- When whole ingredients are fed, pigs and chickens will pick out the ingredients they like best and eat those first (much like people picking out the M&Ms or chocolate chips in trail mix). Chickens have color preferences and will sort out the yellow whole corn to eat first. Pigs also sort out their favorite ingredients. Mixing appropriately-sized ground corn into the feed prevents this "feed sorting" and ensures that the pigs and chickens eat the correct amount of all ingredients in their feed.
- Ground corn helps produce high quality pellets. Whole corn or even course grinding of the corn does not produce high quality pelleted feed.

Activity 1: Particle Size

- Have the students break into groups of 3 or 4. Have several cereal varieties available. One way to get cereal variety is to ask each student to bring 1 cup of cereal from home. Make sure each student in the group has a different kind of cereal.

- Give the students a container to be the mixer. The container needs to have a lid and be able to hold more than 4 cups of cereal. Large yogurt containers with lids and jars with lids work well.

- Have each student in the group add 1 cup of cereal to the mixing container, for a total of 3 to 4 cups. Have one student act as the mixer by physically picking up and shaking the container for about 15 seconds.

- Once the cereals are mixed, have the students sort the cereals back into the original separate cereals, emphasizing that this is what animals do if allowed to pick and choose what they want to eat. The cereals are fairly easy to sort.

- Have the students take the same cereal and smash it into fine particles (easily done in a plastic sandwich bag with a fist or book). Once the cereal is smashed, have the students mix the cereals together again.

- Ask the students to again sort the cereals back into the original separate cereals. This sorting process is increasingly difficult when the cereals are of similar size. There still may be a few large pieces that the students can pick out, but overall, the cereals mix better and are more difficult to sort.

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1. Do you need to grind all feed ingredients?

No, not all ingredients need to be ground. Some are available in appropriate sizes that can be mixed into feed as is. Salt is a good example. There are several sizes of livestock grade salts, but use table salt as the example. Most students will recognize that salt is already small. Compare corn and salt (or any variety of ingredients) to emphasize the size difference.

2. What size should ingredients be ground to?

Particle size varies some across the animal nutrition industry, but ideally, all ingredients in pig and chicken feed should be similar in size to get the best mixture. Ingredients in pig and chicken feed are normally ground to about 700 microns. For comparison, 400 microns is very small (about the size of a piece of sand), 1200 microns is relatively large (about the size of the eye of a needle), and 700 microns is in the middle. Animal nutritionists and feed mill operators chose 700 microns based on the amount of energy (money) it costs to grind the ingredients and the best particle size for each ingredient so it is best utilized by the animal. It is a balance between cost and animal performance (utilization).

3. What are some common problems related to particle size and other properties of the feed ingredients?

Animal nutritionists commonly deal with feed handling problems when formulating livestock diets:

	Feed Handling Problems
Typical Causes	Feed ingredients are ground too fine (small). Fat or another liquid product is added to the feed.
What Happens	When the ingredients are very small, the feed tends to pack together and has a hard time moving through the feeding system. Added fat, which increases the moisture content, causes the feed to pack together. The packed feed has a hard time moving through the feeding system.
End Result	Possible "out of feed" occurrence.
Example	Think of an hourglass minute timer filled with sand that comes with some board games. When the timer is turned upside down, the sand runs from the top to the bottom of the hourglass in 1 minute. Sometimes, the sand packs together and gets stuck. The timer has to be shaken to restart the flow. When feed packs together, it stops flowing through the feeding system. The feed lines or feeders may need to be agitated to restart the flow.

Because a growing and developing livestock animal should have constant access to feed, the animal nutrition industry wants to prevent all "out of feed" occurrences. Animal nutritionists work hard to formulate diets that won't pack together and result in feed handling problems.

4. How is the feed ground?