The Effects of Nutrition and Heat Stress on the High Producing Dairy Cow

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World milk production trends

- World wide = 122 million dairy farmers
- Keep 363 million dairy cows and buffalo
- Average size of <3 cows/herd
- Yield 2100 kg/cow
- US = 115 cows and 9678 kg  UK = 125 cows and 7445 kg  NZ = 393 cows and 3716 kg
Energy balance is probably the single most important nutritional factor related to poor reproductive function in animals.

Based on metabolic priorities for energy, reproductive function is compromised because available energy is directed towards meeting minimum energy reserves and milk production.
High feed intake
→
High blood flow to digestive tract
→
High blood flow to the liver
→
Estrogen and progesterone removed from liver
→
Low estrogen and progesterone level in the blood
→
Changes in reproduction
Effect of proteins

Prolonged inadequate protein intake has been reported to reduce reproductive performance.

More recently it has been found that reproductive performance may be impaired if protein is fed in amounts that greatly exceed the cow’s requirements.
FATS

High fat diets for cattle contain 5% to 8% fat. Exceeding these dietary fat levels impairs rumen function.

Role of Bypass Fat (2.5%). Dietary fat, which resists lipolysis and biohydrogenation in rumen by rumen microorganisms, but gets digested in lower digestive tract, is known as bypass fat or rumen protected fat or inert fat. ... Rumen inert fats offer an alternative means of providing metabolizable energy to cows.
An important concept surrounding macromineral balance is dietary cation-anion difference (DCAD) 
(Sodium + potassium) – (chloride + sulfur) 
= DCAD in mEq/100g of ration dry matter 
A negative DCAD prior to calving helps cows successfully join the milking string, decreasing the incidence of metabolic disorders postpartum and increasing early lactation production.
Cu, Co, Zn, Mn, Se

Vitamins A, D, E

Vitamin C
Effects of heat stress on bovine reproduction
Cows are most efficient at 40 to 70°F

Daily temperatures above 85°F
- Reduce milk production
- Milk fat depression

High humidity increases these effects
Heat Stress & High Humidity

- Profound effects on the dairy cow
  - Appetite
  - Current production
  - Milk fat production
  - Future milk production
Depressed Dry Matter Intake

Degree of DMI depression depends on the digestibility of the diet – especially the forage component.

- If fed separately, forage intake will be selectively reduced compared to grain.
Other Effects of Hot Weather

- Rumen pH (more acidic)
- Cud chewing and gut motility
  - Reduces milk fat
  - At temperatures above 70°F
    - 10° increase in daily high causes a 0.1% drop in milk fat
- Sweating and panting
  - Water and electrolyte loss
What to do? – Feeding

- Feed TMR or forage more frequently during cooler periods of the day
- Feed a TMR to avoid selective eating
- Provide a cool area for forage feeding
- Possibly sprinklers over feeding areas
What to do? – Feeding, cont.

- Check the bunk often
  - Once in the feed bunk, silages (especially wetter silages) heat and mold quickly in the summer
What to do? – Ration

- Use best forage possible to maintain required fiber levels
- Raise nutrient density of the diet
  - Forages generate more heat than grain during digestion (per unit of energy consumed)
- Add fat to the ration to boost energy intake

- Feed sodium bicarb to partially make up for decreased rumination (0.25 to 0.33 lb/d or .75% of total ration DM)
- Increase these minerals to make up for losses in sweat
  - Requirements are not well-defined
    - K up to 1.5%
    - Na up to 0.4%
What to do? – Facilities

- Keep cows as cool as possible
- Provide plenty of cool, clean water
  - Close to feeding areas
  - Near milking areas
Final Points

- Maintain forage quality and intake
- Maintain water quality and availability
THANKS FOR YOUR PATIENT LISTENING
Long live the cows!