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Addition Of Vitamin E In Pigs Feed: Could Prevent Cured-Meat Promotion Of Colon Carcinogenesis In Rats (#482)

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Introduction

Based on epidemiological studies, excessive consumption of cured meats induces a slight, but significant, increase in the risk of developing colorectal cancer [1]. Among the various hypotheses, recent studies have proposed the central role of heme iron in this positive association. Heme iron catalyzes the formation of genotoxic and cytotoxic nitroso-compound (NOCs) and lipid peroxidation end products (alkenals). Based on the important role of peroxidation and nitrosylation in the effect on cancer risk, our recent studies has made possible to propose a limitation of this effect *via* the enrichment of cured meat products with vitamin E during their manufacture [2]. In addition, supplementation in pig diet would also appear interesting to protect cured meat from the formation of carcinogenic substances, NOCs and alkenals [3]. In the present study we assess for the first time the effect of adding vitamin E in pig feed on preventing the promotion of colorectal carcinogenesis in rats fed a sausage-based diet from supplemented animals compare to sausage-based diet from control animals .

Methods

A batch of 60 pigs, from Piétrain sires, were fed with either a basal diet or a basal diet supplemented with vitamin E (500 ppm), during the thirty nine last days of fattening. At slaughterhouse, quality measurements were performed on *Semimembranosus* with pH1 (30 min. *post mortem (pm)*), ultimate pH (pH24 ext., at 24h *pm*) and on *Gluteus Medius* with colour analysis (colorimeter Konica Minolta, Japan) and drip loss sampling (EZ method). Two batches of cooked sausages were produced with pork shoulder and backfat stemming from of pig supplemented (LE) or control (LT). Before experimentation on rats, cooked sausages have been characterized on colour and the levels of vitamin E, lipid oxidation (TBARS), heme and nitrosylated heme iron (Heme-NO). Thirty carcinogen-induced rats, divided among two groups (LE and LT) plus a negative control group (CON) without sausage allowed to determine after a long time nutritional study (one hundred days) the effect of vitamin E on: TBARS and Apparent Total Nitroso Compounds (ATNC) measured on faecal water and the number of mucin depleted crypts per colon, a better predictor of colorectal cancer than other preneoplastic lesions [2].

Results

Quality measurements showed a higher red index (p = 0.03) in favour to meat from supplemented animals (LE) (results not shown). Supplementation increases the vitamin E content by a factor of 2.5 in cooked sausages (Table 1). Colour values of the LE cooked sausages were different compared to the control (LT), but this effect did not probably noticeable to the naked eye. No significant differences in levels of heme, heme-NO and TBARS was observed.

Figure 1 shows that cooked sausage diet increase significantly number of preneoplastic lesions per colon and level of ATNC. Result on the crypts number per colon is in favor to vitamin E supplementation: Fig 1A shows a significant decrease for LE group in comparison to LT group, with a normalization of number of preneoplastic lesions similar to CON group without cured meat. In this study, Heme-NO depicts of eighty to ninety percent of ATNC found in faecal water and no significant effect of vitamin E supplementation was observed on ATNC and TBARS (results not shown).

Conclusion

This study demonstrates for the first time that vitamin E enrichment during pork rearing limits colon cancer promotion associated to cured meat consumption. This strong protective effect is observed with preneoplastic lesions highly representative of colon cancer. However, this effect is not associated to decrease of formation of faecal NOCs and alkenal. Therefore, this protection does not seem to be explained by a limitation of the formation of these toxic compounds. We explore currently detoxification enzymes level in mucosa of rats to verify if this effect is explained by a stimulation of the mucosal cytoprotection.

References

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Notes

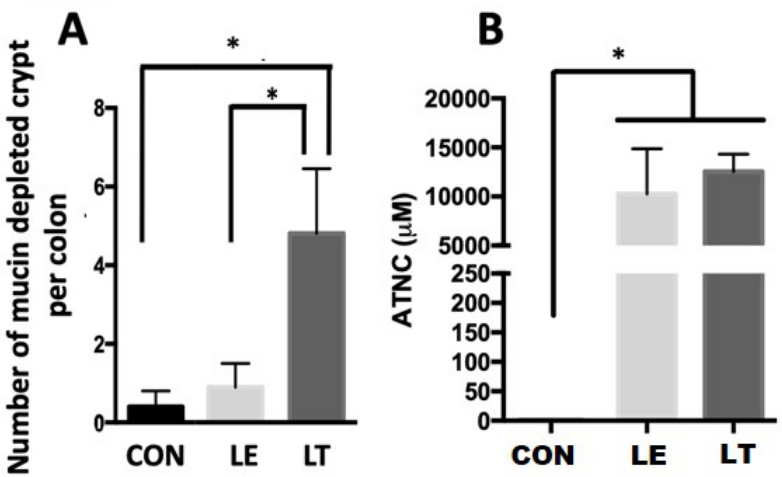

Figure 1 : Effect on mucin depleted crypt per colon (A) and the faecal ATNC (B).
*Significant differences: * p<0.05 and ** p<0.01 (n=10)*

	Colour			Composition				
	L*	a*	b*	Heme mg/kg	Heme-NO mg/kg	% converted	Vit. E mg/kg	TBARS mg MDA/kg
LT	73,9a	7,83a	10,57a	55,3	21,3a	38	5,1a	0,17
LE	72,4b	8,46b	11,04b	63,0	36,7b	58	12,6b	0,20

Table 1: Colour and composition of cooked sausages (n=6).
Within each column, means with different superscript letters are significantly different (p<0.05)

Notes