Implementing CNCPS v. 6.5

General Changes

- aNDF to aNDFom
- New methods for determining CHO B3 and CHO C
- New methods for estimating CHO B3 kd
- Amino Acid revamping
- IUN Assay

NDF

- aNDF to aNDFom
  - account for soil within samples
  - only issue for forages, root crops and by-products that can be contaminated
  - easy change BUT result is all diets on paper drop in NDF and peNDF
    - more in line with what cows ‘see’

uNDF

- There is a lot of confusion in the field!
  - People are talking about uNDF and DMI relationships and throwing around uNDF as a static term
  - In CNCPS 6.5, the following is true
    - CHO C =
      - uNDF240 for forages
      - uNDF120 for non-forages
Example

<table>
<thead>
<tr>
<th>Analytical Values</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>aNDFom</td>
<td>28.0% OM</td>
</tr>
<tr>
<td>Lignin</td>
<td>8.2% DM</td>
</tr>
<tr>
<td>12 hr DNDF</td>
<td>34.1% NDF</td>
</tr>
<tr>
<td>72 hr DNDF</td>
<td>57.7% NDF</td>
</tr>
<tr>
<td>120 hr DNDF</td>
<td>60.2% NDF</td>
</tr>
</tbody>
</table>

Pools and kd

<table>
<thead>
<tr>
<th></th>
<th>CNCPS6.1 Based</th>
<th>CNCPS6.5 Based</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>CHO C</td>
<td>70.3%</td>
<td>39.8%</td>
<td>% NDF</td>
</tr>
<tr>
<td>CHO B3</td>
<td>29.7%</td>
<td>60.2%</td>
<td>% NDF</td>
</tr>
<tr>
<td>CHO B3 kd</td>
<td>4.5%</td>
<td>7.1%</td>
<td>%/hr</td>
</tr>
</tbody>
</table>

At 4 lb feeding rate, this difference in pool size and rate equates to:
1 lb ME and MP allowable milk
13 g MP
1 g LYS
1 g MET
175 g lower CHO C

Amino Acids

- All feeds have been transitioned from %ISR to %CP
- Much larger database
- Old library had a mix of methods
- Larger impact on MET
- Shift to combined efficiency for lactation and maintenance in lactating cows

Example

<table>
<thead>
<tr>
<th></th>
<th>Canola, expellers</th>
<th>Soybean Meal</th>
<th>AminoMax</th>
</tr>
</thead>
<tbody>
<tr>
<td>Methionine</td>
<td>1.4 1.3 2.5</td>
<td>1.3 1.3 2.0</td>
<td>1.3 1.3 2.0</td>
</tr>
<tr>
<td>Lysine</td>
<td>6.7 6.5 6.1</td>
<td>6.1 6.4 6.0</td>
<td>6.1 6.4 6.0</td>
</tr>
<tr>
<td>Arginine</td>
<td>6.8 7.7 6.8</td>
<td>7.3 6.8 6.7</td>
<td>7.3 6.8 6.7</td>
</tr>
<tr>
<td>Threonine</td>
<td>4.9 4.8 4.7</td>
<td>4.7 4.7 4.7</td>
<td>4.7 4.7 4.7</td>
</tr>
<tr>
<td>Leucine</td>
<td>8.0 8.7 8.2</td>
<td>7.6 8.2 8.2</td>
<td>7.6 8.2 8.2</td>
</tr>
<tr>
<td>Isoleucine</td>
<td>4.9 4.0 4.5</td>
<td>4.5 4.5 4.5</td>
<td>4.5 4.5 4.5</td>
</tr>
<tr>
<td>Valine</td>
<td>6.4 5.3 4.4</td>
<td>4.7 6.2 5.8</td>
<td>4.7 6.2 5.8</td>
</tr>
<tr>
<td>Histidine</td>
<td>4.0 2.6 3.8</td>
<td>2.7 3.8 2.9</td>
<td>2.7 3.8 2.9</td>
</tr>
<tr>
<td>Phenylalanine</td>
<td>4.7 4.0 4.9</td>
<td>5.1 4.9 4.8</td>
<td>5.1 4.9 4.8</td>
</tr>
<tr>
<td>Tryptophan</td>
<td>1.2 1.4 1.2</td>
<td>1.3 1.2 1.2</td>
<td>1.3 1.2 1.2</td>
</tr>
</tbody>
</table>
IUN

- A great new assay allowing us to fine-tune diets
- 16 hr *in vitro* (rumen) followed by acid hydrolysis (abomasum) followed by ‘ruminant enzyme cocktail’
- Extremely sensitive

Predicted Difference in N Digestibility

- Treatment difference was created by using two different blood meals
- One blood meal was 9% uN, the other was 34% uN
- Blood meals were fed at iso-N levels
- The calculated difference in N digestibility between the two treatments was 20 g N

<table>
<thead>
<tr>
<th></th>
<th>AminoMax</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Canola Meal</td>
</tr>
<tr>
<td></td>
<td>Avg.</td>
</tr>
<tr>
<td>Unprocessed</td>
<td></td>
</tr>
<tr>
<td>ADICP (%CP)</td>
<td>8.4</td>
</tr>
<tr>
<td>IUN (%N)</td>
<td>25.5</td>
</tr>
<tr>
<td>Processed</td>
<td></td>
</tr>
<tr>
<td>ADICP (%CP)</td>
<td>9.4</td>
</tr>
<tr>
<td>IUN (%N)</td>
<td>19.9</td>
</tr>
</tbody>
</table>
What is the IUN telling us?

• Using the detergent system for protein digestibility does not work well

• Animal production variance we have observed partially explained by ‘poor digestibility knowledge’

• We need to expand feed libraries

• We can formulate better diets

Implementation

• Comments from lab managers
  • “aNDFom has improved NIR calibrations”
  • “uNDF for forages have better NIR calibrations then lignin”
  • “we need more samples to do calibrations for non-forages”
  • “the IUN assay is challenging”

Steps

• Convert to all aNDFom

  • easy for forages

  • for many non-forages, not a large issue. But watch ingredients that may be high. For example:

  • beets, cottonseed, cotton burrs, almond hulls, vegetable residue, etc. Anything that could be ‘touched’ by soil

Steps

• Implement uNDF methods

  • forages represent >60% of CHO C intake. Thus do all forages

  • high fiber by-products appear to fall in two categories

    • highly variable (e.g. wheat midds)

    • high diversity: e.g. red vs white wheat, variety…

    • CGF may be here too given differences in processing plant

    • low variability (e.g. soy hulls)

    • canola variance?

    • DDG variance?
Steps

- IUN
  - Products we rely upon for RUP and amino acid
    - animal protein products
    - by-pass veg products
    - moderate protein products (CGF, canola, soy, cotton, DDG, etc.)
  - BE VERY CAREFUL though
    - if you use IUN for 1-2 products but ADICP for others, you may make the wrong economic decision
      - in some cases, may want to pay the extra for amino acids on the IUN results as well to determine LYS degradation.

Build a library

- Non-forage feeds must have uNDF determined via wet chemistry
  - begin building libraries
  - would you be willing to share the data so we could build a larger library?

Why not a library from CU?

- The answer to this is very simple:
  - Capital
    - people and money
  - it would require >$2 million USD to fully populate the existing library with aNDFom, uNDF, and IUN

Push Suppliers

- Some suppliers are working on building the databases for uNDF and IUN
  - a few suppliers are very uncomfortable with the IUN assay (guess why)
What have we learned?

- IUN is a great new way to evaluate process control
- have been able to identify a few key factors to increase RUP and processing efficiency
- Canola has much higher potentially digestible NDF than previously considered

Amino Acid Implementation

- Relationship between AA and energy is very interesting
  - Very good success implementing globally but…
    - if ME is first limiting, supplemental AA response variable
    - if MET or LYS <100% required, response limited to first limiting (should be no surprise) but
      - could have MET or LYS:ME correct and still be below 100% required. It appears cows are performing to the first limit (as we would expect)

Accuracy

- If you know DMI, group production and components
  - % required for MET and LYS are working pretty good. Typically seeing that production is hitting whichever is first limiting
  - If you want to increase milk and/or milk protein, input higher milk protein % or milk volume
    - this will drive AA requirements as well as ME and MP

Thus…

- Increase ME supply
- Ensure LYS and MET >100% required
  - MET:ME 1.1-1.15 g per Mcal ME
    - then either LYS:MET ~2.65:1, or
      - LYS:ME ~3:1