

# Effects of Feeding Conjugated Linoleic Acid To Market Pigs on Bacon Quality and Composition

J. G. Fulghum, graduate assistant;  
J. G. Sebranek, Professor of Animal Science and  
Food Science and Human Nutrition;  
F. C. Parrish, Jr., Professor of Animal Science  
and Food Science and Human Nutrition;  
B. R. Wiegand, graduate assistant

## ASL-R1617

### Summary and Implications

Bacon produced from pigs fed a diet enriched with conjugated linoleic acid has a firmer substance as compared with bacon produced from control-fed animals. This increase in firmness could lead to an economic return through an increase in slicability and reduction of labor in packaging.

### Introduction

One of the largest problems facing bacon producers today is lack of uniformity in bellies. The particular focus of the problem stems from belly fat softness and the consequential variability in slicing yields. This translates into a direct economic loss for producers. The current study focuses significantly on this problem. It has been suggested recently that pigs fed a diet enriched with CLA produce bellies that are more firm in substance compared with control-fed animals. It is hypothesized an increase in belly firmness will lead to a significant improvement in slicing yield.

The term conjugated linoleic acid refers to a mixture of positional and geometric isomers of linoleic acid. Linoleic acid is an 18-carbon, unsaturated fatty acid with double bonds at the 9 and 12 positions both of cis configuration. Conversely, CLA contains both positional changes of those double bonds and geometric changes about those bonds. There are nine commonly known isomers of CLA with the biologically active isomer believed to be the cis-9, trans-11 isomer.

The objectives of this preliminary study were to determine the effects of feeding CLA on (1) belly firmness (2) bacon slicability and textural uniformity of bellies, and (3) the quantity of CLA deposited into the belly tissues.

### Materials and Methods

Bellies from 20 standard ISU crossbred barrows were obtained. Ten of the animals were fed a diet consisting of 0.75% CLA by weight of the diet. For these animals, CLA replaced soy oil in the diet. The source of CLA used contained 65% CLA. The remaining 10 animals

were fed a control diet. Pigs were allowed ad libitum access to feed and water. The pigs, weighing 115 kg, were slaughtered at Hormel Foods

(Austin, MN), and bellies were collected 24 hours post slaughter and transported to ISU meat laboratory for further processing and analysis. Bellies were initially weighed with the skin off and spare ribs removed. Prior to processing the bellies, firmness was determined by measuring the inside distance between the ends of the belly placed across a stainless steel bar. This is commonly referred to as the bar test. Measurements were taken with both the lean side up and lean side down. Bellies were cured by brine injection by using a Townsend Model 1400 (Townsend Engineering, Des Moines, IA) injector and a target pump of 12%. The brine consisted of 77.13% water, 12.25% salt, 4.25% sugar, 4.25% phosphate, 1.06% smoke flavoring, 0.458% erythorbate, and 0.104% nitrite. Bellies were allowed to equilibrate for 1 hour before being smoked and thermally processed in a Maurer (Maurer, Reichenau, Germany) thermal-processing unit. After smoking and cooking to an internal temperature of 52°C, the bellies were placed in a cooler (2°C) to chill for 24 hours. Bellies were trimmed and weighed prior to slicing. Bacon was sliced with an U.S. Berkel Model 170 GS (U.S. Slicing Machine Company, Inc., Laporte, Indiana) slicer (18 to 22 slices per pound). Slices were segregated for each belly based on visual appraisal of quality (e.g., shattered or torn pieces) into either acceptable or unacceptable portions, and the weights of each were taken.

Slices from each end and the middle of the cured belly were pooled for moisture and fat determination. These slices were frozen with liquid nitrogen prior to grinding in a blender. Fat and moisture determinations were completed according to AOAC (1) methods.

The data were analyzed using SAS (2). The means shown are least-squares means and their corresponding standard errors.

### Results and Discussion

The data in Table 1 shows the firmness of the bellies significantly increased when measured via the bar test for both lean side up ( $P < .0001$ ) and lean side down ( $P < .0079$ ). An increase in firmness would lead to an expectation of an increase in slicing yield, however, in this case no differences were found and might be attributed to the limited number of samples tested. The general trend based on visual observations during slicing is that the slicing character of bacon from pigs fed CLA had a firmer substance that allowed for more rigid slices that stacked more uniformly when using an automated

slicer. This is in contrast with the bacon produced from pigs fed a control diet, which tended to shatter and tear more easily. The increased rigidity of bacon from pigs fed CLA should lead to an improvement in package appearance and a decrease in labor while packaging. All other variables, tested including fat and moisture levels, processing yields, and slicing yields showed no differences between treatments, which again might be attributed to the limited number of samples tested.

**Table 1. Least-squares means and standard errors for belly firmness using the bar test.**

	control	CLA	SEM
Lean up (cm)	23.25 <sup>a</sup>	42.38 <sup>a</sup>	1.10
Lean down (cm)	19.68 <sup>b</sup>	32.25 <sup>b</sup>	1.18

<sup>a</sup> significant at  $P < .0001$ ; <sup>b</sup> significant at  $P < .0079$

**Table 2. Least-squares means and standard errors for slicing characteristics of bacon.**

	Control	CLA	SEM
Acceptable (kg)	4.10	4.30	0.59
Unacceptable (kg)	2.90	2.26	0.60

**Table 3. Least-squares means and standard errors for fat and moisture analysis of bellies.**

	Control	CLA	SEM
Moisture (%)	28.18	29.64	1.06
Fat (%)	54.58	56.04	1.28