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Does Heat Stress Alter the Pig’s Response to Dietary Fat Source, as it Relates to Apparent or True Total Track Digestibility?

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Does Heat Stress Alter the Pig’s Response to Dietary Fat Source, as it Relates to Apparent or True Total Track Digestibility?

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Summary and Implications
Heat stress affects a plethora of pork production variables, in part stemming from a reduction of feed intake. The experimental objective was to investigate the effect of heat stress on the pig’s response to dietary fat in terms of growth performance and digestibility over a 35 d finishing period. A total of 96 barrows were randomly allotted to 1 of 9 treatments arranged as a 3 × 3 factorial with the main effects of environment [thermonetural (TN), pair-fed thermoneutral (PFTN), or heat stress (HS)] and diet [a corn-soybean meal based diet with 0% added fat (CNTR), or the CNTRL with 3% added tallow (3%TAL), or 3% added corn oil (3%CO)]. Pigs were individually housed to record intake. Fecal samples were collected on d 17 (~ 114 kg). No significant interactions between environment and diet were observed (P > 0.100). HS decreased ADFI (27.8%; P < 0.001), ADG (HS = 0.72, TN = 1.03, PFTN = 0.78 kg/d; P < 0.001), and G:F (HS = 0.290, TN = 0.301, PFTN = 0.319; P = 0.006). G:F but not ADG or ADFI tended to increase with added fat (CNTR = 0.292, 3%TAL = 0.303, 3%CO = 0.314 g/100 g; P ≤ 0.073). Environment had no impact of TTTD of AEE (P = 0.118). In summary, HS decreased ADFI, ADG, G:F and ATTD of AEE, but had no significant impact on TTTD of AEE. Therefore, the pig’s response to dietary fat source is not different in heat stress conditions as compared to thermonetural conditions.

Introduction
Heat stress results in major losses to the pork industry through a plethora of production variables. Dietary fat is included in swine diets during seasonally warm conditions to minimize the heat of digestion and to maintain energy intake. The experimental objective was to investigate the effect of heat stress on the pig’s response to dietary fat in terms of growth performance and digestibility of apparent (ATTD) and true total tract digestibility (TTTD) of acid hydrolyzed ether extract (AEE) over a 35 d finishing period.
Table 1. Effects of ad-libitum feed intake in thermal neutral conditions (TN), pair-feeding in thermal neutral conditions (PFTN), or heat stress (HS) and additional inclusion of no dietary fat (CNTR), 3% tallow (TAL), or 3% corn oil (CO) on growth performance, rectal temperature, respiration rate, apparent total tract digestibility (ATTD), and true total tract digestibility (TTTD) of acid hydrolyzed ether extract (AEE).

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Treatments</th>
<th>SEM</th>
<th>T</th>
<th>E</th>
<th>DF</th>
<th>E × DF</th>
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</thead>
<tbody>
<tr>
<td></td>
<td>TN</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ADG, kg</td>
<td>CNTR</td>
<td>1.00</td>
<td>0.99</td>
<td>1.10</td>
<td>0.78</td>
<td>0.80</td>
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<tr>
<td></td>
<td>TAL</td>
<td>3.58</td>
<td>3.35</td>
<td>3.44</td>
<td>2.54</td>
<td>2.42</td>
</tr>
<tr>
<td></td>
<td>CO</td>
<td>0.28</td>
<td>0.29</td>
<td>0.32</td>
<td>0.30</td>
<td>0.33</td>
</tr>
<tr>
<td>RR, bpm</td>
<td>CNTR</td>
<td>37.1</td>
<td>36.8</td>
<td>35.0</td>
<td>34.8</td>
<td>34.5</td>
</tr>
<tr>
<td></td>
<td>TAL</td>
<td>38.1</td>
<td>38.1</td>
<td>38.2</td>
<td>38.2</td>
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</tr>
<tr>
<td></td>
<td>CO</td>
<td>41.3</td>
<td>67.9</td>
<td>71.5</td>
<td>42.9</td>
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<tr>
<td>ATTD, %</td>
<td>CNTR</td>
<td>97.1</td>
<td>96.4</td>
<td>100.1</td>
<td>98.8</td>
<td>96.8</td>
</tr>
<tr>
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<td>TAL</td>
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<td>98.0</td>
</tr>
</tbody>
</table>

Within a row, least squares means lacking a common superscript differ, \( P < 0.05 \).

1Constant thermal neutral environment of ~24.0°C.

2Diurnal heat stress environment of ~33.0°C between 0800 h to 2000 h and ~28.0°C 2000 h to 0800 h from d 0 to d 7, ~33.5°C between 0800 h to 2000 h and ~28.0°C 2000 h to 0800 h for d 7 to d 14, ~34.0°C between 0800 h to 2000 h and ~28.0°C 2000 h to 0800 h for d 14 to d 21, ~34.5°C between 0800 h to 2000 h and ~28.0°C 2000 h to 0800 h for d 21 to d 28, and ~35.0°C between 0800 h to 2000 h and ~28.0°C 2000 h to 0800 h for d 28 to d 35.

3Measured daily at 1100 h.

4Measured on d 17.

5Probability values for main effects of treatment (T), environment (E), and dietary fat (DF), as well as the environment × dietary fat interaction (E × DF).

6Respiration rate (breaths per minute).

7Rectal temperature (°C).

8TTTD (%) of AEE was calculated by correcting ATTD of AEE for endogenous fat losses at 20 g of AEE/kg of dry matter intake.