Nutritional Effects on Equine Reproductive Performance

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Historical Perspectives

• One of the most heavily studied subjects in the scientific literature
• Hypotheses studied as a result of mis-interpretation of study done in South Africa
• Study suggested that mares gaining weight while being bred were more reproductively efficient
Historical Perspectives (cont.)

- It was assumed that “flushing”, a common management practice in the sheep industry, should be utilized in equine breeding operations
- Flushing refers to animals that are fed to gain weight while being bred
Historical Perspectives (cont.)

- One prominent breeding farm manager was heard to say, “If a mare comes to my barn fat, she goes into a box stall with water and salt until I can see her ribs, then I begin to feed and breed her”
- Did not make sense in the scientific community, and studies were developed
The Body Condition Scoring System

- Developed by Dr. Don Henneke
- Utilized over 600 mares in a field study
- Developed the condition score system
- Scores range from 1-9, 1 extremely emaciated, 9 obese
- Determined optimal condition score for reproductive efficiency is 5 (ribs covered)
Henneke Body Condition Scoring System

<table>
<thead>
<tr>
<th>Score</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Poor</td>
<td>Animal extremely emaciated. Spinous processes, ribs, tailhead, tuber coxae and ischii projecting prominently. Bone structure of withers, shoulders and neck easily noticeable. No fatty tissue can be felt.</td>
</tr>
<tr>
<td>2 Very Thin</td>
<td>Animal emaciated. Slight fat covering over base of spinous processes; transverse processes of lumbar vertebrae feel rounded. Spinous processes, ribs, tailhead, tuber coxae and ischii prominent. Withers, shoulders and neck structures faintly discernable.</td>
</tr>
<tr>
<td>3 Thin</td>
<td>Fat buildup about halfway on spinous processes; transverse processes cannot be felt. Slight fat cover over ribs. Spinous processes and ribs easily discernable. Tailhead prominent, but individual vertebrae cannot be easily identified. Tuber coxae appear rounded but easily discernable. Tuber ischii not distinguishable. Withers, shoulders and neck accentuated.</td>
</tr>
<tr>
<td>4 Moderately Thin</td>
<td>Negative crease along back. Faint outline of ribs discernable. Tailhead prominence depends on conformation; fat can be felt around it. Tuber coxae not discernable. Withers, shoulders and neck not obviously thin.</td>
</tr>
<tr>
<td>5 Moderate</td>
<td>Back level ribs cannot be visually distinguished but can be easily felt. Fat around tailhead beginning to feel spongy. Withers appear rounded over spinous processes. Shoulders and neck blend smoothly into body.</td>
</tr>
<tr>
<td>6 Moderately Fat</td>
<td>May have slight crease down back. Fat over ribs feels fleshy-spongy. Fat around tailhead feels soft. Fat beginning to be deposited along the side of the withers, behind the shoulders and along the sides of the neck.</td>
</tr>
<tr>
<td>7 Fleshy</td>
<td>May have crease down back. Individual ribs can be felt, but noticeable filling between ribs with fat. Fat around tailhead is soft. Fat deposited along withers, behind shoulders and along the neck.</td>
</tr>
<tr>
<td>8 Fat</td>
<td>Crease down back. Difficult to feel ribs. Fat around tailhead very soft. Area along withers filled with fat. Area behind shoulder filled with fat. Noticeable thickening of neck. Fat deposited along inner thighs.</td>
</tr>
<tr>
<td>9 Extremely Fat</td>
<td>Obvious crease down back. Patchy fat appearing over ribs. Bulging fat around tailhead, along withers, behind shoulders and along neck. Fat along inner thighs may rub together. Flank filled with fat.</td>
</tr>
</tbody>
</table>
Henneke (cont).

- Mares at condition score 5 or greater had fewer cycles per conception, higher pregnancy rates, and lower incidences of fetal loss
- Mares at condition score 4 (ribby) or lower had more cycles per conception, lower pregnancy rates, and higher incidences of fetal loss
Nutrient that Regulates Body Condition

- Digestible Energy (DE)
- Expressed in kcal/lb
- DE requirements vary according to stage of mare (i.e., open, first 2/3 of pregnancy, last 1/3 of pregnancy, lactation)
DE requirements

• Example of 1000 lb mare
• Maintenance – 16000 kcal/day
• First 2/3 of pregnancy – 17-18000 kcal/day
• Last 1/3 of pregnancy – 20-22000 kcal/day
• Lactation – 29-32000 kcal/day (nearly double as compared to maintenance)
Management Suggestions

• Keep mares in condition score 6 or higher
  – Spongy across the ribs
• Will compensate for changes in condition due to hauling, weather, sickness, etc.
• With pregnant mares, get them to LACTATIONAL level of intake during the last trimester
Management Suggestions

• MUST maintain body condition, and it is safer to gradually increase their intake as opposed to dramatically increasing overnight

• Mares in negative energy balance (require more than they consume) will lose condition and have endocrinological changes that are detrimental to reproductive efficiency
Energy Balance in First Trimester

- Study formulated after working with breeding farms that tended to “turn out” mares after diagnosis of pregnancy (14-30 days, depending on available technology)
- Brought mares back in for re-check at 45 days, and some were open
Potter et al.

- Fed treatment group mares to lose 1 1/2-2 lbs body weight per day, beginning at diagnosis of pregnancy (by ultrasonography) through 90 days of pregnancy
- Control group fed to maintain condition score 6 throughout the study
Results

- All mares in control group maintained pregnancy
- 3 of 10 mares in treatment group experienced fetal loss
- Not statistically significant, because of limited number (10) of mares per group
Biological Significance

• If a producer with 100 broodmares allows them to lose weight during the first trimester, and there is a chance that 30 of them will experience fetal loss, is that significant to his/her operation?

• YES!
Management Suggestion

• Feed mares to maintain at least condition score 5, and preferably 6, THROUGHOUT the pregnancy
Effects of Obesity

• Believed for years that obesity could cause difficulty in foaling, produce foals with reduced birth weights, skeletal disorders, etc.
• Women commonly told not to gain excessive weight in pregnancy, belief carried over
Kubiak et al.

- Study investigated effects of obesity on reproductive parameters
- Looked at foaling difficulty, cervical/vaginal bruising, foal weights, and re-breeding efficiency
- Fed treatment group to achieve condition score 9, control maintained at condition score 6
Results

- NO EFFECT in any variable considered
- Obesity in mares is NOT a problem!
Why would we want obese mares?

- We don’t
- Dangerous to feed the amounts required to achieve obesity
- Not economical to do
The Pathologically Obese Mare

- Some mares are obese, usually due to hormonal dysfunction (pituitary and/or thyroid)
- If we have an obese mare, we needn’t worry about whether or not to breed her
Other Reproductive Considerations

- Breed on foal heat?
- YES, as long as normal uterine involution has occurred and there is no evidence of uterine infection
Photoperiodic Manipulation

- If necessary to have foals early in the year, artificial lighting can cause mares to cycle earlier in the year (i.e., cycle in January/February as opposed to April/May)
- Mare must have exposure to 16 hours of light (normal sunlight and artificial lighting combined)
- Must be exposed to lights for 60 days to achieve effect (start mid-November to cycle in late January to early February)
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