Week of April 6-10, 2020

COON

All of these assignments are on google classroom. You must pick one of the 3 listed and complete by next Monday, April 13 for credit. If you would like to use google docs to complete the work that would be most efficient. However, paper copies can be returned to the school.

Class	Choice 1	Choice 2	Choice 3 (Enrichment)
Ag Science	Anatomy of Animal Reproduction Systems Part 1	Reproductive Development of Animals Part 2	FFA journal
Ag Business Mang	Personal Finances	Time Value of Money	Chart work experiences
BSAA	Heredity and DNA	Animal Growth and Development	Animal Nutrition
Landscape Design	Turf Grass part 1	Turf Grass part 2	Analyzing a Landscape
Intro To Ag	History of Ag part 1	History of Ag part 2	Supervised Ag Experience Part 1
Ag Mech.	Principles of Small Engines	Small Engines and their components	Small engines tear down

April 6-10th

Mr. Coon Bsaa Date Name

Heredity worksheet

Checking Your Knowledge:

1. What is heredity, and what role does DNA play?

2. Differentiate between genes, DNA, and chromosomes.

3. Why do chromosomes occur in pairs?

Heredity and DNA

Do you look like anyone else in your family? Your mother or father? Your brother or sister? Chances are that a lot of qualities from both your mother and father can be seen in you and your siblings! That is because offspring inherit many characteristics from their parents. Let's explore heredity and the role DNA plays in it.

Objective:

Determine the role of DNA in heredity.

Key Terms:

adenine
chromosomes
cytosine
DNA
fertilization
genes
genetic code
guanine
heredity
homologous chromosomes
locus
ovum
sperm
thymine
zygote

Heredity

Heredity is the passing of traits from one generation to the next. Unlike heredity in plants, all heredity in animals occurs through sexual reproduction. This means that the **sperm** (male sex cell, or gamete) must join with the **ovum** (female sex cell, or gamete) during the process of **fertilization**. This union of sperm and ovum creates a **zygote**.

The sperm cell carries genetic material from the father, one-half the chromosomes of the offspring, while the ovum carries genetic material from the mother, again one-half the chromosomes of the offspring. These chromosomes join to create a "blueprint" of a new animal—the offspring of the two parents. Although each parent contributes half the chromosomes, the resulting offspring may have traits that more closely resemble one parent than the other.

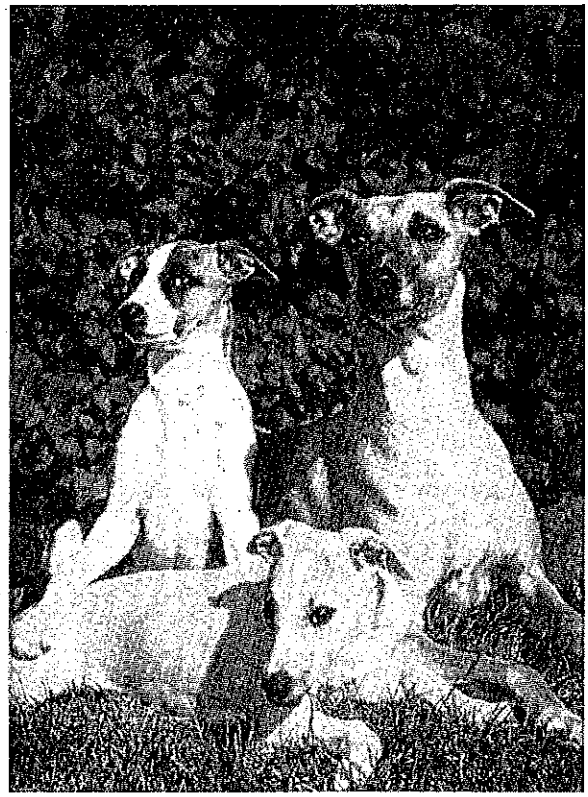


FIGURE 1. These Whippet puppies received half their chromosomes from their mother and half from their father.

DNA

The nucleus of nearly every animal cell contains **DNA** (deoxyribonucleic acid), along with other protein, within **chromosomes**. Each animal has a set number of chromosomes, which varies by species. For instance, the domestic cat has 38 chromosomes, 19 from the father and 19 from the mother. A chicken has 78 chromosomes (39 pairs); a human has 46 chromosomes (23 pairs). The DNA consists of the basic genetic material, **genes**. The genes are the segments of chromosomes that contain heredity traits and are transmitted from the parents to form the genetic

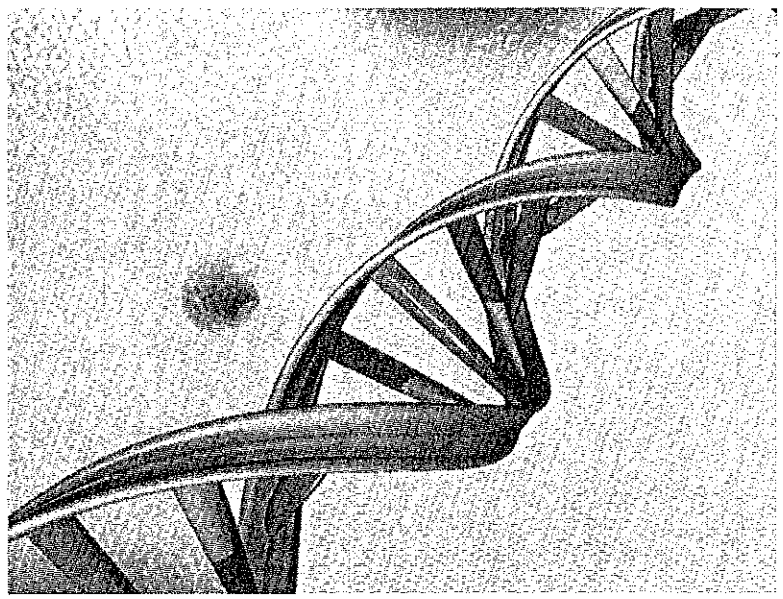


FIGURE 2. A DNA molecule is a twisted double-helix structure with nitrogen bases holding the strands together. (Courtesy, Agricultural Research Service, USDA)

material of the offspring. Each DNA molecule consists of two strands twisted into a double helix. These strands consist of nucleotide bases, made of sugar molecules connected by phosphates, held together by nitrogen bases. The four nitrogen bases found in DNA are **adenine**, **thymine**, **cytosine**, and **guanine**. The sequence of the bases along a DNA molecule determines the **genetic code** of the organism.

The **locus**, or location of the gene on the chromosome, helps determine the genetic information being passed to the offspring. When two genes for the same characteristic have the same locus on two chromosomes that are the same size, they are called **homologous chromosomes**. One of the chromosomes is from the male parent, the other from the female parent.

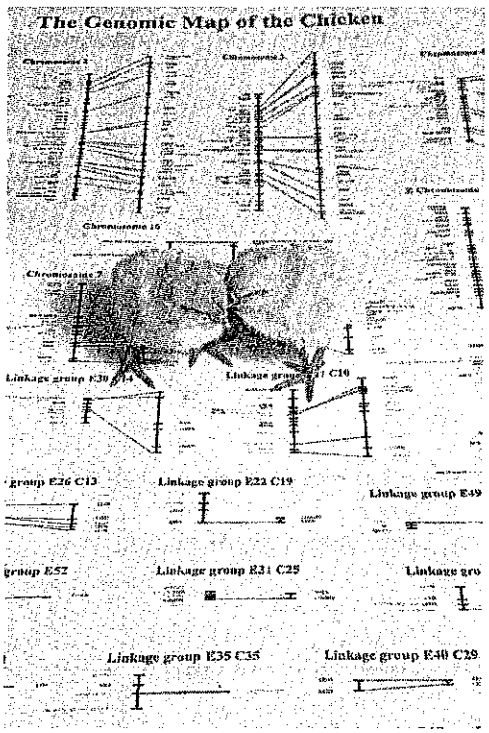


FIGURE 3. Each of these chicks has 78 chromosomes that make up its genome. (Courtesy, Agricultural Research Service, USDA)

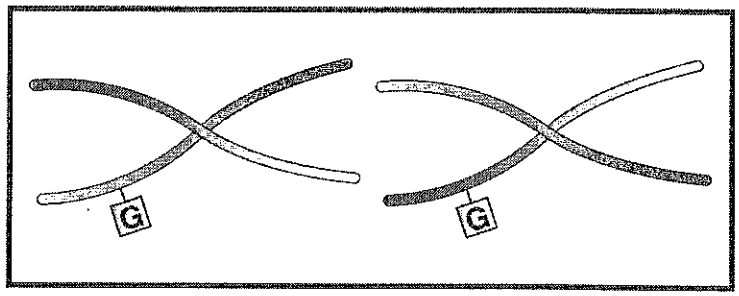


FIGURE 4. When two chromosomes have genes for the same characteristic at the same location on the chromosomes, they are considered homologous chromosomes.

UNDER INVESTIGATION...

LAB CONNECTION: DNA Extraction—Calf Thymus

Deoxyribonucleic acid (DNA) is the basis for transmitting traits from one generation to the next. However, removing DNA from one organism and inserting it into another has created advancements in medicine. For example, specific bacteria given human DNA are now producing insulin needed by diabetics.

A way to gain greater understanding of the structure of DNA is by extracting a mass of DNA molecules from animal cells. Use a material such as the thymus gland of a calf, which has large nuclei. In the first step, crush the thymus to break open cell membranes. Add a soapy solution to break down the nuclear membrane and release the DNA. Then, strain the solution through cheesecloth to separate the nuclear materials from large "chunks" of thymus. Then, transfer a portion to a test tube. Add a salt solution to promote bonding of the ends of DNA molecules to one another. After a few moments, trickle ice-cold 95 percent ethanol into the test tube. The ethanol causes DNA to precipitate from solution and form a cloudy mass. Collect the DNA by twirling a clean glass rod or pipette in the solution.

Summary:

Heredity of traits is dependent upon the DNA transferred from the parents to the offspring during fertilization. Each parent provides half the offspring's genetic material. Genes are the basic units of heredity.

Checking Your Knowledge:

1. What is heredity, and what role does DNA play?
2. Differentiate between genes, DNA, and chromosomes.
3. Why do chromosomes occur in pairs?

Expanding Your Knowledge:

Using paper or some other material, construct a model of a DNA molecule.

Web Links:

Genetic Science Learning Center

http://gslc.genetics.utah.edu/units/disorders/karyotype/
http://gslc.genetics.utah.edu/units/basics/tour/

Agricultural Career Profiles

http://www.mycaert.com/career-profiles

April 6-10th

Jeff Coon BSAA Name Date

Checking Your Knowledge:

1. Compare and contrast growth and development.

2. What is the difference between hypertrophy and hyperplasia?

3. Explain the stages of prenatal growth.

4. When does fertilization occur?

Animal Growth and Development

PRODUCERS are very interested in the growth and development of their animals. An understanding of how growth and development occur and what factors influence them can be the difference between profit and loss for producers. Those producers who do not have a complete understanding of animal growth and development will not be in business for long.

Objective:

Differentiate between growth and development and identify the stages of growth.

Key Terms:

development
ectoderm
endoderm
growth
hyperplasia
hypertrophy
mesoderm
mitosis
postnatal growth
prenatal growth

Growth and Development

Animal growth is of major interest to an animal producer. Efficient growth can mean the difference between profit and loss on an animal raised for food. **Growth** is the process by

which an animal increases in size and weight. Animals that produce meat, wool, or eggs must grow to maximize production.

Animal development is a critical function throughout an animal's life. **Development** is an animal's passing from one stage of growth to the next. A young calf is unable to produce milk and therefore must develop into a mature cow before that function is possible. Likewise, a chick is unable to produce eggs. After growth and development, the chicken will be capable of egg production.

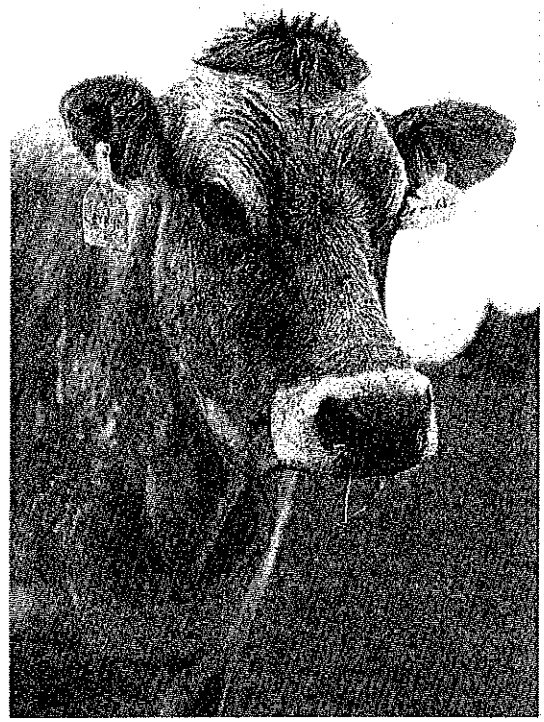


FIGURE 1. Dairy heifers will not produce milk until they give birth. (Courtesy, Agricultural Research Service, USDA)

Stages of Growth

Animal growth is the result of cell growth and multiplication. **Hypertrophy** is the increase in the size of cells. **Hyperplasia** is the increase in the number of cells. Hypertrophy is the primary cause of growth in older animals, while hyperplasia is responsible for most growth in young animals.

Growth occurs in two basic stages: prenatal and postnatal. **Prenatal growth** is growth that occurs while a fetus is developing, before birth or hatching. **Postnatal growth** is growth that occurs after birth or hatching.

PRENATAL GROWTH

Prenatal growth begins with fertilization of the egg cell. The resulting zygote is a single cell that begins undergoing mitosis. **Mitosis** is another name for cell division. The result of mitosis is two copies of the original cells.

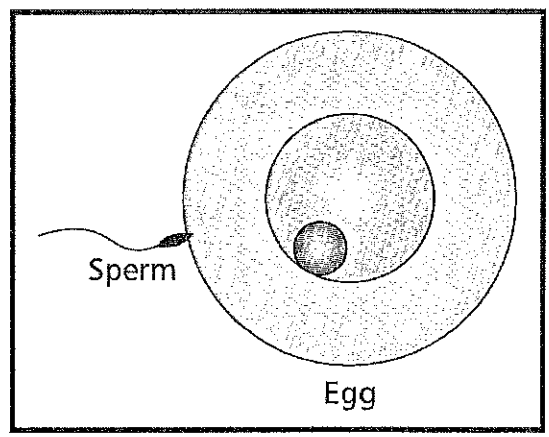


FIGURE 2. Fertilization occurs when the sperm cell and the egg cell unite. Only one sperm cell may enter the egg cell. This is the beginning of the ovum stage of growth.

Ovum Stage

The ovum stage of growth occurs just after fertilization. The zygote is rapidly dividing, creating a mass of cells known as a morula. The cells of the morula continue dividing and collecting into a spherical mass called a blastula. The blastula has a hollow center filled with fluid and an outer layer of cells. The formation of the blastula is the final step

of the ovum stage. This stage typically lasts around 10 days in most livestock species. The cells at this stage are nearly identical.

Embryonic Stage

The embryonic stage begins with the differentiation of cells in the blastula. The cells in the blastula begin to form organs and other specialized tissues. Differentiation results in the formation of tissues that carry out specific functions. For example, muscle tissue functions differently than bone tissue.

The blastula develops into three layers: the ectoderm, the endoderm, and the mesoderm. Each layer is the beginning of distinct structures for the organism.

- **Ectoderm**—The **ectoderm** is the outer layer of the blastula. The epidermal ectoderm will develop into skin and hair or feathers. The neural ectoderm will develop into the nervous system, including the spinal cord and the brain.
- **Endoderm**—The **endoderm** is the center portion of the blastula. This tissue develops into structures like the lungs, the bladder, and the lining of the digestive tract. The endoderm also contains the digestive cavity for the blastula.
- **Mesoderm**—The **mesoderm** is the layer of the blastula that will develop into the other major organ systems. The circulatory system, the reproductive system, the skeletal system, and the muscular system are derived from the mesoderm.

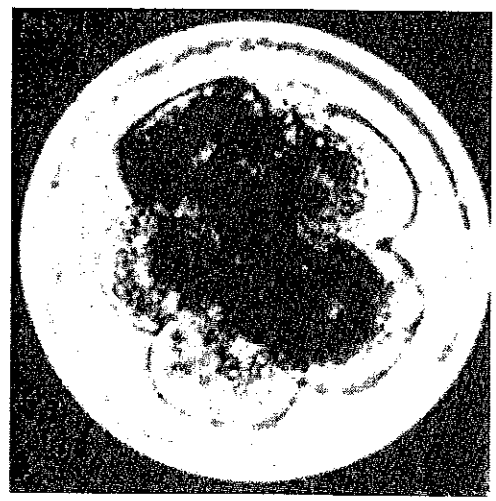


FIGURE 3. The embryo begins to develop into specialized tissues that will carry out specific functions.

This stage of development lasts for 30 to 40 days in livestock mammals and only a few days in poultry.

Fetal Stage

The fetal stage is characterized by the development of the organs and organ systems. The first organs to develop are the liver, the heart, and the kidneys. These organs are necessary for the fetus to utilize fully the nutrients passed to it from the mother. These organs are also required to function quickly after the animal is born.

POSTNATAL GROWTH

As the animal falls to the ground during the birth process, the lungs are jolted to begin breathing. This begins the postnatal growth stage. Immediately after birth, the organs complete their development. The order of development is dependent on the importance of the various systems.

UNDER INVESTIGATION...

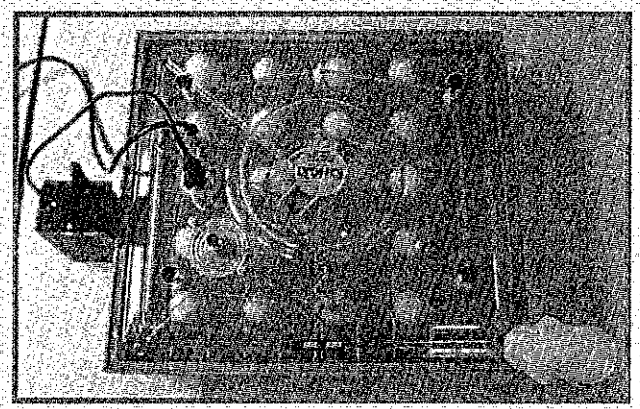
LABORATORY CONNECTION: Chick Embryology and Hatching and Brooding Chicks

Poultry producers are particularly concerned with the hatchability of eggs. Hatchability refers to the number of live chicks produced in a set number of eggs. Hatchability should reach 90 percent or more. To ensure that level of success, numerous factors are considered in the incubation process.

Using an inexpensive incubator and fertile eggs, study the development of a chick from setting the eggs until hatch. Since the incubation of chicken eggs is 21 days on average, the complete study can be done within a relatively short period.

When you candle an egg, you can view the structures forming in the developing embryo. You can then make connections to the prenatal development of other animals.

After the chicks have hatched, proper brooding ensures they get off to a good start. Note the care needed in the early stages of life.



A classroom incubator is used to demonstrate embryology and incubation. Care must be taken to monitor temperature and humidity.

Following the development of organs, the animal begins to grow rapidly. This growth concludes when the animal reaches puberty. The animal consumes high-protein feeds to meet the nutritional needs of growth. Muscle and bone make up most of an animal's weight. Muscle cells do not undergo mitosis; instead, they grow only in size through hypertrophy. Bone cells grow by hyperplasia. They grow at the end of the bone as cartilage turns to bone tissue.

Like humans, livestock animals gain weight at different rates. The growth is often illustrated using a standard growth curve. The growth curve depicts three stages of postnatal growth. The early stage of growth, organ development, yields little in the way of increased size or weight. During the middle stage, growth occurs rapidly. An animal in this stage exhibits the best feed conversion efficiency that it will have anytime in its life. Feed conversion efficiency measures the amount of feed it takes to put a pound of gain on an animal. It is during this stage

Dressing Percentage

Swine	72
Broiler	70
Beef	64
Lamb	52

FIGURE 4. Livestock species yield different dressing percentages. Dressing percentage represents the percentage of the live weight that results in a carcass after harvest. Meat processors want the highest dressing percentage possible.

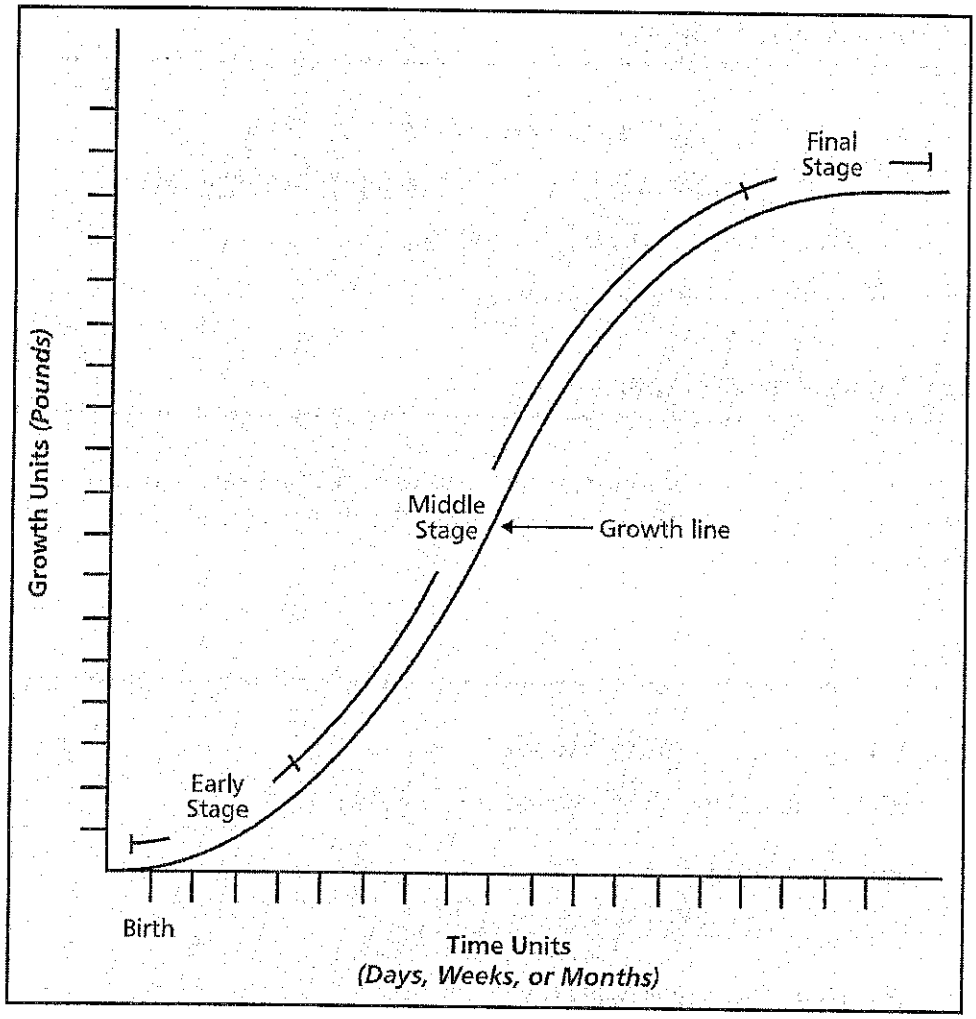


FIGURE 5. A typical growth curve. Note the rate of growth changes as the animal ages.

that a meat animal nears its marketable weight. The final stage of growth is the time when an animal reaches its mature weight. As an animal reaches its mature weight, its efficiency is reduced, meaning the animal gains weight less rapidly and requires more feed to put that weight on. When a nonmarket animal reaches mature weight, its feed intake needs are for body maintenance and reproduction.

Summary:

Growth in animals is increase in their size or weight. Development includes progressions of animals through different stages of their life. Both growth and development are important to producers in making management decisions.

Checking Your Knowledge:

1. Compare and contrast growth and development.
2. What is the difference between hypertrophy and hyperplasia?
3. Explain the stages of prenatal growth.
4. When does fertilization occur?

Expanding Your Knowledge:

Using the Internet, chart the growth curves of different livestock species. Compare them against the growth curve of humans. Report any similarities and differences to your class.

Web Links:

Beckman Institute "Chickscope"
http://chickscope.beckman.uiuc.edu/explore/

Animal Cell Mitosis
http://www.cellsalive.com/mitosis.htm

Agricultural Career Profiles
http://www.mycaert.com/career-profiles

April 6-10th

Mr. Coon BSAA Name Date

Animal Nutrition worksheet

Checking Your Knowledge:

1. Identify and describe the use of the six groups of nutrients needed by animals.

2. Describe the five uses of nutrients in the body.

3. List four fat-soluble vitamins.

4. What is the difference between an amino acid and a protein?

Nutrient Needs of Animals

LIKE humans, livestock and pets also require certain levels of nutrients. To maximize their growth or production, they must receive a complete and balanced diet. Animals in the wild are able to scour their habitat to find the food sources they need. Livestock and pets rely on us to provide for their nutritional needs.

Objective:

Identify the nutrients needed by animals.

Key Terms:

amino acids
carbohydrates
disaccharides
fats and oils
finish
growth
macrominerals
maintenance
microminerals
minerals
monosaccharides
nutrient
polysaccharides
production
protein
reproduction
vitamins

Nutrient Needs

A **nutrient** is a substance in food that is needed to support life. Nutrients are often assimilated into cells and tissues.

Nutrients are needed in the body for five primary purposes: maintenance, growth, production, reproduction, and finish. **Maintenance** is the minimum nutrient requirement for an animal that will maintain its current body without growth or deterioration. Maintenance includes regulating body temperature, repairing damaged cells and tissues, keeping the body processes functional, and allowing for minimal movement.

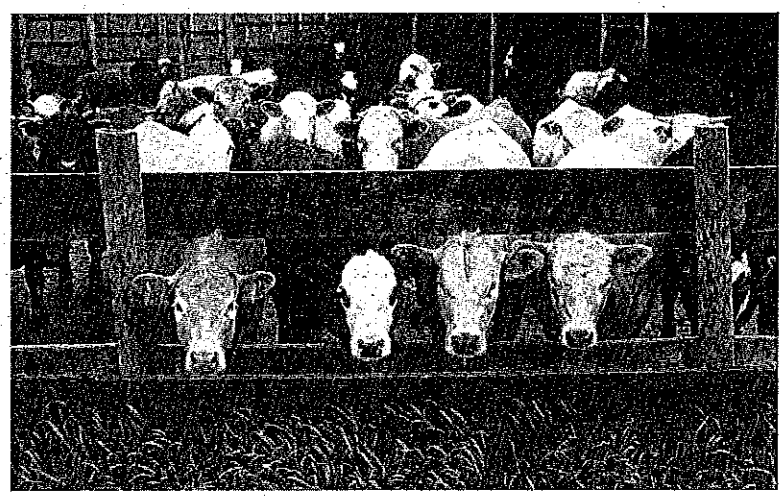


FIGURE 1. Animals receive nutrients from their feed and water. (Courtesy, Agricultural Research Service, USDA)

Growth is the increase in size and weight of an animal. It is the development of the animal through its typical life cycle. For example, an animal is growing when it reaches puberty. While growth will occur under less than desirable nutritional situations, a proper diet will allow an animal to grow rapidly and maximize its potential. Poor nutrition in the growth stage can result in poor performance later in the life of the animal, either as an animal fed-out for food purposes or as a mature animal in the breeding herd.

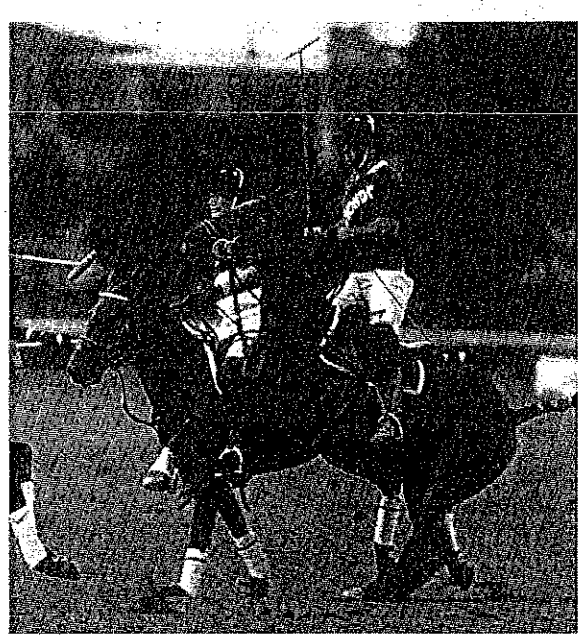


FIGURE 2. The diet of polo ponies must provide the nutrients needed to move and carry the riders.

Production results in the manufacture of livestock products, such as milk, wool, and eggs. Production requires large quantities of protein and energy nutrients. Proper nutrition allows animals to produce the quantity and quality of animal products that are most productive for their owner.

Reproduction involves the breeding process and production of offspring. Nutrients are critical to ensure gametes are produced and that an embryo will develop normally. Typically, animals in the reproductive stage will be fed more protein and key vitamins and minerals. Proper nutrition in this stage is needed long before breeding actually takes place. Animals must be in

ON THE JOB...

CAREER CONNECTION: Animal Nutritionist

Animals must be fed a complete diet to grow and produce efficiently. Animal nutritionists study animal diets to determine which ones allow animals to grow fastest while requiring the least amount of feed. They may find that two different feedstuffs can bring animals to a target weight but that one can do so with a lesser amount than the other. Animal nutritionists would utilize this information when formulating rations for producers and feed companies.

Feed manufacturers and research facilities, like universities, commonly employ animal nutritionists. As researchers, animal nutritionists may look for ways to make feedstuffs more palatable and more desirable for animals. Additives like molasses are often used to achieve this goal.

An animal nutritionist must have a strong background in science and mathematics. Nutritionists use data from feeding trials and other experiments to measure the efficiency of animal feeds and feeding methods. A thorough understanding of digestion and metabolism in animals is required. Animal nutritionists must also understand how to design experiments and draw conclusions.

Animal nutritionists determine the best feeds for animals. Here a nutritionist is attaching a device that will track the grazing patterns of this animal. (Courtesy, Agricultural Research Service, USDA)

proper condition to be able to breed or be bred. Re-breeding success of a mother, particularly after she births her first offspring, has a direct correlation to her body condition and nutritional intake. Nutrition of a gestating mother is important in order for her to deliver a quality offspring.

Finish is the deposition of a layer of fat on the animal's body. Some degree of finish is desirable for meat animals. Diets are developed specifically for different stages of animal production to get the correct amount of growth with the ideal amount of finish. Poor nutrition of market animals produced for food results in a lack of finish. This is because all energy is utilized for body function and muscle development. The result is little or no finish, which translates into lower-quality carcasses that are worth less money. Finish also refers to the "fleshiness," or fat, on breeding animals. Animals exposed to the extreme conditions of the outdoors use the fat layer as insulation.

Nutrient Classes

Animals require certain nutrients in the proper amounts and balance to maintain health. A deficiency or overabundance of one nutrient can reduce growth rate or have other effects, like reproductive failures. Producers must formulate rations to maximize animal growth and health.

All animals require nutrients from each of the following six groups: carbohydrates, fats and oils, protein, vitamins, minerals, and water.

CARBOHYDRATES

Carbohydrates are organic substances that provide energy to animals when digested. Carbohydrates are the primary source of energy in animal diets. They are composed of carbon, oxygen, and hydrogen. Carbohydrates are classified as monosaccharides, disaccharides, and polysaccharides.

Monosaccharides are also known as simple sugars. Simple sugars require minimal digestion to be absorbed. They are often referred to as quick energy. Glucose and fructose are examples of simple sugars.

Disaccharides are double sugars. Sucrose is a double sugar. Disaccharides are also readily digested in both ruminant and nonruminant systems.

Polysaccharides are often called complex carbohydrates. Starches and fiber are examples. Starches are converted to sugars during digestion. Fiber is plant material that is not readily digestible. Fiber is necessary for a ruminant to maintain the health and function of the rumen.

Carbohydrates must be fed daily, as they are not stored in the animal. Excess sugars are stored in the animal as fat.

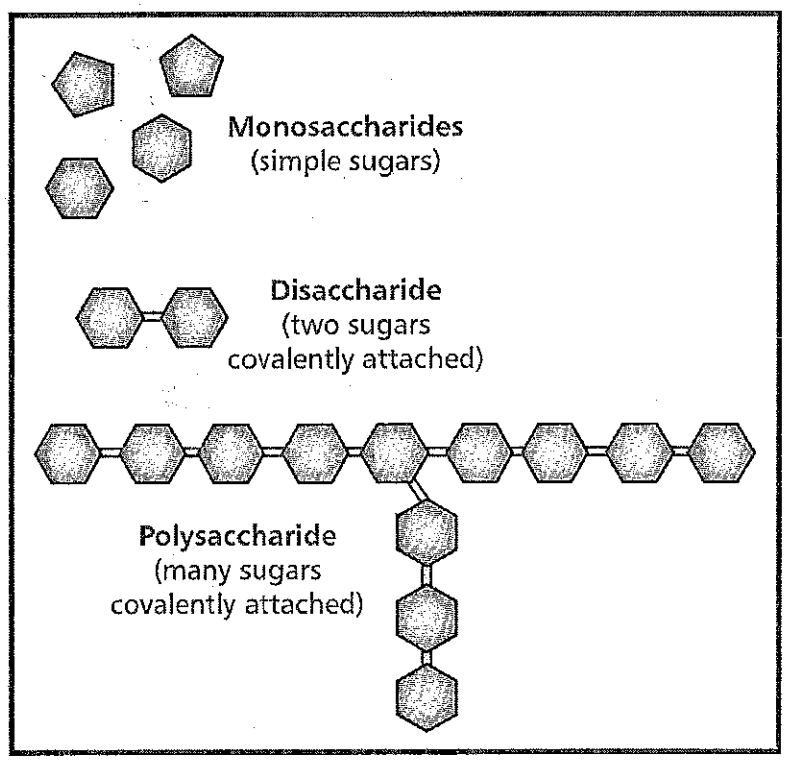


FIGURE 3. Examples of carbohydrates.

FATS AND OILS

Fats and oils are another energy source. Carbon, hydrogen, and oxygen make up fats. Fats contain 2.25 times more energy than carbohydrates. However, fats are not as easily digested as carbohydrates and are typically less of a concern when formulating a ration.

Fats help provide healthy skin and carry fat-soluble vitamins. Vitamins A, K, D, and E are soluble in fat. Fats are also necessary to maintain the nervous system and to add flavor to feed, making it more palatable.

PROTEIN

Protein is a nutrient needed to build and repair tissue. It is especially necessary during growth and gestation. Proteins are commonly called the building blocks of the body. Proteins are made of carbon, hydrogen, oxygen, and nitrogen.

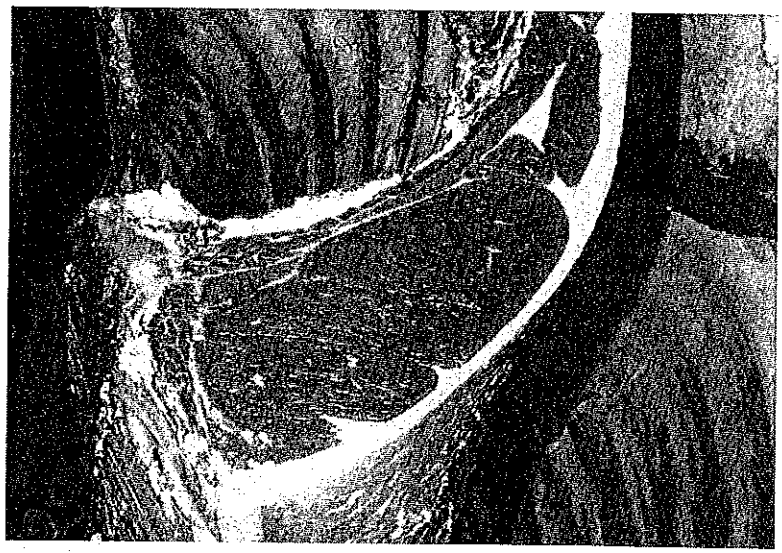


FIGURE 4. Proteins form the building blocks for muscle tissue. (Courtesy, Agricultural Research Service, USDA)

Amino acids are the components that make proteins. To be absorbed, proteins consumed in feed must be digested into their component amino acids. The amino acids are then used by cells to manufacture protein. Ten amino acids are essential for animals. Arginine, histidine, isoleucine, leucine, lysine, methionine, phenylalanine, threonine, tryptophan, and valine are the essential amino acids. They are necessary for the synthesis of the other 13 amino acids found in protein.

Great effort must be made to ensure enough protein is in the diet of animals. Protein deficiency is the most common deficiency in animals. Protein is often provided as a supplement to traditional feedstuffs lacking in protein. Good sources of protein include soybean meal, alfalfa meal, cottonseed meal, and fish meal.

Protein content of rations must be adjusted as animals grow. Young animals need diets with more protein to promote active growth and development.

VITAMINS

Vitamins are organic compounds used in the body to carry out specific functions. Vitamins assist in the use of energy, the regulation of body function, and the maintenance of animal health.

Vitamins are classified as fat soluble and water soluble. Fat-soluble vitamins are stored in fat and are released as needed. Fat-soluble vitamins were discussed earlier in the section on fats and oils. Water-soluble vitamins dissolve in water and include vitamin C and the B-complex vitamins. Water-soluble vitamins are not stored in the body.

Vitamins are commonly present in green plant material. As a result, ruminants get plenty of vitamins through their daily intake of grass or hay and rarely suffer from vitamin deficiency. Vitamin D is obtained naturally by animals that are exposed to the sun.

MINERALS

Minerals are inorganic elements needed for healthy bones and for regulation of body processes. Minerals must be available to animals, or poor growth, reproductive failures, and decreases in production of animal products may result. Death from mineral deficiency is rare.

Many minerals are provided through supplements. A trace mineral block is often given to grazing animals. These ruminants have a natural tendency to know when their bodies need minerals and will go to the salt or mineral block as necessary. Animals on a complete ration will often have trace minerals added to their feed.

FIGURE 5. A mineral block provides trace minerals. Note how animals have been licking at this mineral block.

Minerals are classified as macrominerals and microminerals. **Macrominerals** are needed in large quantities. **Microminerals**, also called trace minerals, are needed in small quantities. Both are necessary for the animal, just in differing amounts.

Calcium is the macromineral needed in the largest amount. It is necessary for strong bones and teeth. A deficiency of calcium in the feed causes the body to use calcium from teeth and bones to regulate other body processes.

Iron is another essential mineral. A lack of iron leads to anemia, characterized by tiredness and lethargy. Hemoglobin synthesis requires iron.

Sodium and potassium are needed to maintain proper water balance in the animal. They are also needed to transfer nutrients and waste through cell membranes.

WATER

Water is essential for animals to live. Water is found in all cells. It makes up about 75 percent of the weight of an animal. Water intake varies with an animal's use and age. Lactating or gestating animals require more water. Working animals also consume larger quantities of water.

Water is needed to regulate body temperature and promote numerous body processes. As water transfers heat and evaporates, it lowers body temperature.

Water is most commonly consumed by drinking, although feeds may also provide some water. Clean water should be provided at all times. Special care and attention are needed during weather extremes. Water freezes in the winter when temperatures dip below freezing, making it necessary to thaw or heat the water with a tank heater or provide fresh water more often. Animals getting water from a creek or pond may need a hole cut in the ice for them to be able to drink. In warm weather, animals drink more water. Free access to water is essential in the summer months.

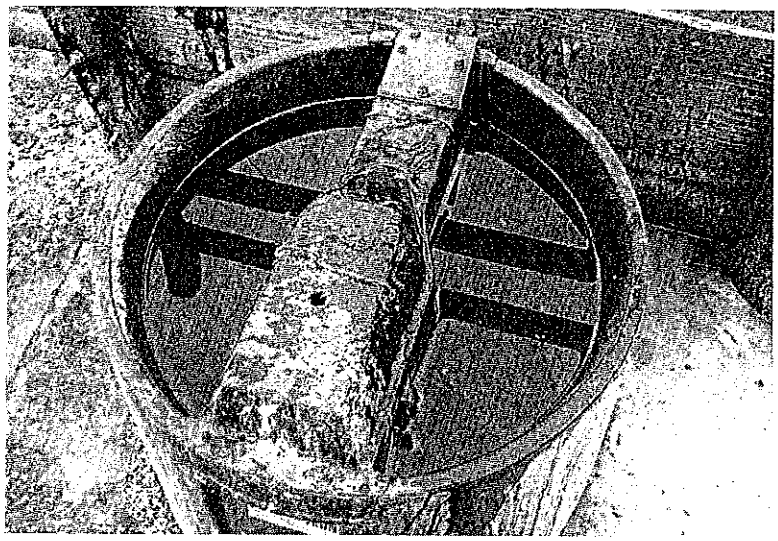


FIGURE 6. A clean source of fresh water is always necessary. Water must continually be available during the winter.

Summary:

Nutrients are substances in food needed to support life. The primary purposes of nutrients are maintenance, growth, production, reproduction, and finish. Nutrients are divided into six groups: carbohydrates, fats and oils, protein, vitamins, minerals, and water. Each nutrient group carries out specific functions necessary for the animal to survive and produce.

Checking Your Knowledge:

1. Identify and describe the use of the six groups of nutrients needed by animals.
2. Describe the five uses of nutrients in the body.
3. List four fat-soluble vitamins.
4. What is the difference between an amino acid and a protein?

Expanding Your Knowledge:

Gather feed labels and compare the nutrient levels provided by each feed.

Web Links:

Noble Foundation—Nutrient Use

http://www.noble.org/Ag/Livestock/NutrientUse/

NSTA—Animal Nutritionist

http://www.nsta.org/main/news/stories/science_teacher.php?news_story_ID=49461

Agricultural Career Profiles

http://www.mycaert.com/career-profiles