

2025

Junior Dairy

Management

Study Guide

Cattle

Selection-

Linear

Linear Descriptive Traits

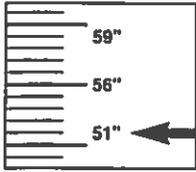


Holstein Association USA, Inc.

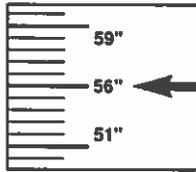
1 Holstein Place, PO Box 808, Brattleboro, VT 05302-0808
800.952.5200 www.holsteinusa.com

STATURE - ST

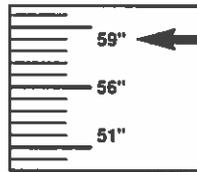
Primary Trait



1-5 pts.
Extremely short



25 pts.
Intermediate



45-50 pts.
Extremely tall

RUMP WIDTH - RW

Primary Trait



1 pt. = 2"
Extremely narrow



25 pts. = 4-1/2"
Intermediate width



50 pts. = 7"
Extremely open

STRENGTH - SR

Primary Trait



1-5 pts.
Extremely narrow and frail



25 pts.
Intermediate



45-50 pts.
Extremely strong & wide

REAR LEGS, SIDE VIEW - LS

Primary Trait



1-5 pts.
Posty and straight



25 pts.
Intermediate set in hock



45-50 pts.
Extremely sickled

BODY DEPTH - BD

Primary Trait



1-5 pts.
Extremely shallow body



25 pts.
Intermediate



45-50 pts.
Extremely deep body

REAR LEGS, REAR VIEW - RL

Primary Trait



1-5 pts.
Severe toe-out



45-50 pts.
No toe-out

DAIRY FORM - DF

Primary Trait



1-5 pts.
Extremely tight



25 pts.
Intermediate



45-50 pts.
Extremely open

FOOT ANGLE - FA

Primary Trait



1-5 pts.
Extreme low angle



25 pts.
Intermediate angle



45-50 pts.
Extremely steep angle

RUMP ANGLE - RA

Primary Trait



1-5 pts.
Pins clearly higher than hooks



25 pts.
Slight slope from hooks to pins



45-50 pts.
Extremely sloped from hooks to pins

LOCOMOTION - LO

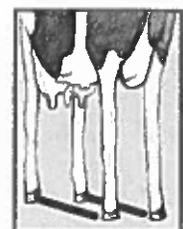
Research Trait



1-15 pts.
Severe abduction with short stride and skating motion



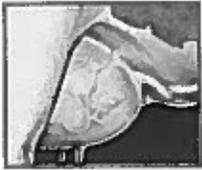
20-35 pts.
Slight abduction with medium stride



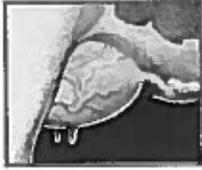
40-50 pts.
No abduction with long stride

FORE UDDER ATTACHMENT - FU

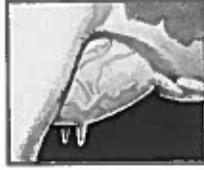
Primary Trait



1-5 pts.
Extremely loose



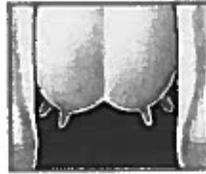
25 pts.
Intermediate strength



45-50 pts.
Extremely snug & strong

FRONT TEAT PLACEMENT - TP

Primary Trait



1-5 pts.
Extremely wide placement
on outside of quarter



25 pts.
Centrally placed
on quarter



45-50 pts.
Base of teats on
extreme inside of quarter

REAR UDDER, HEIGHT - UH

Primary Trait



1-5 pts.
Extremely low



25 pts.
Intermediate height



45-50 pts.
Extremely high

FRONT TEAT LENGTH - LF

Primary Trait



1-5 pts.
1-1/4 inches or smaller



25 pts.
2-1/4 inches



45-50 pts.
3-1/4 inches or longer

REAR UDDER, WIDTH - UW

Primary Trait



1-5 pts.
Narrow rear udder



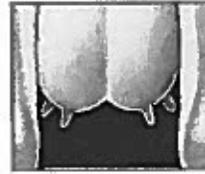
25 pts.
Intermediate width



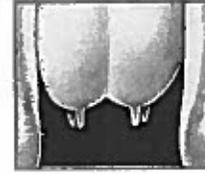
45-50 pts.
Extremely wide rear udder

REAR TEAT PLACEMENT - RT

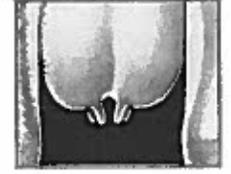
Primary Trait



1-5 pts.
Extremely wide placement
on outside of quarter



25 pts.
Centrally placed
on quarter



45-50 pts.
Base of teats on
extreme inside of quarter

UDDER CLEFT - UC

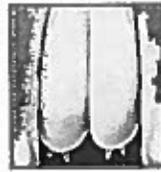
Primary Trait



1-5 pts.
Weak cleft



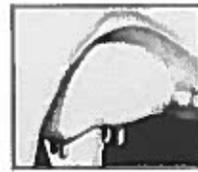
25 pts.
Intermediate



45-50 pts.
Extremely strong cleft

UDDER TILT - UT

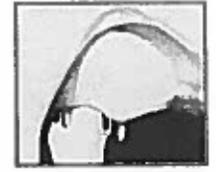
Research Trait



1-5 pts.
Rear quarters deep



30 pts.
Front and rear quarters level



45-50 pts.
Front quarters deep

UDDER DEPTH - UD

Primary Trait



1-5 pts.
Very deep udder floor
well below hocks



25 pts.
Udder floor
above hocks



45-50 pts.
Extreme height of udder
floor above hocks

BODY CONDITION - CS

Research Trait



1-10 pts.



21-30 pts



41-50 pts.

FINAL SCORE

A cow's final score is based on the five major classification categories or breakdowns of front end and capacity, dairy strength, rump, feet and legs, and udder. The classifier numerically assigns each category a score ranging from 1 to 100 points. The numbers are based on the level of desirability exhibited by individual cows for each category compared to the true-type model. The final score is the sum of the five major breakdown scores weighted as follows:

COWS		BULLS	
Front End & Capacity	15%	Front End & Capacity	40%
Dairy Strength	20%	Dairy Strength	25%
Rump	5%	Rump	10%
Feet and Legs	20%	Feet and Legs	25%
Udder	40%		

In assigning major breakdown scores, the classifier considers such factors as age, number of lactations, and stage of lactation. Major breakdown and final score is expressed numerically. Those numbers correspond with the following brackets:

Excellent [E]	90-97 points	Good [G]	75-79 points
Very Good [VG]	85-89 points	Fair [F]	65-74 points
Good Plus [GP]	80-84 points	Poor [P]	50-64 points

MAJOR BREAKDOWN DESCRIPTIONS

FRONT END AND BODY CAPACITY 15%

The skeletal parts of the cow, with the exception of feet & legs, and rump. Listed in priority order, the descriptions of the traits to be considered are as follows:

Front End: Adequate constitution with front legs straight, wide apart and squarely placed. Shoulder blades and elbows set firmly against the chest wall. The crops should have adequate fullness.

Chest: Deep and wide floor with well-sprung fore ribs blending into the shoulders.

Barrel: Long, with adequate depth and width; spring of rib increasing toward the rear with a deep flank.

Back/Loin: Back should be straight and strong, with loin broad, strong, and nearly level.

Stature: Height including length in the leg bones with a long bone pattern throughout the body structure. Height at withers and hips should be relatively proportionate.

Breed Characteristics: Exhibiting overall style and balance. Head should be feminine, clean-cut, slightly dished with broad muzzle, large open nostrils and strong jaw.

DAIRY STRENGTH 20%

A combination of dairyness and strength which supports sustained production and longevity. Major consideration is given to general openness and angularity while maintaining strength, width of chest, spring of fore rib, and substance of bone with freedom from coarseness. Body condition should be appropriate for the stage of lactation. Listed in priority order, the descriptions of the traits to be considered are as follows:

Ribs: Wide apart. Rib bones wide, flat, deep, and slanted toward the rear.

Width of Chest: Wide, showing capacity for vital organs.

Spring of Fore Rib: Well sprung, expressing fullness and extending outside the point of elbows.

Thighs: Lean, in-curving to flat and wide apart from the rear.

Withers: Sharp with chine prominent.

Neck: Long, lean, and blending smoothly into shoulders; clean-cut throat, dewlap, and brisket.

Skin: Thin, loose, and pliable.

RUMP 5%

The rump should be long and wide throughout with thurls centrally placed to enhance mobility. Listed in priority order, the descriptions of the traits to be considered are as follows:

Rump Angle: Pin bones should be slightly lower than hip bones.

Rump Width: Thurls should be wide apart with adequate pin width.

Vulva: Should be nearly vertical and the anus should not be recessed.

Tail Head: Should set slightly above and neatly between pin bones and be free from coarseness.

FEET AND LEGS 20%

Feet and rear legs are evaluated. Evidence of mobility is given major consideration. Listed in priority order, the descriptions of the traits to be considered are as follows:

Rear legs, Rear view: Straight, wide apart with feet squarely placed.

Locomotion: The use of feet and rear legs, including length and direction of step.

Rear legs, Side view: Moderate set (angle) to the hock.

Feet: Steep angle and deep heel with short, well-rounded closed toes.

Thurl Position: Centrally placed between hip and pin bones.

Hocks: Cleanly molded, free from coarseness and puffiness with adequate flexibility.

Bone: Flat and clean with adequate substance.

Pasterns: Short and strong with some flexibility.

Slightly more emphasis placed on Feet than on Rear Legs when evaluating this breakdown.

UDDER 40%

The udder traits are evaluated. Major consideration is given to the traits that contribute to high milk yield and a long productive life. Listed in priority order, the descriptions of the traits to be considered are as follows:

Udder Depth: Moderate depth relative to the hock with adequate capacity and clearance. Consideration is given to lactation number and age.

Fore Udder: Firmly attached with moderate length and ample capacity.

Rear Udder: Wide and high, firmly attached with uniform width from top to bottom and slightly rounded to udder floor.

Teat Placement: Squarely placed under each quarter, plumb and properly spaced from side and rear views.

Udder Cleft: Evidence of a strong suspensory ligament indicated by adequately defined halving.

Teats: Cylindrical shape; uniform size with medium length and diameter.

Udder Balance and Texture: Udder floor level as viewed from the side. Quarters evenly balanced; soft, pliable and well collapsed after milking.

Dairy Business

Management

2025 All-American Dairy Show Junior Dairy Management Contest

Dairy Business Management Study Guide

Main Types of Business Structures:

- **Corporation** – As a business structure that is owned by several people known often as “stockholders”, corporations are recognized as a separate legal entity. Often, a board of directors is elected to make most or all the business decisions. Additionally, accurate bookkeeping is required for this type of business structure.
 - **Benefits:** Own property, pay taxes, make contracts, sue individuals, and ownership is easily transferable from one individual to another through the sale of stock
 - **Drawbacks:** Extremely costly to start up, additional taxes are owed if the corporation closes, individuals or other businesses can sue, small corporations may find it difficult to find individuals to sell their stock to, and all income is taxed twice (once as a corporate tax and then shareholders are taxed on profits)
- **S-Corporation** – Displays all the characteristics of a corporation but is taxed like a sole proprietorship with the benefit of offering limited liability.
- **Limited Liability Company (LLC)**– This business structure is neither a partnership nor a corporation and offers many great tax advantages.
 - **Benefits:** Liability of the business is separate than its members (owners), offers flexible management options, and avoids double taxation as the owners are recognized as “self-employed”
 - **Drawbacks:** Extremely expensive to form and require a lot of additional bookkeeping requirements
- **Sole-Proprietorship** – A simple and easy business structure to organize, that offers few government regulations and/or restrictions.
 - **Benefits:** The owner has the power to make all the business decisions, receives all the profits from the business and pays taxes once the income is received
 - **Drawbacks:** Creditors can claim the owners’ personal assets for payment on business debts and can hold owners personally responsible for emergencies that occur at the business
- **Partnership** – Business structure that generally consists of two or three business owners
 - **Benefits:** Offers lower start-up costs, can obtain capital immediately, business partner can offer additional support, both monetary and expertise, and all profits made from the business are split among the partners and taxed once the income is received
 - **Drawbacks:** Creditors can claim owner personal assets for business debts, owners can be held personally responsible for emergencies that occur at the business and disputes between partners can occur when managing the business and sometimes end partnerships

Business Planning Tools:

○ **Mission & Vision Statements:**

- **Mission Statements:** A company's mission statement is essentially its statement of purpose. It serves as a guide for all the business's decision-making. Owners, leaders and employees are generally the target of the mission. It should help workers within the organization know what decisions and tasks best align with the mission of the company.
 - **Example:** The mission of Center for Dairy Excellence Foundation to build and invest in programs that cultivate and inspire the next generation of producers, consumers, and advocates for the dairy industry.
- **Vision Statements:** Vision statements are sometimes confused or used synonymously with mission statements. However, vision statements should offer more of a direction and include a perspective of values. A vision might provide a direction for the business for the next five to ten years, while also noting a commitment to integrity, transparency, openness and other such values.
 - **Example:** The vision of the Center for Dairy Excellence Foundation is to empower the next generation of the dairy industry.

- **SWOT Analysis:** A major tool that is easy to utilize for business success is completing a SWOT analysis. This tool is used to assess the Strengths, Weaknesses, Opportunities, and Threats of the dairy business. Serious thought must be given when completing this because it shows the owner's holistic view of the business.

Strengths:	Weaknesses:
<ul style="list-style-type: none"> ▪ Strengths are considered mostly internal <ul style="list-style-type: none"> ○ For example, what do you and your family, employees, and management team bring to the business? <ul style="list-style-type: none"> ➤ <i>Your family is very supportive of the time you spend in the business and you have hired or developed experienced, loyal, and caring employees.</i> ➤ <i>Your management team works well together and provides excellent input for the business.</i> ➤ <i>Equipment is up-to-date and you have saved the depreciation money to replace outdated equipment.</i> 	<ul style="list-style-type: none"> ▪ Weaknesses are also considered mostly internal and are the items you will need to address for success of your business <ul style="list-style-type: none"> ➤ <i>Lack of experience in the selected industry</i> ➤ <i>Family members do not completely support you in this venture</i> ➤ <i>Lack of qualified employees or your business will not support full time employees</i> ➤ <i>Poor decision that is now impacting the business</i> ➤ <i>High turnover of employees.</i> ➤ <i>Lack of necessary capital for equipment, and/or a high short-term debt load.</i>
Opportunities:	Threats:
<ul style="list-style-type: none"> ▪ Opportunities are considered mostly external <ul style="list-style-type: none"> ➤ <i>Take advantage of low interest loan packages from various sources</i> ➤ <i>Producing a product or idea that has not been previously done in your area</i> ➤ <i>Fulfilling a niche market for your local area</i> ➤ <i>Expanding operation by adding a lagoon or a new milking facility</i> ➤ <i>Hire a summer intern who could become a fulltime, successful employee/manager</i> 	<ul style="list-style-type: none"> ▪ Threats are also considered mostly external. These are threats from outside your business that will directly impact you over and may have very little control. <ul style="list-style-type: none"> ➤ <i>Local regulations negatively impacting your business</i> ➤ <i>Unforeseen competition (local or foreign)</i> ➤ <i>Dissolution of markets, and adverse weather may also have a negative effect on your business</i> ➤ <i>Rising interest rates may have a greater impact</i> ➤ <i>Heavily leveraged businesses will be greatly impacted by an increase in your interest rates</i>

Understanding Financial Management:

A series of financial statements are needed to measure progress on a dairy farm. Lenders need these documents to satisfy loan requirements and farmers and managers need them, so they can continually measure progress toward their objectives. Financial analyses can give identical answers to different dairyman who will make different decisions based on the data, depending on their objectives and what they think their alternatives really are.

- **Balance Sheets, Income Statements and Cash Flow Plans** – Whether it is a mom and pop farm or a 10,000 dairy, the basic principles of financial business management consistently utilizes these two tools to analyze different aspects of the farm.
 - **Balance Sheet:** used to tell how much of a business is owned, how much collateral can secure additional borrowing, and how far away bankruptcy is (*measures what there is to work with*)
 - **Income Statements:** shows whether the business was profitable or not and can be used to estimate debt servicing ability (*tells whether enough money is being made to accomplish objectives*)
 - **Cash Flow Plans:** show how much and when money flows through the dairy and helps test the feasibility of changes that might be made in the dairy (*financial road map*)
- **Assets and Liabilities** - When evaluating a business, all financial related items fall into one of 2 categories—Assets or Liabilities.
 - **Asset:** a resource owned by the farm.
 - Examples: land, cash in the bank, supplies, equipment, building structures and money owed to the farm (accounts receivable).
 - **Liability:** a debt owed by the farm.
 - Examples: loan payments, equipment payments, mortgage payments, wages, and taxes.
 - Assets and liabilities can be further divided based upon how long the asset will be utilized for or how long the debt will take to repay. This is done to match up the useful life of the item and the time in which it will take to pay it off (i.e. it would be almost impossible to pay off a \$300,000 debt in less than a year).
- The 3 sub-divisions are short-term, intermediate, and long-term for assets and liabilities.
 - **Short-Term** assets/liabilities are under 12 months (an asset will have a useful life of under 1 year and a liability will be paid off in less than a year)
 - **Intermediate** assets/liabilities are classified as 13-120-month investments (1 year-10 years)
 - **Long-Term** assets/liabilities are longer than 10 years
- **Knowing a Farm's Equity** – There are several common ratios utilized to determine financial stability of a farm business. Below is a list of the ratios that are important financial indicators, their definition and how to calculate that ratio. Specifically, the information needed to find these financial indicators are located on income statement and a balance sheet.

Equity: Equity (also referred to as Net Worth), usually refers to the value of “things” where Net Worth refers to the value of a person. Percent Equity, however, is a measure of the assets owned by the business itself. To calculate the equity of a farm and the percent equity, see the formulas shown below:

$$\text{Assets} - \text{Liabilities} = \text{Equity}$$

$$(\text{Assets} - \text{Liabilities}) \div \text{Assets} = \text{Percent Equity}$$

- **Current Ratio** - A ratio that measures the liquidity of a business. It shows the ability of the business to pay its current obligations on a short-term basis.
 - **Current Assets ÷ Current Liabilities = Current Ratio**
 - ✓ $890,000 \div 252,000 = 3.53:1$
- **Intermediate Ratio** - A ratio that measures the ability of a business to pay its intermediate obligations.
 - **Intermediate Assets ÷ Intermediate Liabilities = Intermediate Ratio**
 - ✓ $1,900,000 \div 575,000 = 3.30:1$
- **Net Income** - The funds that a business has left after taking all the expenses away from the total revenue earned.
 - **Income – Expenses = Net Income**
 - ✓ $\$3,132,000 - \$2,267,000 = \$865,000$
- **Solvency: Debt to Asset Ratio** – The measure of the ability of a business, at a point in time, to meet all debt obligations following the sale of all assets. The ratio increases as the business incurs greater levels of debt and decreases as debt is paid off
 - **Total Debts ÷ Total Assets X 100 = Solvency Rate**
 - ✓ $1,802,000 \div 7,290,000 \times 100 = 24.72\%$
 - **Example:** If a farmer has a 20% solvency rate, they are not highly leveraged and can take on more debt if they plan to expand or buy new equipment. If a farmer has a 60% solvency rate, they would be highly advised to not take on more debt because they would have more debt than assets. (Less than 30% is a competitive level)
- **Debt Per Cow** – This is another way of looking at the ability of a dairy farm to meet its debt obligations. Debt per cow indicates how a manager would repay the debt due to cows generating the money needed to make both the principal and interest payments.
 - **Total Debts ÷ (Lactating Cows + Dry Cows) = Debt Per Cow**
 - ✓ $1,802,000 \div (425 + 75) = \$3,604$
 - **Competitive Levels:**
 - ✓ Less than \$3,300 per cow, less than \$4,300 per cow during an expansion
 - If debt per cow is too high, it may be experiencing a difficult time in meeting all principal and interest payments. If debt per cow is too low, the management team should carefully assess the operation and consider if moderate investments could increase efficiency and profitability.

All American Dairy Farm Balance Sheet 12/31/2024

<u>ASSETS</u>		<u>LIABILITIES & OWNERS EQUITY</u>	
Current Assets		Current Liabilities	
Checking Account	58,000	Accts payable	40,000
Accounts Receivable	207,000	Operating Debt	6,000
Prepaid Expenses	70,000	Current portion of:	
Feed	520,000	Intermediate debt	120,000
Supplies	35,000	Long Term debt	86,000
Total Current Assets:	890,000	Total Current Liabilities:	252,000
Intermediate Assets		Intermediate Liabilities	
Dairy Cows	700,000	Machinery & Equipment	375,000
Heifers	450,000	Livestock	200,000
Machinery & Equipment	750,000		
Total Intermediate Assets:	1,900,000	Total Intermediate Liabilities:	575,000
Long Term Assets		Long Term Liabilities	
Land & Buildings	4,500,000	Real Estate	575,000
		Buildings & Improvements	400,000
Total Long-Term Assets:	4,500,000	Total Long-Term Liabilities:	975,000
TOTAL ASSETS	7,290,000	TOTAL LIABILITIES:	1,802,000
		Total Equity:	5,488,000
		Total Liabilities + Equity:	7,290,000

All American Dairy Farm Income Sheet 12/31/2024

INCOME	
Description	Total
Milk	2,875,000
Cull Cows	215,000
Calves	30,000
Crops	
Govt Receipts	12,000
TOTAL INCOME:	3,132,000

EXPENSES			
Description	Total	Description Cont.	Total Cont.
Hired Labor	400,000	Other livestock expenses	10,000
Feed		Crops	
Dairy grain and concentrate	750,000	Fertilizer & lime	50,000
Dairy Roughage	45,000	Seeds & plants	45,000
Machinery		Spray & other crop exp	20,000
Machinery hire/rent	40,000	Crop professional fees	3,000
Machinery repair	100,000	Real Estate	
Fuel, Oil, Grease	90,000	Building/fence repair	42,000
Livestock		Taxes	25,000
Replacement livestock	70,000	Rent & lease	32,000
Breeding	28,000	Other	
Vet & Medicine	80,000	Insurance	20,000
Milk Marketing	95,000	Utilities	52,000
Bedding	50,000	Interest paid	72,000
Milking supplies	40,000	Other professional fees	14,000
Custom Boarding	35,000	Miscellaneous	9,000
rbST expense	50,000		
TOTAL OPERATING EXPENSE: 2,267,000			
NET FARM INCOME: 865,000			

DEPRECIATION	
Machinery Depreciation	120,000
Building Depreciation	60,000
TOTAL DEPRECIATION	180,000

Farm size is 500 mature dairy cows: 425 lactating and 75 dry cows. Total milk marketed in 2024 was 12,000,000 lbs. Value of unpaid owner/management & labor in 2024 was \$60,000.

Nutrition

JDMC Nutrition Test Study Resources 2025

Please review the articles below to prepare for questions that will be asked on the JDMC Nutrition exam.

Forages

- **(Primarily focus on the Ensiling Process and Harvest Maturity sections)**
<https://content.ces.ncsu.edu/forage-conservation-techniques-silage-and-haylage-production>

Mycotoxins

- **(Mold and Fungus Identification Guide)**
https://f.hubspotusercontent40.net/hubfs/745395/Alltech%20Mold%20&%20Fungus%20Chart.pdf?_hstc=126399186.4ebc66a7761478cf1a9e958aedf491da.1571035941055.1606638319365.1607477178917.39&_hssc=126399186.6.1607477178917&_hsfp=3212866697&hsCtaTracking=cc8c9eec-b7ae-4a79-bbed-c719b6c2994b%7C44172897-f471-4f0b-be6b-c9a2f635ea2b
- **(Warning Signs of Mycotoxins)** <https://www.alltech.com/ae-en/blog/9-warning-signs-mycotoxins-your-dairy-herd>
- **(Manure Scoring)** <https://www.alltech.com/node/14821>

Ingredients fed to Dairy Cattle

- <https://extension.psu.edu/concentrates-for-dairy-cattle/>

Forage ID Resources

- <https://quizlet.com/93960030/dairy-feeds-flash-cards/>



Pesticide Management

Pesticide Management and Safety-Study Resources

“Basic knowledge of handling, storing, and safety of pesticides”

Resources

1. RoundUp Powermax3 Label: Pages 1-10 <https://www.carovail.com/wp-content/uploads/2022/05/RoundUp-PowerMax-3-Label.pdf>
2. <https://apps.msuextension.org/montguide/guide.html?sku=MT200810AG>
3. <https://onvegetables.com/2019/05/24/pmra-factsheets-on-rei-and-phi/>

Spanish for Agriculture

2025 All-American Dairy Show Junior Dairy Management Contest

Spanish for Agriculture Study Guide

Dairy and Agriculture Specific Vocabulary - Nouns

English	Spanish		English	Spanish
blood	la sangre		machine	la máquina
bucket	el cubo or la cubeta		milk	la leche
bull	el toro or el novillo		mother	la madre
calf	el becerro (boy) or la becerro (girl)		parlor	la sala de ordeño
cow	la vaca		pen	el corral
dip/iodine	el yodo		pipe	el tubo
farm	la granja or el rancho		pipeline	la tubería
father	el padre		pulsator	el pulsador
filter	el filtro		sand	la arena
foam	la espuma		sawdust	el aserrín or el serrín
food	la comida		soap	el jabón
group	el grupo		straw	la paja
heifer	la vaquilla		tank	el tanque
hose	la manguera		water	el agua

Dairy and Agriculture Specific Vocabulary - Adjectives

Spanish uses grammatical gender. Nouns are either masculine or feminine. Adjectives must match the nouns in gender. Notice most of these adjectives have two versions. One that ends in *o*, which denotes masculine, and one that ends in *a*, which denotes feminine.

English	Spanish		English	Spanish
big	grande		old	viejo/a
clean	limpio/a		sick	enfermo/a
dirty	sucio/a		slow	despacio
dry	seco/a		slowly	lentamente
fast	rápido		small	pequeño/a
fat	gordo/a		thin	delgado/a
fresh	fresco/a		tiny	chiquito/a
new	nuevo/a		wet	mojado/a

Nouns and Adjectives Together

In English, we usually say the adjective first, then the noun: “green soap.” But in Spanish, it’s usually the noun first, then the adjective: “jabón verde” → soap green. It might sound backwards at first, but that’s just how Spanish works most of the time!

✦ Easy Formula: [Noun] + [Adjective]

Examples:

 vaca fresca → *fresh cow*

 tanque grande → *big tank*

 filtro nuevo → *new filter*

✦ Points to Remember:

- 1.) Match the genders.
- 2.) Flip the order.

Example: There are two words for “bucket” depending on where someone is from.

- Cubo is masculine because it ends in an o. Therefore, the adjective must be masculine as well.

Dirty bucket: cubo sucio

- Cubeta is feminine because it ends in an a. Therefore, the adjective must be feminine as well.

Dirty bucket: cubeta sucia

Why Learn About Spanish Culture? 🌍

Learning a language isn't just about words, it's about **people**.

Understanding Spanish-speaking cultures, especially holidays we may not celebrate ourselves, helps us:

- 👁️ See the world differently.
- 🤝 Respect other traditions.
- 💬 Connect better with Spanish speakers.

Knowing about holidays like *Día de los Muertos* or *Cinco de Mayo* shows that we care—not just about speaking Spanish, but about the **people who live it**.

🎥 Watch this [short video](#) about the real meaning of Cinco de Mayo. As you watch, pay attention to these key points:

- 🌞 Cinco de Mayo is NOT Mexico's Independence Day (biggest misconception).
- 📅 Mexico's actual Independence Day is September 16.
- 🗣️ What is the true reason Cinco de Mayo is celebrated?
- 🤝 How is the holiday connected to the U.S. Civil War? And how might history have changed without it?

Study Guide was created by Katie Dotterer, Owner of AgvoKate.



Heat

Abatement

Heat Abatement:

Please review the following items regarding Heat Abatement:

1. **In-Utero Heat Stress: Dry Period Heat Stress Effects on the Calf:** *Avoid negative effects of in-utero heat stress on the calf by cooling the dry cow.*
 - a. <https://extension.psu.edu/in-utero-heat-stress-dry-period-heat-stress-effects-on-the-calf>
2. Heat Stress Abatement in Dairy Shelters PowerPoint pages 2-22.
3. Heat Stress Basics article by John T. Tyson pages 23-26.



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Heat Stress Abatement in Dairy Shelters

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Agricultural Engineer
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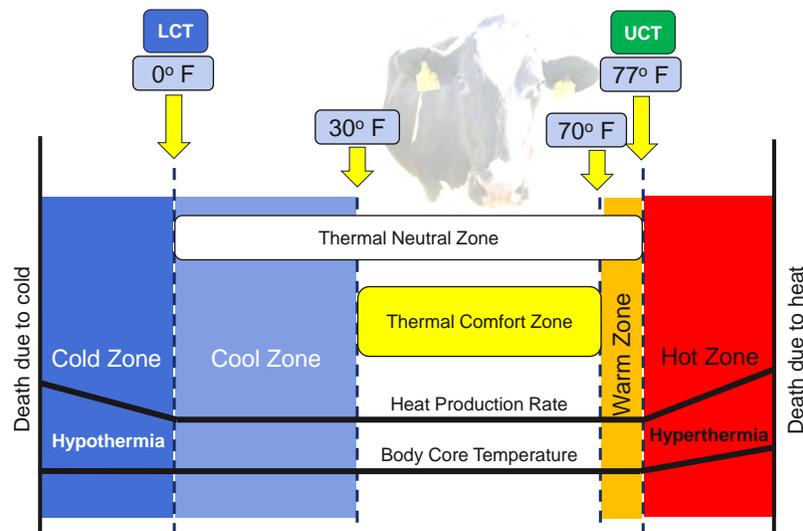
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Dairy Cattle Characteristics

- Homeothermic
 - Constant body temperature
 - 101.5°F
- Northern European Origins
 - Evolved in moderate to mild winters and cool summers
 - Overtaxed by heat more than cold

Cows are Homeotherms

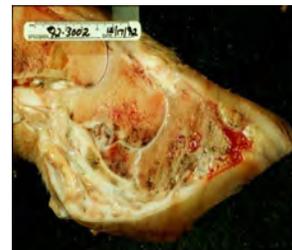


Health reasons to control heat stress

- Animal well being concern
- Improve Dry matter intake
 - Reduce risk of lameness
 - Reduce risk of mastitis
- Improve pregnancy rate
 - Improve estrus
 - Improve conception rate
- Reduce embryonic loss
- Minimize reduction in milk yield

Laminitis

- With heat stress (HS)
 - Reduced DMI and fiber digestion
 - Loss of CO₂ via respiration
 - Increased acidosis (lose bicarbonate)
 - Endocrine changes
 - Blood flow shunted to periphery
- Release of vasoactive compounds
- Alteration to blood flow to sensitive parts of hoof
- Tend to stand longer - respiratory rate is increased
- Loss of oxygen and nutrients to laminae
- Death of cells and weakness in hoof



Heat Stress and Reproduction

- Cows exposed to heat stress on day one or two post breeding suffer increased embryonic death. (*Ealy, 1993*)
- Embryonic loss day 17 is increased due to hormone changes in the heat stressed cow. (*Putney, 1988*)



Heat Stress and Reproduction

- Heat stressed cows show less estrus behavior. (*Hansen, 2005*)
- An increase in body temp of $.9^{\circ}\text{F}$ decreased Conception Rate by 12.8%. (*Gwazdauskas et al, 1973*)



Retained placenta and metritis

- With heat stress - dry cow DMI can be greatly reduced
 - Increased risk of ketosis
 - Reduced free water-dryer and less full rumen
 - Reduced bicarbonate
 - More risk of LDA
- Reduced protein
 - Lowered immune function
 - Risk of mastitis
 - Risk of RP or metritis
- Delayed delivery-risk of stillborns

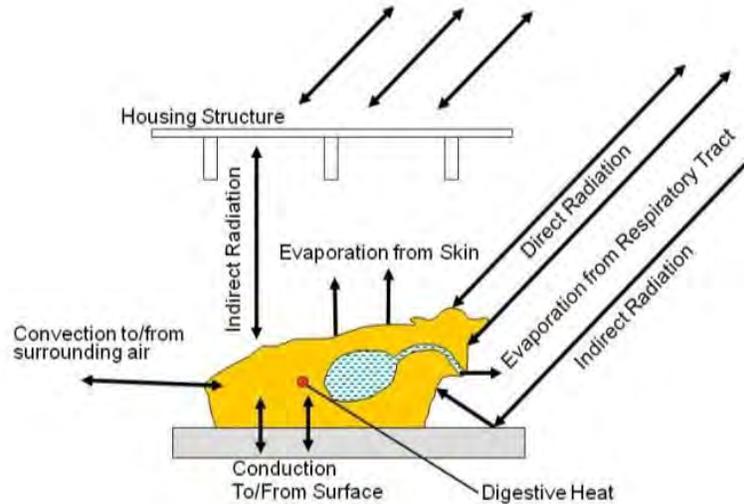


What About Heat Stress?

- If heat gain is greater than heat loss
- Eventually you get hot!
- Need to slow Heat Gain and/or Speed up Heat Loss



Thermodynamics of the Cow



Reducing Heat Stress

- Shade
- Air
 - exchange
 - movement (speed)
- Water
 - drinking
 - cooling



Shade from Buildings

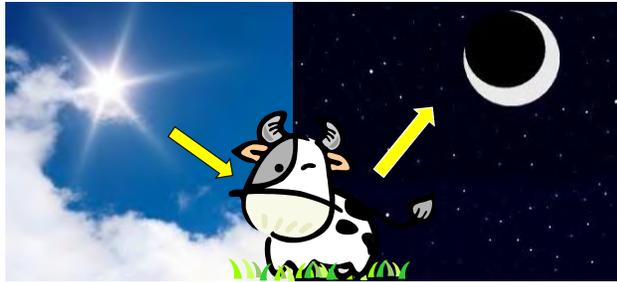


Shade can be Simple



Radiation

- Direct sunlight to cow (Heat stress)
- Cow directly to night sky (Cooling)



Heat moves from Hot to Cold

Insulation

- Pros
 - Reduces solar gain
 - Reduces condensation
 - Isolates steel roofing
- Cons
 - Prone to bird damage
 - Requires careful installation



Air Exchange

- Controls levels of moisture, gases, pollutants & heat
 - Warm, moist, stale air out
 - Fresh, dry air in
- Exchange driven naturally and/or mechanically
 - At least one air change per minute
- Inside T_{db} approximately 1 to 3°F shaded outside T_{db}

All other heat stress abatement methods
limited by poor air exchange

Air Speed

- Forced Convection
- Helps carry heat away from cow's body
 - Turbulent air movement around cows body
- Increases rate of evaporation
- 3 ½ - 5 mph (308 -440 fpm) required



Axial Circulation Fans



Fans over each freestall row

Axial Circulation Fans



Fans over the feeding area

Axial Circulation Fans

- “In-line” fan spacing
 - Over feeding area 8-10 X diameter apart
 - Over single stall row 7-8 X diameter apart
 - Over double stall row 7-8 X diameter apart
- Mounting height
 - Guarded: Fan bottom 6 to 8 ft above surface
 - Unguarded: Fan bottom 8 ft minimum
- Tilt to 10° to 20° from vertical
 - Air movement at resting level



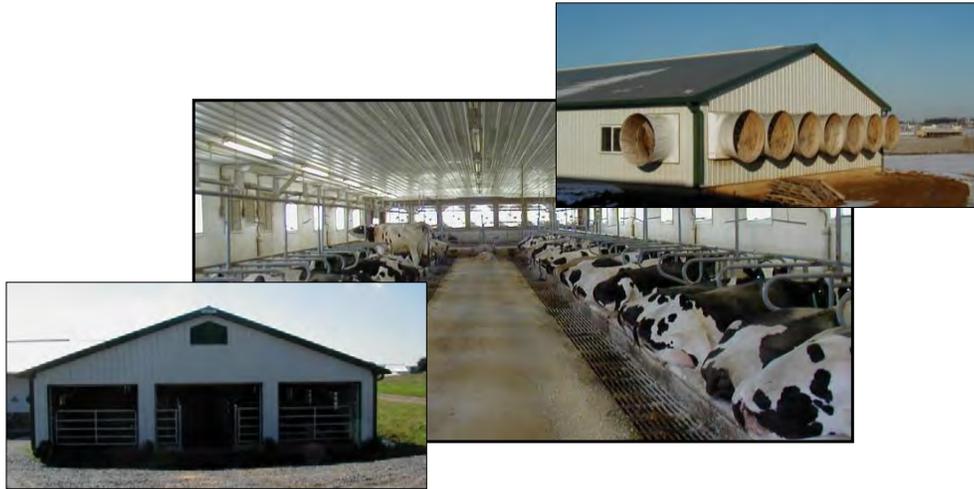
Circulation Fans

- Circulation fans added to increase Air velocity

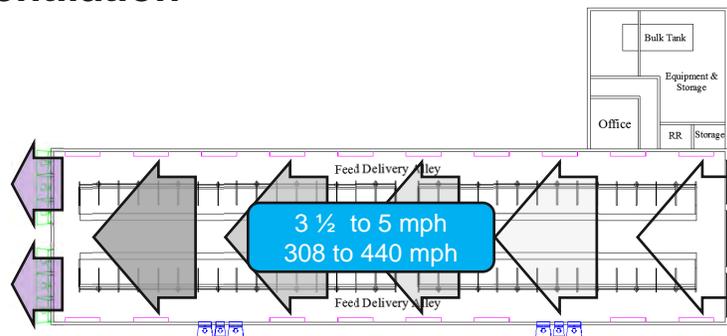
**Circulation Fans
DO NOT
Exchange Air!**



Tunnel Ventilation



Tunnel Ventilation



- Rapid air exchange
- Cooling breeze



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Cooling Cows with Water

- Drinking Water
- Direct evaporative cooling
- Indirect evaporative cooling



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Add Evaporative Cooling

- 1st increase water space
- Consumption can be 2X in hot weather



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Evaporative Heat Removal

- BTU's to Evaporate water
 - ~ 1,000 BTU per 1 pound of water
 - ~ 8,300 BTU per 1 gallon of water

Direct Evaporative Cooling

- Evaporation of moisture from skin
 - Removes heat directly from the animal surface
- Best method of evaporative cooling for dairy cows in more 'humid' climates
- Moisture & heat are added to the animal space
 - Good air exchange & forced convection are essential

Spray Cooling

- Intermittent wetting & drying of cow's skin
 - Allows better heat transfer from cow to environment



Respiration rate lowers almost immediately

Tie Stall Spray Cooling



Intermittent Spray Cooling

Holding Area

- Very tight conditions



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Return Lane

- Soak cows as they return to barn



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Indirect Evaporative Cooling

- Decreases ambient temp surrounding cows
 - Latent heat used to convert liquid to gas state
- Most effective in 'arid' climates

- Moisture & heat added to the animal space
 - Good air exchange & forced convection are essential

Evaporative Cooling

- Air is drawn into the barn through water covered pads
- Lower air temp by evaporating water



Evaporative Cooling

- Small water droplets sprayed into the air stream
- As H₂O evaporates temp lowered
- Needs to be monitored to not make a “wet” barn



High Pressure Misting

Heat Abatement Steps

- Decrease solar load
 - Shade
- Increase Convective Cooling
 - Larger air exchange rate
 - Faster air velocity w/in the shelter (at cow level)
- Increase Evaporative Cooling
 - Added drinking water
 - In-direct evaporative cooling
 - Direct evaporative cooling



Questions?

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Heat Stress Basics

John T. Tyson
Agricultural Engineer
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There is a misconception that the environment humans feel comfortable in, cows will feel comfortable in. Therefore it has been traditional to design for winter conditions. This has led to barns that stay warm in the winter (for workers) and can be unbearably hot in the summer for anybody to work.

Dairy cattle in general prefer a cooler environment than do humans. Remember dairy animals originate from Northern Europe where the climate is much cooler than here in the US. Dairy cows prefer temperatures from about 30°F to 70°F, and can hold production in temperatures below 0°F. However, cows can start to experience heat stress at about 68°F to 70°F, with normal relative humidity levels. Their high body weight to surface area ratio is meant to conserve heat and therefore limits their ability to give off heat. Combine this with the huge furnace capability of the rumen and it's pretty easy to see why cows like cooler weather and why summer heat is harder on their production than are the blizzards in January.

One question that often comes up is why do we talk so much about heat stress now and haven't in the past. One answer could be 'production'. Since 1990 alone the average US dairy cow produces about 50% more milk annually. With that increase in production has come an increase in feed intake and therefore heat production from digestion of that feed.

Cows can stand to be exposed to higher temperatures for short periods of time during the day if they are allowed to cool off at night. The goal is the balance the cow's heat over a 24 hour period. So in early spring and even late fall when the afternoon temperatures shot into the mid 80's, but the night time lows fall to the low 60's milk production may not suffer. However when the nightly lows remain in the 70's for more than a 48 hour period, production begins to suffer. Humidity also plays a role in heat stress. At high humidity levels the natural ability of cow to lose heat through evaporation from their lungs is reduced, as while as our ability to lower air temperature with non-direct evaporative cooling methods. I often like to look at the weather report and forecast for the dew point temperature. This is the temperature at which the air will become saturated and begin to produce condensation or 'dew'. When dew point temperatures reach the mid to upper 60's heat stress is going to be an issue.

It's not just milk production that suffers during heat stress. Many other health issues can arise. Lower immune function, high mastitis risk, lower conception rate, and increased embryonic loss to list and few. Changes can also be seen in behavior. One of the most pronounced is an increase in standing time. The common theory is that by standing, a cow increases the body surface area exposed to convective cooling. The down side of the additional standing is more stress of the feet. This additional standing time, partially if on a hard surface, can lead in increased hoof issues 6 to 8 weeks after the heat event. A hot summer often leads to an outbreak of foot health issues in the fall.

When Are Cows In Heat Stress?

Three common measures are used to judge if cows are in heat stress. If rectal temperatures of 8 out of 10 cows is above 102.5 °F, or respiration rates in breaths per minute are over 80, or dry matter intake and milk production drop 10% in hot weather, cows are in heat stress. However the goal needs to be preventing heat stress before it happens not reacting after the event.

THI

Several indices have been developed and used to predict comfort of environmental conditions. Generally the two environmental parameters considered have been dry-bulb temperature and a measure of moisture content of the air. The most common comfort index is the Temperature-Humidity Index (THI). Originally THI was developed as a comfort index for humans; however it has also been used to evaluate animal comfort. When THI exceeds 68, dairy cows are adversely affected.

Temperature		% Relative Humidity																				
°F	°C	0	5	10	15	20	25	30	35	40	45	50	55	60	65	70	75	80	85	90	95	100
72	22.0	64	65	65	65	66	66	67	67	67	68	68	69	69	69	70	70	70	71	71	72	72
73	23.0	65	65	66	66	66	67	67	68	68	68	69	69	70	70	71	71	71	72	72	73	73
74	23.5	65	66	66	67	67	67	68	68	69	69	70	70	70	71	71	72	72	73	73	74	74
75	24.0	66	66	67	67	68	68	68	69	69	70	70	71	71	72	72	73	73	74	74	75	75
76	24.5	66	67	67	68	68	69	69	70	70	71	71	72	72	73	73	74	74	75	75	76	76
77	25.0	67	67	68	68	69	69	70	70	71	71	72	72	73	73	74	74	75	75	76	76	77
78	25.5	67	68	68	69	69	70	70	71	71	72	73	73	74	74	75	75	76	76	77	77	78
79	26.0	67	68	69	69	70	70	71	71	72	73	73	74	74	75	76	76	77	77	78	78	79
80	26.5	68	69	69	70	70	71	72	72	73	73	74	74	75	75	76	77	77	78	78	79	80
81	27.0	68	69	70	70	71	72	72	73	73	74	75	75	76	77	77	78	78	79	80	80	81
82	28.0	69	69	70	71	71	72	73	73	74	75	75	76	77	77	78	79	79	80	81	81	82
83	28.5	69	70	71	71	72	73	73	74	75	75	76	77	78	78	79	80	80	81	82	82	83
84	29.0	70	70	71	72	73	73	74	75	75	76	77	78	78	79	80	80	81	82	83	83	84
85	29.5	70	71	72	72	73	74	75	75	76	77	78	78	79	80	81	81	82	83	84	84	85
86	30.0	71	71	72	73	74	74	75	76	77	78	78	79	80	81	81	82	83	84	84	85	86
87	30.5	71	72	73	73	74	75	76	77	77	78	79	80	81	81	82	83	84	85	85	86	87
88	31.0	72	72	73	74	75	76	76	77	78	79	80	81	81	82	83	84	85	86	86	87	88
89	31.5	72	73	74	75	75	76	77	78	79	80	80	81	82	83	84	85	86	86	87	88	89
90	32.0	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	86	87	88	89	89	90
91	33.0	73	74	75	76	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90	90	91
92	33.5	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90	91	91	92
93	34.0	74	75	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90	91	92	92	93
94	34.5	74	75	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90	91	92	93	94
95	35.0	75	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95
96	35.5	75	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95
97	36.0	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96
98	36.5	76	77	78	80	80	82	83	83	85	86	87	88	89	90	91	92	93	94	95	96	98
99	37.0	76	78	79	80	81	82	83	84	85	87	88	89	90	91	92	93	94	95	96	98	99
100	38.0	77	78	79	81	82	83	84	85	86	87	88	90	91	92	93	94	95	96	98	99	100
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102	39.0	78	79	80	82	83	84	85	86	87	89	90	91	92	94	95	96	97	98	100	101	102
103	39.5	78	79	81	82	83	84	86	87	88	89	91	92	93	94	96	97	98	99	101	102	103
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105	40.5	79	80	82	83	84	86	87	88	89	91	92	93	95	96	97	98	99	100	101	102	103
106	41.0	80	81	82	84	85	87	88	89	90	91	93	94	95	97	98	99	101	102	103	104	106
107	41.5	80	81	83	84	85	87	88	89	91	92	94	95	96	98	99	100	102	103	104	106	107
108	42.0	81	82	83	85	86	88	89	90	92	93	94	96	97	98	100	101	103	104	105	107	108
109	43.0	81	82	84	85	87	89	89	91	92	94	95	96	98	99	101	102	103	105	106	108	109
110	43.5	81	83	84	86	87	89	90	91	93	94	96	97	99	100	101	103	104	106	107	109	110
111	44.0	82	83	85	86	88	90	91	92	94	95	96	98	99	101	102	104	105	107	108	110	111
112	44.5	82	84	85	87	88	90	91	93	94	96	97	99	100	102	103	105	106	108	109	111	112
113	45.0	83	84	86	87	89	91	92	93	95	96	98	99	101	102	104	105	107	108	110	111	113
114	45.5	83	85	86	88	89	92	92	94	96	97	99	100	102	103	105	106	108	109	111	112	114
115	46.0	84	85	87	88	90	92	93	95	96	98	99	101	102	104	106	107	109	110	112	113	115
116	46.5	84	86	87	89	90	93	94	95	97	98	100	102	103	105	106	108	110	111	113	114	116
117	47.0	85	86	88	89	91	93	94	96	98	99	101	102	104	106	107	109	111	112	114	115	117
118	48.0	85	87	88	90	92	94	95	97	98	100	102	103	105	106	108	110	111	113	115	116	118
119	48.5	85	87	89	90	92	94	96	97	99	101	102	104	106	107	109	111	112	114	116	117	119
120	49.0	86	88	89	91	93	95	96	98	100	101	103	105	106	108	110	111	113	115	117	118	120

Mild heat stress

Severe heat stress

Moderate heat stress

Dangerous heat stress

Figure 1. The Temperature Humidity Index (THI) combines air temperature and humidity.

Heat stress is when the animal's heat gain is higher than its heat loss. The animal produces body heat through metabolism, physical activity, and performance. Heat can also be gained from the environment through radiation from other bodies of higher temperature, convection from the air if at a higher temperature, and conduction from a surface if at a higher temperature. Heat can also be lost from the animal through radiation to a body of lower temperature, convection to

surrounding air of a lesser temperature, conduction to a resting surface if at a lesser temperature, or through evaporation where heat is lost due to the phase change of water from liquid to vapor.

The four modes of energy transfer represented (radiation, convection, evaporation, and conduction) are governed by physical law. For the animal to maintain homeothermy (i.e. no change in core body temperature) energy gains from the transfer modes and from internal metabolic processes must equal energy losses.

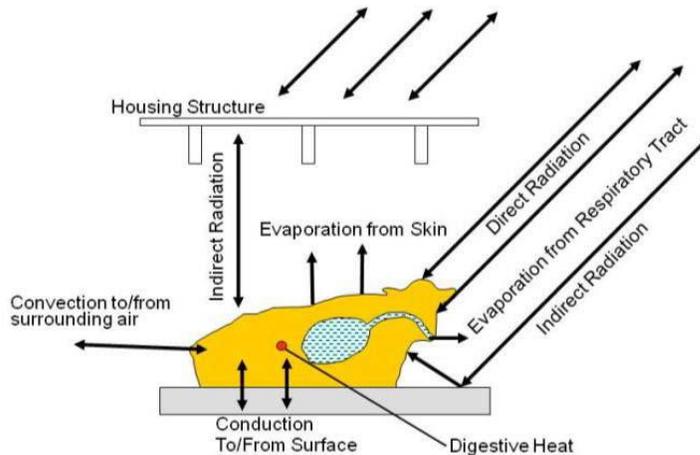


Figure 2. Energy exchanges between the animal and its surroundings. Adapted from Hahn (1985) and Graves (2002).

SAAW

SAAW is an acronym used to remember the four basics to hot weather cow care. Providing these four basics will help the cow to increase her natural cooling ability during the summer and fight off heat stress related production drops and health problems.



Shade is the first step to improving heat stress. Bring the cows out of the intense summer sun. This lowers the direct radiation heat load on the animal and therefore she has less heat to lose. Natural shade, shade structures, or a well ventilated barn are all suitable.

Air exchange removes the hot, moist air from around the animal and from the building along with providing fresh air, thus lowering the inside temperature and allowing for increased convective cooling. 1000 to 1500 cubic feet per minute (cfm) per animal is the recommended exchange rate. This can be down with either mechanical ventilation (i.e. tunnel ventilation) or well designed and managed natural ventilation.

Air velocity increases the natural cooling ability of the animal by carrying away the hot air close to the skin and allowing fresh cooler air to replace it (ie enhance convective cooling of the cow). 308 to 440 feet per minute (3.5 to 5 mph) is the recommended velocity.

Air velocity can be increased in an open, natural ventilated barn with the use of circulation fans. A general rule is that fans can throw air about eight times their diameter. Therefore, the placement of fans depends on their size, 3 ft fans should be placed about 24 ft apart and 4 ft fans about 32 to 36 ft apart. Hang the fans high enough to allow equipment clearance and aim them slightly down toward the animal's backs. Remember cows should be resting 12 to 14 hours per day, therefore the resting area becomes the priority area to cool. So, I recommend placing fans over the resting area(s) first and then over the feeding area next if the budget allows. Head to head freestalls create a very dense area of cow mass and should be addressed first. In enclosed structures tunnel ventilation is often used. See Penn State Agricultural Engineering Factsheet G-78 "Tunnel Ventilation for Tie Stall Dairy Barns" for more information.

Water is the most important ingredient in milk. During summer heat cows will increase their water intake by as much as two fold. However, this extra water is first utilized in cooling through respiration and sweating. Any leftover will be used to produce milk. Add extra waterers that are easy to access and protected from the summer heat.

Water can also be used to aid in the cooling of cows. Cooling is provided by using evaporative cooling to remove heat from the air and/or animals within the facility. In-direct evaporative cooling or direct evaporative cooling can be used. In-directive cooling such as a misting system injects a fine aerosol of water into the air stream where it evaporates and cools the air that is then circulated around the cow. For proper performance of a misting system, it is very import that the water droplets are small enough to evaporate before settling on a surface or the animal. Therefore, these systems should be operated at a high pressure (600 to 1200 psi) to ensure this small droplet.

Direct evaporative cooling, such as a feed line sprinkler system, wets the cow to the skin and then use the BTU's produced by the cow to evaporate this water, thus removing heat directly from the cow. Direct evaporative systems use low pressure to form a larger water droplet that can penetrate the cow's hair coat and make it to the skin layer. However, any water that misses a cow and falls to the floor becomes additional wastewater that must be handled through the manure system.

Heat stress abatement should be started in the low 60's by adding additional air exchange and air velocity. By the mid 60's the air exchange rate of the structure should be maximized, and by 70°F air velocity should be maximized along with additional evaporative cooling if available. Remember it is easier to keep a cow cool before she is hot than to cool her down after she is already in heat stress.

For more information on Dairy Housing visit the Penn State Extension Dairy Team at: <https://extension.psu.edu/animals-and-livestock/dairy/facilities-and-technology>.

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