Development of Informational Resources Pertaining to Zoonotic Diseases in Kansas

Kortnee Van Nest

MPH Candidate

2024

KANSAS STATE UNIVERSITY

About Me

- From Holton, Kansas
- Bachelor of Science in Veterinary Medicine from Kansas State University in 2023, Minor in Animal Science
- Anticipated Master of Public Health from Kansas State University in 2024
  - Area of Emphasis: Infectious Disease and Zoonosis
- Anticipated Doctor of Veterinary Medicine from Kansas State University in 2025
- Anticipated Doctor of Philosophy in Pathobiology from Kansas State University in 2027

KANSAS STATE UNIVERSITY

Outline

- Overview of Applied Practical Experience (APE)
- APE Objectives and Activities
- Background
- APE Projects and Products
- Future Considerations
- MPH Competencies
- Emphasis Area Competencies
- Conclusion
- Acknowledgements

APE OVERVIEW

Applied Practical Experience

- APE Site: The National Agricultural Biosecurity Center
  - Manhattan, KS
- Dates: December 1, 2022 – January 1, 2024
- Preceptor: Adrian Self, BGS
  - Operations Research Analyst

NABC
National Agricultural Biosecurity Center

Applied Practical Experience

- National Agricultural Biosecurity Center
  - Center Objectives[1]
    - Assist government agencies, private industry, and other organizations responsible for addressing diverse threats to America's agricultural infrastructure
    - Assist in evaluation and review of policy and procedures of agricultural events and exercises to improve future responses
    - Increase public awareness of the agroterrorism threat and its ramifications for homeland security
    - Engage in policy review and analysis (evaluation) to improve agrosecurity safeguards
    - Review and analyze policies, procedures, events, training exercises, and response plans

APE OBJECTIVES AND ACTIVITIES

APE Objectives

1. Gain a better understanding of what information is important for different audiences to know about zoonoses
2. Learn more about different zoonotic diseases that are commonly transmitted from animals to humans in Kansas
3. Become proficient in working on interdisciplinary teams to reach set goals
4. Gain knowledge in designing informational tools and writing in appropriate styles based on various audiences

APE Activities

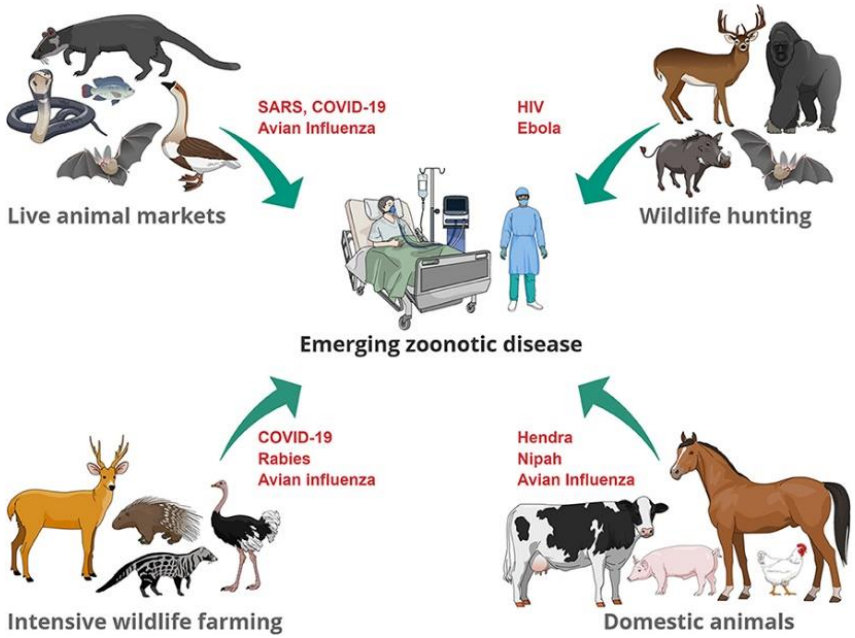
1. Attended meetings with various groups
2. Formed and lead a multidisciplinary team
3. Researched information pertaining to different zoonotic diseases and situations
4. Developed informational handouts for both veterinary and human medical professionals
5. Developed informational handouts for veterinarians to provide animal owners

BACKGROUND

Background

Zoonotic diseases

- Diseases transmitted between animals and humans
- Represent 75% of all emerging infectious diseases[2]
  - Human dependence on animals leads to disease spillover[4]
- Difficult to eradicate and prevent



https://www.frontiersin.org/articles/10.3389/fvets.2020.582743/full

Background

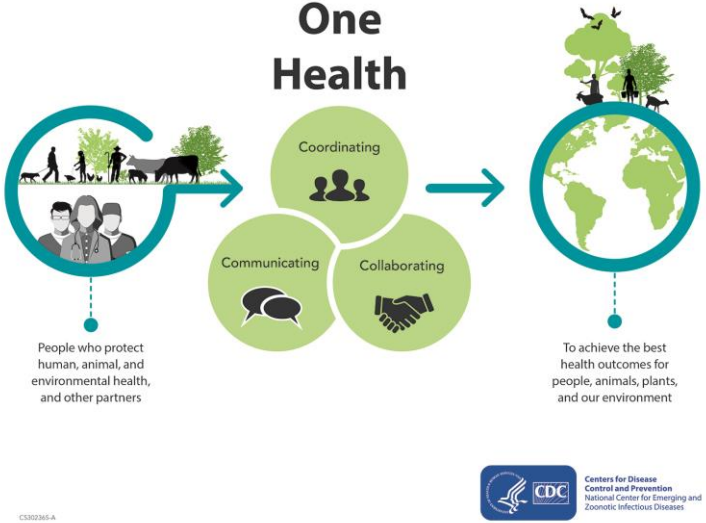
Veterinary and Human Medical Professional Involvement

- Have the knowledge to address zoonotic diseases
- Need to collaborate between the two fields of medicine
- Should provide patients/clients adequate information regarding zoonotic disease risks
- Aim for a One Health approach to medicine

Background

One Health

- Collaborative efforts from various disciplines to promote human, animal, and environmental health[4]



https://www.cdc.gov/onehealth/resource-library/one-health-graphics.html

Background

Knowledge of Zoonosis

- Human physicians
  - Only 50% of physicians are comfortable with their knowledge of diagnosing and treating zoonotic diseases[5]
    - Study of physician in Ohio
- Veterinarians
  - Only 57% of veterinarians report knowing when to report zoonotic diseases[6]
    - Multiple veterinarians who stated they knew when to report diagnosed diseases reportable in their state and did not report them
      - Disease included: leptospirosis, avian chlamydiosis, tularemia, and brucellosis

Background

Interdisciplinary Collaboration

- Current lack in collaboration between veterinarians and human physicians
- Collaboration efforts improved during the recent COVID-19 pandemic
- Only 53% of physicians believe that collaborating with veterinarians specialized in zoonotic diseases would provide any benefit[5]

Background

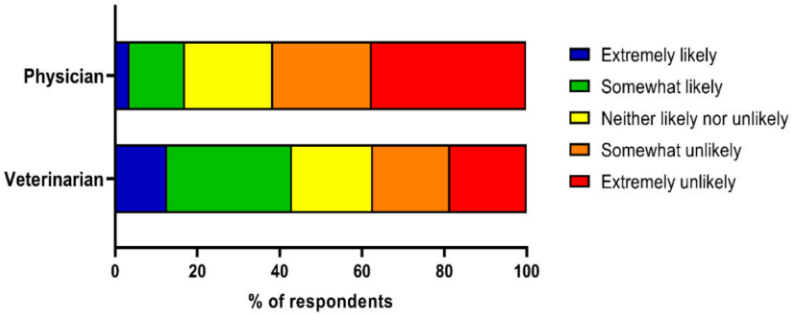
Patient/Client Education

- Initiation of discussions
  - Only 54% of human physicians believe it is important to ask patients involved with livestock of zoonotic disease exposures[5]
  - Only 43% of veterinarians report to initiate discussions with clients about zoonotic diseases daily[7]
- Provide resources
  - 47% of veterinarians do not have educational resources on zoonotic diseases to provide clients[7]

Background

Patient/Client Education

- Public perception
  - A study of pet owners showed that only half had heard of the term “zoonotic disease”[8]
  - Only 20% of pet owners are concerned about contracting a disease from their pets[8]
  - People are more likely to contact a veterinarian for information on zoonotic diseases[8]
    - Previous experience discussing zoonoses with veterinarian
    - Public has a better perception of veterinarians[9]



APE PRODUCTS

APE Products

One Health Briefs for Practitioners

- Seven handouts created
- Diseases/Situations covered
  - Tularemia
  - Toxoplasmosis
  - Rabies
  - Q Fever
  - Ringworm
  - Zoonotic influenza
  - Backyard poultry

One Health Briefs For Practitioners: Tularemia

What is Tularemia?

Tularemia, also called Rabbit Fever or Deer Fly Fever, is a disease caused by the gram-negative coccobacillus, *Francisella tularensis*.

Tularemia has over 100 host species with the most common being rodents, rabbits, cats, humans, dogs, sheep, and birds.

How is Tularemia spread?

Tularemia is primarily spread through arthropod vectors. Tick species in the U.S. that can transmit the bacteria are the American Dog Tick (*Dermacentor variabilis*), Wood Tick (*Dermacentor andersoni*), and the Lonestar Tick (*Amblyomma americanum*). Deer flies (*Chrysops spp.*) can transmit the bacteria as well.

Other methods of transmission include contact with or consumption of infected animal tissues or contaminated water, cat bites, and inhalation.

Veterinary Medical Professionals

Common signs and symptoms: Symptoms vary based on route of entry with ulceroglandular tularemia being the most common type. Signs in cats and rabbits can include lymphadenopathy, lingual or oral ulcers, abscesses, fever, splenomegaly, and hepatomegaly.

Diagnostics: Veterinarians with patients suspected to be infected with *Francisella tularensis* should contact the Kansas Veterinary Diagnostic Laboratory to submit samples. Necropsies should only be preformed by a qualified pathologist under a biosecurity hood.

PPE: Veterinary staff should use gloves, eye and face shields, and gowns when working with suspected infected animals. All surfaces and instruments that contact the animal should be cleaned with an appropriate disinfectant.

Owner Communication: Owners should be informed of the zoonotic potential and that animals treated with antibiotics are no longer infectious after 72 hours. Clients are encouraged to discuss health concerns with their local health department or medical provider.

Human Medical Professionals

Common signs and symptoms: Symptoms vary based on route of entry with ulceroglandular tularemia being the most common type. Most signs are non-specific and can include fever, chills, headache, malaise, and chest pain.

Diagnostics: The most common diagnostics used for Tularemia in human patients include culture and serology. Wounds believed to have caused the infection should be cultured. Suspected cases without wounds or ulcers should utilize serology.

Patient Communication: Patients should be asked if they have any exposure to animals such as cats or rabbits, whether domestic or wild, as well as raw or under cooked meat. They should also be asked if they have been to an area infested by ticks or deer flies, or if they have recently mowed. Patients should be informed that there is no evidence that Tularemia can spread from person to person.

References

American Veterinary Medical Association. (2003). Tularemia facts. https://www.avma.org/tularemia-facts
Centers for Disease Control and Prevention. (2019). Tularemia. https://www.cdc.gov/tularemia/index.html

One Health Briefs For Practitioners: Q Fever

What is Q Fever?

Q Fever is a disease caused by the gram-negative, obligate intracellular bacteria, *Coxiella burnetii*.

C. burnetii can infect many animals, but, is most commonly associated with infections in cattle, sheep, goats, and occasionally humans.

How is Q Fever spread?

C. burnetii is shed from the milk, urine, feces and birth products, such as the placenta, of infected animals. The bacteria is primarily spread through the inhalation of aerosolized dust particles that contain the bacteria.

Another route of infection is through the consumption of undercooked animal tissues or unpasteurized milk products. Some species of ticks may also pay a role in transmission, however, this is considered controversial and not proven.

Veterinary Medical Professionals

Common signs and symptoms: The most common signs of Q Fever infection in animals such as cattle, goats, or sheep are abortions or stillbirths. Other symptoms are typically non-specific and can include fever, anorexia, and lethargy.

Diagnostics: As many animals may be asymptomatic, diagnosis may be difficult. Serological testing can be used to screen herds for *C. burnetii*. Other diagnostic tools available include PCR or immunohistochemistry. Culture is typically not used due to the bacteria being highly pathogenic.

PPE: Gloves should be worn and hands washed when handling tissues or excretions from animals that may be infected. Masks are also recommended when assisting with parturition of a suspect animal.

Owner Communication: Owners of animals infected with *C. burnetii* should be informed of the zoonotic potential of the bacteria. They should be encouraged to use proper PPE and hand hygiene when working with potentially infected animals.

Human Medical Professionals

Common signs and symptoms: Many people infected with *C. burnetii* are asymptomatic. Symptomatic individuals may develop non-specific symptoms such as fever, headache, and muscle pain. More serious infections may lead to miscarriage, pneumonia, or chronic Q fever.

Diagnostics: For definitive diagnosis of Q Fever PCR and/or serological testing on acute and convalescent samples is used. Treatment should not be withheld pending laboratory results and should be initiated based on clinical signs and patient history. Culture is not typically useful in the diagnosis of Q fever.

Patient Communication: Patients suspected of having Q Fever should be asked if they have come into contact with agricultural animals, particularly sheep, goats, or cattle or if they consume raw milk or dairy products. Patients should be informed of the zoonotic potential of the disease and should be advised on proper safety precautions to minimize the risk of future infections.

References

World Organization for Animal Health. (2023). Q Fever. https://www.woah.org/en/disease/q-fever/
Centers for Disease Control and Prevention. (2019). Q Fever. https://www.cdc.gov/qfever/index.html

One Health Briefs For Practitioners: Zoonotic Influenza

What is Zoonotic Influenza?

Influenza, commonly called the flu, can infect multiple different species. However, most influenza viruses are species specific and not zoonotic.

Although uncommon, influenza A is known to occasionally be spread from animals to humans. The most common animals implicated in the spread of the disease to humans include poultry and swine.

How is Influenza spread?

Influenza virus is primarily spread through aerosolized respiratory droplets. Outbreaks are most likely to occur when large quantities of sick animals are kept in close quarters with limited ventilation or airflow.

Veterinary Medical Professionals

Common signs and symptoms: Swine typically present with respiratory disease with signs including coughing, conjunctivitis, and pyrexia. Poultry infected with influenza often present with both respiratory and digestive symptoms and very high mortality rates.

Diagnostics: Common diagnostic tests used to identify influenza virus in poultry and swine include RT-PCR, virus isolation, and ELISA.

PPE: Veterinary professionals who come into contact with poultry, swine, or other animals potentially infected with influenza should use caution. Gloves should be worn while handling animals and hands should be washed afterward. N-95 masks are also recommended to be worn.

Owner Communication: Owners of animals infected with influenza should be informed of the risk of zoonotic infection. They should be encouraged to avoid face-to-face contact with their animals, wash hands immediately after handling or feeding sick animals, and consult their healthcare provider if they develop fever, cough, or other upper respiratory symptoms. Depending on the species, public health monitoring may occur after an individual has been exposed to zoonotic influenza.

Human Medical Professionals

Common signs and symptoms: Zoonotic influenza presents with the same symptoms as typical influenza found in humans including fever, sore throat, cough, conjunctivitis, and fatigue. Although typically uncomplicated, some patients, especially though who are immunocompromised, many have more severe symptoms including encephalitis, sepsis, or even death.

Diagnostics: Multiple different tests are available to diagnose influenza, the most common being the "rapid influenza diagnostic tests" (RIDT). Other tests available include rapid molecular assays, RT-PCR, viral culture, or immunofluorecense assays.

Patient Communication: Patients presenting with symptoms of influenza should be asked if they regularly work with or come into contact with animals such as poultry or swine. Although zoonotic influenza infections are rare, rapid identification is necessary. If you suspect your patient has zoonotic influenza, contact the state or local health department for confirmatory testing. Patients who work with ill swine or poultry animals should be encouraged to use PPE, including fit-tested N-95 masks.

References

World Health Organization. (n.d.). Zoonotic Influenza. https://www.who.int/news-room/spotlight/influenza-are-we-ready/zoonotic-influenza
Centers for Disease Control and Prevention. (2022). Influenza (flu). https://www.cdc.gov/flu/other/animal-flu.html

One Health Briefs For Practitioners: Rabies

What is Rabies?

Rabies is a deadly zoonotic disease caused by the negative-sense RNA Lyssavirus, Rabies virus.

Rabies can infect all mammals and is considered to have a 100% fatality rate after the onset of symptoms.

How is Rabies spread?

Rabies is primarily spread through direct contact with the saliva of infected animals. Mostly commonly, this occurs through a bite. However, contact of saliva with open wounds or mucus membranes should also be considered.

Other less potential methods include scratches and contact with nervous or brain tissue.

Veterinary Medical Professionals

Common signs and symptoms: Symptoms of rabies in animals can vary based on the stage of disease and species. Some of the most common symptoms can include ataxia, paralysis, seizures, aggression, and excessive salivation.

Diagnostics: The most common diagnostic test is a postmortem direct fluorescent antibody test (dFA) of brain tissue. Rabies in animals is reportable in the state of Kansas and samples should be submitted to the Kansas State Veterinary Diagnostic Laboratory (KSVDL).

PPE: Veterinary staff should use extreme caution when working with suspected rabid animals. Heavy rubber gloves, masks, eye protection, and protective gowns should be worn when decapitating suspected animals. Staff should be vaccinated against the virus.

Owner Communication: Owners and those who have come into contact with the animal should be informed of the zoonotic potential. They should be encouraged to talk to the local health department and/or their medical provider, especially if they have come into contact with saliva.

Human Medical Professionals

Common signs and symptoms: Symptoms of rabies in humans typically begin as non-specific flu like symptoms that progress to cerebral disease, agitation, hydrophobia, and hallucinations. Patients suspected to be infected with rabies should immediately be reported to the state health department.

Post-Exposure Prophylaxis (PEP): Not all animal bites require PEP. State and local guidelines should be used to determine when PEP should be administered with bite and non-bite exposures. Bats found in rooms with children as well as adults who are asleep or impaired are considered exposed.

Diagnostics: Multiple ante-mortem tests including RT-PCR and virus isolation can only be performed to diagnose rabies in the terminal stage of disease. Collected samples should include CSF, skin biopsies, saliva, and serum.

Patient Communication: Bites and scratches from wildlife, bats, and stray animals present the greatest risk for rabies exposure. Patients should be educated to avoid handling or petting these animals and to seek medical care if they are bitten or scratched or consult public health if they find a bat in their home.

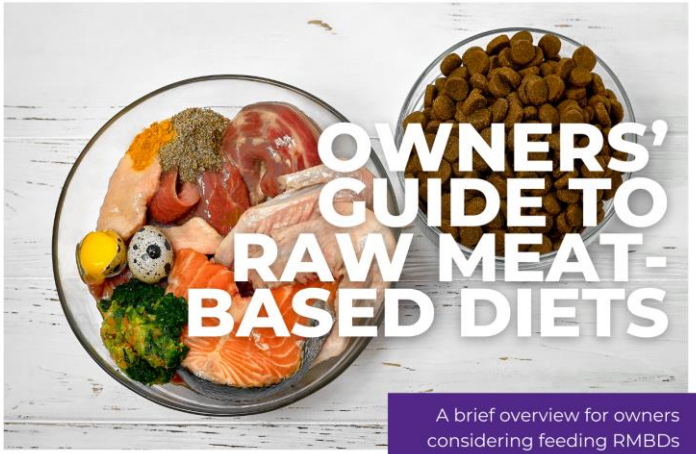
References

Kansas State Veterinary Diagnostic Laboratory. (2023). Rabies Laboratory. https://ksvdl.org/laboratories/rabies-laboratory/
Centers for Disease Control and Prevention. (2022). Rabies. https://www.cdc.gov/rabies/index.html

APE Products

Owners' Guides

- Ten handouts created
- Diseases/Situations covered
  - Tularemia
  - Toxoplasmosis
  - Rabies
  - Q Fever
  - Ringworm
  - Zoonotic influenza
  - Cryptosporidium
  - Giardia
  - Helminthiasis
  - Raw meat-based diets



OWNERS' GUIDE TO RAW MEAT-BASED DIETS

A brief overview for owners considering feeding RMBDs to their pets

What is a RMBD?

Raw meat-based diets (RMBD) are diets made for pets containing raw meat or other raw animal tissues.

Why do owners choose these diets?

Pet owners may choose to feed RMBDs to their pets because of multiple reasons. Some reasoning is that these diets are perceived as "healthier" or more "natural" compared to traditional kibble.

Do RMBD have health benefits?

Currently, there is no research-based evidence to prove that RMBDs have any health benefits compared to traditional kibble. However, RMBDs have been linked to pet illnesses due to improperly balanced diets and numerous bacterial and parasitic infections.

Can RMBD trasmit diseases to pets?

Although all foods can potentially transmit diseases, raw meat or other raw animal tissues have a higher chance of transmitting serious pathogens such as *Salmonella*, *E. coli*, *Clostridium*, *Trichinella*, and *Toxoplama gondii*.

Are there risks to humans?

Numerous disease outbreaks in humans have been linked to RMBDs, including *Salmonella* and *Listeria*. Immunocompromised persons and children are especially at risk for infection and severe outcomes.

Scan to learn more about pet food safety from the Centers for Disease Control and Prevention (CDC).

OWNERS' GUIDE TO TULAREMIA

A brief guide for owners when a pet is diagnosed with tularemia

What is Tularemia?

Tularemia, also called Rabbit Fever, is a zoonotic disease caused by the bacteria *Francisella tularensis*. The disease can cause varying symptoms depending on the species infected and method of infection.

How did my pet become infected?

Tularemia can be transmitted through multiple pathways. Most commonly, infection happens from the bite of an infected tick or consuming animal tissues or milk from infected animals.

What is a zoonotic disease?

Zoonotic diseases are diseases that can be transmitted between animals and humans. Animals do not have to show signs of illness to transmit some diseases.

How do I prevent myself or others from becoming infected?

Pets infected with tularemia are no longer considered infectious after 72 hours of antibiotic treatment and clinical improvement. Pet owners should use flea and tick preventatives to avoid future infections. They should also work to reduce fly populations and use tick repellents in infested areas. People should avoid animal bites/scratches and seek medical care if they feel unwell.

Should I seek medical treatment?

People who are exposed to Tularemia positive animals should contact their medical provider to determine the next steps.

Scan to learn more about tularemia from the Centers for Disease Control and Prevention (CDC).

Future Considerations

Home for the handouts

- Current plan
  - NABC webpage
  - KDHE: State Public Health Veterinarian's Webpage
- Other potential locations
  - Kansas Department of Agriculture
  - One Health Newsletter
  - Advertised at local and state medical or health conferences

Future Considerations

Expanding Topics

- Future diseases to consider
  - Avian chlamydia
  - COVID-19
  - West Nile virus
  - Salmonella
  - Brucella
- Updates
  - Diagnostics
  - Treatments
  - Adaptations

Future Considerations

Government Agencies

- Expansion of reportable diseases
  - Should diseases reportable in one species, be reportable in all?
    - What level should they be reportable to?
  - Should all zoonotic diseases be reportable?
- Local public health agencies
  - At what extent should they be involved?
  - Should they lead the charge for interdisciplinary collaboration?

MPH FOUNDATIONAL COMPETENCIES

KANSAS STATE UNIVERSITY

MPH Foundational Competencies

#13: Propose strategies to identify stakeholders and build coalitions and partnerships for influencing public health outcomes

- Identified different stakeholders that could help create the zoonotic disease handouts
- Of the identified potential stakeholders, I invited a selected few that would have the greatest direct impacts on zoonotic disease spread in Kansas to serve on the team
- Team members: NABC veterinarian, State Public Health Veterinarian, infectious disease physician, vector-borne disease epidemiologist, and an operations research analyst

MPH Foundational Competencies

#18: Select communication strategies for different audiences and sectors

- Created brief informational handouts for veterinarians, human practitioners, and pet owners to reference when faced with different zoonotic diseases
- Handouts were chosen because they are:
  - Quick to read while still provide adequate information
  - Pleasing to the eye
  - Easy to disperse

MPH Foundational Competencies

#19: Communicate audience-appropriate public health content, both in writing and through oral presentation

- Presented information about the importance of accessibility to zoonotic disease information for health professionals
  - Audience: health professionals
- Created different informational handouts for various audiences about the common zoonotic disease
  - Audience: health professionals; general public
- Information and writing/speaking styles changed based on audience

MPH Foundational Competencies

#21: Perform effectively on interprofessional teams

- Worked with and led an interprofessional team including public health professionals, veterinarians, and physicians
- Identified:
  - What diseases are of greatest importance
  - What information should be included for each disease
    - Clinical signs symptoms
    - General disease information (transmission, common names, species)
    - Diagnostic tests
    - Reportability
    - Client/Patient communication

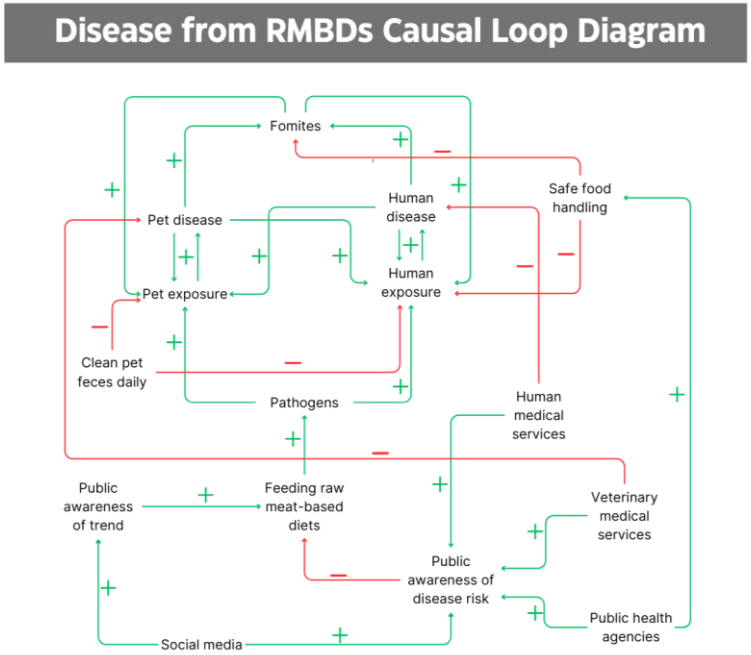
MPH Foundational Competencies

#22: Apply systems thinking tools to a public health issue

- Developed and used a causal loop diagram to determine what information is important for owners to know about disease transmission from feeding pets raw meat-based diets
- Information was used to create the Owners' Guide to Raw Meat-Based Diets handout

MPH Foundational Competencies

#22: Apply systems thinking tools to a public health issue



KANSAS STATE UNIVERSITY

Infectious Disease and Zoonosis

EMPHASIS AREA COMPETENCIES

KANSAS STATE UNIVERSITY

Emphasis Area Competencies

Pathogens/pathogenic mechanisms

Evaluate modes of disease causation of infectious agents

- Courses: DMP 814 (Veterinary Bacteriology and Mycology), DMP 834 (Veterinary Parasitology), VDMP 891 (International Animal and Zoonotic Disease)
- APE project: Information pertaining to pathogens including virulence factors, pathogenic mechanisms, transmission, and more, was used to discuss potential pathogen choices for the handouts with the multidisciplinary team. It was then applied directly to the information found in the handouts.

Emphasis Area Competencies

Host response to pathogens/immunology

Investigate the host immune response to infection

- Courses: DMP 817 (Veterinary Immunology)
- APE project: Better understood how hosts of disease react to the different pathogens selected for the handouts and develop clinical signs lists. This knowledge also allowed me to better understand rabies prophylaxis conversations.

Emphasis Area Competencies

Environmental/ecological influences

Examine the influence of environmental and ecological forces on infectious diseases

- Courses: MPH 802 (Environmental Health), DMP 880 (Problems in Pathology)
- APE Project: Understood and explained routes of transmission for diseases used in the handouts. An example is that fungal spores that cause ringworm, thrive in dark, moist environments.
- DMP 880: Determined where to collect the most amounts of flies as well as understand the relationship between those environments and the potential pathogens they may carry.

Safety of wild-caught *Musca domestica* for use as protein supplement in chicken feed

Kortnee N. Van Nest[1,2], Sabrina E. Swistek[2], Lee W. Cohnstaedt[2], Robert D. Ewing[2], Morgan L. Olmstead[3], Alina De La Mota-Peynado[2], Brenda S. Oppert[3], Phillip T. Shults[2]

Department of Diagnostic Medicine and Pathobiology[1], College of Veterinary Medicine, Kansas State University, Manhattan, KS; National Bio and Agro-Defense Facility[2] and Center for Grain and Health Research[3], USDA ARS, Manhattan, KS

Introduction

- Protein additives, such as soybean meal, can be an expensive addition to chicken feeds.
- Animal-based proteins are generally more digestible and absorbed quicker than plant-based proteins.
- Agricultural operations such as dairy and chicken farms attract a surplus of houseflies, *Musca domestica.* Previous studies indicate flies raised in captivity can be utilized as animal-based protein supplements for poultry.
- Wild houseflies are mechanical vectors for various pathogens which infect both animals and humans.
- Some harmful pathogens may be unique to certain farm types, thus harvesting flies from one livestock operation and using them as feed for a different livestock may reduce risk of infections.
- Disinfection treatments are needed to safely utilize houseflies as protein supplements in animal feed to prevent the spread of pathogens.
- Certain disinfection treatments may damage nutritional content such as crude protein.

Objectives

1. Determine microbiome of houseflies found on different animal agricultural operations.
2. Develop simple methods for producers to disinfect pathogens carried by flies to be utilized in animal feed.
3. Quantify crude protein content of houseflies after disinfection treatments.

Methods

Sample Collection

Flies were collected using nets from two local animal agriculture operations: a dairy and a chicken farm. Both sets of samples were frozen for 24 hours to ensure all flies were euthanized.

Treatments

Samples from each location were sorted into three separate treatment groups: whole (control), dried meal, and heated meal. Flies for the "whole" treatment were left unaltered. The "dried meal" treatment consisted of flies heated in an oven at 75°C for one hour then pulverized in a food processer. The "heated meal" treatment was dried at 75°C for one hour, pulverized in a food processer, and then heated to 200°C for two minutes.

Pathogen Detection

0.01 grams of each sample were suspended in three milliliters of sterile saline solution. 0.2 milliliters of each solution were evenly spread onto an unaltered lysogeny broth agar and a lysogeny broth agar with ampicillin for incubation at two different temperatures, 41°C and 28°C. Plates were incubated for 24 hours. Area of growth was recorded and DNA from individual colonies were extracted for genus identification using Sanger DNA sequencing.

Nutritional Analysis

Subsets of each treatment group from both agricultural locations were sent to a nutritional analysis company for testing.

Results

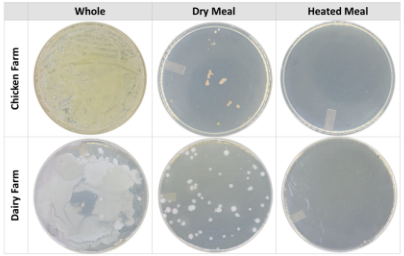


Figure 1. Differences between both the total area of bacterial growth and individual colony characteristics were noted between treatments as well as among the two collection locations.

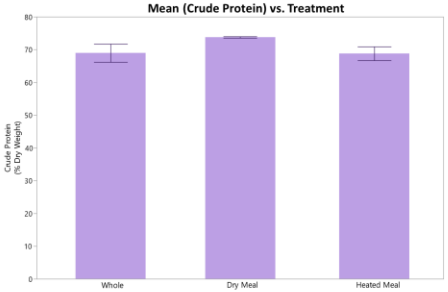


Figure 4. Nutritional analysis of the three treatments demonstrated no significant changes in percent of crude protein on a dry matter basis (P = 0.2171).

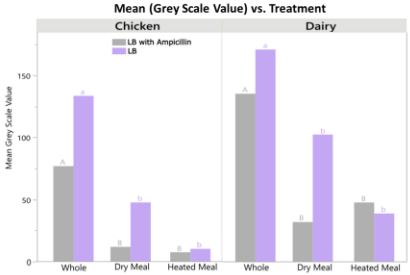


Figure 2. Disinfecting the samples reduced the area of bacterial growth in both ampicillin treated and unaltered lysogeny broth agars, independent of collection location. Total growth for dried meal and heated meal samples was significantly lower than the control for ampicillin (chicken, P = 0.0036; dairy, P < 0.001) and unaltered plates (chicken, P < 0.001; dairy, P = 0.0036).

Chicken Farm	Dairy Farm
Klebsiella sp.	*Klebsiella sp.*
Pseudomonas sp.	*Myroides sp.*
Proteus sp.	*Enterobacter sp.*
Bacillus sp.	*Bacillus sp.*
	Escherichia sp.

Figure 3. Bacterial genera sequenced from individual colonies varied between types of agricultural animal operations.

Discussion

Outcomes

- Bacterial genera extracted from flies collected on both the chicken and dairy operations could cause potential health issues in animals and humans.
- Both the drying and heating treatments can be utilized to disinfect flies used as feedstuffs. The heat treatment reduced the amount of bacteria by the greatest factor, thus making it the safest alternative tested.
- Overall, protein damage due to treatments, either dried or heated, was minimal if present at all. Treatments did not affect the nutritional value of the flies in terms of crude protein.

Future

- This study is limited by only testing for bacterial pathogens that can grow on agars. More detection methods are currently underway to incorporate other pathogens such as RNA viruses, fungi, or protists.

Scan the QR code to the microscopic environment of a plated sample.

Acknowledgments

- The National Bio and Agro-Defense Facility (NBAF)
- The USDA-ARS
- ARSX
- Michelle Reba and Jerry Don Clark
- SDK Labs
- Boehringer Ingelheim Veterinary Scholars Program

DMP 880

KANSAS STATE UNIVERSITY

Emphasis Area Competencies

Disease surveillance

Analyze disease risk factors and select appropriate surveillance

- Courses: MPH 754 (Introduction to Epidemiology), VDMP 891 (International Animal and Zoonotic Disease), DMP 880 (Problems in Pathology)
- APE Project: Discussed the importance of reporting specific diseases to the appropriate entities. An example of this was in the rabies handout for practitioners where I discussed where to submit samples for laboratory diagnosis.
- DMP 880: Collected flies from different locations over time to show what pathogens were present and monitored for antimicrobial resistant bacteria.

Emphasis Area Competencies

Disease vectors

Investigate the role of vectors, toxic plants and other toxins in infectious

- Courses: DMP 814 (Veterinary Bacteriology and Mycology), DMP 834 (Veterinary Parasitology), DMP 880 (Problems in Pathology)
- APE Project: Create both the handouts for practitioners and animal owners. Examples of vectors that I discussed were ticks and deer flies known for transmitting *Francisella tularensis*, the bacteria known for causing tularemia.
- DMP 880: Used my knowledge of diseases that flies may be a vector for to ensure that flies fed to animals were treated to prevent the spread of disease.

CONCLUSION

Conclusion

- Zoonotic diseases represent a growing threat to animal and human health
- Veterinary and human medical professionals must:
  - Expand their knowledge
  - Collaborate
  - Educate the public
- Room for growth in policy and government
  - Consistency of reportable diseases
  - Public health agency involvement

Conclusion

- Handouts provide:
  - Quick, reliable references
  - Encourage communication between professions and with patient/clients
- Limitations:
  - Diseases covered
  - Accessibility
  - Practitioners drive to use handouts
  - Locality

Acknowledgements

- MPH Committee
  - Dr. Robert Larson, major professor
  - Dr. Waithaka Mwangi, committee member (Ph.D. major professor)
  - Dr. Ellyn Mulcahy, committee member
- APE Site Preceptor
  - Adrian Self, Operations Research Analyst, NABC
- NABC and KDHE Team
  - Dr. Erin Petro, State Public Health Veterinarian, KDHE
  - Dr. Anna Pees, veterinarian and project manager, NABC
  - Stephanie Lindemann, vector-borne disease epidemiologist, KDHE
  - Dr. Kellie Wark, infectious disease physician
  - Savannah Greiner, emergency manager, NABC
- Others
  - FABADRU, USDA-ARS
    - Dr. Lee Cohnstaedt, Dr. Phillip Shults, Dr. Leela Noronha, Dr. Alina De La Mota-Peynado, Robert (JR) Ewing
  - My husband, Torin Van Nest
  - My parents, Ted and Melissa VanDonge
  - My sister, Rilee Steinlage

NABC
National Agricultural Biosecurity Center

Kansas Department of Health and Environment

USDA Agricultural Research Service

Kansas State University

References

1. National Agricultural Biosecurity Center. (2023). About. Retrieved from https://www.k-state.edu/nabc/about/index.html
2. Taylor, L.H., Latham, S.M., & Woolhouse, M.E.J. (2001). Risk factors for human disease emergence. Philosophical Transactions of the Royal Society B, 356(1411), 983–989
3. Magouras I, Brookes VJ, Jori F, Martin A, Pfeiffer DU and Dürr S (2020) Emerging Zoonotic Diseases: Should We Rethink the Animal–Human Interface? Frontiers in Veterinary Science 7, 582743.
4. Centers for Disease Control and Prevention (2024) One Health. Retrieved from https://www.cdc.gov/onehealth/index.html
5. Kersting, A.L., Medeiros, L.C., & LeJeune, J.T. (2009) Zoonoses and the Physicians' Role in Educating Farming Patients, Journal of Agromedicine, 14(3), 306-311.
6. Venkat, H., Yaglom, H.D., & Adams, L. (2019). Knowledge, attitudes, and practices relevant to zoonotic disease reporting and infection prevention practices among veterinarians - Arizona, 2015. Preventative Veterinary Medicine,196, 10471.
7. Lipton, B. A., Hopkins, S. G., Koehler, J. E., & DiGiacomo, R. F. (2008). A survey of veterinarian involvement in zoonotic disease prevention practices. Journal of the American Veterinary Medical Association, 233(8), 1242-1249.
8. Powell, L., Lavender, T.M., Reinhard, C.L., & Watson, B. (2022) Pet Owners' Perceptions of COVID-19, Zoonotic Disease, and Veterinary Medicine: The Impact of Demographic Characteristics. Veterinary Sciences, 9(5),195.
9. Kedrowicz, A.A., & Royal, K.D. (2020) A Comparison of Public Perceptions of Physicians and Veterinarians in the United States. Veterinary Sciences. 7(2), 50.

KANSAS STATE UNIVERSITY

Thank you

QUESTIONS?

KANSAS STATE UNIVERSITY