Progress Report on the Development of Systems Research of a Cow-calf System

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Systems research combines the effects of all factors and their interactions that are known to influence a production system. Mathematical relationships among the factors are developed to describe a production system. Presently, efforts are being made to develop the mathematical relationships to accurately describe a cow-calf operation.

To illustrate mathematical relationships, the amount of TDN required per day for a cow can be predicted as a function of the weight and age of the cow, level of milk production, stage of lactation and stage of pregnancy. From the amount of TDN required, percent of TDN in a feed source and calving date, the daily dry matter intake can be estimated. For example, assuming 49 to 59 percent TDN in the pasture during a

Table 1. Dry matter intake and TDN requirements of beef cows calving at 2 years of age.

<table>
<thead>
<tr>
<th>Condition of cow</th>
<th>Body weight lb</th>
<th>Milk productiona lb</th>
<th>Approximate daily dry matter intakeb lb</th>
<th>TDN lb</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dry pregnant-middle third of pregnancy</td>
<td>731</td>
<td>11.95</td>
<td>6.82</td>
<td></td>
</tr>
<tr>
<td>Dry pregnant-middle third of pregnancy</td>
<td>766</td>
<td>12.37</td>
<td>6.82</td>
<td></td>
</tr>
<tr>
<td>Dry pregnant-middle third of pregnancy</td>
<td>817</td>
<td>13.00</td>
<td>7.17</td>
<td></td>
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<tr>
<td>Dry pregnant-last third of pregnancy</td>
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<td>15.76</td>
<td>7.72</td>
<td></td>
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<td>17.21</td>
<td>8.43</td>
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<td>Lactating</td>
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<td>9.6</td>
<td>20.64</td>
<td>10.95</td>
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<td>12.5</td>
<td>22.76</td>
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<td>Lactating</td>
<td>817</td>
<td>14.5</td>
<td>24.90</td>
<td>13.22</td>
</tr>
</tbody>
</table>

aBased on crossbred cow data.

bDaily dry matter intake needed to achieve TDN requirement.
year, 2-year-old heifers calving in February and weaning age of 205 days, the daily dry
dry matter intake and TDN requirements of a first calf heifer can be predicted (Table I).
However, dry matter intake is only part of a cow-calf system. Reproduction performance
of the cow and bull, economic considerations, breed differences and growth of
the calf are some additional factors needed to describe a cow-calf system.

At this time, mathematical relationships describing forage intake of calves from
birth to weaning, weight gain of dry non-pregnant cows and breed effects are being
developed to improve the prediction of the inputs and outputs of a cow-calf system. The
final goal of this project is to use the developed mathematical relationships to predict
the inputs and outputs of alternative management schemes.

Functional Properties
of Bovine Hide Collagen
in Coarse Ground Beef Sausage

D.H. Schalk and R.L. Henrickson

With the continuing development of the Third World nations, a need for labor-
intensive industries to be utilized by them has led to shoe and leather manufacturing
industries being established within their respective borders. This in turn has resulted in
the decline of shoe and leather industries in the United States. To help combat this
trend, new leather tanning processes have been developed, and ways of using surplus
hides and hide trims are being explored. The excess hides and their trim contain food
grade collagen, which is a valuable protein source. It is of great importance to find an
economical and suitable outlet for this product. Food-grade hide collagen is manufac-
tured from the flesh split of the hide, which is also used to make suede leather. The
protein attained from the bovine hide collagen is not a complete protein; it lacks the
essential amino acid methionine and is low in tryptophan. Therefore, the collagen
should be used in conjunction with a complete protein. The experiment is nearing
completion, and after computer analysis of the data, conclusions concerning the
functional properties of the bovine hide collagen will be made.

“Cold” boned meat from a market cutter/canner grade cow was utilized. The
meat was then ground through a half-inch plate and mixed in a 100-lb sausage mixer
for 2 minutes. It was then divided into 10-lb units and double-wrapped in freezer paper
and stored in a -16°F freezer. The 10-lb units were then randomly assigned differing
levels of bovine hide collagen (0-10-20-30 percent). The units were mixed with the
collagen and spices. The sausage mixture was then stored for 22 hours at 34°F. The
sausage was then removed and stuffed into 2½-inch fibrous casings and cooked for 4
hours until an internal temperature of 155°F was attained, using a Blodgett convection
oven. The sausages were removed from the oven and placed in a 40°F ice bath for 1
hour. After this cooling period they were removed, dried, and placed in a 34°F cooler for
16 hours.