# 3-P16

## Effects of Conjugated Linoleic Acid (CLA) on Lipid Oxidation and Residual Nitrite of Emulsion-type Sausages

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**Abstract**

Conjugated linoleic acid (CLA) was used to manufacture value-added emulsion-type sausage. Emulsion-type sausa (ETS) was manufactured with pork back-fats (20% total weight) as a control. ETS containing CLA was manufactur with one of following CLA amounts: 0, 2.5, 5, 7.5 and 10% CLA replaced the total pork back-fat content in contr ETS. Several factors influencing the shelf-life of the ETS were determined when stored at 4℃ for 28 days. Significa difference in thiobarbituric acid reactive substances (TBARS) was shown between control and CLA treatment grou during storage ($p<0.05$). CLA in CLA treatment gorups was not degraded during storage. CLA treatment significant reduced nitrite content in ETS when storage and such an effect was proportional to CLA amount treated. Nitrite conte in control group was significantly higher than in CLA-treated gorups ($p<0.05$). These results suggest that CLA added ETS revealed no adverse effects on quality, lipid oxidation, nitrite content and elevation of unsaturated fatty acid conte Given these positive effects of CLA, CLA could be used as a fat substituter to manufacture value-added ETS.

**Introduction**

Conjugated linoleic acids (CLA) has recently been recognized as anticarcinogen. CLA is widely distributed in many foo including dairy products, meat, certain vegetable products and some infant foods (Chin et al, 1992). Among the anim products, ruminant tissues and dairy products are recognized as major dietary sources of CLA; however, non-rumina animal products are not.

Minor changes in the fatty acid composition of foods were known to occur as a result of cooking (Kamal et al., 199 Ha et al. (1989) reported that levels of CLA in grilled ground beef was increased as compared to uncooked one. Th suggested that cooking temperatures and methods could influence CLA concentrations in beef if CLA is formed as result of thermal oxidation of linoleic acid. Since CLA is potentially a beneficial dietary component that could be obtain from ruminant animal products, it is important to establish how to accumulate CLA concentrations in non-rumina animal products such as egg, pork or processed meats. The purpose of this study was to investigate the effect of CL on lipid oxidation and residual nitrite of the ETS fortified with CLA.

**Materials and Methods**

Pork loin and back-fat purchased were trimmed excess fats or connective tissues, and then minced. CLA was chemica synthesized from linoleic acid (purity 99.9%) by alkaline isomerization method described by Ha et al. (1990). Five differe ETS were manufactured : control with 20% pork back-fat of total weight and treatments 1 to 4 replacing the po back-fat by 2.5, 5, 7.5 and 10% CLA, respectively. Samples were stored at 4℃ for 28 days. Lipid oxidation of t refrigerated emulsion-type sausage was assessed by TBARS test. Fatty acid methyl esters were analyzed on a g chromatography (Hewlett Packard 5890 Gas chromatography) with an on-column injector port and flame ionizatio detector. Residual nitrite was determined by diazotization method (AOAC, 1995). Statistical analysis was performed usi ANOVA with the Statistical Analysis System (SAS, 1996) at 5% level of significance.

**Results and Discussion**

Figure 1 shows the changes in TBARS of ETS with CLA during storage at 4℃. Although the TBARS of control g CLA-treated groups were not significantly different at 1 day of storage, the TBARS of CLA-treated groups were low than that of control at 7 days of storage. Especially, 10% CLA-treated group showed significantly lower TBA compared to that of control during storage. These results suggest that lipid oxidation of ETS could be affected by t

levels of CLA. Because CLA is a stable component, it was uncertain how to reduce lipid oxidation in ETS by CLA. Table 1 shows the fatty acids composition of ETS. The content of polyunsaturated fatty acids in CLA-treated sausages was higher than that of control sausage. Arachidonic acid level was decreased, when increased the amount of CLA replacement. Figure 2 shows the changes in CLA content of ETS during storage. The CLA content was increased as the level of CLA replacement was increased, and there was no significant changes in CLA content during storage. The results indicate that CLA in processed meat products is stable during chilled storage.

Figure 3 shows the changes in residual nitrite of ETS for 28 days of storage. It is well known that nitrite is a precursor of nitrosamines and is a hazardeous compound restricted in use by law. Upper limit of residual nitrite in meat products is 70 ppm in Korea and Japan, but in most countries including England and Germany, it is ranging 100~200ppm. We observed that the content of residual nitrite of CLA-treated sausages was more rapidly decreased compared to control. Further research to elucidate the mechanism by which nitrite content is reduecd in ETS by CLA is necessary.

## Conclusion

CLA could be used as an additive to ETS. During chilling storage of CLA containing ETS, lipid oxidation was delayed and CLA concentration was not changed. It was also observed that residual nitrite was decreased by CLA.

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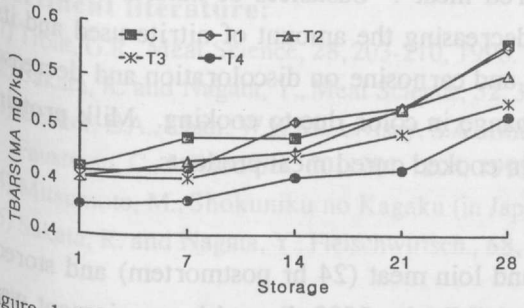


Figure 1. Effects of CLA on TBARS of emulsion-type sausage during storage at 4℃.
C : pork bac-kfat(20%) ; T1 : 2.5% CLA ; T2 : 5%CLA ; T3 : 7.5% CLA ; T 4 : 10% CLA

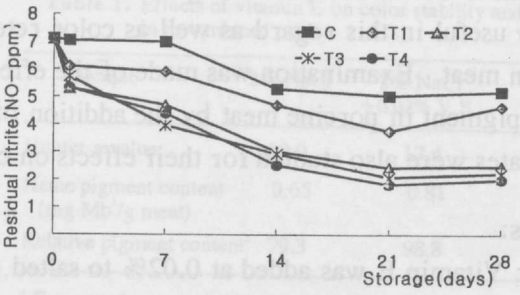


Figure 2. Effects of CLA on residual nitrite of emulsion type sausage during storage at 4℃. Treatments are the same as in Figure 1.

Table 1. Effects of storage on the composition of fatty acid and CLA of emulsion-type sausage with CLA[1)]

| Fatty acid | Treatment[2)] | | | | |
|---|---|---|---|---|---|
| | Control | T1 | T2 | T3 | T4 |
| C14:0 | 1.50 | 1.32 | 1.30 | 1.28 | 1.22 |
| C16:0 | 19.70 | 19.42 | 18.98 | 18.92 | 18.48 |
| C16:1 | 1.72 | 1.75 | 1.70 | 1.70 | 1.69 |
| C18:0 | 7.93 | 7.62 | 7.89 | 7.92 | 7.50 |
| C18:1 | 35.82 | 35.04 | 34.02 | 33.98 | 33.60 |
| C18:2 | 10.40 | 9.95 | 9.87 | 8.85 | 9.66 |
| C18:3 | 0.90 | 0.82 | 0.74 | 0.72 | 0.54 |
| CLA | 0.00 | 2.28 | 3.58 | 4.56 | 5.46 |
| C20:4 | 0.35 | 0.24 | 0.23 | 0.22 | 0.20 |

1) Samples were stored at 4℃ for 28 days.
2) Treatments are the same as in Figure 1.

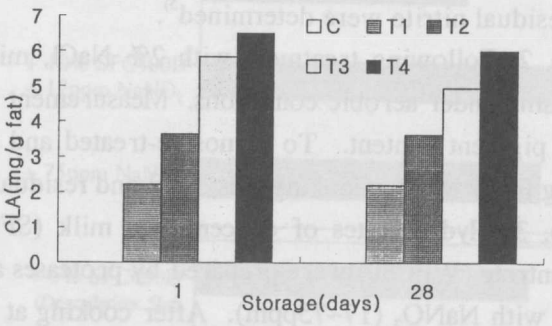


Figure 3. Changes in CLA content of emulsion type sausage with CLA storage at 4℃ for 1 and 28 days. Treatments are the same as in Figure 1.