Lesson B2–2

Exploring the Dairy Industry

Unit B. Animal Science and the Industry

Problem Area 2. Identifying and Understanding the Segments of the Animal Science Industry

Lesson 2. Exploring the Dairy Industry

New Mexico Content Standard:

Pathway Strand: Animal Systems

Standard: **I:** Apply knowledge of anatomy and physiology to produce and/or manage animals in a domesticated or natural environment.

Benchmark: **I-A.** Use classification systems to explain basic functions of animal anatomy and physiology.

Performance Standard: **1.** Describe functional difference in animal structures and body systems. **2.** Classify animals according to anatomy and physiology.

Student Learning Objectives. Instruction in this lesson should result in students achieving the following objectives:

1. Identify major external parts of dairy cattle.
2. Describe major internal parts of dairy cattle.
3. Discuss selection of cattle to encourage herd improvement.
4. Explain dairy marketing options.
5. Explore the seven major breeds of dairy cattle used for milking.

List of Resources. The following resources may be useful in teaching this lesson:

Ensminger, M. E., *The Stockman's Handbook.* Danville, Illinois: Interstate Publishers, Inc. 1992 (Textbook, Index keyword: dairy)

Lee, Jasper S. *Introduction to Livestock and Companion Animals 2nd Edition.* Danville, Illinois: Interstate Publishers, Inc. 2000 (Textbook and Activity Manual Chapter 10)

Other Resources. The following resources will be useful to students and teachers:

Internet keywords: dairy, Holstein, dairy judging, milk production, dairy farm, and Dairy Herd Improvement.

List of Equipment, Tools, Supplies, and Facilities

Writing surface
Overhead projector
Transparencies from attached masters
Copies of student lab sheets

Terms. The following terms are presented in this lesson (shown in bold italics):

Artificial insemination (AI)
Beef
Butterfat
Cattle by-products
Crossbreeding
Culling
Dairy Herd Improvement (DHI)
Gestation
Mammary system
Outcrossing
Parturition
Purebreeding
Reproductive system
Testes
Veal

Interest Approach. Use an interest approach that will prepare the students for the lesson. Teachers often develop approaches for their unique class and student situations. A possible approach is included here.

Have students name as many external parts of a cow as they can. Write a collection of all the answers on an overhead or marker board. Try to get both technical and non-technical terminology. When they can no longer come up with any, pass out LS: B2–2A so students can follow along while discussing the external parts of a dairy cow.

Summary of Content and Teaching Strategies

Objective 1: Identify major external parts of dairy cattle.

Anticipated Problem: What are the major external parts of a dairy cow?

I. Dairy cattle have many external parts that we need to be able to identify in order to judge them and to describe any problems they may have. Since the main purpose of dairy cattle is to produce milk, their structure has been developed to do so more efficiently by intensive breeding programs. Some of the main external parts of a dairy cow include:

   A. Head and neck
   B. Legs and feet
   C. Udder and mammary system
   D. Rump and back
   E. Tail

Use TM: B2–2A along with LS: B2–2A to fill in all the parts of a dairy animal. You may also want to make extra copies of LS: B2–2A to use as a quiz or test.

Objective 2: Describe major internal parts of dairy cattle

Anticipated Problem: What are the major internal parts of dairy cattle?

II. Since dairy cattle are used mainly for milk production, their reproductive system and mammary system are the most important internal parts.

   A. The ***reproductive system*** is the system used to reproduce cattle by natural, in vitro, and various artificial means of insemination. It is the most important factor in improvement of the dairy breeds.
   B. The male reproductive system serves the purposes of producing sperm cells and male sex hormones. The ***testes*** are the organs that produce sperm cells and the male hormone testosterone.

C. The female reproductive system serves the purposes of producing eggs and the female sex hormones estrogen and progesterone. This system is also responsible for ***gestation***, which is the time between when the egg is fertilized by the sperm and the birth of a calf. The technical term for the birth of a calf is called ***parturition***.

D. The ***mammary system*** is the system responsible for producing milk after parturition. It includes the teats, udder, fore and rear udder attachments, alveoli, suspensory ligaments, mammary veins, and milk wells. The production of milk is dependent on management techniques including proper feeding, watering, and breeding programs.

Call your local large animal vet or slaughterhouse to obtain a real mammary system and male and female reproductive systems. Use TM: B2–2B to discuss the parts of the mammary system.

Objective 3: Discuss selection of cattle to encourage herd improvement.

Anticipated Problem: How do I select cattle to improve my herd?

III. Being able to recognize desirable and undesirable traits is important in herd improvement. You must use breeding techniques to continually improve your herd while ***culling*** or removing animals from your herd based on set criteria or other situations that may arise. There are many options to consider when trying to encourage herd improvement.

A. Using the Dairy Herd Improvement Program, also known as DHI, can help you with herd improvement. The ***Dairy Herd Improvement Program (DHI)*** is a national dairy testing and record keeping program through which you test your herd and compare it with other herds across the nation.

B. Permanently removing or culling animals from your herd is a way of opening up space in your business for more profitable animals. Some of the main things to consider before culling are milk production, reproduction history, age of animal, chronic health problems, and cows that may be a threat to workers because they are jumpy and dangerous.

C. Using a bull for natural breeding or using artificial insemination is another option to consider. ***Artificial insemination (AI)*** is a method, other than natural mating, used to bring sperm in contact with eggs. When using AI, you can select sperm from hundreds of different donors. You can look at daughters of the sire and determine if they have the traits you are trying to improve in your own herd. The disadvantage of AI is catching your cows in heat and taking the time to breed them. Keeping a bull on your farm limits your genetic pool, but saves time by letting the bull do heat detection for you.

D. Purebreeding is another means of herd improvement. ***Purebreeding*** is the mating of a purebred animal to another purebred animal. With purebreeding, you can improve your herd by keeping registration papers of the ancestry of both the sire and the dam. If you use this system, you may want to become familiar with genetics so you can pick the best sire for improvement of offspring.

E. Outcrossing is another useful system of breeding. ***Outcrossing*** is the mating of an unrelated male and female of the same breed. This method will simply help produce hybrid vigor within the breed you are outcrossing.

F. ***Crossbreeding*** is mating one breed of cattle to a recognized, but different breed. For example: You would be crossbreeding if you mated a Holstein with a Jersey animal. There are many advantages to crossbreeding including higher production and more resistance to diseases. Disadvantages include not being able to register the animals because they are not purebred and difficulty predicting what the offspring will look like.

Use TM: B2–2C to discuss herd improvement options.

Objective 4: Explain dairy marketing options.

Anticipated Problem: What are some of the marketing options with dairy cattle?

IV. Even though the dairy industry is probably best known for its milk production, there are several items in addition to milk products that are used to generate an income from a dairy farm.

A. Milk production is important to the economy because milk is used in so many different products. If you compare nutrition, milk is one of the least expensive products on the food and beverage market. Since the average American uses just under 600 pounds of milk and other milk products each year, the industry must produce over 150 million pounds annually to keep up with the demand. Milk is produced by a cow after its first calf. Cows will continue to produce milk if they are milked frequently and fed a nutritious ration for a long time. When milk production starts to drop, the cow must be bred again and have another calf to produce more milk. Some farmers also use bovine growth hormone (BGH) to increase milk production for extended periods of time.

B. ***Veal*** is the meat of young calves that are not used for replacement animals in the dairy herd. Veal calves must be fed a specific diet to keep the color of the lean meat in the carcass light pink. Vealers are usually under three months of age and have been fed a diet of milk only.

C. ***Beef*** is the meat from cattle. When cows are no longer profitable because of age, production, or reproductive problems, they are shipped to slaughter and used to make beef. Male offspring are also used for beef, if they are not kept for a breeding program. They are fed for period of time and then slaughtered for their meat and other products that are made from their hide, hoofs, and organs.

D. ***Cattle by-products*** are products made from various parts of cattle. Cattle by-products come from the carcass, fat, bones, glands, intestines, brains, heart and many other places. Some by-products are used to make cat and dog food. Others are used for medicines, marshmallows, cosmetics, furniture, and clothing.

Use TM: B2–2D to discuss money making options on a dairy farm. Use LS: B2–2B to research cattle by-products.

Objective 5: Explore the seven major breeds of dairy cattle used for milking.

Anticipated Problem: What dairy breeds are used for milking?

V. There are seven major breeds of dairy cattle that are used for milking. Each breed has advantages and disadvantages.

A. Holstein cattle are the most popular breed of dairy cattle. This breed makes up more than 90 percent of the dairy cattle in the United States. Holstein is shortened from Holstein-Friesian and came from the Netherlands in the early 1600s. They are black and white and very large. The cows can weigh upwards of 1,500 pounds and the bulls are known to get as large as 2,200 pounds. The biggest advantage of the Holstein is that they produce the largest average amount of milk per cow in comparison to other breeds. The disadvantage of the breed is even though they produce more milk, it is lower in butterfat and protein. ***Butterfat*** is simply the fat content in the milk.

B. The red and white Holstein breed evolved from the black and white Holstein. Other than the color difference, all other characteristics are very similar to the Holstein. They are large animals that have high milk production but lower butterfat and protein than other breeds.

C. Ayrshire cattle originated in Scotland and were introduced to North America in the early 1800s. The colors are light to dark cherry red, browns, and white in any combination. There is a polled strain of Ayrshire and they are most widely known for having strong feet and legs, grazing ability, and strong well-attached udders.

D. Brown Swiss dairy cattle originated in the Alps of Switzerland and were introduced in 1869 to North America. In comparison to the Holstein, Brown Swiss have a higher fat and protein ratio and a calmer disposition. Brown Swiss are solid brown in color. The browns vary greatly from very light to dark. Both the nose and tongue are black and the muzzle has a light-colored band around it.

E. Guernsey dairy cattle originated on the island of Guernsey and were brought to North America in 1831. Their color is mostly fawn with clearly defined white markings. Guernsey cattle usually have smaller calves compared to the other breeds. They are most commonly known for their milk color because it is more golden than the other breeds of dairy cattle. The popularity of this animal has declined, even though they are small, quiet cattle that are very easy to work with.

F. Jersey cattle originated on the island of Jersey and were brought to North America in 1850. They vary greatly in colors and color patterns but can be fawn, near white, grayish, with or sometimes without, white markings. The breed is especially known for their udder qualities: well-shaped with strong attachments. Even though the amount of milk is lower in Jersey cattle compared to other breeds, the butterfat and protein content is the highest. The popularity of this small breed has increased in the last few years.

G. The Milking Shorthorn originated in England and can be any combination of red and white, just red, or just white. The breed is very adaptable to a variety of situations and is

commonly used for beef production, as well as dairy. The breed is fairly new compared to other breeds since it was just designated as a dairy breed in 1968.

Use TM: B2–2E to discuss the various milking breeds.

Review/Summary. Use the student learning objectives to summarize the lesson. Have students explain the content associated with each objective. Student responses can be used to determine which objectives need to be reviewed or retaught with a different approach. Questions provided in recommended textbooks may also be used to help review.

Application. Application can involve student activity with the provided labs.

Evaluation. Evaluation should focus on student achievement of the objectives for each lesson. Various techniques can be used, such as performance on the application activities. A sample written test is attached.

Answers to Sample Test:

Part One: Matching

1 = c, 2 = g, 3 = h, 4 = a, 5 = b, 6 = d, 7 = f, 8 = e

Part Two: Completion

1. artificial insemination
2. butterfat
3. Cattle by-products
4. crossbreeding
5. beef

Part Three: Short Answer

The biggest advantage of the Holstein is they produce the largest average amount of milk per cow in comparison to other breeds. The disadvantage of the breed is while they produce more milk, it is lower in butterfat and protein.

Brown Swiss have a higher fat and protein ratio and a calmer disposition.

Guernsey cattle usually have smaller calves compared to the other breeds. They are most commonly known for their milk color; it is more golden than the milk of other breeds.

Sample Test Name _____

Test

Lesson B2–2: Exploring the Dairy Industry

Part One: Matching

Instructions. Match the term with the correct response. Write the letter of the term by the definition.

a. Mammary system
b. Parturition
c. Testes
d. Gestation
e. Purebreeding
f. Veal
g. Outcrossing
h. Reproductive system

_____ 1. The organs that produce sperm cells and the male hormone testosterone.

_____ 2. When you mate a male and female of the same breed that are not related.

_____ 3. The system used to reproduce cattle by natural, in vitro, and various artificial means of insemination.

_____ 4. The system responsible for producing milk after parturition.

_____ 5. The technical term for the birth of a calf.

_____ 6. The time between when the egg is fertilized by the sperm and the birth of a calf.

_____ 7. The meat of young calves that are not used for replacement animals in the dairy herd.

_____ 8. When you mate a purebred animal to another purebred animal.

Part Two: Completion

Instructions. Provide the word or words to complete the following statements.

1. Using a method other than natural mating to bring sperm in contact with eggs is called _____ _____.
2. Fat content in the milk is referred to as _____.
3. _____ _____ are products that are made from various parts of cattle and used to make many common items.
4. _____ is mating one breed of cattle to a recognized, but different, breed.
5. The meat from cattle is called _____.

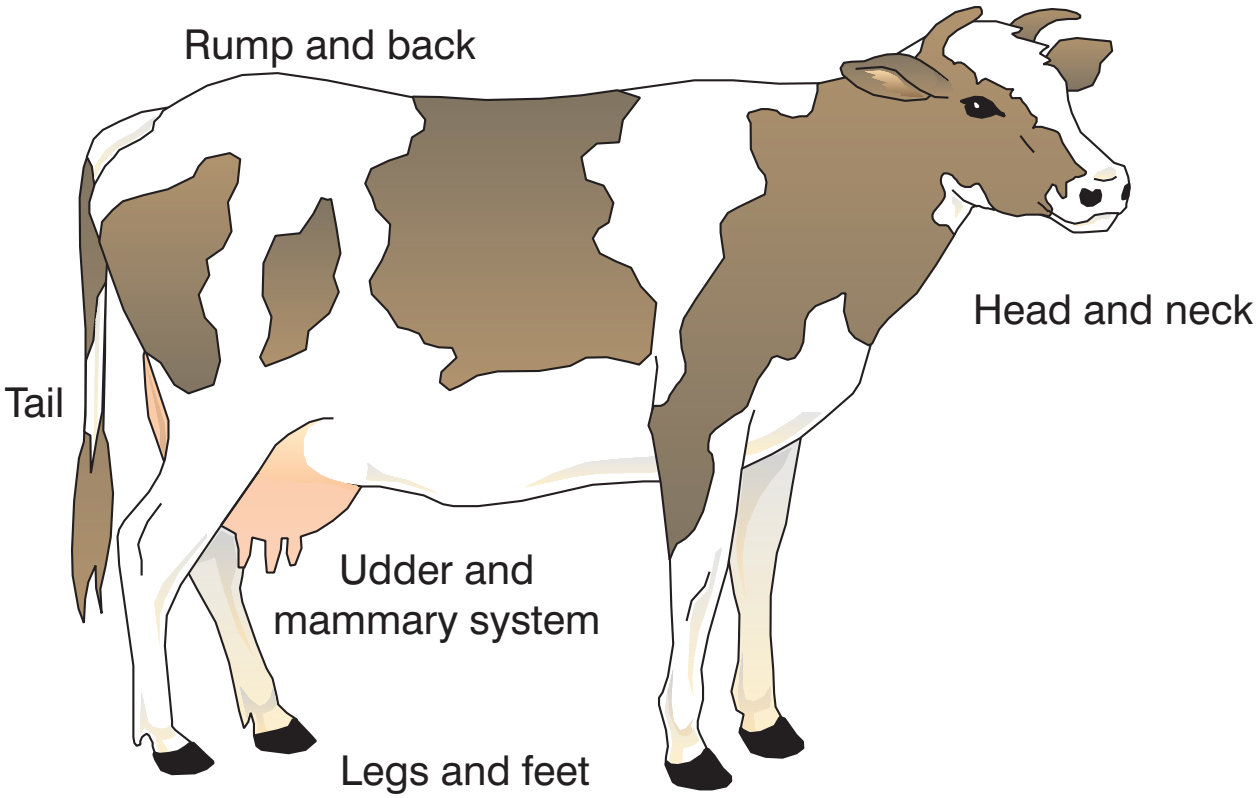
Part Three: Short Answer

Instructions. Provide information to answer the following questions.

Compare and contrast Holstein, Brown Swiss, and Guernsey cattle.

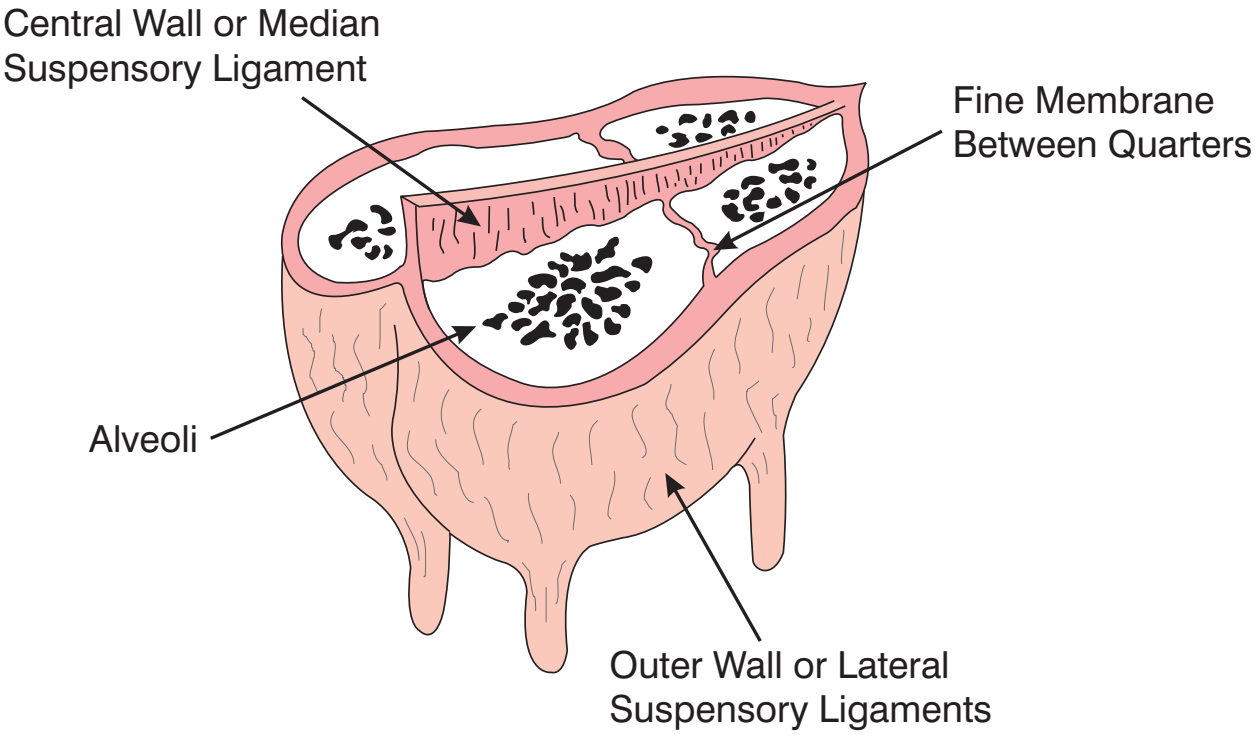
TM: B2–2A

EXTERNAL PARTS OF A DAIRY COW



TM: B2–2B

MAMMARY SYSTEM



TM: B2–2C

SELECTION OF CATTLE TO ENCOURAGE HERD IMPROVEMENT

- **DHI is a national dairy testing and record keeping program through which you test your herd and compare it with other herds across the nation.**
- **Permanently removing or culling animals from your herd is a way of opening up space in your business for more profitable animals.**
- **Using a bull for natural breeding or using artificial insemination is another option.**
- **Purebreeding is the mating of a purebred animal to another purebred animal.**
- **Outcrossing is the mating of and unrelated male and female of the same breed.**
- **Crossbreeding is mating one breed of cattle to a recognized, but different breed.**

TM: B2–2D

EXAMPLES OF MARKETABLE PRODUCTS THAT COME FROM DAIRY ANIMALS

- Cat and Dog Food
- Medicines
- Marshmallows
- Cosmetics
- Furniture
- Clothing
- Beef
- Milk
- Milk Products
- Veal

TM: B2–2E

BREEDS OF DAIRY CATTLE

- Holstein
- Red and White Holstein
- Ayrshire
- Brown Swiss
- Guernsey
- Jersey
- Milking Shorthorn

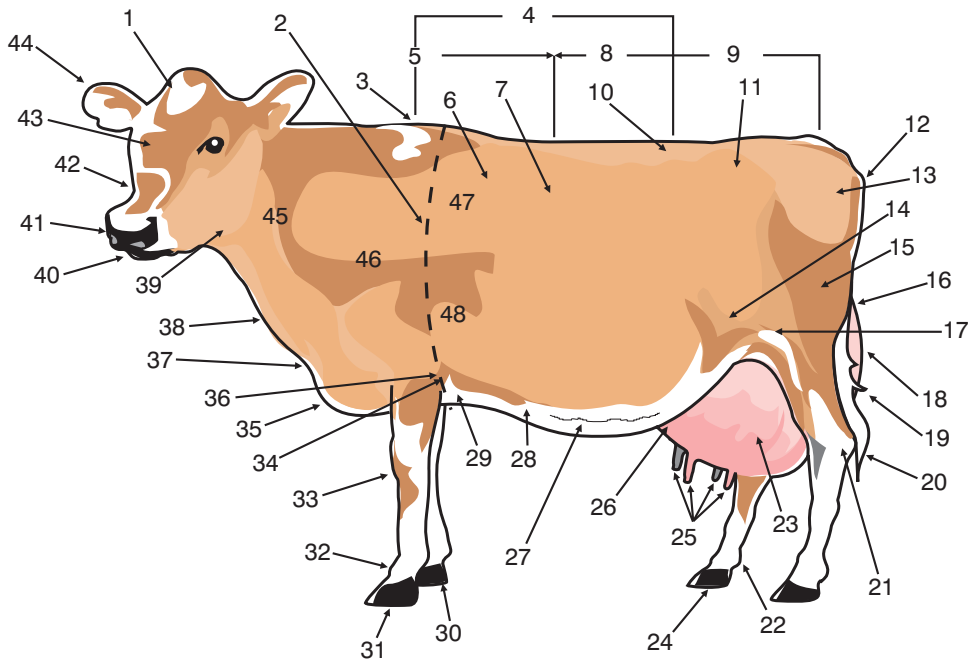
LS: B2–2A Name _____

Lab Sheet

External Parts of a Dairy Cow

Directions:

Label the parts of a dairy cow.



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47. _____
48. _____

Lab Sheet Key

External Parts of a Dairy Cow

1. Poll
2. Heart Girth
3. Withers
4. Back
5. Chine
6. Crops
7. Barrel
8. Loin
9. Rump
10. Hip or Hook
11. Thurl
12. Tailhead
13. Pinbone
14. Stifle
15. Thigh
16. Rear Udder Attachment
17. Rear Flank
18. Rear Udder
19. Tail
20. Switch
21. Hock
22. Dewclaw
23. Fore Udder
24. Hoof
25. Teats

26. Fore Udder Attachment
27. Mammary Veins
28. Milk Wells
29. Chest Floor
30. Heel
31. Sole
32. Pastern
33. Knee
34. Fore Flank
35. Brisket
36. Point of Elbow
37. Dewlap
38. Point of Shoulder
39. Jaw
40. Muzzle
41. Nostril
42. Bridge of Nose
43. Forehead
44. Ear
45. Neck
46. Shoulder Blade
47. Ribs
48. Chest

LS: B2–2B Name _____

Lab Sheet

Cattle By-products Research

Directions:

List 25 cattle by-products and the part of the animal from which they are taken.

	Cattle By-products	Animal Part
1.		
2.		
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