

# Quality Characteristics of Traditional, Natural and Organic Bacon

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### Summary and Implications

The change in ingredients and processing procedures necessary for natural and organic bacon are likely to result in some product quality differences when compared with traditionally processed bacon. Preliminary results for % cured color, TBARS value, and residual nitrite concentrations in this study suggest variability in quality of products currently on the market. This may affect consumer satisfaction and repeat purchases of these products. Further, these results imply differences in shelf-life and safety of these products as well.

### Introduction

Market growth of natural and organic meat products has been dramatic. However, traditional preservatives such as sodium nitrite are not permitted in these products. Because sodium nitrite is essential and irreplaceable for maintaining quality and safety of cured meats, processors of natural and organic products face a major challenge in trying to produce products that meet consumer expectations. As processors develop different approaches to provide traditional cured meat properties in products that are not cured with conventional sodium nitrite or sodium nitrate, quality issues become a concern. One popular method currently used by industry is the incorporation of vegetable juice powder (VJP), which has been known to contain natural levels of nitrate. A nitrate-reducing starter culture, *Staphylococcus carnosus*, is also included to reduce nitrate to nitrite. Because these processes are likely to introduce considerable variation, each company may be producing bacon with a variety of different quality issues, which can ultimately affect the consumer perceptions of quality of natural and organic bacon.

Sodium nitrite is regulated at 120 ppm ingoing concentration for bacon and is the primary traditional curing agent used in processed bacon. It is responsible for cured color development, flavor, improved oxidative properties, and antibacterial activity. There is no known substitute. Using a natural source of sodium nitrate from vegetable products with a starter culture has been the only means of producing typical cured meat properties in natural and organic processed meats where cured meat properties are expected.

Vegetable juice powder from celery extract along with *Staphylococcus carnosus* is available commercially. Celery contains high levels of nitrate while having little effect on taste, thus providing “natural” nitrate for processed meats. Currently there are no industry standards for manufacturing natural, organic or alternatively cured bacon products. More information is needed to verify the quality and safety of the current products on the market. Our objective was to compare the quality attributes of natural and organic bacon on the market to traditionally cured bacon.

### Materials and Methods

A total of 12 brands of bacon were analyzed, including nine natural/uncured, two organic, and one traditionally-cured bacon sample. Three replications with different lot codes for each product were conducted. Objective color values (using a Hunter Color Meter measuring one light and one dark muscle), percent cured color (calculated from total pigment and cured pigment), water activity, TBARS value, pH, salt, and residual nitrite were measured.

### Results and Discussion

Data means are presented in Tables 1 and 2, but because this project is ongoing, statistical analysis of the data is not yet complete and levels of significance have not been determined. Nevertheless, the L, a, and b color means, water activity, pH, and % salt appear to be comparable for the natural and organic products relative to the traditionally-cured products. However, 4 of the natural/uncured brands and one organic brand appear to have a lower % of cured pigment compared to the control. All of these products also appear to be lower in residual nitrite, implying that less nitrite was introduced by the natural curing process. Three of those products also appear to have higher TBARS numbers implying a faster deterioration of flavor. Because nitrite is necessary for typical cured meat color and flavor, it is not surprising that these quality changes could result in products with less residual nitrite present. On the other hand, two natural bacon brands seem to be higher in residual nitrite than the control sample. It appears that natural and organic bacon products are more variable than traditionally-cured bacon for the quality characteristics measured in this study. This implies that microbiological safety may also be a concern since this is another critical function of nitrite in cured meat.

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**Table 1. Color measurement in traditionally-cured (control), natural and organic bacon samples**

ID:	Hunter color meter						Pigment Concentration		
	Lighter muscle			Darker muscle			Total Pigment	Cured Pigment	Cured Color
	L	a	b	L	a	b	(ppm)	(ppm)	%
Control	40.94	8.85	5.25	52.83	3.87	2.35	64.40	39.85	62.41
<u>Natural/Uncured</u>									
Brand 1	42.83	8.27	5.84	56.22	2.11	3.24	73.24	31.38	43.24
Brand 2	42.97	9.40	6.33	52.05	5.13	4.19	68.63	39.58	58.44
Brand 3	40.99	10.11	6.88	52.78	4.14	2.74	88.21	52.77	62.35
Brand 4	41.17	8.23	6.56	53.01	3.49	3.70	68.86	44.91	69.98
Brand 5	41.60	7.90	3.64	53.26	4.80	4.19	80.36	42.74	55.37
Brand 6	43.96	8.45	7.35	55.47	4.45	5.81	74.69	38.97	54.14
Brand 7	40.05	8.89	5.82	48.02	3.60	2.44	64.65	43.19	67.64
Brand 8	45.13	9.69	6.07	58.40	4.28	3.02	64.78	37.90	60.81
Brand 9	39.93	10.67	6.12	51.02	5.08	4.16	89.71	42.64	48.06
<u>Organic</u>									
Brand 1	40.39	8.43	7.95	52.56	6.81	7.87	68.99	17.42	25.69
Brand 2	43.67	10.36	6.94	53.52	4.27	2.79	77.05	55.95	72.50

**Table 2. Chemical Properties as  $a_w$ , TBARS, pH, salt content and residual nitrite in traditionally-cured (control), natural and organic bacon samples**

ID:	Chemical Properties				
	$a_w$	TBARS	pH	NaCl	Residual Nitrite
		(mg malonaldehyde per 1000g of sample)	pH	%	(ppm)
Control	0.94	0.09	6.04	2.43	7.06
<u>Natural/Uncured</u>					
Brand 1	0.92	0.26	5.90	2.52	1.24
Brand 2	0.89	0.14	6.12	2.10	9.27
Brand 3	0.85	0.17	6.00	1.75	4.07
Brand 4	0.89	0.15	6.25	2.32	10.69
Brand 5	0.88	0.42	6.05	2.26	3.18
Brand 6	0.90	0.13	6.05	2.20	4.40
Brand 7	0.93	0.14	6.15	2.37	18.33
Brand 8	0.94	0.12	5.96	1.29	3.29
Brand 9	0.92	1.30	5.91	2.47	1.57
<u>Organic</u>					
Brand 1	0.86	3.10	6.10	2.46	1.05
Brand 2	0.90	0.60	6.04	1.64	2.78