

# Feed Mill Biosecurity

Biosecurity practices are implemented to minimize risk of introducing biological hazards into the feed mill that could compromise swine health status and cause significant economic loss. Therefore, there is increasing interest in opportunities to reduce risk through development and implementation of biosecurity plans for the feed mill. A biosecurity plan requires the identification and evaluation of hazards and implementation of prevention and mitigation strategies.

## Prevention strategies

### **Risk in feed ingredients**

Preventing the introduction of biological hazards into the feed mill is essential and the most effective part of a feed mill biosecurity plan (Table 1). Prevention strategies should be implemented for incoming ingredients, feed manufacturing flow, and visitor and employee flow.

- **Supplier verification**

- Specify requirements for ingredients being purchased including documentation at receiving.
  - Date, time, lot number, previous hauled ingredient
- Communicate safety expectation of inbound ingredients.

- **Eliminate highest risk ingredients.**

- Higher risk ingredients include ingredient that could potentially be contaminated especially those sourced from a country with foreign animal disease (Dee et al., 2016, 2018)
- Follow PIC guidelines, in “Additional Resources” for ingredients and complete feed outlining high risk ingredients.
- A combination of severity of possible disease and probability of a pathogen

present should be used for decision making, which is highly dependent on facility.

- Evaluate potential risk before accepting ingredients from countries with active foreign animal disease outbreaks.
- **If high risk ingredients are necessary**
  - Routine sampling
    - Retain samples for every lot of high-risk ingredients.
    - Use of aseptic technique for pathogen sampling to prevent potential cross-contamination of samples.
  - Schedule for high-risk ingredient sampling
    - Dependent on each feed mills assessment of hazards, risk, and analytical capabilities.
    - Necessary high-risk ingredients and sources from high-risk countries should undergo an inventory holding procedure at a supplier warehouse until ingredient risk is reduced, time has passed where pathogens are no longer present, and/or ingredients have undergone a treatment process to destroy pathogens. For recommendations on ingredient holding time please refer to *Additional Resources*, “Swine Health information Center (Ingredient Holding Time)” at the end of this document.
- **Traceability**
  - Maintaining records for tracking ingredient movement is needed in the possibility of an outbreak.
    - Date, time, lot number, previous hauled ingredient

**Table 1. Biosecurity implementation**

<b>Practical steps for all feed mills</b>	<b>More challenging implementation</b>
<ul style="list-style-type: none"><li><input type="checkbox"/> Covering pits when not in use</li><li><input type="checkbox"/> No sweeping into pits</li><li><input type="checkbox"/> Supplier verification</li><li><input type="checkbox"/> Housekeeping</li><li><input type="checkbox"/> Drivers remain in trucks at receiving <u>or</u> have shoe coverings</li><li><input type="checkbox"/> Pre-planned finished feed routes</li><li><input type="checkbox"/> Employee zoning (especially at receiving)</li><li><input type="checkbox"/> Warehouse first-in first-out sectioning</li></ul>	<ul style="list-style-type: none"><li><input type="checkbox"/> Truck washing after visiting health compromised sites</li><li><input type="checkbox"/> Employee shoe changing</li><li><input type="checkbox"/> High risk ingredient holding time</li><li><input type="checkbox"/> Chemical mitigation</li><li><input type="checkbox"/> Thermal Processing</li></ul>

## ***Feed mill production flow and strategies***

The various points and surfaces that feed and ingredient encounter prior to being shipped makes physical cleaning of the feed mill very challenging once a biological hazard has been introduced. These surfaces and how they are cleaned ultimately impacts the risk of spread via cross-contamination.

### **• Receiving**

- Clear signage should be displayed instructing visitors on feed mill protocols.
  - Ideally, drivers should always stay in the vehicle. If it is necessary for drivers to leave their vehicles, shoe coverings should be provided before exiting the vehicle.
  - Under no circumstances should trucks hauling pigs be weighed on receiving scale.
- Create cleaning and disinfection stations for delivery vehicles.
  - In extreme scenarios of disease, the use wet-cleaning and sanitizers can be used to remove debris from the tires, wheels, undercarriage, and exterior of ingredient trucks prior to their entry into the mill.
- Limit pathogen entry into the receiving pit.
  - Ingredient receiving pits should be covered each time a truck drives across and remain covered until unloading process is to occur. Receiving pits should be re-covered after the unloading process, before receiving trucks pull away.
  - Cones and funneling devices should be used to limit spills in receiving. Additionally, a slower unloading speed will decrease the chance of ingredient spillage.
  - Under no circumstance should spilled ingredients be swept into the receiving pit. Spilled ingredients should be thrown away.
- Clear documentation should be provided from truck drivers to mill employees.
  - Including date, time, last place traveled, last ingredient hauled.
- Dust, floor sweepings, screenings, or similar materials should never be swept into pit or added back into feed production to minimize shrink. Therefore, adjustments may need to be made for allowable shrink.
  - Dust is consistently reported to carry high levels of pathogens, and should be composted or discarded, never fed to animals.
  - Creating a raised surface around the unloading pit can deter employees from sweeping into the pit.
- Equipment should be monitored for potential risk of ingredient or feed hang-up, potentially leading to pathogen carryover.
  - Important equipment to monitor and clean include grain cleaners, dust collection equipment, screw conveyers, mixer hand add station, inside coolers, storage bins, and boot pits of bucket elevators.
  - Use of sequencing or flushing may need to be used but should only be considered as risk reduction, not risk elimination. Complete cleanout and sanitation may be best.
    - Sequencing utilizes a preplanned order of production, storage, and distribution of feed.
    - Flushing involves running an abrasive-type ingredient through manufacturing equipment.
      - Data suggest that PEDv risk can be reduced after a third flush, or after the use of a chemically enhanced flush (Gebhardt et al., 2016;

Muckey, 2016; Schumacher et al., 2017).

- Flushing or sequencing may require several rounds or be used in conjunction with each other.

- **Housekeeping**

- Sweep or vacuum all dirt and dust from floor, then mop with a 10% bleach solution or an EPA approved FAD disinfectant on a weekly basis to limit the accumulation and spread of virus on non-feed-contact surfaces.
- Equipment or utensils such as brushes, shovels, brooms, scoops, or barrels should remain in the same area of the manufacturing process. These may be labeled, or color coordinated to represent a manufacturing step.
  - For example, red brooms at receiving, blue brooms at loadout.
- Utensils should be stored off the ground via a broom holder or set of hooks.
- Daily cleaning and sanitization should be done for utensils not zoned, weekly for zoned.

- **Feed truck delivery**

- Create cleaning and disinfection stations for feed trucks.
  - In extreme scenarios of disease, the use wet-cleaning and sanitizers can be used to remove debris from the tires, wheels, undercarriage, and exterior of ingredient trucks prior to their entry into the mill. Similarly, create stations prior to entry of delivery trucks on and off farms.
- Coordination of delivery should be from farms at higher risk of disease to those with lower-risk of disease, especially if a single load must visit multiple locations.

- Feed should be delivered to negative farms first and positive sites at the conclusion of the week. Sow farms should be served before growing sites.
- Follow the PIC Bioshield recommendations for feed vehicle downtime, washing, disinfecting, drying, and inspection before loading and delivery out of biosecurity order.
- If possible, trucks should be segregated to only deliver to multiplication sites or commercial production sites.

- Utilize truck washes and/or thermo-assisted decontamination drying, and sanitation methods for feed truck delivering to health challenged sites.
- Specific directions for driver routes should be provided to prevent route cross over of trucks driving too and from contaminated sites.
- Drivers should ideally stay in vehicle and on-site worker should open bin lids.
  - Drivers must wear provided shoe coverings on farm sites if leaving the truck is necessary.
- Drivers and trucks should never encounter animal housing areas, animal disposal areas, or site employees.
- When delivering feed, use cleaning and disinfection stations prior to entering and exiting farms. Alternatively, consider unloading feed across a line of segregation or fence into another feed truck or extend bin augers so bins can be filled on the exterior of the line of segregation, as shown in Figure 3.

- **Physical cleaning of feed mills is extremely challenging.**

- Therefore, physical, and chemical cleaning may be necessary and most effective with chemical sanitizers.

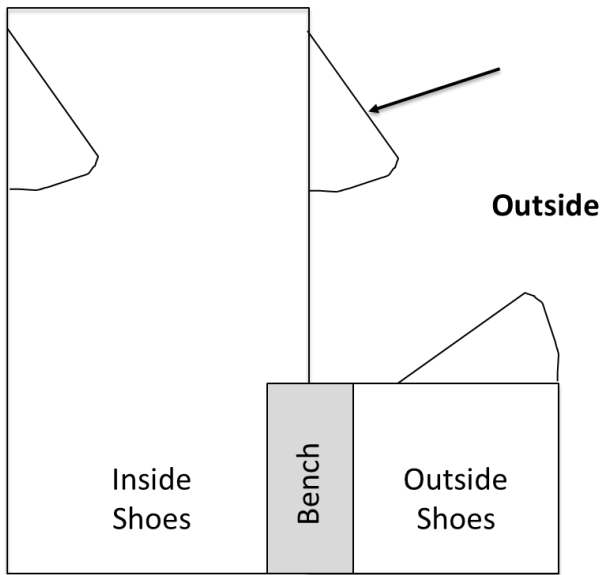
- Cleaning of non-animal food contact surfaces should not be overlooked as biological hazards can efficiently spread throughout a facility through dust and other airborne particulates.

### **Visitor and employee flow and strategies**

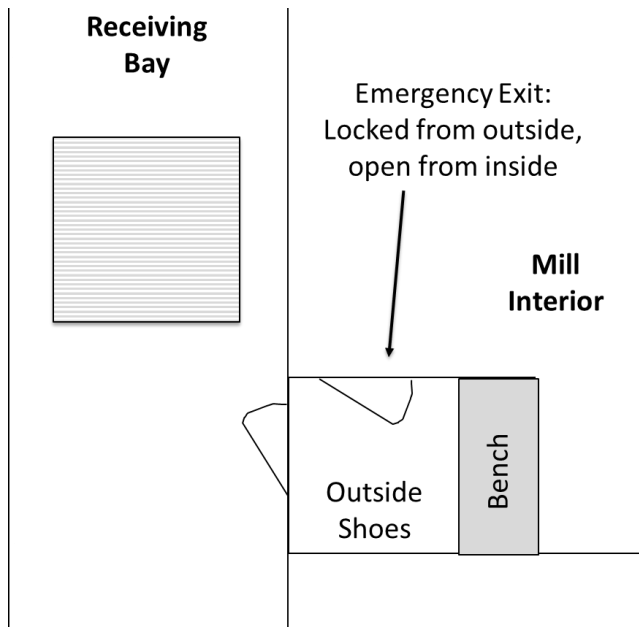
The feed mill is a hub for movement of people; employees, visitors, guests, truck drivers, and subcontractors; all of which can introduce feed contaminants. The most likely vector is the bottom of employee shoes. Therefore, zoning of the feed mill is a low-cost contamination prevention strategy.

- **Minimize foot traffic, especially in high-risk areas.**
  - High risk areas include pits, grates, and hand adds stations.
  - Designating no-walk zones is a clear way to demonstrate to employees and visitors the importance of disease prevention.
- **Protocols should be established for employees that have come into contact with pigs. Including:**
  - Amount of down time before returning to the feed mill.
  - Clothing and shoe change from items that were on the farm.
  - Showering before returning to the mill.
- **Visitors should always be accompanied by a mill employee.**
  - Visitors should remain in vehicles if possible.
    - If visitors are necessary, such as truck driver's footwear, plastic boots, or boot coverups should be provided.
  - Logbooks should be kept for entry of visitors.
  - Signage should be clearly displayed for off-limit areas.
- **Create hygienic zoning by treating a feed mill similarly to a farm.**
  - Create one point of entry into the feed mill.
    - At this entry, employees should be changing shoes (Figure 4).
    - In situations with higher health concern, implementing a change of clothes or coveralls over clothing are steps for further prevention practices.
  - Create lines of separation at all doors to minimize contamination from footwear.
    - This involves employees and visitors changing shoes to keep exterior shoes on one side of the line and interior shoes on the other. Examples of how facilities may implement lines of separation are shown in Figures 1 and 2. In both examples, additional exits are available in case of emergency to satisfy OSHA requirements.
    - If lines of separation cannot be developed, consider zoning to standardize traffic patterns, with foot baths or food-grade dry sanitizing powder placed in high traffic areas.
- **Communication between infected sites and the feed mill is paramount. This allows for the feed mill schedule planned delivery routes to prevent disease spread to other sites.**

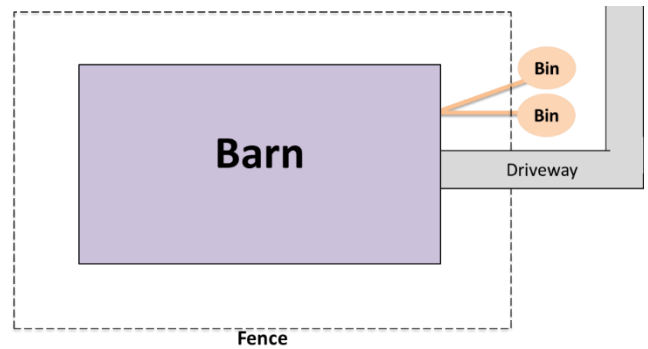
**Figure 1.** Example of zoning at feed mill entry



**Figure 2.** Example of zoning at receiving



**Figure 3.** Example of zoning for drivers on farm site



**Figure 4.** Implementation of shoe change from dirty (upper side of bench) to clean (bottom side of bench).



## Mitigation strategies

Mitigation can occur via physical or chemical processes. However, chemical is most promising because of residual mitigation potential, unlike thermal processing which could be re-contaminated in post pelleting.

- Chemical strategies are potential mitigation techniques that can be used as continuous prevention, often provided as a feed additive.
  - Recommendations for chemical mitigation strategies can be found under *Additional Resources*, “Chemical Mitigation Strategies” at the end of this document.
- Physical strategies include thermal processing and sanitation. Sanitation should be implemented via a clearly defined SOP for sanitation procedures.

## Summary

Implementing a biosecurity plan to prevent or mitigate biological hazards in a feed mill is challenging because of differences in facility design, manufacturing operations, and significant risk factors among feed mills. The first step toward minimizing risk is to develop a feed mill biosecurity plan. While, the success of biosecurity practices will never be known, the cost of an outbreak far outweighs those of prevention.

1. Identify and evaluate hazards.
2. Implement and assess prevention strategies for people and production. (KSU Biosecurity Audit)
3. Understand mitigation techniques.

## Additional resources

PIC Bioshield

- <https://www.pic.com/services/bioshield-program/>

K-State Swine Feed Mill Biosecurity Audit

- <https://www.asi.k-state.edu/research-and-extension/feedsafetyresources/index.html>

Swine Health Information Center

- <https://www.swinehealth.org/feed-risk-and-mitigation/>

Swine Health Information Center (Ingredient Holding Time)

- <https://www.swinehealth.org/wp-content/uploads/2020/02/Holding-Time-Calculations-for-Feed-Ingredients-to-Mitigate-Virus-Transmission-Print-02.04.20.pdf>

Chemical Mitigation Strategies

- <https://onlinelibrary.wiley.com/doi/full/10.1111/tbed.13749>

AFIA Guide: “Developing Biosecurity Practices for Feed & Ingredient Manufacturing”

- <https://www.afia.org/pub/?id=E348BF9F-98ED-09DB-A45D-504737FE7AE2>

FDA Guidance for Industry #235: “Current Good Manufacturing Practice Requirements for Food for Animals.”

- <https://www.fda.gov/regulatory-information/search-fda-guidance-documents/cvm-gfi-235-current-good-manufacturing-practice-requirements-food-animals>

FDA Guidance for Industry #239: “Human Food By-Products for Use As Animal Food”

- <https://www.fda.gov/files/animal%20&%20veterinary/published/CVM-GFI--239-Human-Food-By-Products-For-Use-As-Animal-Food.pdf>



FDA Guidance for Industry #245: "Hazard Analysis and Risk-Based Preventive Controls for Food and Animals"

- <https://www.fda.gov/regulatory-information/search-fda-guidance-documents/cvm-gfi-245-hazard-analysis-and-risk-based-preventive-controls-food-animals>

FDA Guidance for Industry #246: "Hazard Analysis and Risk-Based Preventive Controls for Food for Animals: Supply-Chain Program"

- <https://www.fda.gov/regulatory-information/search-fda-guidance-documents/cvm-gfi-246-hazard-analysis-and-risk-based-preventive-controls-food-animals-supply-chain-program>

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