Systems Approach to Feed Safety

Activity Time: 60 Minutes plus homework.

Lesson Plan Summary:

In this lesson, students will study the basic concepts of a systems approach to feed safety. After an introduction to feed safety, students will engage in an activity designed to use Systems Thinking to review the field of animal feed safety. Finally, students will individually show their knowledge of Systems Thinking as it applies to a pet food outbreak.

STUDENT UNDERSTANDINGS

Big Idea & Enduring Understanding:

- **Systems Approach:** The systems approach to problem solving can provide an effective model for analysis. When responding to a large-scale health risk, such as melamine contamination, it is important to consider the entire system of feed/food processing also known as the product life cycle.

Essential Questions:

- What are the basic components of a system, as understood in Systems Thinking?
- How might one evaluate and prepare for long-term consequences of actions taken in the present?

Learning Objectives:

Students will know…

- When impurities such as melamine are introduced into animal feed, and therefore the human food chain, they can have widespread effects.

Students will be able to…

- Use the components of a system to think about problems and solutions.
- Consider the upstream causes and downstream impacts of an adverse safety event when considering feed/food safety concerns.
- Discuss the work of the Food and Drug Administration (FDA) in ensuring feed safety.

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Vocabulary:

- Boundary
- Cyanuric acid
- Drivers
- Feedback
- Input
- Melamine
- Output
- Risk
- Systems Thinking

Standards Alignment:

This lesson addresses the following Washington State Essential Academic Learning Requirements (EALRs) and/or Grade Level Expectations (GLEs) for grades 9–12:

- **Science EALR 1 (9-12 SYSA):** Students know that *feedback* is a process in which the *output* of a *system* provides information used to regulate the operation of the *system*. Positive *feedback* increases the disturbance to a *system*. Negative *feedback* reduces the disturbance to a *system*.
- **Science EALR 1 (9-12 SYSB):** Students know that s*ystems* thinking can be especially useful in *analyzing* complex situations. To be useful, a *system* needs to be specified as clearly as possible.
- **Science EALR 1 (9-12 SYSC):** Students know that in complex *systems*, entirely new and unpredictable *properties* may emerge. Consequently, modeling a complex *system* in sufficient detail to make *reliable predictions* may not be possible.
- **Science EALR 3 (9-12 APP):** Students will transfer and apply abilities in science and technological design to develop solutions to societal issues.

This lesson addresses the following Washington State Career and Technical Education (CTE) model frameworks for Agriculture, Food, and Natural Resources (AFNR):

- **FPP.01.01.02.a:** Identify and explain environmental and safety concerns about the food supply. Level I.
- **FPP. 01.01.02.b:** Discuss the issues of safety and environmental concerns about foods and food processing (e.g., genetically modified organisms (GMO), microorganisms, contamination, irradiation). Level II.
- **FPP.02.02.01.a:** Describe contamination hazards (physical, chemical and biological) associated with food products and processing. Level I.
- **FPP 03.01.02.b:** Explain how the chemical and physical properties of foods influence nutritional value and eating quality. Level II.

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Common Student Preconceptions:

- Problems are solved by looking at each individual component in detail.
- Some problems are so complex that they cannot be modeled or resolved.
- Since feed/food is professionally packaged, we can presume it is always safe.

TEACHER PREPARATION

Materials:

Item	Quantity
Systems Approach to Feed/Food Safety Handout	1 per student
Systems Approach to Feed/Food Safety Teacher Answer Key	1

Preparation:

- Photocopy the *Student Handout*.
- Prepare your class presentation system to show the melamine video (see *Hook* section).
- While this lesson covers nine stages of food production, break the students into eight teams. (The first stage—farming—is offered as an example on the *Student Handout.*)

PROCEDURE

Hook:

1. Watch/listen to the news clip on melamine poisoning found at this website:

   Tainted Pet Food Recalled, 9/19/07 (3:44 minutes)
   http://www.cbsnews.com/video/watch/?id=2582962n&tag=mncol;lst;3

2. Ask students how they would approach solving a world-wide outbreak of animal illness. How would they start? What information would they need?

3. Tell the students that they will be reenacting the Systems Thinking approach that was used to solve this animal health issue. Ask students to imagine that they will reenact the role of an FDA Consumer Safety Officer responsible for ensuring that all the pet food and animal feed sold in Washington State is safe.

4. Point out that the role of the WSDA and the Food and Drug Administration (FDA) is to ensure a safe and reliable source of animal feed, which in turn leads to food safety for all of us. The WSDA, http://agr.wa.gov/, can assist with plant protection, pesticide management, inspections, livestock identification, licensing, permits, and compliance. Their primary goals include:

   - Protect and reduce the risk to public health by assuring the safety of the state's human and animal food supply.
   - Ensure the safe and legal distribution, use, and disposal of pesticides and fertilizers in Washington State.

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- Protect Washington State's natural resources, agriculture industry, and the public from selected plant and animal pests and diseases.
- Facilitate the movement of Washington agricultural products in domestic and international markets.

Activity Procedure:

5. Divide the students into eight groups. Distribute the *Student Handouts*.

6. Assign each of the teams to one of the following steps in food production, as outlined on the *Student Handout*:

   Grow, Harvest, Transport, Process, Package, Wholesale, Retail, Eat, and Dispose

7. Tell the students that they will use **Systems Thinking** to consider the inputs, outputs, risks, and feedback for eight of the nine stages (the first stage, "grow," is offered as an example on the *Student Handout*). Provide your students an analogy of a familiar system and its components and connections. We suggest that you introduce Systems Thinking with these points:

   a. Tell students that an academic definition of a system is "a set of objects or elements in interaction to achieve a specific goal."

   b. Discuss a system in the context of one that they know, such as a cafeteria (see ***Table 1***).

   c. Practice out loud with students. Ask the students to imagine and describe a library using Systems Thinking.

Table 1: Systems Thinking and the School Cafeteria

Category	Definition	Example
Drivers	Real and imagined benefits that motivate or enhance systems processes.	Cafeteria budget is increased allowing the staff to buy higher quality corn.
Inputs	The components that enter the system. May include risks.	Hungry people, cooks, cashiers, cooking energy, refrigeration, water, energy, food, and drinks.
Outputs	The components that leave the system. May include valued as well as harmful/unintended components.	Full people, waste, dirty dishes, and revenue.
Feedback	Information about a component or process that can be used to evaluate and monitor the system and to guide it to more effective performance.	A menu item not being purchased by students.
Risks	Factors (actions and resources) which can disturb/decrease/stop the rate with which the system converts inputs to outputs.	Food spoils and cannot be served to students.

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8. Each of the eight teams will serve as an FDA Consumer Safety Officer for eight stages of food production, thinking through the risks and drivers related to the inputs and outputs for each stage of the system. Teams will complete the table on the *Student Handout*, using the provided example. Additionally, students should be mindful of the means by which they can:

    a. Optimize processes to cut costs (e.g., do more with less).

    b. Optimize processes to meet consumer demand (e.g., provide organic food).

    c. Optimize processes to reduce infectious disease risk (e.g., homogenize milk, refrigerate prepared foods).

    d. Optimize processes to minimize chance of contaminated/adulterated food entering feed (e.g., WSDA inspects feed mills for the presence of meat and bone meal in cattle feed as a means of reducing possible protein contamination that might cause Bovine Spongiform Encephalitis).

    e. Optimize processes to maximize health of livestock and therefore the public (e.g., WSDA inspectors inspect beef for possible Bovine Spongiform Encephalitis infections).

9. Once the student teams have identified the risks, drivers, inputs, and outputs at each stage of food production, they will share their findings with the class in a five minute presentation and class discussion.

10. Assess the students' learning and their participation in the group presentations and class discussion using the provided *Group Presentation and Discussion Scoring Rubric*:

Dimension	Fails to Meet Expectations	Approaching Expectations	Meets Expectations	Exceeds Expectations
Commitment (Voice)	Makes no attempt to make the group care about his/her ideas and suggestions.	Half-hearted attempt to make the group care about his/her ideas and suggestions.	Uses one or two reasons to show why the group should care or know more about his/her ideas and suggestions.	Uses several reasons AND appropriate emotion to convince the group to care or want to know more about his/her ideas and suggestions.
Focus on Ideas and Support for Ideas (Content)	The ideas and details are not clear AND there is a random collection of anecdotes or irrelevant ideas and details.	Main idea is somewhat clear BUT supporting thoughts are random or key issues are unsupported.	Main idea is clear BUT the supporting information is general and less well-thought-out, or one key issue or idea is unsupported.	Ideas presented are clear, focused, and well supported by well-thought-out information that goes beyond the obvious or predictable.
Word Choice	Uses limited vocabulary that does not communicate strongly. Uses jargon or clichés that detract from message.	Uses words that communicate clearly BUT word choice lacks topic-specific vocabulary, variety, punch, or flair AND may be inaccurate or overdone.	Uses some vivid words and phrases that linger or draw pictures in the group's mind. Sometimes uses topic-specific and technical vocabulary.	Uses vivid words and phrases that linger or draw pictures for the listeners. Uses vocabulary that is topic-specific and appropriately technical.
Conclusion (Organization)	There is no clear conclusion; the discussion just ends.	The conclusion is recognizable BUT does not tie up loose ends.	The conclusion is clear AND ties up loose ends.	The conclusion is strong and convincing AND synthesizes the main points and compelling evidence.

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Wrap-up:

11. Once the team presentations are completed, tell the students to familiarize themselves with the melamine pet food recall using the *Student Handout* and remembering the newscast video they watched earlier in the class.

12. Assign students homework wherein they use Systems Thinking to identify the inputs and processes in determining: how the animals got sick; the opportunities for risk; and the opportunities to minimize suffering through innovation and improvements.

Assessment Opportunities:

- Observe group and class participation for even distribution of content across the headings and thoroughness of responses.

- Assess students' ability to contribute to meaningful group participation. Use the provided group presentation and discussion rubric (see *Step #10* of the lesson plan) to review students' group contribution.

- Additionally, you may collect the groups' completed *Team Systems Thinking Matrix* from the *Student Handouts*. Assess students' responses with the scoring rubric provided on the *Teacher Answer Key*. If your time is limited, you can merely collect these forms and not conduct the classroom presentations.

- Collect and assess each student's *Individual Student Homework* from the *Student Handout* regarding melamine-related poisoning. Assess students' understanding of Systems Thinking and poisoning using the scoring rubric provided on the *Teacher Answer Key*.

Student Metacognition:

- Students' gains in understanding of systems thinking as a consequence of participating in the lesson can be reviewed through their final matrix related to melamine poisoning.

Extension Activities:

- Ask students to define their home as an environment and think of all the systems within their home, describing the boundaries, inputs, and outputs.

- Ask students to imagine other issues that drive the productivity, inputs and risks in the feed and food industry.

- Ask students to prepare additional Systems Thinking handouts for other feed safety issues such as mad cow disease, *E. coli* contaminated beef, and *Salmonella*-contaminated spinach.

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TEACHER BACKGROUND & RESOURCES

Career Links:

- Animal feed control officer
- Animal feed manufacturer
- Animal pathologist
- FDA Consumer Safety Officer
- Research biologist
- Veterinarian

Background Information:

Basic information about Systems Thinking, systems approach, and pet food poisoning can be obtained from the websites listed in the *Resources* section.

Resources:

Overview of Systems Thinking
http://www.thinking.net/Systems_Thinking/OverviewSTarticle.pdf

Melamine and Cyanuric Acid Video (1:55 min)
http://www.youtube.com/watch?v=s8U9we0HEQg

FDA Review of Melamine-related Pet Food Recall (including press releases)
http://www.fda.gov/animalveterinary/safetyhealth/recallswithdrawals/ucm129575.htm

CVM Researcher Renate Reimschuessel Nominated for Service to America Medal
http://www.fda.gov/AnimalVeterinary/NewsEvents/FDAVeterinarianNewsletter/ucm084109.htm

Credit:

Lesson plan written by Nona Clifton of the Washington Global Health Alliance.

Student Handout photograph courtesy of Theresa Britschgi.

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Name:_____Date:_____Period:_____

Systems Approach to Feed/Food Safety

Student Handout

Team Member Names: _____

The Flow Plan Stage you investigated: _____

Grain silo. **Credit**: Theresa Britschgi.

To most Americans, food moves from the farm to the table in this one-way flow:

Grow → Transport → Eat

You are a team of WSDA feed and food inspectors. You are part of an important team of specialists who work to protect our food supply and the public. This means that you know that growing and delivering foods safely to the public is more complex than most Americans think. In reality, the overall flow of food from farm to table is more accurately described as:

Grow → Harvest → Transport → Process → Package → Wholesale → Retail → Eat → Dispose

This linear flow describes how food moves through nine stages. In reality, various risks and drivers have an impact on every stage. These influence the movement of food through the stages, resulting in feedback loops. Like any good mystery detective, a food inspector must appreciate all these elements at once to be able to manage the process and ensure that the public has reliable access to safe food at the best price. In this activity, you will use **Systems Thinking**—an all-encompassing view of a problem—to analyze the many ways that the public is at low, moderate, or high risk due to a variety of stages in the delivery of safe food.

Working as one of eight teams, your team will be responsible for ***one*** of these defined stages of food production: **Harvest, Transport, Process, Package, Wholesale, Retail, Eat, and Dispose**. Each team will work to complete the matrix for ***their*** assigned stage of the flow plan, following the example provided for the "Grow" stage. Your teacher will assign your team one of these categories. After about ten minutes of work time, your team will share your entries with the class through a five-minute presentation and discussion. Remember, the health of Americans depends on your ability to complete the matrix reliably.

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Team Systems Thinking Matrix:

Sample for **Grow** stage:

Drivers: 1. Economic: World markets buying final crop at high price. 2. Cultural/Global: Large, hungry, and possibly impoverished global population.	
Inputs: 1. Land, seed, fuel costs, or water. 2. Farming equipment, available labor.	**Outputs:** 1. Final crop. 2. Profits.
Risks: 1. Infectious: Water or soil contaminated with an infectious organism, such as *E. coli*. 2. Chemical: Water or soil contaminated with toxic chemical, such as lead or arsenic. 3. Economic: Surplus yield drops price that wholesalers pay for crops. 4. Global: Drought in competing country reduces global yield and raises price wholesalers pay for crops.	

Complete the matrix below for your team's stage in food development.

Drivers: 1. Economic: 2. Cultural/Global:	
Inputs: 1. 2.	**Outputs:** 1. 2.
Risks: 1. Infectious: 2. Chemical: 3. Economic: 4. Global:	

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Individual Homework:

Background:

In 2007, veterinarians began to notice a growing number of cases of sick dogs and cats who ate specific brands of feed within a pattern of pathology and location. They began communicating with one another to determine the cause of the animals' illness.[1, 2] Inspectors had to scrutinize the pathway—looking at inputs and outputs at all stages in the pet food brands of concern.

Through experiments with fish, FDA scientist Dr. Renate Reimschuessel identified small crystals in the fish kidneys that were blocking proper function. As reports of pet-related illnesses and deaths increased, the pet food manufacturer, private and public universities, and the FDA mounted an impressive international collaborative effort to identify the cause of the poisoning. Soon after, Cornell University and the FDA Forensic Chemistry Center jointly identified melamine-cyanuric acid as the pet food contaminant.

Multiple state regulatory agencies and the FDA then worked quickly to remove potentially contaminated products from store shelves to limit the risk of animal injury and death, and also to inform consumers of the dangers of feeding their animals the suspect products. These agencies, including WSDA Feed Safety Specialists and the WSDA Chemical Lab in Yakima, Washington, also worked to discover the contamination sources by testing collected samples.

Eventually, the outbreak was traced back to melamine and cyanuric acid contamination in wheat flour imported from China and used as an ingredient in the pet food. The melamine had been intentionally added at the processing stage in China to give the flour the ***false impression*** of being rich in protein. By adding melamine, producers could price their products more inexpensively and competitively relative to U.S. wholesalers. These wholesalers sold the tainted product to a variety of pet food companies, who incorporated it into their products. They unknowingly sold their feed products to retailers, and in turn, to pet owners. In some cases processed feed was placed in shipping containers that had previously stored cyanuric acid. As a result of investigating the 2007 pet food problem, global surveillance methods of melamine content were launched to enhance the safety of the pet and human food supply. Additionally, officials enhanced public response and communications protocols to inform consumers of this new risk. Outbreaks associated with melamine and melamine analogues in pets and pigs have been confirmed in North America, Korea, Taiwan, the Philippines, Spain, Thailand, South Africa, and Italy.

In today's world, it is crucial to understand and deal with the global implications of intentional and unintentional foodborne contamination if problems like the melamine outbreak are to be prevented.

Footnotes:

1 http://www.youtube.com/watch?v=s8U9we0HEQg
2 http://www.fda.gov/animalveterinary/safetyhealth/recallswithdrawals/ucm129575.htm

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Review the stages in delivering feed from the farm to the pets' bowls. Note in the matrix below the potential sources of risk for each stage in the development and use of the feed. Then, propose how you might reduce each of these risks. Provide two answers for each heading.

	Was the feed altered during the growing and cultivation stage?	**Was the feed at risk during processing?**	**Was the feed at risk during distribution?**	**Why didn't the processors or feed inspectors find the melamine before animals died?**	**How was the public informed of the risk?**
Sources of Risk	1. 2.	1. 2.	1. 2.	1. 2.	1. 2.
Interventions and Innovations	1. 2.	1. 2.	1. 2.	1. 2.	1. 2.

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Systems Approach to Feed/Food Safety

Teacher Answer Key

Student Handout Scoring Rubric:

Fails to Meet Expectations	Approaching Expectations	Meets Expectations	Exceeds Expectations
Does not complete *Handout*. Or, fails to proficiently complete at least 50%.	Attempts to complete *Handout*, with >50% proficiency regarding possible risks.	Completes most of *Handout*, with >70% proficiency regarding possible risks.	Completes most of *Handout*, with >90% proficiency regarding possible risks.

Team Systems Thinking Matrix:

Teachers should expect to see a variety of answers to this open-ended exercise. This is because the breadth of the answers is dependent upon how broadly the students define the boundary or extent of their system. The following answer guide attempts to provide answers most explicitly associated with the learning goals of the lesson.

Harvest

Drivers: 1. Economic: World markets buying final crop at high price. 2. Cultural/Global: Large, hungry, and possibly impoverished global population.	
Inputs: 1. Mature crop. 2. Harvesting equipment, available labor. 3. Fuel.	**Outputs:** 1. Shipment-ready feed/food. 2. Cash for farmer. 3. Crop residue in field, nutrient-depleted soil.
Risks: 1. Infectious: Contaminated equipment. Crops left so long that they acquire mold. 2. Chemical: Contaminated equipment or rinsing water. 3. Economic: Insufficient labor, high fuel costs, rising cost of mature crop. 4. Global: Drought in competing country reduces global yield and raises price wholesalers pay for crops.	

Transport

Drivers: 1. Economic: Cost of labor, fuel, port service fees, availability of rail and cargo containers. 2. Cultural/Global: Large, hungry, and possibly impoverished global population.	
Inputs: 1. Crops. 2. Available skilled labor. 3. Fuel, rail, cargo containers, ports, boats.	**Outputs:** 1. Crop arrives for processing. 2. Empty and clean containers. 3. Documentation on use of the container and its location, facilitating container traceability.
Risks: 1. Infectious: Containers dirty or not sterile. 2. Chemical: Containers dirty. 3. Economic: Cost of fuel escalates. 4. Cultural/Global: War, terrorism, or piracy impedes movement of goods. Food defense not consistent. Disdain or fear of GMO crops.	

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Process

Drivers: 1. Economic: Cost of labor, fuel, and additives. 2. Cultural/Global: Large, hungry, and possibly impoverished global population.	
Inputs: 1. Transported crop. 2. Labor, packaging, additives, preservatives. 3. Processing facilities. 4. Government and third party inspectors. 5. Standard Operating Procedures (SOPs) used to maintain equipment and record methods.	**Outputs:** 1. Processed crop. 2. Empty containers.
Risks: 1.Infectious: Additives not clean/sterile. Crops stored poorly and rot. 2.Chemical: Unhealthy additives. 3. Economic: Cost of additives and labor encourage unhealthy processing practices (e.g., use of melamine, adding fill instead of protein). 4. Cultural/Global: Population demands fewer or safer additives; kosher food preparation.	

Package

Drivers: 1. Economic: Cost of labor and packaging. 2. Cultural/Global: Regulatory agencies require clear documentation of safe preparation of product ingredients. Consumers require an attractive and culturally appropriate package.	
Inputs: 1. Processed food and feed. 2. Packaging, fuel, and labor. 3. Storage areas.	**Outputs:** 1. Empty containers. 2. Packaged food.
Risks: 1. Infectious: Processing equipment and/or processing water not clean/sterile. Storage was insufficient to preserve or protect the food and feed from vermin or rot (both bacterial and fungal). 2. Chemical: Processing equipment or water not clean. 3. Economic: Cost of packing and fuel. 4. Cultural/Global: Packaging was not attractive to a variety of populations/cultures and languages.	

Wholesale

Drivers: 1. Economic: Ability to offer an adequate supply of safe, packaged materials at a competitive price. 2. Cultural/Global: Large, hungry, and possibly impoverished global population.	
Inputs: 1. Packaged foods. 2. Inspection agents. 3. Government and third-party inspectors. 4. Consumers and retailers.	**Outputs:** 1. Empty storage areas. 2. Wholesaler has packaged food to sell to retailers.
Risks: 1. Infectious: Industry fails to protect packaged food and feed from potential infectious hazards. 2. Chemical: Industry fails to protect packaged food from potential chemical and contamination hazards. 3. Economic: Consumers not interested in packaged food before it goes bad. 4. Global: Packaging fails to meet all the needs of consumers.	

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Retail

Drivers: 1. Economic: Ability to offer safe, packaged materials at a competitive price. 2. Cultural/Global: Large, hungry, and possibly impoverished global population.	
Inputs: 1. Wholesale foods. 2. Consumers. 3. Fuel, grocery bags, retail outlets, and skilled labor.	**Outputs:** 1. Food delivered to consumer. 2. Stores depleted of packaged food.
Risks: 1. Infectious: Food not stored properly in store. Tampering. 2. Chemical: Tampering/terrorism. 3. Economic: Online purchasing versus in-person purchasing. 4. Global: Food interests change resulting in overstock/understock.	

Eat

Drivers: 1. Economic: Food interests/fads/diets. 2. Cultural/Global: Large, hungry, and possibly impoverished global population.	
Inputs: 1. Purchased food, cooking energy, water. 2. Cook, hungry diner, restaurants, kitchens, cutlery, plates, servers. 3. Food inspectors.	**Outputs:** 1. Dirty dishes. 2. Full diner. 3. Empty kitchens.
Risks: 1. Infectious: Food poorly prepared or stored. 2. Chemical: Food poorly prepared or tampered with (e.g., poisoned). 3. Economic: Economy declines and people do not eat out. Food fads change dining choices. 4. Global: Food interests change resulting in overstock/understock.	

Waste

Drivers: 1. Economic: Use of waste food and paper products in compost and recycling. 2. Cultural/Global: Large, hungry, and possibly impoverished global population.	
Inputs: 1. Waste food and packaging. 2. Waste storage, processing, and staff.	**Outputs:** 1. Waste, compost. 2. Landfills.
Risks: 1. Infectious: Potentially hazardous waste. 2. Chemical: Landfills filled with methane. 3. Economic: Large cost of processing and disposing waste. 4. Global: Community lack of interest in/distaste for waste.	

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Individual Homework Answer Key:

	Was the feed altered during the grow and cultivation stage?	Was the feed at risk during processing?	Was the feed at risk during distribution?	Why didn't the processors or feed inspectors find the melamine before animals died?	How was the public informed of the risk?
Sources of Risk	The contamination did not occur during the growth and cultivation stage.	The feed was at risk due to intentional contamination during processing.	Unintentional contamination of feed during shipment or storage.	1. Experts had not realized how serious melamine poisoning could be for animals and therefore did not screen for it until many animals died. It was a new combination of chemical contaminants not typically found in animal feed. 2. It was a complex contamination that required investigation of several clues.	1. The public learned through the media, veterinarians, and pet food stores. 2. These sources were informed by the FDA and health officials. 3. The processors and wholesalers recalled the feed; pet stores removed feed from shelves. 4. From personal experience via the loss of a pet.
Interventions and Innovations	There is no risk here so no need for intervention.	1. Know the source of your inputs. 2. Have regulations and testing agencies.	1. Clean the containers per approved SOPs to remove chemical contamination. 2. Know the source of your inputs.	1. Once it was established how the pets were poisoned, feed was routinely tested for melamine and cyanuric acid. 2. Additionally, the FDA increased its presence in foreign countries.	1. Officials enhanced public response systems. 2. Officials enhanced the communications protocols that informed consumers of the new risk.

Individual Homework Scoring Rubric:

Fails to Meet Expectations	Approaching Expectations	Meets Expectations	Exceeds Expectations
Does not complete *Handout*. OR fails to proficiently complete at least 50% of answers regarding cause of poisoning and how scientists used data to determine risks.	Attempts to complete *Handout*, with >50% proficiency regarding cause of poisoning and how scientists used data to determine risks.	Completes most of *Handout*, with >70% proficiency regarding cause of poisoning as a result of co-contamination by melamine and cyanuric acid and how scientists used data to determine risks.	Completes most of *Handout*, with >90% proficiency regarding the cause of poisoning, and how WSDA used FDA data to reduce possible risks to animals eating feed.

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