Considerations for Developing Non-GMO Dairy Rations

Dr. L. E. Chase
Cornell University
A number of New York dairy producers have shifted to a non-GMO milk market.
The primary use of the milk is yogurt production.
In 2017, there were at least 30,000 acres of corn for silage shifted to non-GMO corn seed.
It is unclear as to how much future growth there will be for non-GMO crops and milk.
News Flash!!!

- Oklahoma State University Dept. of Agricultural Economics.
- Food Demand Survey – 2015.
- Ban on sale of raw, unpasteurized milk = 59% of respondents.
- Mandatory labels on foods produced with GE technology = 82%.
- Mandatory labels on foods containing DNA = 80%.
DannonWave

- 3 brands of yogurt will be made from milk sourced from cows fed non-GMO rations. (Dannon, Oikos, Danimals).
- Will need about 50,000 cows and are targeting about 18 herds.
- Phillippe Caradec – Vice President:
  - DannonWave does not question the safety of GMO-linked foods.
  - 20% of consumers are actively seeking non-GMO foods.
“There was no substantial scientific evidence that foods from GE crops were any less safe when compared to foods from non-GMO crops”
What Does Science Say?

- Dr. A. L. Van Eenannam – University of California – Davis:
  - Data from >100 studies feeding GE crops did not reveal unfavorable or perturbed trends in livestock health and productivity.
  - Genetically engineered crops are digested in animals in the same way as conventional crops.
  - Genetically engineered DNA, or the novel proteins encoded therein have never been detected in the milk, meat or eggs derived from anima fed genetically engineered feedstuffs.
  - There is no reason to suspect that genetically engineered DNA will behave any differently than any other sources of DNA.
What About Humans?

- Dr. Ruth MacDonald – Iowa State University
- “The way the body digests and utilizes food is the same regardless of how the food was originally produced”
- “GMO technology allows for the insertion of a specific gene into a plant seed”
- “The inserted gene looks the same as the rest of the DNA”
- “When we eat the plant, our body breaks down all of the DNA in the same way”
Ingredient Classes

- Major - > 5% of total ration DM.
  - Must be tested or verified.

- Minor - At least 0.5% but <5% of total ration DM.
  - Are exempt from evaluation.
  - Can use multiple minor ingredients

- Micro - <0.5% of total ration DM
  - Any added nutrient, vitamin or other active compound = non-GMO

- As of May 2019, all minor and micro ingredients in livestock feeds are exempt from evaluation.
Key Questions

- How does going non-GMO affect:
  - Available forages and feeds.
  - Ration formulation strategy.
  - Herd management.
# Example Dairy Ration

<table>
<thead>
<tr>
<th>Feed</th>
<th>Lbs. of DM</th>
<th>% in Ration DM</th>
<th>GMO</th>
<th>Non-GMO</th>
</tr>
</thead>
<tbody>
<tr>
<td>BMR CS</td>
<td>12.2</td>
<td>22</td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>Conv. CS</td>
<td>9.25</td>
<td>17</td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>Alfalfa haylage</td>
<td>8</td>
<td>14</td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>Corn grain</td>
<td>10</td>
<td>18</td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>SBM</td>
<td>1.9</td>
<td>3.6</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Soy hulls</td>
<td>2.2</td>
<td>4</td>
<td>X</td>
<td>X</td>
</tr>
</tbody>
</table>
## Example Ration - 2

<table>
<thead>
<tr>
<th>Feed</th>
<th>Lbs. DM</th>
<th>% of Ration DM</th>
<th>GMO</th>
<th>Non-GMO</th>
</tr>
</thead>
<tbody>
<tr>
<td>Canola meal</td>
<td>1</td>
<td>Feed</td>
<td>Lbs. DM</td>
<td>% of Ration DM</td>
</tr>
<tr>
<td>Roasted soybeans</td>
<td>2.5</td>
<td>4.6</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Expeller SBM</td>
<td>2.5</td>
<td>4.6</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Bypass fat</td>
<td>0.5</td>
<td>0.9</td>
<td>?</td>
<td>?</td>
</tr>
<tr>
<td>Min-vit</td>
<td>2.3</td>
<td>4.2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>RPAA</td>
<td>0.05</td>
<td>0.1</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Rations

- The quantity of each feed in the ration needs to be recorded.
- List of GMO and non-GMO ingredients in the ration.
- Percent of the ration dry matter from each feed.
- Actual dry matter intakes are needed.
- Need to track quantity of feed fed and refusals.
- Adjustments for forage dry matter changes.
- Best way to do this is the use of an electronic feed management system.
Non-GMO Feeds Available (if verified or tested)

- Corn, hominy, distiller’s, CGF, CGM.
- SBM, expeller SBM, soy hulls, roasted soybeans.
- Beet pulp.
- Canola meal, expeller canola meal.
- Alfalfa pellets.
- Sunflower meal.
- Linseed meal.
- Molasses (from sugarcane)
Non-GMO feeds - 2

- Wheat, oats and barley grains and their processed products should be non-GMO since there are no GE varieties of these grains.
- There has been an increase in number and availability of non-GMO feeds in the last year or so.
GM and Isogenic Corn Hybrids

- Meta-analysis.
- Compared nutrient composition and milk production.
- Studies used had a GM corn hybrid and it’s isogenic hybrid.
- 21 means for isogenic 13 means for GM hybrids
<table>
<thead>
<tr>
<th>Item</th>
<th>Isogenic Hybrids</th>
<th>GM hybrids</th>
<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>CP, % of DM</td>
<td>8</td>
<td>8</td>
<td>0.88</td>
</tr>
<tr>
<td>NDF, % of DM</td>
<td>39.2</td>
<td>40.4</td>
<td>0.10</td>
</tr>
<tr>
<td>Lignin % of DM</td>
<td>2.6</td>
<td>2.7</td>
<td>0.73</td>
</tr>
<tr>
<td>Starch, % of DM</td>
<td>34.5</td>
<td>33.1</td>
<td>0.02</td>
</tr>
<tr>
<td>Ash, % of DM</td>
<td>4.8</td>
<td>4.8</td>
<td>0.79</td>
</tr>
</tbody>
</table>
## Animal Performance

<table>
<thead>
<tr>
<th>Item</th>
<th>Isogenic Hybrids</th>
<th>GM Hybrids</th>
<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>DMI lbs.</td>
<td>53.5</td>
<td>53.5</td>
<td>0.55</td>
</tr>
<tr>
<td>Milk, lbs.</td>
<td>77.0</td>
<td>76.6</td>
<td>0.50</td>
</tr>
<tr>
<td>3.5% FCM, lbs.</td>
<td>78.3</td>
<td>77.7</td>
<td>0.38</td>
</tr>
<tr>
<td>Milk fat, %</td>
<td>3.62</td>
<td>3.61</td>
<td>0.67</td>
</tr>
<tr>
<td>Milk true protein, %</td>
<td>3.19</td>
<td>3.19</td>
<td>0.58</td>
</tr>
<tr>
<td>MUN, mg/dl</td>
<td>17.1</td>
<td>17.1</td>
<td>0.98</td>
</tr>
</tbody>
</table>
- The best situation would be to source ingredients that have been tested, verified and have documentation to verify this.
- If an ingredient is sourced that doesn’t have this, it must be stored separately sampled and samples sent for testing.
- It cannot be used until test results are returned and product is verified and approved.
- This may take 1-2 weeks.
- If it doesn’t meet test requirements then it cannot be used in non-GMO rations.
Verified Products Must Have Systems in Place For

- Testing
- Traceability
- Segregation
- Formulation
- Labeling
- Quality assurance
What Records Are Required?

- Forage and feed purchases -
  - Supplier and date of purchase.
  - Quantity purchased and storage location.
  - Save invoices, feed tags, weight slips and information on forage seed bags.

- Verification – Requires letters from suppliers if they are providing non-GMO certified products.

- Feed ingredients -
  - GMO or non-GMO status of each feed must be recorded.
Herd Management

- Dairy calves – no changes to current feeding programs.
- Heifers – Can be fed GM based rations for most of the growing period. However, they must be fed a non-GMO ration for at least 30 days before milk can be verified as non-GMO. This may require a change in heifer housing and rations. What if she calves early?
- Dry and lactating cows – Must feed non-GMO rations continuously once they have calved for the first time.
Third Party Verification

- Each milk processor will contract with a 3rd party firm to conduct audits and verification.
- Need to know the specific requirements from the specific 3rd party auditor working with your farms.
- The basic requirement is to have the records and documentation required by the 3rd party auditing firm.
- May include on-farm audits and visits.
Summary

- Non-GMO rations will need to be developed on a number of New York and Northeast dairy farms.
- Ration feed cost will be increased due to higher ingredient costs.
- Ration formulation parameters will be similar to what you currently use.
- Increased management time will be needed on the farm to do the record keeping required to meet the non-GMO requirements.
- There needs to be a milk pricing contract that provides a premium to the farm to cover added costs.
- It will take time to get the whole forage and feed supply chain in place.
Thanks!