Electronic Supplementary Material (ESI) for Food & Function.
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**Table S1.** Ingredient composition and nutritional levels of the diet.

| Ingredient | Content (%) | |
|---|---|---|
| | Control | CLA |
| Corn | 68.6 | 68.6 |
| Soybean meal | 19.0 | 19.0 |
| Wheat bran | 7.6 | 7.6 |
| Premix[1] | 3.8 | 3.8 |
| Soybean oil | 1 | 0 |
| CLA | 0 | 1 |
| Total | 100 | 100 |
| Digestive energy, MJ/kg | 14.2100 | 14.2105 |
| Metabolizable energy, MJ/kg | 13.3127 | 13.3130 |
| Lysine (%) | 0.72 | 0.72 |
| Methionine + Cystine (%) | 0.53 | 0.53 |
| **Nutritional levels** | | |
| Crude protein | 13.613±0.615 | 13.780±1.290 |
| Crude fiber | 0.967±0.058 | 0.900±0.100 |
| Ether extract | 5.380±0.320 | 5.547±0.804 |
| Water | 8.273±0.638 | 7.810±0.380 |

[1] Each kilogram of the premix contains 10.0-16.0 million IU vitamin A acetate, 5.0-212.0 million IU vitamin D3, 900mg DL-α-tocopherol acetate, 50.0 mg menadione, 40.0 mg ammonium sulphate nitrate, 160 mg riboflavin, 50.0 mg pyridoxine hydrochloride, 0.85 mg cyanocobalamin, 30.0 mg folic acid, 520mg nicotinamide, 280 mg D-calcium pantothenate, 2.0 mg D-biotin, 210-625 mg copper, $1.50 \times 10^3$ - $7.50 \times 10^3$ mg iron, 700 - $2.1 \times 10^3$ mg manganese, 700 - $2.0 \times 10^3$ mg zinc, 15.0 mg iodine, 3.0-9.0 mg selenium, etc. The rest is limestone powder.

**Table S2.** Effects of CLA on the growth performance of Heigai pigs[1].

| Growth Performance[2] | Control | CLA | SEM[3] | *P*-value |
|---|---|---|---|---|
| Initial weight | 87.28±10.97 | 83.88±9.68 | 2.765 | 0.224 |
| Final weight | 105.21±11.44 | 102.29±10.44 | 2.926 | 0.321 |

| | | | | |
|---|---|---|---|---|
| Total weight gain(kg) | 17.93±5.67 | 18.40±5.60 | 1.506 | 0.755 |
| ADG (kg/d) | 0.51±0.16 | 0.53±0.16 | 0.043 | 0.755 |
| ADFI (kg/d) | 2.56±0.29 | 2.46±0.36 | 0.266 | 0.709 |
| F:G ratio | 5.47±1.61 | 5.09±1.60 | 0.429 | 0.377 |

[1] Results were presented by mean ± SD; n = 28, number of replicates.

[2] ADG, average daily gain; ADFI, average daily feed intake; F:G ratio, ratio of feed to gain.

[3] SEM, standard error of the mean.

**Table S3.** Effects of CLA on the carcass traits of Heigai pigs[1].

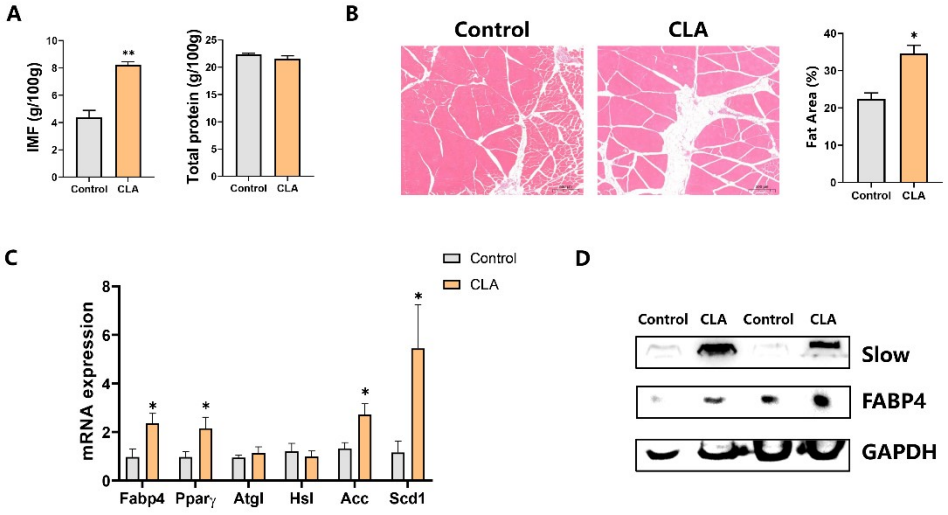
[1] Results were presented by mean ± SD; n = 8, number of replicates; * $P < 0.05$.

[2] SEM, standard error of the mean.

| **Carcass Quality Traits** | **Control** | **CLA** | **SEM[2]** | ***P*-value** |
|---|---|---|---|---|
| Slaughter weight (kg) | 98.94±3.34 | 98.00±3.39 | 1.684 | 0.586 |
| Carcass weight (kg) | 77.18±2.17 | 74.73±3.90 | 1.578 | 0.143 |
| Dressing percentage (%) | 78.10±3.86 | 76.29±4.05 | 1.978 | 0.376 |
| Straight length (cm) | 99.13±4.22 | 99.56±2.77 | 1.783 | 0.810 |
| Dip length (cm) | 83.88±4.13 | 84.63±2.15 | 1.646 | 0.656 |
| Carcass length (cm) | 91.51±4.04 | 92.13±2.22 | 1.630 | 0.713 |
| Skin thickness (mm) | 4.24±0.45 | 4.25±0.63 | 0.274 | 0.964 |
| Backfat thickness (mm) | 41.75±6.33 | 35.64±4.23* | 2.692 | 0.039 |
| Loin muscle area ($cm^2$) | 26.73±4.38 | 26.88±6.31 | 2.717 | 0.955 |
| Lean percentage (%) | 57.65±1.36 | 59.04±1.47 | 0.708 | 0.071 |

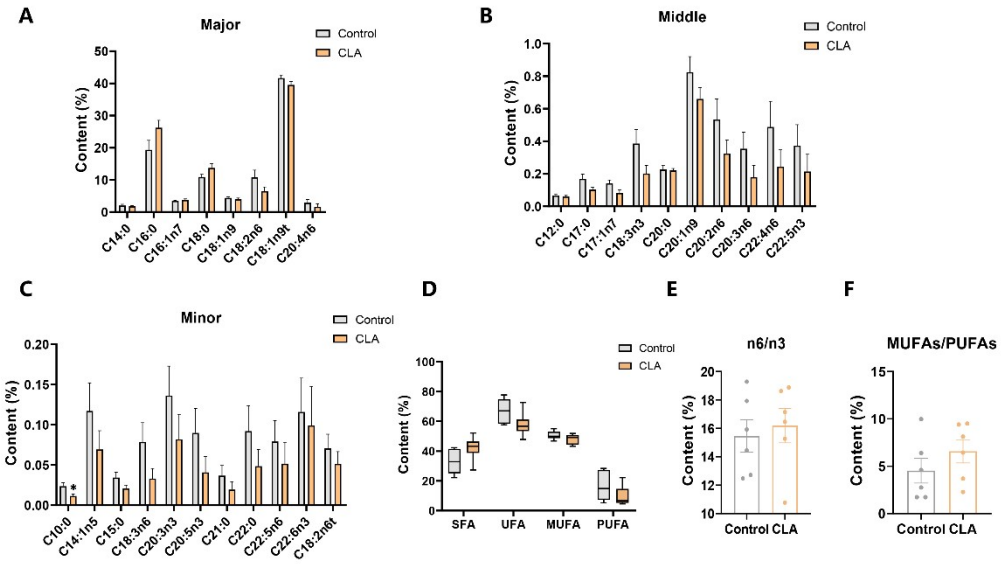
**Table S4.** The primer sequence of qPCR.

| Primer name | Sequence (5'-3') |
|---|---|
| 18s-F | CCCACGGAATCGAGAAAGAG |
| 18s-R | TTGACGGAAGGGCACCA |
| Acc-F | AGCAAGGTCGAGACCGAAAG |
| Acc-R | TAAGACCACCGGCGGATAGA |
| Atgl-F | GCACCTTCATTCCCGTGTAC |
| Atgl-R | TTGTCTGAGATGCCACCGTC |
| Fabp4-F | TGGAAACTTGTCTCCAGTG |
| Fabp4-R | GGTACTTTCTGATCTAATGGTG |
| Hsl-F | CCCCCGTGCGCTGGAGGAGT |
| Hsl-R | GGGAGGGGGAGGCGGCAGAC |
| Pparγ-F | GGCGAGGGCGATCTTGACAG |
| Pparγ-R | GATGCGAATGGCCACCTCTTT |
| Scd1-F | CAAACACCCAGCCGTCAAAG |
| Scd1-R | CGAAGAAAGGTGGCGACGAA |

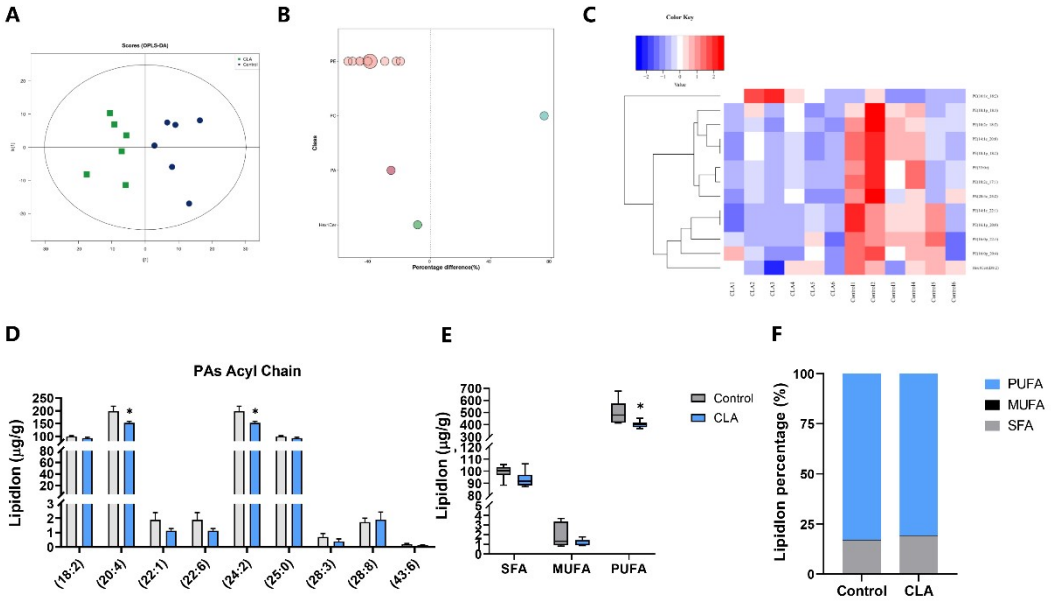



**Supplementary Figure 1. CLA increases fat deposition and regulates lipid metabolism in LDM of Heigai pigs. (A)** The contents of IMF and total protein in LDM from Heigai pigs fed with different diets (soybeal oil, "Control"; CLA, "CLA"; n = 3). **(B)** H&E staining and fat area statistics of LDM sections from Control and CLA pigs. Scale bars, 500 μm (n=3). **(C)** The expression of lipid metabolism relative genes in LDM from Control and CLA pigs (n=5). **(D)** Protein levels of FABP4 and Slow muscle heavy chain were detected by western blot. Error bars represent SEM. **P* < 0.05, ***P*

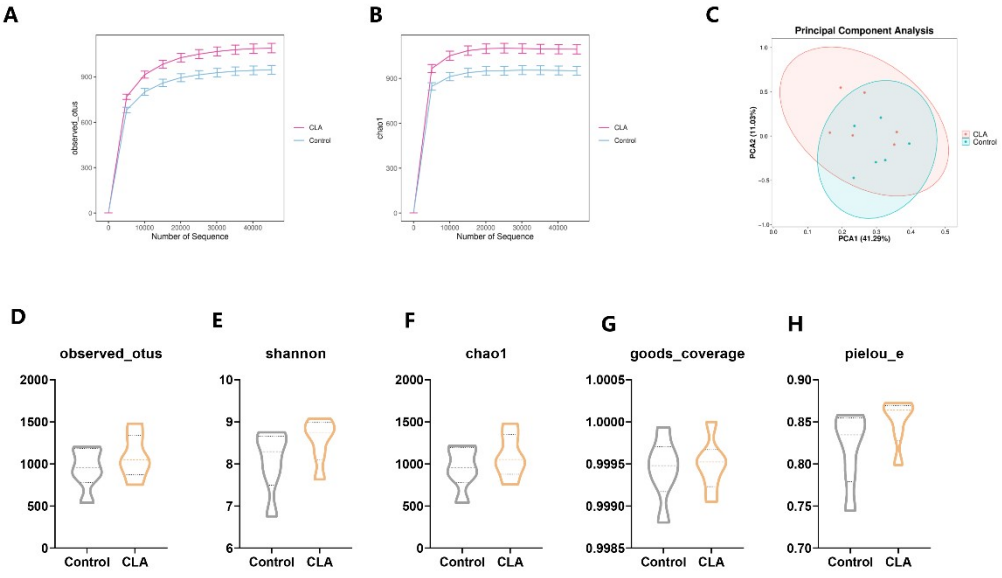
< 0.01, two-tailed Student's t-test.




**Supplementary Figure 2. The changes of fatty acid composition in LDM of Heigai pigs after feeding CLA. (A–C)** The concentration of individual fatty acids in LDM from Control and CLA pigs. Fatty acids are divided into major **(A)**, middle **(B)** and minor **(C)** species based on abundance. **(D)** The contents of total SFAs, UFAs, MUFAs and PUFAs in LDM from Control and CLA pigs. SFAs, saturated fatty acids; UFAs, unsaturated fatty acids; MUFAs, monounsaturated fatty acids; PUFAs, polyunsaturated fatty acids. **(F-G)** The ratio of n6-fatty acids/n3-fatty acids (n6/n3) **(F)** and MUFAs/PUFAs **(G)** in LDM from Control and CLA pigs. n = 6. Error bars represent SEM. **P* < 0.05, ***P* < 0.01, two-tailed Student's t-test.




**Supplementary Figure 3. (A)** OPLS-DA plot of differentially lipids in different group. **(B)** Bubble plot of differentially lipids between Control and CLA group. **(C)** Heatmap of differentially lipid species in different group. **(D)** The changes of individual fatty-acyl chains associated with PAs. **(E)** PAs acyl chain content at different saturation levels. **(F)** PAs acyl chain percentage at different saturation levels. n = 6. Error bars represent SEM. **P* < 0.05, two-tailed Student's t-test.




**Supplementary Figure 4. (A-B)** Differences in the colonic bacterial α-diversity index after CLA treatment. Data are presented as mean ± SEM (n = 6). **(C)** PCA plot of differentially bacterial taxa in different group. **(D-H)** Rarefaction curve comparing the

number of OTUs found in the 16S rDNA gene libraries from microbiota in the colon.