

Die Wirkung von α tocopherol (Vitamin E) auf die Lagerstabilitaet von Pork und Bacon

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Die Antioxidantwirkung bei Schweinefilet (pork steak) und Bacon von einer Fuetterungsbeigabe von Vitamin E (800mg/Tag/Schwein) in den 7 Tagen vor der Schlachtung wurde bei gekuehlter bzw. gefrorener Lagurung unter Anwendung von sauerstoffdurchlaessiger bzw. Vakuumverpackung untersucht.

Die Beigabe von Vitamin E hat bei gewoehnlich verpacktem gefrorenem Pork (12 Wochen) eine Senkung der TBA-Werte um mehr als 50 v.H., bei gekuehltem Pork (14 Tage) bei einer Temperatur von 5°C sogar eine noch bedeutendere Sunkung bewirkt. Bei Vakuumverpackung wurde eine Verringerung von chemischen sowie bakteriologischen Aenderungen festgestellt. Das zu Bacon bearbeitete, mit Vitamin E behandelte Schweinefleisch erwies dagegen keinen Vorzug gegenueber den Kontrollproben.

Influence of α tocopherol (Vitamin E) on the Storage Stability of Pork and Bacon

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The effect of feeding supplemental dietary vitamin E (800mg/day/pig) for 7 days prior to slaughter as an antioxidant in pork steak and bacon, was studied during refrigerated and frozen storage using oxygen, permeable wrapping and vacuum pack.

Vitamin E treated samples had the effect of reducing TBA values by over 50% in normal wrapped frozen pork (12 weeks) with even more significant reductions for refrigerated (14 days) storage at 5°C. Vacuum packaging had the effect of reducing both chemical and bacteriological changes. Bacon produced from vitamin E treated pork showed no advantage over controls.

Influence d' α -actopherol (Vitamine E) sur la Stabilité de Stockage de Porc et du Bacon

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L'effet de mettre Vitamine E au régime supplémentaire (800mg/jour/porc) pendant une période de 7 jours avant l'abattage comme un antioxydant dans le steak de porc et dans le bacon, fut étudié pendant le stockage réfrigéré et gele en se servant d'oxygène, d'emballage perméable et d'empaquetage sous vide.

Des échantillons traitées de Vitamine E ont produit l'effet d'une réduction plus de 50% des valeurs TBA dans le porc d'emballage normal réfrigéré (12 semaines) et avec des réductions plus significantes dans le stockage à 5°C (14 jours). Mettre en paquets sous vide avait l'effet de réduire les changements chimiques et bactériologiques. Bacon produit de porc traite de Vitamine E remportait nul avantage sur le bacon naturel.

Влияние α -токоферола (Витамин Е) На Устойчивость Хранения Свинины И Бекона

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Изучалось действие кормления дополнительным диетическим витамином Е (800 мг/в день/свинья) за 7 дней прежде убоя как антиокислитель в свиномштексе в течении замороженного и замёрженного хранения, употребляя проницаемую упаковку и вакуум-упаковку.

Обнаружили обработку витамином Е пробы уменьшение величин ТБА на 50% с лишком что касается до нормальной обвёрнутой замёрженной свинины (12 недель) и более заменательные уменьшения что касается до замороженного хранения (14 дней) при 5°C. Уменьшило вакуум-упакование и химические и бактериологические изменения. Что касается бекона произведенного из обработанной витамином Е свинины, преимущество над контролях невидно.

Influence of α tocopherol (Vitamin E) on the Storage Stability of Pork and Bacon

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Introduction

Lipid oxidation is one of the major causes of deterioration in the quality of meat and meat products, particularly in frozen stored meats. Undesirable changes in colour, flavour and even nutritive value occur as meat fats are oxidised and interact with other meat constituents such as proteins and carbohydrates.

The fats in meat can be classified as depot or intermuscular fat, and tissue or intramuscular fat. The intramuscular fats exist in close association with protein and contain a high proportion of the total phospholipid content of meat. Although the phospholipid content is small it is highly susceptible to oxidation, which makes it important in influencing meat quality.

Oxidation occurs as a result of the reaction between atmospheric oxygen and the unsaturated fatty acids. Peroxides are intermediate products in the oxidation process, which in turn break down to odour- and flavour-producing compounds. It has been established that the level of lipid peroxides can be significantly reduced in pigs fed supplemental vitamin E(1). Other studies have shown that supplemental vitamin E improves the stability and flavour of veal fat, frozen poultry and pork.

With the increased impetus on efforts to raise the levels of polyunsaturated fatty acids in animal fats so as to lower cholesterol content, the possibility of using biological anti-oxidants such as α tocopherol is of practical significance. The objective of this study was to determine if vitamin E supplementation influenced the storage stability of ground pork steak and bacon during refrigerated and frozen storage in vacuum and normal packs.

Experimental Design

Twenty bacon weight pigs were used, ten as controls fed without vitamin E and ten as treatment with vitamin E supplementation of 800mg/day/animal in the feed for 7 days prior to slaughtering.

Slaughtering was carried out in the usual manner in a bacon factory. The carcasses were held in the cooler for 2 days prior to removal of the *psoas major* muscle or pork steak from both sides, which were suitably identified.

Sample Preparation

All pork steaks from the left hand side were ground individually through $\frac{1}{8}$ " plate. Each pork steak was divided into vacuum and normal packs.

All pork steaks from the other side were cured using a brine composed of 18% salt and 500 ppm nitrite, then ground and divided into vacuum and normal packs.

Samples were then stored at a refrigerator temperature of 5°C and at a freezer temperature of -20°C.

The t-test was used to check for statistical significance.

Results

Pork from the vitamin E treatment held at 5°C had significantly lower (at 99.9% level) TBA values than those of controls, in both the normal and vacuum packs (Table 1). Pork in the vacuum packs had significantly lower TBA values than those in normal packs. Bacon from the vitamin E treatment held at 5°C showed little significant difference in TBA values from those of controls, in both the normal and vacuum packs (Table 2). This may be due to the fact that bacon contains nitrite which also acts as an antioxidant. Vacuum packaging again significantly reduced the TBA values of the bacon over those of normal packs. pH 6.0 was used as a cut-off point to indicate bacterial spoilage.

During frozen storage the pork from the vitamin E treatment again had significantly lower

Table 1

PORK REFRIGERATED AT 5°C

Time	Control TBA Values			Treatment TBA Values			t.test
	pH	Mean	S.D.	pH	Mean	S.D.	
	<u>NORMAL PACK</u>						
0 day	5.55	0.338	0.023	5.7	0.141	0.012	(P < 0.001)
3 day	5.6	0.937	0.717	5.7	0.188	0.038	(P < 0.1)
6 day	5.6	1.167	0.069	5.8	0.193	0.023	(P < 0.001)
10 day	6.3	1.98	0.552	6.4	0.438	0.115	(P < 0.001)
	<u>VACUUM PACK</u>						
0 week	5.6	0.241	0.037	5.8	0.138	-	(P < 0.001)
2 week	5.6	0.266	0.015	5.8	0.157	0.013	(P < 0.001)
4 week	5.6	0.434	0.059	5.8	0.297	0.027	(P < 0.001)
8 week	5.6	0.513	0.036	5.8	0.303	0.026	(P < 0.001)

Table 2

BACON REFRIGERATED AT 5°C

Time	Control TBA Values			Treatment TBA Values			t-test
	pH	Mean	S.D.	pH	Mean	S.D.	
	<u>NORMAL PACK</u>						
0 day	5.8	0.046	0.009	5.85	0.043	0.009	N.S.
7 day	5.85	0.062	0.008	5.9	0.057	0.011	N.S.
14 day	5.9	0.084	0.011	5.9	0.069	0.004	(P < 0.01)
30 day	5.95	0.115	0.01	6.0	0.117	0.015	N.S.
	<u>VACUUM PACK</u>						
0 week	5.8	0.034	-	5.85	0.027	0.009	(P < 0.1)
12 week	5.95	0.169	0.017	6.0	0.089	0.067	(P < 0.001)
14 week	5.95	0.174	0.025	6.05	0.114	0.01	(P < 0.01)

Table 3 PORK STORED FROZEN AT -20°C

Control TBA Values				Treatment TBA Values			t-test
Time	pH	Mean	S.D.	pH	Mean	S.D.	
<u>NORMAL PACK</u>							
0 week	5.6	0.341	0.021	5.7	0.141	0.012	(P < 0.001)
6 week	5.6	0.510	0.209	5.75	0.184	0.013	(P < 0.001)
13 week	5.6	0.746	0.240	5.8	0.323	0.031	(P < 0.001)
<u>VACUUM PACK</u>							
0 week	5.6	0.318	0.089	5.7	0.138	-	(P < 0.001)
7 week	5.6	0.472	0.053	5.8	0.304	0.015	(P < 0.001)
16 week	5.6	0.487	0.044	5.8	0.282	0.026	(P < 0.001)

Table 4 BACON STORED FROZEN AT -20°C

Control TBA Values				Treatment TBA Values			t-test
Time	pH	Mean	S.D.	pH	Mean	S.D.	
<u>NORMAL PACK</u>							
0 week	5.9	0.044	0.009	5.9	0.043	0.009	N.S.
5 week	5.9	0.093	0.009	5.9	0.086	-	N.S.
12 week	5.9	0.156	0.015	6.0	0.152	0.017	N.S.
<u>VACUUM PACK</u>							
0 week	5.9	0.044	0.009	5.9	0.043	0.009	N.S.
5 week	5.9	0.124	0.008	5.95	0.103	-	(P < 0.001)
19 week	5.95	0.128	0.009	6.0	0.156	0.018	N.S.

TBA values (at 99.9% level) over those of controls, in both normal and vacuum packs (Table 3).

During frozen storage the bacon produced from the vitamin E treatments showed no significant difference in TBA values over the controls in either the normal or vacuum packs (Table 4). The vacuum packs showed reduced TBA values over the normal packs, particularly for pork during frozen storage.

A final experiment was carried out to observe the effect of cooking on TBA values for both pork and bacon. The mean TBA values of 10 samples tested in each case are summarised in Table 5.

Table 5 Effect of Cooking on TBA Values for Pork and Bacon

	Control			Treatment		
	Uncooked	Cooked	Factor	Uncooked	Cooked	Factor
Pork	0.338	1.31	4	0.205	0.83	4
Bacon	0.130	0.25	<2	0.14	0.25	<2

An increase in TBA values by a factor of 4 occurred for pork and an increase of less than 2 occurred for bacon.

Discussion

Vitamin E supplementation has been shown to stabilise animal products from as far back as 1946 (2) and this effect has since been confirmed by many research workers for various animal products, including poultry and turkey meat (3,4,5), milk (6) and pork (7,8).

Pigs, in particular, are able to deposit fats present in the feed and if unsaturated in nature the likelihood for oxidative rancidity to develop is increased. While most of the synthetic anti-oxidants are not readily absorbed, vitamin E is readily absorbed and when added to pig rations it counteracts the development of rancidity and reduced keeping quality in pork.

The results of this study would confirm that vitamin E supplementation does reduce the development of rancidity in pork stored at 5°C and -20°C, thereby increasing its shelf life in vacuum packs and oxygen-permeable packs in particular.

The effects of vitamin E supplementation on bacon are less pronounced, probably due to the presence of nitrite which also acts as an antioxidant.

A TBA value of 1.0 would seem to be a good cut-off point for pork, seeing that on cooking this value increased to 4.0 at which point a rancid flavour can be detected. This increase in TBA value during cooking is probably associated with the denaturation of the pigments present with the resultant release of iron which acts as a catalyst for oxidation.

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