440,000
57	5/25/2006	5/25/2006	6/5/2006	20	D	Yes	0.000/22.4	72,000	310,000
58	5/25/2006	5/25/2006	6/5/2006	20	D	Yes	0.000/23.2	260,000	400,000
59	5/25/2006	5/25/2006	6/5/2006	20	D	Yes	0.000/22.0	180,000	720,000
60	5/25/2006	5/25/2006	6/5/2006	20	D	Yes	0.000/23.1	120,000	300,000