

- The four compartments of the dairy cow's stomach are:
 - Rumen
 - Reticulum
 - Omasum
 - Abomasum
- The reticulum is located closest to the heart.
- The rumen is the bovine stomach compartment known as the fermentation vat. It is the largest of the stomach compartments.
- Bacteria, fungi, and protozoa are types of organisms that live in the rumen and digest feed.
- Carbon dioxide and methane are gases produced in the rumen.
- The tiny, finger-like projections that line the wall of the rumen are called papillae. The small projections in the small intestine are called villi.
- The omasum is often referred to as "manyplies." Its primary function is the dehydration of partially digested feed.
- The abomasum is often referred to as the true stomach. It is the enzyme and acid secreting portion of the ruminant stomach.
- Forage analysis or testing is the most reliable way of knowing the nutrient content of forages.
- Forage testing methods
 - NIR
 - Wet chemistry
- Items needed to do a quick and easy dry matter determination on a forage at home:
 - Microwave oven
 - Gram scale
 - Paper plate
 - Water glass
- Phases of silage fermentation
 - Aerobic phase
 - Anaerobic phase
 - Stable phase
 - Feeding phase
- Corn silage has the best fermentation and preservation characteristics with minimal seepage when harvested at 35% dry matter.
- Nitrogen fixing bacteria are associated with legumes like alfalfa and soybeans.
- Most proteins contain 16% nitrogen.
- A cow's two sources of amino acids are rumen undegraded protein and rumen microbes.
- Hydrogen, oxygen, carbon, and nitrogen are four basic elements that are present in all proteins.
- The three basic elements contained in carbohydrates are carbon, hydrogen, and oxygen.
- The main products of carbohydrate digestion by rumen microorganisms are volatile fatty acids. The three major volatile fatty acids produced in the rumen are:
 - Acetic acid (Acetate)
 - Butyric acid (Butyrate)
 - Propionic acid (Propionate)
- Propionic acid is the volatile fatty acid produced from the digestion of starch and grain.
- Acetic acid is the volatile fatty acid that is the primary source of energy and milk fat.
- Milk urea nitrogen (MUN) indicates how well nitrogen and fermentable carbohydrates are balanced in the ration.
- The first edition of the National Research Council's *Nutrient Requirements of Dairy Cattle* was published in 1945. It was most recently updated in 2001 (7th Revised Edition).
- Surveys indicate that the most common reason that farm owners adopted grazing was to reduce costs. The two main costs cited for reduction were feed and labor.
- Energy is most likely to be the limiting nutrient for the high producing dairy cow.
- Performance as seen through growth or milk production will be reduced the quickest through a lack of water as compared to other nutrients.



Virginia 4-H Dairy Quiz Bowl Team Study Materials
Section 4 – Nutrition, Feeds, and Feeding

- Factors that influence the amount of water consumed by dairy cattle:
 - Body size
 - Environmental temperature
 - Water temperature
 - Relative humidity
 - Breed
 - Diet
 - Milk production
 - Water quality
- Fat soluble vitamins:
 - Vitamin A
 - Vitamin D
 - Vitamin E
 - Vitamin K
- Water soluble vitamins
 - B complex Vitamins
 - Vitamin C
- The B complex vitamins are:
 - B1 - Thiamine
 - B2 - Riboflavin
 - Niacin
 - Pantothenic Acid
 - Biotin
 - Folic Acid
 - Choline
 - B12
- Beta-carotene is found in most grasses and legumes and is a precursor of Vitamin A.
- Vitamin E and selenium have similar functions.
- Vitamin K plays a role in the coagulation of blood.
- Niacin is a water-soluble vitamin added to feeds to aid in the prevention of ketosis.
- Macrominerals required by dairy cows:
 - Calcium
 - Chloride
 - Magnesium
 - Phosphorus
 - Potassium
 - Sodium
 - Sulfur
- Trace minerals (microminerals) required by dairy cows:
 - Cobalt
 - Copper
 - Iodine
 - Iron
 - Manganese
 - Selenium
 - Zinc
- Potassium is the mineral that the dairy cow needs in the greatest quantity.
- Limestone is a mineral supplement that is an excellent source of calcium.
- The optimum calcium to phosphorus ratio in the lactating cow ration is 1.5-2.0 to 1.
- The two most limiting amino acids in dairy cattle nutrition are lysine and methionine.
- The most concentrated energy source in dairy cattle rations is fat.
- Molasses are often added to dairy cattle rations to improve taste or palatability and to reduce dustiness.
- Dietary cation-anion difference (DCAD) is a helpful tool in milk fever prevention. The four elements used to calculate DCAD are sodium, potassium, chloride, and sulfur.
- Ionic salts used in pre-fresh cow rations to help prepare cows for the sudden demand for blood calcium:
 - Ammonium chloride
 - Ammonium sulfate
 - Calcium chloride
 - Calcium sulfate
 - Magnesium chloride
 - Magnesium sulfate
- A young calf has a dietary requirement for the B complex vitamins and Vitamin K while the mature cow does not because young calves do not have rumen microorganisms functioning to synthesize these vitamins.
- The digestibility of plant fiber decreases as the plant increases in age or in hot weather.
- The three compounds that make up neutral detergent fiber (NDF) are:
 - Cellulose
 - Hemicellulose
 - Lignin
- Sodium bicarbonate and magnesium oxide are feed additives that are sometimes included in the ration to maintain or increase fat test.
- Cold flow ammonia is added to corn silage to increase the crude protein content.

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Section 4 – Nutrition, Feeds, and Feeding

- The recommended maximum level of fat in a lactating cow's ration is 5 to 7% of ration dry matter.
- Heat damage in haylage is indicated by dark color and burnt odor.
- Raw soybeans will turn rancid if they are ground.
- Characteristics of corn that have been introduced through transgenics:
 - Corn borer resistance
 - Herbicide resistance
 - High oil content
 - Waxy corn
- Bt corn hybrids were genetically engineered to provide resistance to the European corn borer.
- Mycotoxins come from molds.
- Major nutrients contained in feedstuffs:
 - Energy (carbohydrates and fats)
 - Protein
 - Vitamins
 - Minerals
 - Water
- Feed is the largest cost in milk production.
- Factors required to determine the nutrient requirements of a lactating cow:
 - Body weight
 - Age
 - Milk production level
 - Fat test
 - Stage of lactation
 - Reproductive status
 - Body condition
 - Environmental temperature
- Immature hay is more valuable as a feed for dairy cows than mature hay because of...
 - Higher nutrient content
 - Higher digestibility
 - Greater voluntary intake (more palatable)
 - Lower fiber
- Fiber is needed in dairy cattle rations to:
 - Maximize dry matter and energy intakes
 - Maintain normal rumen function
 - Maintain normal milkfat percentage
 - Protect against postcalving difficulties
- Of the different amino acids needed to make the required proteins, ten amino acids are considered to be "essential" for milking cows and must be provided in the diet.
- Even distribution of silage within the silo to exclude air is an important part of making good quality silage.
- If a farmer said he was feeding a 16% dairy feed, the 16% would refer to crude protein.
- The minimum recommended rate of feeding from an upright silo is 2" per day.
- The main processes for which a cow uses her feed are:
 - Growth
 - Maintenance
 - Production
 - Reproduction
- Feeding urea to dairy cattle should be limited to 1.5% of the total grain mix.
- The acid detergent fiber (ADF) content of a high producing cow's ration should be 18-21%.
- Peak milk production usually occurs 2-3 weeks before peak feed intake.
- Types of storage facilities for silage:
 - Bunker silo
 - Trench silo
 - Upright/tower silo
 - Oxygen limiting silo
 - Plastic bag
- Forms of fat used in dairy cattle rations:
 - Animal fats (tallow, lard)
 - Protected fats (calcium soaps)
 - Whole oil seeds (whole cottonseeds, whole soybeans)

- To determine the crude protein content of a feed, multiply the nitrogen fraction by 6.25.
- Lactic acid is the most desirable acid produced during ensiling. Butyric acid is an undesirable acid.
- Phosphorus is critical for the establishment of legumes.
- Advantages of feeding a total mixed ration (TMR):
 - Eliminate selective eating
 - Consistent ration
 - Higher dry matter intake
 - Free-choice mineral not needed
 - Higher milk production
 - Lower percent fiber needed in ration
 - Easier to balance precisely
 - Fewer digestive upsets
 - Can feed a variety of by-products
- By-products can be successfully used as feed for dairy cattle. The following factors should be considered before including a by-product in the ration:
 - Nutrient composition
 - Cost
 - Availability
 - Palatability
 - Storage
 - Consistency
 - Ability to feed (use)
- By-product feedstuffs commonly used in Virginia:
 - Cottonseed hulls
 - Cottonseed meal
 - Distillers grains
 - Dried brewers grain
 - Hominy feed
 - Peanut meal
 - Soybean hulls
 - Soybean meal
 - Wet brewers grain
 - Wheat middlings
 - Whole cottonseed
- Grains that can be fed to dairy cattle with no processing:
 - Corn
 - Oats
 - Barley
 - Wheat
 - Triticale
- Factors that may be considered by a dairy producer when grouping the milking herd:
 - Body condition
 - Lactation number
 - Production
 - Reproductive status
 - Stage of lactation
- Whole oil seeds contain high levels of unsaturated fatty acids.
- Proteins derived from poultry, marine or vegetable sources can be used in ruminant rations. Proteins derived from ruminant sources cannot be used in ruminant rations because of concerns associated with Mad Cow Disease.
- Fats have 2.25 times the energy value of starch.
- Uses for a forage particle size separator:
 - Evaluate whether there is enough long fiber in the ration
 - Check for overmixing and particle size reduction
 - Develop baseline particle size information for comparison
 - Check ration uniformity
 - Determine optimum mixing order
 - Evaluate whether particle size changes with hay quality
 - Check for sorting
- When sampling square bales of hay, 20 bales should be sampled.
- The general recommendation for the theoretical length of cut for corn silage harvested with a conventional harvester is 3/8 inch. The recommended chop length for corn silage harvested with a harvester fitted with a crop processor is 3/4-inch theoretical length of cut.
- Brown midrib corn varieties have lower lignin concentrations, which raise fiber digestibility.