

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**.

Minerals & Vitamins

An important concept surrounding macromineral balance is dietary cation-anion difference (DCAD)

$(\text{Sodium} + \text{potassium}) - (\text{chloride} + \text{sulfur})$
= 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



- λ Cows are most efficient at 40 to 70°F
- λ Daily temperatures above 85°F
 - Reduce milk production
 - Milk fat depression
- λ High humidity increases these effects

Heat Stress & High Humidity

λ Profound effects on the dairy cow

- ↓ Appetite
- ↓ Current production
- ↓ Milk fat production
- ↓ Future milk production



Depressed Dry Matter Intake

λ 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

λ ↓ Rumen pH (more acidic)

λ ↓ Cud chewing and gut motility

– Reduces milk fat

– At temperatures above 70°F

λ 10° increase in daily high causes a 0.1% drop in milk fat

λ ↑ Sweating and panting

– Water and electrolyte loss

What to do? – Feeding

- λ Feed TMR or forage more frequently during cooler periods of the day
- λ Feed a TMR to avoid selective eating
- λ Provide a cool area for forage feeding
- λ Possibly sprinklers over feeding areas



What to do? – Feeding, cont.

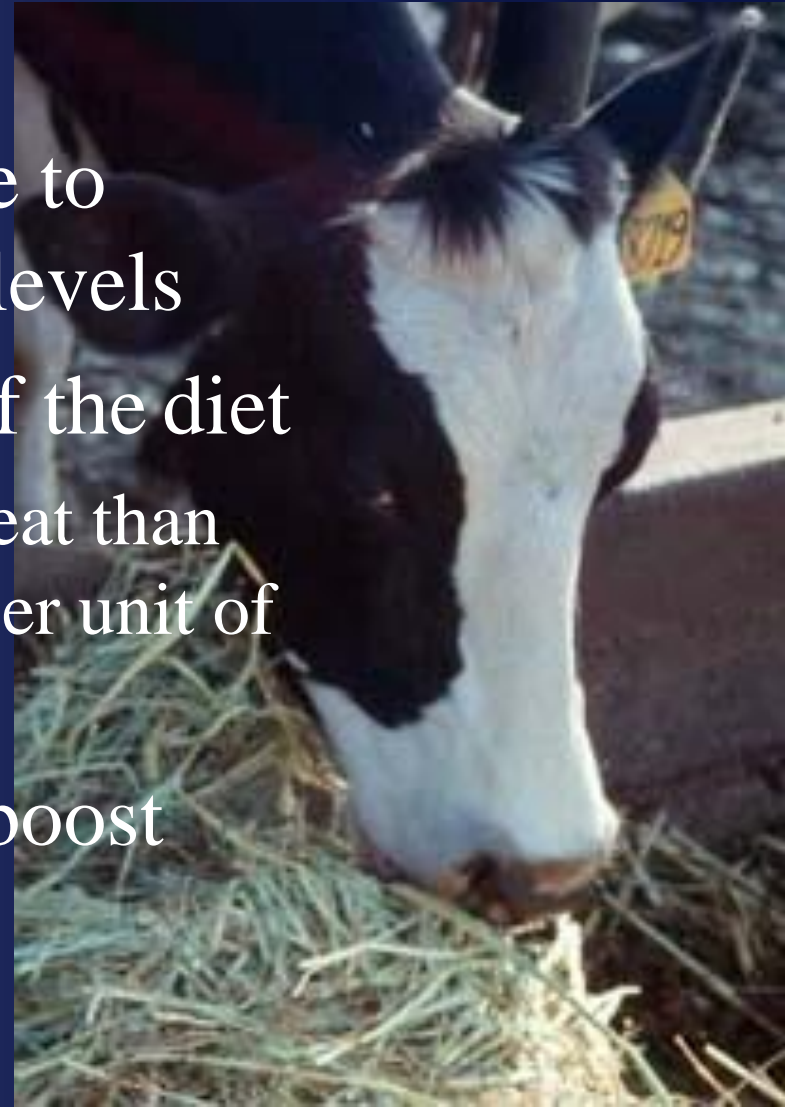
λ Check the bunk often

- Once in the feed bunk, silages (especially wetter silages) heat and mold quickly in the summer



What to do? – Ration

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



What to do? – Ration cont.

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



What to do? – Facilities

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



Final Points

λ Maintain forage quality and intake

λ Maintain water quality and availability





THANKS FOR YOUR PATIENT
LISTENING

Long live the cows!

