



Development of One Health Lesson Plans and Analysis of Kansas WebIZ and ESSENCE Rabies Data

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Introduction

- Bachelors in Biochemistry from Arizona State University
- Prior experience in Pharmaceuticals and Education
- Most recent experience as a Health Coach
- Current MPH Candidate
 - Emphasis in Infectious Diseases and Zoonoses

Background

- One Health
 - According to the WHO, One Health is defined as “an integrated, unifying approach that aims to sustainably balance and optimize the health of people, animals, and ecosystems. It recognizes that the health of humans, domestic and wild animals, plants and the wider environment (including ecosystems) are closely linked and interdependent” (1).
 - Importance of One Health in tackling “wicked” problems
 - Complex problems that have many interdependent factors
 - Require interdisciplinary approach
 - One Health in the classroom
 - After undergraduate studies, students are already siloed in their fields (2)
 - Incorporating One Health earlier on in education can encourage collaboration and can help students embrace this interconnectedness (2)
 - Most successful in diverse student cohorts, inclusive of all backgrounds (science, technology, mathematics, social sciences, arts) (2)

Background

- Rabies
 - Zoonotic disease, high mortality rate in humans and animals (nearly 100% once symptoms are present)
 - Human rabies is still a global issue, especially in developing countries
 - Endemic in many Asian and African countries
 - Majority of cases in humans are due to dog bites in these countries
- Taking a One Health approach to managing rabies
 - Proven effective in the U.S.
 - Rabies is rare, one to three cases per year
 - Majority of human cases are due to contact with bats, raccoons, skunks, and foxes
 - Room for improvement
 - Each year there are 30,000 to 60,000 humans receiving post-exposure prophylaxis

Applied Practice Experience

- Kansas Department of Health and Environment (KDHE)
 - Worked remotely
 - September 2022 to July 2023
 - Preceptor
 - Dr. Erin Petro (DVM, MPH)
 - State Public Health Veterinarian at KDHE
- Mission: “To protect and improve the health and environment of all Kansans”



Projects

- Project One
 - One Health Lesson Plans Development Project
 - Lesson plans spanning grades kindergarten through 12th grade
- Project Two
 - Analysis of Kansas WebIZ Rabies Data
- Project Three
 - Analysis of Kansas ESSENCE Rabies Data

Products

- One Health Lesson Plans, spanning from kindergarten thru 12th grade, seven plans in total
 - Lesson Topics
 - Spread of Infectious Diseases and Human-Animal Bond
- Rabies Data Analysis Tables for KSWebIZ project
- Rabies Manual Data Review/Analysis for ESSENCE project

Example Products from Project 1

Teacher Notes: Human-Animal Bond

This lesson introduces the human and animal bond and the benefits it can bring to both humans and animals. Humans have been drawn to animals since the beginning of time. When the first tools were developed to draw, animals were one of the first things humans drew on walls.

The human-animal bond is a mutually beneficial and dynamic relationship between people and animals. This relationship is influenced by behaviors that are essential to the health and well-being of both humans and animals. The relationship influences both the psychological and physiological state of both animals and humans.

Animals can offer social support to humans, which is necessary for well-being. They can buffer stressful events, allow for better coping and adaptive behavior, and improve the health and survival of humans. Similar benefits can be seen in animals too. Many studies have been conducted where data reveals animals' positive benefits on human health, like reducing the risk of health issues.

However, it is also important to note that the human-animal bond can negatively impact humans and animals. An example could be in times of evacuation when pet owners do not want to leave their pets behind. This puts themselves and their animals in danger by staying in unsafe conditions. Another example could be a dirty and unkept environment with animals that could spread infectious diseases (hoarder that has animals at home).

Often referred to as sentinel species, animals can be used to identify risks by providing warning of a danger that humans may face. One famous example of disease sentinels is canaries in a coal mine. Miners used canaries to help detect carbon monoxide gas. A canary's breath is much more rapid than a human's, causing them to breathe more air. If carbon monoxide were in the air, they would become sick much faster than humans; therefore, the miners would know to leave the mine.



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Teacher Notes: Spread of Infectious Disease (HS)

This lesson is an introduction to the spread of infectious diseases. **Infectious diseases** are diseases caused by microorganisms that we can't see with the naked eye, which are also called pathogens. **Zoonotic diseases** are diseases that are spread between animals and people. Many of the sick days we see are due to infectious diseases, like the common cold and influenza. These pathogens that infect us can include bacteria, viruses, fungi, or parasites.

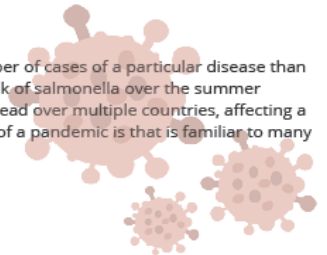
Infectious diseases can spread in several ways. The first is via **direct contact** (or person to person) like if someone coughs or sneezes on someone else. In relation to direct contact, a person can be **asymptomatic**, show no signs of disease or illness, and still be able to spread the disease to another person. A second way disease can spread is via **indirect contact**, like touching a doorknob that has been contaminated by germs. Two other ways disease is transmitted is through contaminated **food or water**. Lastly, diseases can be transmitted from a **vector** (carrier) to a human. For instance, diseases like Malaria or Lyme disease are transmitted to humans via mosquitos and ticks respectively.

The microorganisms that cause disease can change and adapt over time, which can lead to a resistance to once effective treatments. This is what we call **antimicrobial resistance**, which is a serious issue the world faces today. This is also why it is important to know whether a disease is caused by bacteria or a virus, to ensure antibiotics are being prescribed correctly.

The **disease triad** is a model that can help to understand how diseases spread. The disease triad has three corners:

- The "agent" which is the microorganism that causes the disease.
 - These can be germs, bacteria, virus, fungi, or parasites.
- The "host" which is the organism that is exposed to and harbors the disease.
 - This can be an animal or human
- The "environment" which is the surroundings and conditions that allow for the disease to spread.
 - Temperature
 - Dry or wet areas
 - Seasons

An **outbreak** or epidemic is a sudden increase in the number of cases of a particular disease than what is typical in an area. An example would be an outbreak of salmonella over the summer months in Kansas. A **pandemic** is an epidemic that has spread over multiple countries, affecting a much larger population of people. A most recent example of a pandemic is that is familiar to many is COVID-19.



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Example Products from Project 1

LESSON NAME: The Bond That Can't Be Broken

ONE HEALTH TOPIC

Human-Animal Bond

STATE STANDARDS

ELA: W.3.2, W.4.2, W.5.2, W.6.2, W.3.3, W.4.3, W.5.3, W.6.3
Science – LS2.A, LS2.D
History – Standard 1 Choices Have Consequences

GRADE LEVEL

Elementary School

SUBJECT AREAS

 English Language Arts

 Science

 Social Studies

LEARNING GOALS/OBJECTIVES:

Students will be able to:

- Identify human and animal bonds and their benefit on both humans and animals
- Identify negative impacts that animal and human bonds have on each other
- Define disease sentinel
- Identify examples of disease sentinels in the past and present

MATERIALS NEEDED:

Lesson Introduction

- Access to the internet and video player/projector

Drawing and Describing the Human-Animal Bond

- Markers, crayons, or colored pencils

Canaries in a Coal Mine

- Copies of the article entitled "Canaries in a Coal Mine"
- Notebook paper
- Pen or pencil

Journal Entry (ELA and Social Studies)

- Notebook paper
- Pen or pencil

Mini Poster (Science)

- Magazines/Access to online images and printer
- Age-appropriate scissors
- Large piece of construction paper or poster board
- Glue

This project was funded by CDC Grant # NU907P22155-01 Public Health Emergency Response: Public Health Crisis

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LESSON INTRODUCTION:

View the following videos with students.

- "The Human-Animal Bond" Running Time: 00:01:47
https://www.youtube.com/watch?v=WS5EdpazmMek&t=1s&ab_channel=TheAnimalMuseum
- "5 Unbelievable Cases of Human-Animal Bond" Running Time: 00:06:58
https://www.youtube.com/watch?v=CB6fWJZW5G4&t=87s&ab_channel=bodhispeak

Following the videos, begin a class discussion about the human-animal bond. The following questions may be used to help guide discussion:

- What is the human-animal bond?
- What are the benefits of this relationship?

LEARNING ACTIVITIES:

Activity Option #1: Drawing and Describing the Human-Animal Bond (Meets standards W.3.3, W.4.3, W.5.3, W.6.3, LS2.A, LS2.D, and Standard 1 Choices Have Consequences)

Have students create a picture of a pet or their favorite animal. Instruct them to write a paragraph (or words for the younger grades) about the relationship they have with that animal, how that animal makes them feel, what benefits they get from that relationship, and how they know how to interact with that animal.

Once students are finished, have them turn to their neighbors to share their pictures (or if they are in a group, take turns). Call on a few students to share with the entire class and write some of the responses on the board.

Continue discussing with the class the benefits as well as negative consequences of the human-animal bond and mention the different ways animals are present in our lives (e.g., law enforcement animals, therapy animals, etc.). See reference material entitled "Human-Animal Bond: Teacher Notes" for details.

Activity Option #2: Canaries in a Coal Mine (Meets standard 1 Choices Have Consequences)

Provide students with a copy of the paper entitled "Canaries in a Coal Mine", and read the article together as a class. Invite students to turn to a partner or take turns in their groups and answer the following question:

- What are other animals that have been used or have helped us to identify dangers before they happen?

Activity Option #3: Write a Journal Entry (Meets standards W.3.2, W.4.2, W.5.2, W.6.2, W.3.3, W.4.3, W.5.3, W.6.3, and Standard 1)

- Have students write 1-2 sentences or a paragraph about what they learned about the relationship between humans and animals.

Activity Option #4: Mini Poster (Meets standards LS2.A, LS2.D)

- Ask students to create a small poster using pictures and descriptions that summarize what they learned about the relationship between humans and animals, including the benefits and negative consequences, and animals as disease sentinels.

This project was funded by CDC Grant # NU907P22155-01 Public Health Emergency Response: Public Health Crisis

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Example Products from Project 1

LESSON NAME: The Bond That Can Never Be Broken

ONE HEALTH TOPIC

Human-Animal Bond

GRADE LEVEL

Middle School

STATE STANDARDS

ELA: W.7.7, W.8.7, W.7.8, W.8.8
HGSS: Standard 1 Choices have
Consequences, Standard 5 Relationships
between people, places, ideas, and
environment are dynamic

SUBJECT AREA



English Language Arts



Social Studies

LEARNING GOALS/OBJECTIVES:

Students will be able to:

- Identify human and animal bonds and their benefit on both humans and animals
- Identify negative impacts that animal and human bonds have on each other
- Define disease sentinel
- Identify examples of disease sentinels in the past and in future

MATERIALS NEEDED:

Introduction

- Access to the internet and video player/projector

Small Group Research Activity

- Access to the internet and a computer/computer lab

Poster Activity

- Magazines/Access to online images and printer
- Age-appropriate scissors
- Large piece of construction paper or poster board
- Glue

LESSON INTRODUCTION:

View the video "Sentinels of the Sea" with students to introduce the topic of disease sentinels. Note that the video is approximately 27 minutes long, but the first 3 minutes and 28 seconds summarize the concept well. If time permits, feel free to watch the entirety of the video with students.

Following the video, discuss the topic of disease sentinels. Use the following questions to help guide the class discussion:

- Are there other examples of disease sentinels you can think of? (See teacher notes for example about canaries in coal mines)
- Do you feel that using animals, such as canaries in mines to detect carbon monoxide, as disease sentinels is ethical? Why or why not?
- What are some potential consequences of the human-animal bond?

LEARNING ACTIVITIES:

Activity #1: Small Group Research Project (Meets Standards W.7.7, W.8.7, W.7.8, W.8.8, Standard 1 and Standard 5)

Split students into five equal groups to research the following topics:

- Benefits (health, social, emotional) to humans from Human-Animal Bond
- Benefits (health, social, emotional) to animals from Human-Animal Bond
- Evolution of wolves/dogs: The history of the Human-Animal Bond
- Service dogs for PTSD, disaster relief, prisoner rehabilitation
- Law enforcement animals

Once students have had time to gather their research, invite them to present their findings to the class with either a poster or a PowerPoint presentation.

Activity #2: Written Assignment (Meets Standards W.7.7, W.8.7, W.7.8, W.8.8, Standard 1 and Standard 5)

Ask students to write a short summary of what they learned from their classmates' presentations and their own research. The following questions may be used as a guide:

- What are the benefits to humans from the human-animal bond?
- What are the benefits to animals from the human-animal bond?
- What are disease sentinels? Why are they important?

ASSESSMENT:

Develop an age-appropriate rubric for student presentations/posters, or use the provided rubric as a guide.

Develop an age-appropriate rubric for students' written assignments.

RESOURCES:

- *The Human-Animal Bond*
https://www.youtube.com/watch?v=WSFdpazmMek&t=1s&ab_channel=TheAnimalMuseum
- *5 Unbelievable Cases of The Human-Animal Bond*
https://www.youtube.com/watch?v=CR6fWJZW5G4&t=87s&ab_channel=bodhispeak
- *Human-Animal Bond and One Health*. Dr. Takashima
<https://echo360.org/media/f5c6b726-faba-436f-87b6-e808f00ccb53/public>
- *Sentinels of the Sea*
https://www.youtube.com/watch?v=Ar4QpyQG1F4&ab_channel=ChangqingSeasTV

Example Products from Project 1

LESSON NAME: Stop the Spread!

ONE HEALTH TOPIC

Spread of Infectious Diseases

GRADE LEVEL

High School

STATE STANDARDS

ELA: W.9-10.7, W.11-12.7
Science: LS4.C
HGSS: Standard 1 Choices have Consequences

SUBJECT AREA



English Language Arts
Science
Social Studies

LEARNING GOALS/OBJECTIVES:

Students will be able to:

- Identify the five ways diseases spread throughout a population.
- Define and provide an example of asymptomatic disease transmission
- Define and provide an example of vector-borne diseases
- Define "indirect" and "direct" transmission.
- Identify and provide examples of the disease triad.

MATERIALS NEEDED:

Introduction

- Access to the internet and video player/projector

What's Happened to Jack? Activity

- Copies of Handouts:
 - Part 1: What Happened to Jack?
 - Possible Infections Diseases and Symptoms Chart
 - Part 2: What is the source?
- Premade Index Cards listing interview questions and answers, each on a separate card. One full set per group.
- Envelopes – two per group. One contains set of Question index cards, the other for Answers

LESSON INTRODUCTION:

View TEDEd video titled "How Pandemics Spread".

https://www.youtube.com/watch?v=UG8YbNbdaco&ab_channel=TED-Ed Running Time: 00:7:59

Following the video, ask students to turn to a partner nearest them and discuss the following questions:

- What makes a "pandemic" different than an "epidemic"?
- Which facts surprised you the most?

LEARNING ACTIVITIES:

Using information from the supplemental material titled, "Teachers Notes", share background information and terms with students so they gain a better understanding of how diseases spread.

Activity Option #1: What Happened to Jack? (Meets Standards LS4.C and Choices Have Consequences.)
(See supplemental materials for handouts and instructions)

Students work in small groups of four to determine the type and source of illness in a small child.

Activity Option #2: Small Group Research Project (Meets Standards W.9-10.7, W.11-12.7, and Choices Have Consequences)

Students work in pairs or small groups to research an infectious disease of their choosing. Examples include plague, influenza, malaria, and tuberculosis. Questions to guide this research include:

- What is the history of the disease?
- How does the disease spread? Is it vector-borne?
- What steps were taken or could be taken to help stop the spread of this disease?

ASSESSMENT:

Use the provided rubric for the *What Happened to Jack* activity,

Create a rubric for the small group research project.

RESOURCES:

BioEd Online: Infectious Disease Case Study

<https://www.bioedonline.org/lessons-and-more/lessons-by-topic/microorganisms/microbes/infectious-disease-case-study/>

Centers for Disease Control and Prevention – Introduction to Epidemiology: Section 8 Concepts of Disease Occurrence

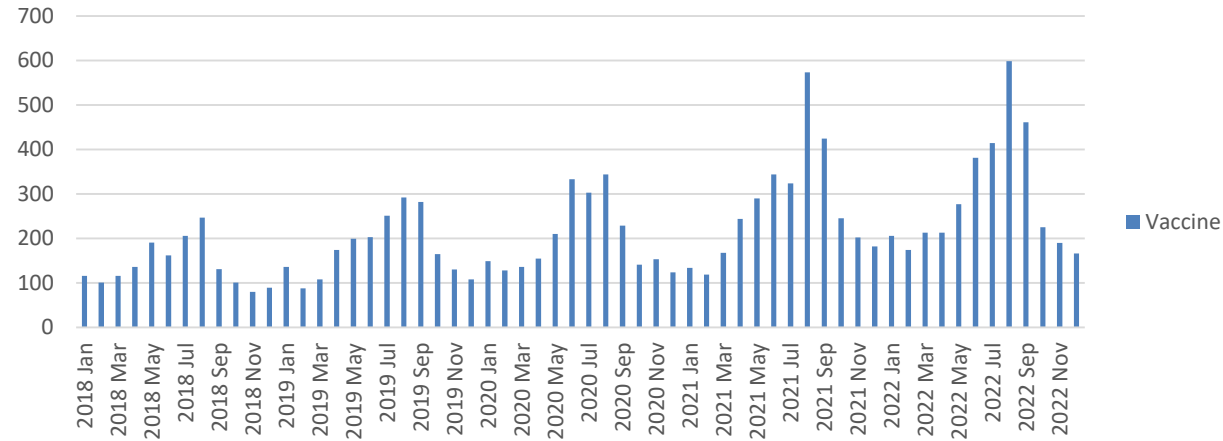
<https://www.cdc.gov/csels/dsepd/ss1978/lesson1/section8.html#:~:text=The%20triad%20consists%20of%20an,a%20source%20to%20that%20host.>

Mayo Clinic – Causes of Infectious Diseases

<https://www.mayoclinic.org/diseases-conditions/infectious-diseases/symptoms-causes/syc-20351173#:~:text=Infectious%20diseases%20commonly%20spread%20through,someone%20who%20isn't%20infected.>

Example Products of Project 2

Doses Administered per Year



Doses Administered by Sex			
Sex	Vaccination Type		
	Rabies Immune Globulin	Rabies Vaccine	Total
Male	697	7231	7928
Female	672	5738	6410
Total	1369	12969	14338

Example Products of Project 2

<i>Doses of Rabies Vaccine and Immune Globulin Administered by Age Group</i>			
Age Group	Vaccination Type		
	Rabies Immune Globulin	Rabies Vaccine	Total
0 to 9 years old	137	1803	1940
10 to 18 years old	175	1688	1863
19 to 29 years old	273	3084	3357
30 to 39 years old	254	2054	2308
40 to 49 years old	151	1279	1430
50 to 59 years old	155	1305	1460
60 to 69 years old	104	981	1085
70 years or older	120	775	895
Total	1369	12969	14338

<i>Doses of Rabies Vaccine and Immune Globulin Administered by Region</i>			
Region	Vaccine Type		
	Rabies Immune Globulin	Rabies Vaccine	Total
Northeast Kansas	621	6168	6789
Southeast Kansas	60	431	491
North Central Kansas	79	967	1046
South Central Kansas	403	2407	2810
Northwest Kansas	25	419	444
Southwest Kansas	33	195	228
Total	1221	10587	11808
Frequency Missing = 2530			

<i>Funding Source by Vaccination Type</i>			
Funding Source	Vaccine Type		
	Immune Globulin	Rabies Vaccine	Total
Private	177	5334	5511
Public	0	342	342
Total	177	5676	5853
Frequency Missing = 8485			

Example Products of Project 3

Rabies Y/N	PEP Y/N	Notes If questionable	Zipcode	Sex	Age	Chief_Complaint_Combo	Diagnosis_Combo
Y	Y	bit by stray dog, getting next dose	67135	Female	14	pt bit by stray dog 2 weeks ago needing 3rd rabies vaccination.;General medical	Z20.3 Contact with and (suspected) exposure to
Y	Y	pt went in for next dose of rabie	67135	Female	14	Patient states she is here for a rabies vaccine.;Vaccination	Z23 Encounter for immunization;Z23
Y	Y	Dog bite	67135	Female	14	Dog bite/scratch;Dog bite	A82.9 Rabies unspecified;Z23
Y	N		67217	Male	29	mother's cat attacked by dogs. pt rescued cat but cat bit his R hand and scratched	W55.01XA Bitten by cat Initial encounter
Y	Y	raccoon bite	67208	Male	17	Pt to the ER with c/o a bite from a racoon 3 days ago. Pt states the tooth of the	S83.92XA Sprain of unspecified site of left
Y	N	bat encounter, no mention of r	67152	Female	13	Laceration on forehead left side of face when patient was hit in the head by a bat	S09.90XA Unspecified Injury of head Initial
Y	Y	pt receiving last dose of PEP, ca	67501	Female	13	Pt returning for 4th and final rabies vaccine after a previous cat bite.;General	Z23 Encounter for immunization
Y	Y	feral cat bite	67501	Female	13	Patient was bit on the 6th by a feral cat here for her third rabies shot.;Vaccination	Z23 Encounter for immunization
Y	Y	returning for vaccine series	67501	Female	13	pt being seen for repeat rabies shot. pt denies any issues.;General medical	Z23 Encounter for immunization
Y	Y	dog bite	67211	Male	15	Pt is here for rabies shot.;Contact with and (suspected) exposure to rabies	Z20.3 Contact with and (suspected) exposure to
Y	Y	pt getting 3rd rabies vaccine	67211	Male	15	needs 3rd rabies injection;Encounter for immunization	Z23 Encounter for immunization;Z23
Y	Y	pt getting rabies vaccine	67211	Male	15	here for rabies shot;Encounter for immunization	Z23 Encounter for immunization;Z23
Y	Y	dog bite	67211	Male	15	dog bite to left forearm at 0730;Open bite of left forearm Initial encounter	Z23 Encounter for immunization;S51.852A
N	N	metal bat mentioned	67401	Male	25	pt arrives w reports bilateral arm pain following assault w a metal bat. reports	M79.601 Pain in right arm;M54.9 Dorsalgia
Y	Y	bitten by bat, last rabies vaccine	67205	Female	55	Pt to the ER for last rabies vaccine. Pt states she was bit by a bat and has	Z23 Encounter for immunization
Y	Y	bitten by bat, next rabies vaccin	67205	Female	55	Bit by a bat in St Louis Mo. Lives here came in for 2 vaccine. Reported no side	T14.8XXA Other injury of unspecified body region
N	N		67203	Female	66	Pt c/o shaking and chills. Hypertensive for EMS has not taken BP meds today. BSG	R68.83 Chills (without fever);E11.9 Type 2
Y	N	cat bite, no mention of vaccinat	67060	Female	71	Pt to the ER with c/o a cat bite to the left lateral lower leg. Pt states the cat is a	S81.852A Open bite left lower leg Initial

Conclusion

- Why is a focus on One Health earlier in education important?
 - Rise in complex problems we face today (zoonotic diseases, antimicrobial resistance, disease prevention) that require multiple disciplines in tackling
- Why is a focus on rabies surveillance (PEP administration and emergency room visits) in Kansas important?
 - Prevention
 - Educate public
 - Reduce burden of animal-bite/rabies-related emergency room visits

Conclusion

- Limitations
 - Project 1
 - Time - expected to pilot in Spring 2023 but took a bit longer
 - Won't receive feedback from lessons this Spring
 - Extension on grant from CDC approved through the end of 2023
 - Project 2
 - Data limitations
 - Individuals receiving more than one round of rabies series
 - Incomplete data/Missing county data for patients
 - Underreporting (reporting was not required until July 2020)
 - Data entry errors
 - Project 3
 - Not all facilities report the areas needed for analysis (chief complaints)
 - ICD-9 codes missing for some entries
 - Not all health facilities have been onboarded to use ESSENCE

Conclusion

- Future Directions/Current Status
 - One Health Lesson Plans Project
 - Pilot in Fall 2023
 - Review Feedback from Teachers
 - House lesson plans on KDHE website
 - Rabies KSWebIZ Data Analysis
 - Data was presented at an immunization conference in June 2023
 - First step towards further analysis
 - More aware of limitations for the future
 - ESSENCE Data Analysis
 - Data was presented at a KDHE presentation on data and epidemiology
 - Use data collected to reduce burden of animal bite related emergency visit
 - Improve sensitivity and specificity of the query used
 - Identify cases where PEP was administered but was unnecessary and identify cases where PEP was not administered but was necessary

Competency 3

Analyze quantitative and qualitative data using biostatistics, informatics, computer-based programming, and software as appropriate

- Competency achieved in Rabies WebIZ and ESSENCE projects
 - Analyzed data exported from Kansas WebIZ in Statistical Analysis Software (SAS version 9.4) and in Microsoft Excel version 230
 - Doses administered by age group, doses administered by sex, doses administered by funding source, and doses administered per month over 5-year period
 - Analyzed data exported from ESSENCE in Microsoft Excel version 230
 - Burden of animal-bite visits, number of rabies-related emergency room visits, number of patients receiving PEP

Competency 4

Interpret results of data analysis for public health research, policy, or practice

- Competency achieved in Rabies WebIZ project
 - Trends in demographic data and seasonality of rabies cases

Competency 18

Select communication strategies for different audiences and sectors

- Competency achieved in One Health lesson plan project
 - Responsible for determining most effective way to present One Health information, specifically on the spread of infectious diseases and the human-animal bond, to a wide age-range audience

Competency 19

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

- Competency achieved in One Health lesson plan project
 - Responsible for taking topics that can be highly scientific and technical and make it easily accessible and comprehensible for teachers and students

Competency 21

Perform effectively on interprofessional teams

- Competency achieved in One Health lesson plan project, Rabies WebIZ project, and Rabies ESSENCE project
 - Worked alongside professionals with diverse backgrounds.
 - Educators, public health veterinarian, epidemiologists, and project managers
 - To ensure the success of the projects, it was important to work effectively together as a team and it was interesting to be able to gain perspective from the many different areas of backgrounds that each team member brought to both projects

Emphasis Area Competency 1

Pathogens/Pathogenic Mechanisms

Evaluate modes of disease causation of infectious agents

- DMP 850 Domestic Animals Immunology
 - Learned about how different infectious agents, whether that be a virus, bacteria, fungi, or parasite cause disease which helped lay the groundwork needed to understand the rabies virus
 - While it was not necessary to have this prior knowledge, it was helpful to be able to understand the background behind the virus when looking at immunization data and in developing lesson plans emphasizing disease spread

Emphasis Area Competency 2

Host response to pathogens/immunology

Investigate the host response to infection

- DMP 850 Domestic Animal Immunology
 - Learned about the diverse ways an animal's immune system reacted to different foreign pathogens, and symptoms that would develop because of the response
 - Not a key part of my APE but it was helpful to have the knowledge of the immune response and vaccination prior to working on the projects

Emphasis Area Competency 3

Environmental/ecological influences

Examine the influence of environmental and ecological forces on infectious diseases

- MPH 802 Environmental Health and DMP 710 Introduction to One Health
 - Climate change and urbanization among others can lead to greater interactions between humans and animals which are drivers for disease spread
 - Environmental and ecological influences can at times be seen in animals long before humans, therefore can identify disease sentinels
 - Was able to translate this knowledge over into my APE when developing lessons for students

Emphasis Area Competency 4

Disease Surveillance

Analyze disease risk factors and select appropriate surveillance

- MPH 754 Introduction to Epidemiology and DMP 710 Introduction to One Health
 - Disease surveillance for disease control and eradication of disease
- ESSENCE and WebIZ are both programs that allow for disease tracking and tracking rabies immunizations respectively, which help to monitor rabies within any given state

Emphasis Area Competency 5

Disease Vectors

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

- MPH 802 Environmental Health and DMP 710 Introduction to One Health
 - Vector-borne diseases, such as malaria, West Nile encephalitis, and Lyme disease
 - Toxic plants and toxins, how they can build up over time in the environment, and how they can cause disease
- Provided the foundation I needed around these topics that I was able to translate over into my APE lesson planning projects

Thank you

❖ Graduate Committee

- Dr. Mulcahy
- Dr. Adams
- Dr. Kastner

❖ APE Preceptor

- Dr. Petro

❖ Project Team Members

❖ Stephanie Lindemann

❖ Family

- My husband, my daughter (soon to be daughters), and my parents



Thank You
Questions?

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