

# Types of Samples

There are two types of samples to take in a feed mill: feed or environmental samples. This resource will help explain the most current and scientifically proven methodology for sampling complete feed, feed ingredients, and feed mill environments. To access information on how to take feed or environmental samples, refer to “Collecting Feed Samples” and “Collecting Environmental Samples.” If requiring information on how to prepare for sampling, refer to “Assembling Materials for Environmental Sampling of Viral Pathogens.”

## Feed samples

Sampling feed intended for livestock species can offer a way to assess potential contamination in either complete feed or feed ingredients. However, sampling feed is challenging since potential contamination may not be evenly distributed within the feed or ingredient, creating “hot spots” of contamination. To account for this type of distribution, the Association of American Feed Control Officials (AAFCO) feed inspector’s manual offers different solutions on how to sample feed: utilizing sleeved feed probes or single tube triers or sampling via cut stream (AAFCO, 2020). Sleeved feed probes are the only validated methodology for viral pathogens while the other methodologies have yet to be validated (Jones et al., 2020; Elijah et al., 2021, Dee et al., 2022). Table 1 offers a summary of the three methodologies for feed sampling.

All methodologies rely on collecting 10 subsamples per load or lot of complete feed or feed ingredients and combining the 10 subsamples for a single composite sample for submission. The AAFCO feed inspector’s manual recommends a minimum of 10 subsamples so that the sampling methodology can account for unevenly distributed contamination. If a feed mill is trying to identify potential contamination within a specific batch of feed, taking 10 subsamples within a single load of feed answers the question of potential contamination before delivery. However, if a feed mill is busier than normal, like during times of harvest, collecting 10 subsamples per truck load can be challenging. In this case, if the feed mill is interested in potential contamination throughout the day, each load of bulk ingredient could be considered a subsample, one subsample pulled from each load, and then 10 subsamples from 10 loads could be combined as a composite sample for the bulk ingredients received that day. Depending on the question, the minimum of 10 subsamples can be manipulated to account for different sampling scenarios.

**Table 1.** Methodologies for sampling feed ingredients or complete feed.

Methodology	Used When?	Materials Needed	Minimum number of sub-samples <sup>1</sup>
Sampling with Sleeved Probes <sup>2</sup>	<ul style="list-style-type: none"><li>• Can get an overview of the sampling container.</li><li>• Sample container deep enough for the double tube feed probe.</li><li>• Used for bulk feed ingredients or complete feed.</li></ul>	<ul style="list-style-type: none"><li>• Sleeved feed probe</li><li>• Plastic storage bag</li><li>• Permanent marker</li><li>• Disinfectant wipes</li></ul>	10
Sampling via Cut Stream <sup>3</sup>	<ul style="list-style-type: none"><li>• If unable to sample feed with sleeved feed probes.</li><li>• Used for bulk feed ingredients or complete feed.</li></ul>	<ul style="list-style-type: none"><li>• 8 ounce cup</li><li>• Plastic storage bag</li><li>• Permanent marker</li><li>• Disinfectant wipes</li></ul>	10
Sampling with Single Tube Trier <sup>4</sup>	<ul style="list-style-type: none"><li>• Used for bagged feed ingredients or complete feed.</li></ul>	<ul style="list-style-type: none"><li>• Single tube trier</li><li>• Plastic storage bag</li><li>• Permanent marker</li><li>• Disinfectant wipes</li></ul>	10

<sup>1</sup>Sub-samples refers to the number of samples, or pulls, from the intended sample container that will go into the composite sample.

<sup>2</sup>Sleeved feed probes have an internal and external compartment. Insert the sleeved probe with compartments closed, open compartments once probe is inserted into the feed ingredient or complete feed, shake the probe to fill, close the probe, then withdraw from feed ingredient or complete feed.

<sup>3</sup>Cut stream is the terminology used to describe when sampling relies on a stream of feed ingredients or complete feed and the sampling container passes through the stream and fills the sampling material to obtain a sub-sample.

<sup>4</sup>Single tube trier has an open sampling compartment with a handle. Single tube triers are rotated so sampling material is collected into the open compartment.

## Environmental Samples

Based on the pathogen of interest, three factors will influence how to take samples: 1) methodology, 2) sampling material, and 3) pre-moistening solution. Methodology is influenced by the accessibility of the sampling location. For viral pathogens, you can hand sample or use a paint roller to sample while for bacterial pathogens, you can only hand sample. Pathogen of interest will influence the sampling material. The 3M sponge sticks are the most effective for bacterial pathogens (Moore and Griffith, 2002; FDA, 2021) while cotton gauze is the most effective for viral pathogens (Stewart et al., 2019). For the paint roller methodology, material of choice is synthetic paint roller covers (Wu et al., 2021; Elijah et al., 2022) but if unable to acquire these, cotton paint roller covers are an acceptable substitute. Pathogen of interest will also influence the pre-moistening solution. By pre-moistening the sampling material, you maximize the ability of the sample material to pick up potential pathogens (Moore and Griffith, 2002). For gram negative bacteria, pre-moistening solution of choice is buffered peptone water. For viruses, pre-moistening solution of choice is phosphate buffered solution (1X concentration, pH=7.4) but recent research has shown that 0.9% NaCl sterile saline is an acceptable substitute (Rodino et al., 2020).

Sampling the environment of the feed mill can offer a way to understand the directionality, or spread, of pathogens of interest or monitor the biosecurity practices in place. To help with this, environmental samples are classified into zones based on the surface and what that surface comes into contact with.

### Feed Contact Surfaces

Feed contact surfaces have direct contact with feed ingredients or complete feed. These surfaces are associated with feed manufacturing, storage, and delivery. If these surfaces are positive for pathogen of interest, its origin may have been from a contaminated feed ingredient.

<b>Surfaces associated with the feed mill</b>	<b>Surfaces associated with feed delivery</b>
Corn cleaner	Interior of feed truck compartments
Receiving pit grates	Interior of feed truck boom
Fat intake inlet or hose	
Interiors of feed bins	
Load out auger or sock	
Interiors of bucket elevators	

### **Non-Feed Contact Surfaces**

Non-feed contact surfaces are surfaces with a fixed location that are close or next to feed contact surfaces. These surfaces are either covered by dust from feed manufacturing or have a lot of foot traffic. If these surfaces are positive for pathogen of interest, its origin may have been through a contaminated feed ingredient dust generated during feed manufacturing or transient surfaces spreading contamination.

<b>Surfaces associated with the feed mill</b>	<b>Surfaces associated with feed delivery</b>
Floor of load out bay	Exterior of feed truck compartments
Control room floor	Exterior of feed truck boom
Floor mat by main entrance	
Receiving floors	
Manufacturing floors <ul style="list-style-type: none"> <li>▪ Floors around hand add ports</li> <li>▪ Areas near sample ports</li> </ul>	
Warehouse floors	
Exterior of pellet mill	
Pellet mill air intake	
Inside dust collection system	

### **Transient Surfaces**

Transient surfaces are surfaces with a non-fixed location and can move within the feed mill or during feed delivery. These surfaces have intermittent contact with other surfaces that could potentially have exposure to pathogen of interest. If these surfaces are positive for pathogen of interest, its origin may have been through employees introducing or spreading the contamination.

<b>Surfaces associated with the feed mill</b>	<b>Surfaces associated with feed delivery</b>
Fork lift tires	Feed truck steps
Broom	Feed truck floor mat and pedals
Shovels	Feed truck tires
Worker shoes	Workers shoes
Worker clothing	Workers clothing

**Table 2.** Methodologies for environmental sampling based on pathogen.

Pathogen	Methodology <sup>1</sup>	Sampling Material <sup>2</sup>	Pre-Moistening Solution <sup>3</sup>	Size of Sampling Area	Number of Passes of Sampling Area <sup>4</sup>
Bacteria	Hand Sampling	3M Sponge Sticks	Buffered Peptone Water	8 × 8 in.	10 horizontal pushes and pulls 10 vertical pushes and pulls
Virus	Hand Sampling	4 × 4 in. Cotton Gauze	Phosphate Buffered Solution 0.9% NaCl Sterile Saline	8 × 8 in.	10 horizontal pushes and pulls 10 vertical pushes and pulls
Virus	Extension Set Sampling	Synthetic Paint Roller Cover	Phosphate Buffered Solution 0.9% NaCl Sterile Saline	--	10 horizontal pushes and pulls 10 vertical pushes and pulls

<sup>1</sup>Methods of collecting environmental samples can rely on hand sampling or usage of an extension set to sample hard to reach areas for viral pathogens.

<sup>2</sup>Sampling material refers to the material that will pass over the surface of interest.

<sup>3</sup>Pre-moistening solution refers to the solution that moistens the material before sampling.

<sup>4</sup>Number of passes refers to the number of times the sampling material should pass over the sampling area to pick up the pathogen of interest.

## References

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