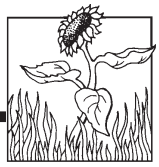


Gimme Some Milk

Objective: Students will understand the basics of milk production.

Summary: Students discuss milk products and milk production, then run a relay race that illustrates how milk is made by a cow before being transported to consumers.

Time: 1 hour

Student Grouping: Eight- to 12-person relay teams

Materials: Per team: Five paper cups, a 12 oz. can or bucket, a 5" x 5" piece of carpet or laminated paperboard, a rubber glove with pinholes in the fingers, one water bottle, assorted dairy products and utensils/cups to sample them (milk, cheese, butter, cream, yogurt, sour cream, whipped cream, ice cream, milk chocolate).

Background Information: Cows are part of the multi-stomach ruminant family. They are very talented animals, able to turn plants into milk and meat. A ruminant has a four-compartment stomach that mixes its food with microorganisms, allowing the animal to digest cellulose. Cellulose is a major part of plant tissue that we humans and other simple- (single) stomach animals cannot digest. In one day a dairy cow grazes in fields, eats 50 lbs. of silage (chopped plants and grasses) and 15 lbs. of grain, and drinks 25-30 gallons of water to produce six gallons of milk.

When a cow first swallows, a mouthful goes into the first compartment of her stomach, which is called the "rumen." Here bacteria start breaking down the plant fibers and cells. Later she will bring some of that food back up and chew it. It is now called "cud." The next time she swallows, chewed cud returns to the first compartment then goes to the second compartment of her stomach and on through the third and fourth compartments, becoming more digested as it proceeds. This process allows the cow to get all the nutrition she needs to make the plant material into milk.

Cows are milked by machines in rooms called "milking parlors." The milk is piped directly into tanks. It is tested and handled carefully to keep it from spoiling as it is next trucked to a creamery.
At the creamery, milk is processed into saleable milk and milk products.

Marin Ag. Facts: Marin County sold almost $27 million worth of milk in 2006, contributing $75 million to the local economy. About 25 percent of the San Francisco Bay Area's milk comes from our county's dairies. For over 125 years the dairy industry has been the county's biggest agricultural money-maker. There are 28 dairies here, ranking Marin as the 15th-highest milk-producing county in the state. Today most of the dairies in Marin are members of the California Cooperative Creamery in Petaluma and supply almost 40 percent of the creamery's milk.

Preparation:

1. Read through the background information so you are familiar with cows and milk-making. Review the diagram and procedure for the relay so you will be better able to explain it to your students.
2. Collect all materials. For each group, label one cup "Student #2," one cup "Chamber 1" (rumen), one cup "Chamber 2" (reticulum), one cup "Chamber 3" (omasum), and one cup "Chamber 4" (abomasum). You don't need all of the milk products, just a few to act as visual, tactile, taste-able aids to discussion. If available, some pictures of dairy cows would be good to have around.
3. Decide how you will assign the teams for the relay. If the numbers are not right for eight- member teams, you can have students double up on stomach compartment positions. These children will pour water back and forth rather than down a line.

Procedure:

1. Put out samples of dairy products. Have students sample them and discuss their common origin. Ask if anyone has ever milked a cow or seen one milked. Ask students if they could make milk.
2. Have them brainstorm all the things required for milk production. Ask if anyone knows how many stomachs a cow has. Talk briefly about the unique digestion of cows and how milk gets from the cow to their house.
3. Take students and materials outside. Assign teams. Set up teams as shown in diagram.
4. Relay proceeds as follows (see diagram). You decide the distance based on space available, age and size of kids.

NOTE: If water is spilled, it must be replaced by going to the water bottle and refilling.

Student #1, as a cow, walks on all fours, goes to the grass (carpet or paperboard) and brings it back to student #2. This student has simulated the eating of green plant materials (grazing plus 50 lbs. of silage).

Student #2 walks across to the water and cup. This student must pour a cup full of water and carry it on the "grass" (like a waiter's tray) back to student #3. This student has simulated the cow drinking water (25-30 gallons).

Student #3 This student "swallows" the grass and water by carrying them to the first compartment of the stomach, student #4. Student #4 places his/her cup on the "grass" tray and student #3 pours the water from the first cup into student #4's cup (marked "Chamber 1"). The receiving cup is not held but is instead balanced on the grass.

Student #4 now transfers the grass to the next stomach chamber, student #5's cup (marked "Chamber 2"). This is done by handing student #5 the grass and pouring the water from student #4's cup into student #5's cup.

(If you don't have the correct number of students to allow one student per stomach compartment, two students can pass water back and forth four times to represent all four stomach chambers.)

Student #5 repeats this transfer with student #6.

Student #6 repeats this transfer with student #7.

Student #7 drops the grass, and the water is now considered milk (six gallons). The milk is carried to the cow's udder, a rubber glove held by student #8.

Student #8 holds open the rubber glove, and the water is poured in.

Student #1 now becomes the rancher and milks the glove into a bucket.

Remaining students must line up arm's length apart and pass the bucket one to the next between their legs. This represents transportation and processing. The last student pours the milk into a cup. This cup is sold (carried) to the "Consumer" (the teacher). If the cup is less than half full, the expense of making the milk was too high for the yield and the consumer refuses to buy the milk.

Questions for Discussion:

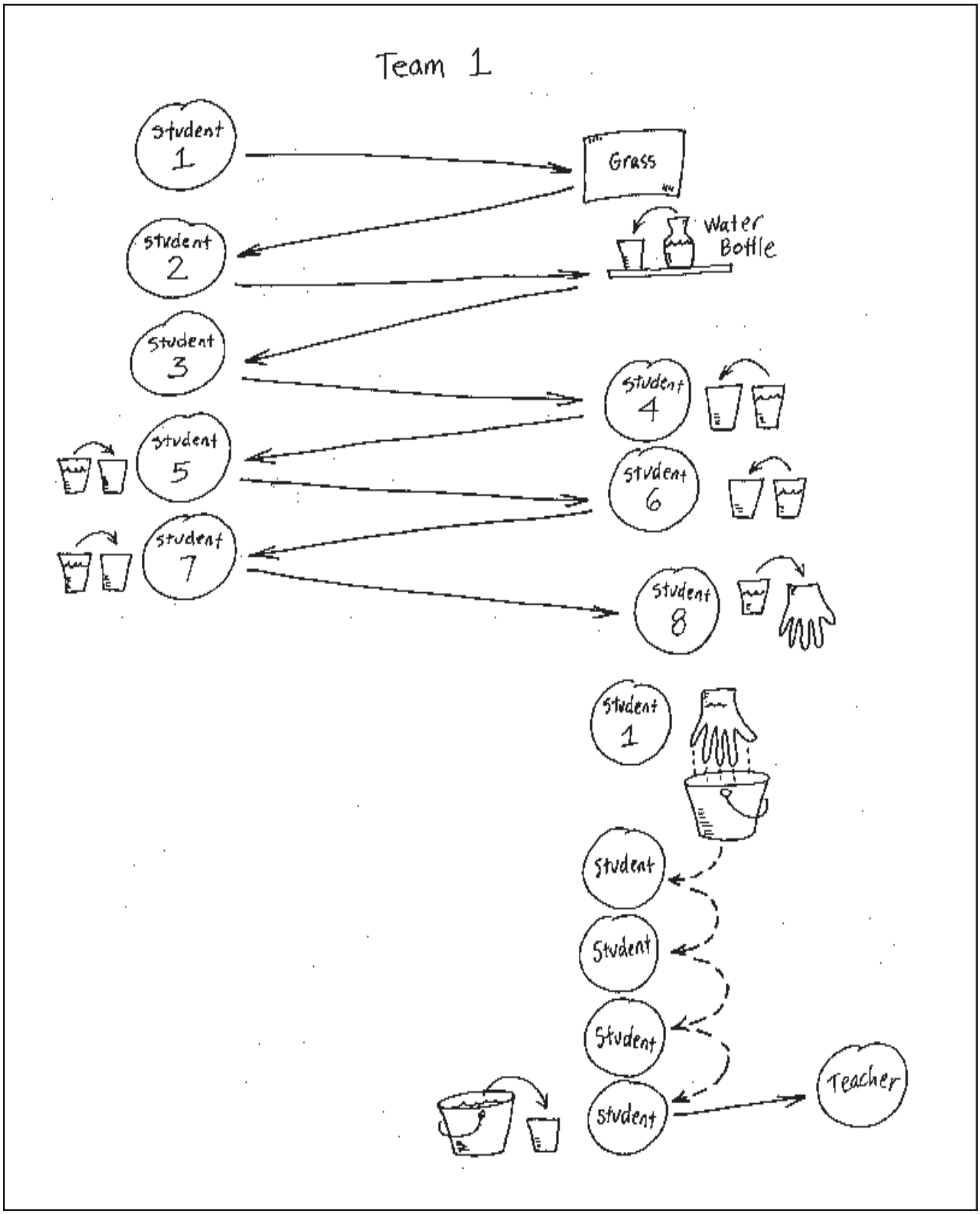
- Where does milk come from?
- What does a cow need to make milk?
- How many chambers does a ruminant's stomach have?
- Does the milk supply affect the cost of the milk?
- Name some things made from milk.

Extensions:

- Take a field trip to the California Cooperative Creamery and/or Clover Stornetta (see Resources Directory) and see milk being processed.
- Contact a local dairy farmer for a field trip or to talk to your class about dairy farming.
- Have students do group research and write to the National Dairy Council to get more detailed information on processing of specific milk products. See the Resources Directory.

Adapted from Walker Creek Ranch activity, Marin County Office of Education.

Gimme Some Milk



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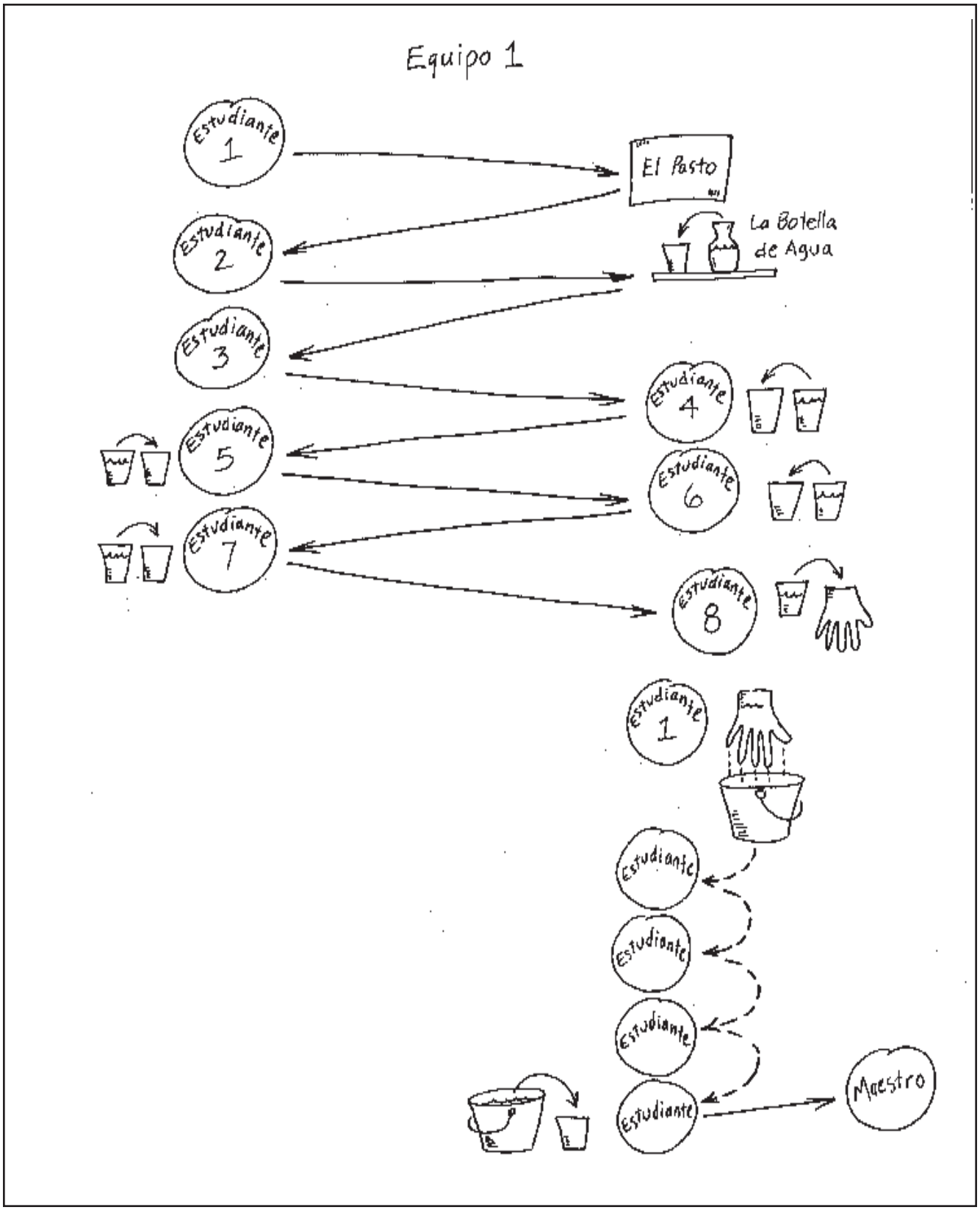
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El Pasto
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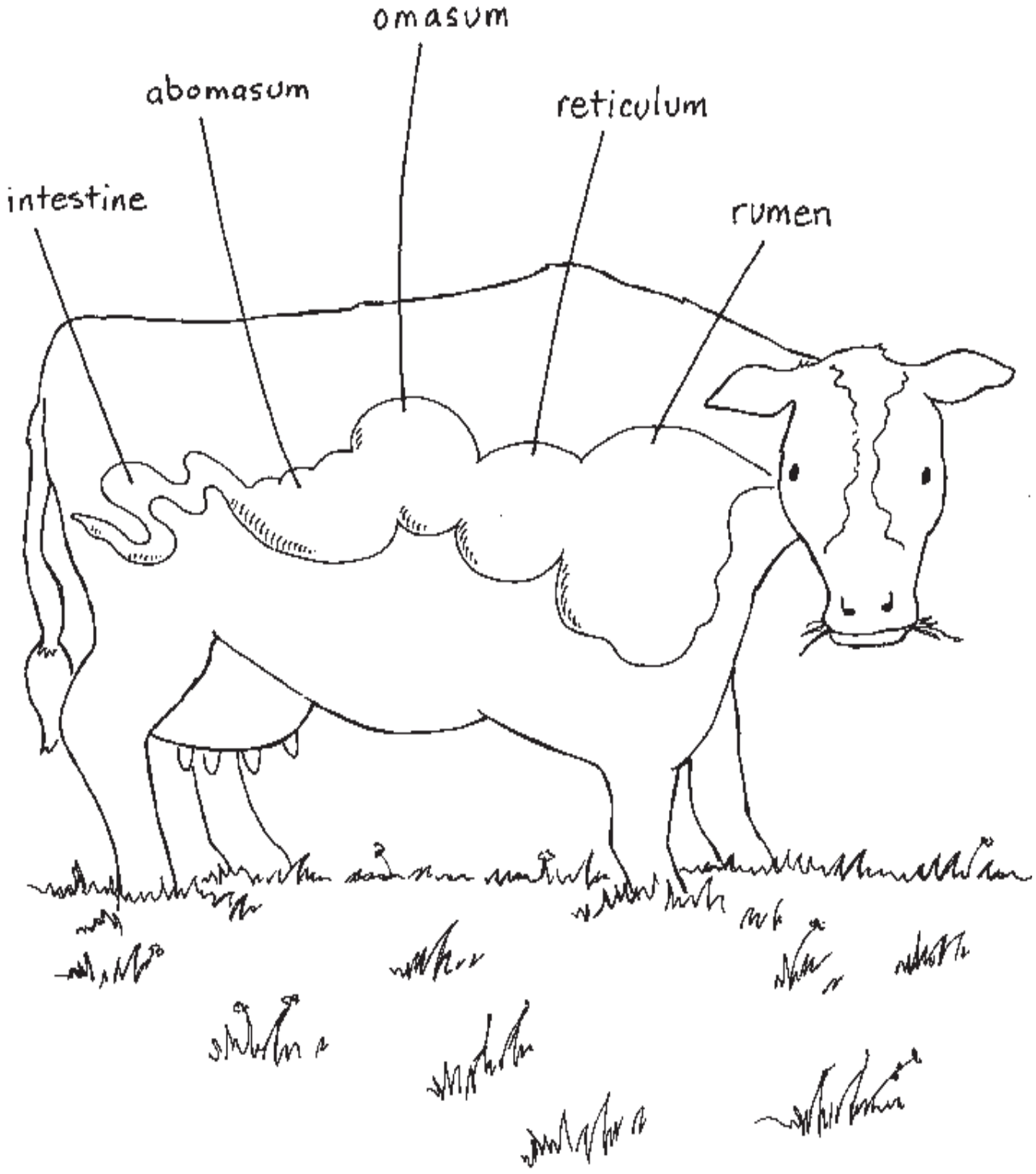
omasum
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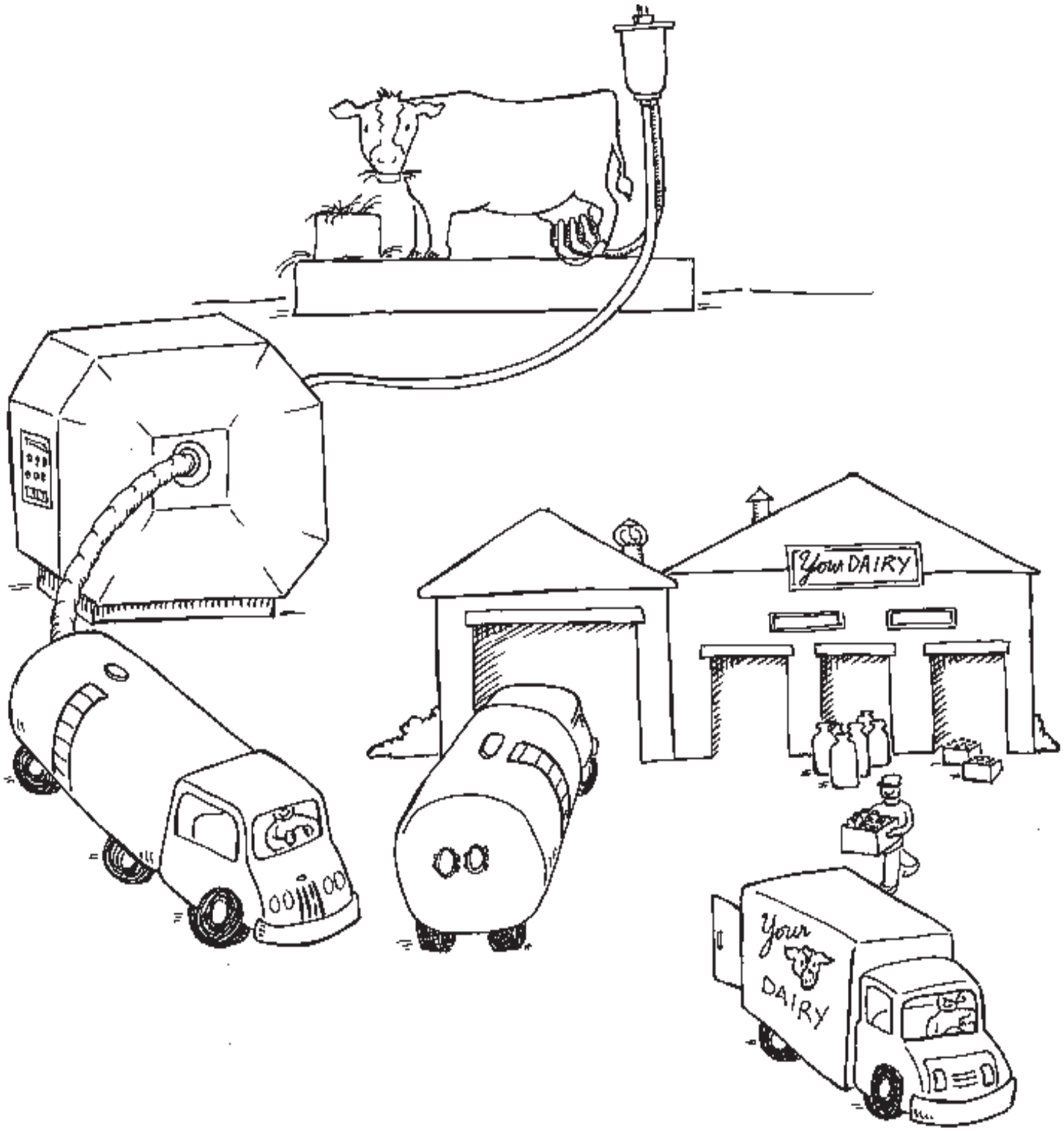
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