ACVPM Essay Exam: Example Questions and Answers

NOTICE: Below are samples of essay questions from previous ACVPM board certification exams. Also included are example answers that were deemed acceptable by the Examinations Committee subject matter experts.

Environmental Health and Toxicology

Question:

After causing substantial damage in the Caribbean, Hurricane Ida made landfall near Port Fourchon, Louisiana on August 29th, 2021, as a Category 4 storm with sustained winds of 150 miles per hour, ultimately resulting in nearly 100 lives lost and more than $75 billion in damage in the United States.

You are the Public Information Officer for Lafourche Parish, which includes Port Fourchon. One year after the storm, the Lafourche Parish President continues to receive questions from residents concerned with wide-ranging issues related to hurricanes. She has asked you to create a Question and Answer (Q&A) document for residents addressing the questions below.

- Could climate change be contributing to hurricanes? If so, what are two separate consequences of climate change that could contribute to hurricane frequency or severity and how are they contributing?
- We usually lose power during hurricanes. Are there any indoor human health hazards we should be aware of following power outages? If so, what are two of these hazards and how could we prevent them?
- I have several hundred head of cattle. What are three measures I can take as a livestock producer before the next storm to limit my losses?
- What is environmental justice and how could it have anything to do with flooding associated with hurricanes?

Example Answer:

To the residents of Lafourche Parish,

My name is Dr. Jack Sparrow, and I am the Public Information Officer for Lafourche Parish. As we recover from the terrible losses and damage caused by Hurricane Ida, I would like to take this opportunity to address a few of your questions and concerns.

Q: Could climate change be contributing to hurricanes?  A: Yes, it can. The two primary consequences of climate change that could contribute to hurricane frequency and severity are rising global temperatures and rising sea levels. Rising global temperatures contribute to climate change by affecting the moisture in the air and wind patterns, which can cause more frequent and severe storms. Rising sea levels can affect how hurricanes develop over the sea, as well as the severity of their impact on the coasts where we live.
Q: Are there any indoor human health hazards we should be aware of following power outages due to losing power during hurricanes?  
A: Yes, there are several health hazards. Two major ones are food safety and indoor temperatures. If your refrigerator and freezer go out, your food can rapidly spoil and become unsafe to eat. As it is difficult to determine how long refrigerated and frozen foods may have been held at unsafe temperatures during a power outage, especially if the power comes back on and foods re-chill or re-freeze, it is safest to dispose of most refrigerated and frozen foods following prolonged power outages. Another serious hazard is indoor temperatures becoming too hot or too cold. During hurricane season, overheating is usually the bigger concern. Those most at risk are very young, very old, and ill individuals. If your power goes out and temperatures are rising without air conditioning, it is important to seek alternate shelter, especially if you care for babies and young children, elderly people, or sick family members.

Q: What measures can livestock producers take to limit their losses before the next storm?  
A: The most important measure is to have a plan. Work with your team to develop an emergency preparedness plan for your operation. You can utilize county and state frameworks for this, as well as the National Response Framework and National Incident Management System guidelines. This plan should address the specific risks to your operation, as well as the capabilities that you have to manage these risks. The second important action is to maintain preventive medicine for your herd. This includes vaccines, parasite control, and good nutrition. Diseases can spread rapidly after natural disasters and having a strong and healthy herd will help mitigate these risks. Finally, ensure all of your animals are clearly identified, through branding, tattooing, ear tags, RFID, or other measures. This will help keep track of your animals during and following a disaster and will help with reunification if they are lost or relocated from your operation.

Q: What is environmental justice, and how could it be related to flooding associated with hurricanes?  
A: Environmental justice is a term used to discuss the unequal or inequitable effects that environmental issues, including those related to natural disasters and climate change, have on different groups. Flooding due to hurricanes is one example of this. Flooding may be more likely to affect groups of people who live in less-protected areas (for example, low-lying areas that are not well-protected by dams or levees). These people may also have fewer options to evacuate during a hurricane - they may rely on public transportation or public shelters. Finally, those affected by environmental justice inequity may have fewer resources to rebuild after a disaster. All of this can contribute to greater risk of injury or illness and can further the cycle of inequity.

Thank you for all of your questions and attention. If I can provide additional information on storms or answer further questions on preparing for future hurricanes, please contact me at 777-777-7777.

I appreciate the opportunity to work with our community!

Dr. Jack Sparrow  
Public Information Officer, Lafourche Parish
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Question:
The Dixie Fire burned more than 1,500 square miles in Northern California during July–October 2021 and affected air quality as far east as Utah and Colorado before it was 100% contained. Wildfires are occurring with increasing frequency and severity, highlighting a disturbing and dangerous trend.

You are a Park Ranger for the Lassen Volcanic National Park which was affected by the fire. You have been asked by your supervisor to contribute a short article for the quarterly park newsletter reflecting on the wildfire, approaching one year following the fire. Please address the following issues in your article.

• Briefly describe three separate consequences of climate change that can contribute to wildfire frequency or severity.
• Briefly describe how urban sprawl can affect wildfires.
• Identify the three air pollutants of concern during wildfires that are included in EPA National Ambient Air Quality Standards (NAAQS) and describe two methods individuals could use indoors or outdoors (one method each) to protect themselves from wildfire smoke.
• Despite the negative consequences, wildfires have an important role in ecosystem health. Briefly describe three environmental benefits of wildfires.

Example Answer:
One Year Since the Dixie Fire: What Do We Know?
Dr. Smokey Bear, Park Ranger

June 1, 2022

As we close in on the one-year anniversary of the Dixie Fire, which burned more than 1,500 square miles in Northern California, it is important to reflect on what we know and how this may impact wildfire prevention and emergency preparedness in our community. This requires an investigation into why wildfires are increasing in frequency and severity in recent years, the health consequences they represent, and why they may actually be beneficial to the environment in some capacity. Many factors contribute to the increasing frequency and severity of wildfires, but two of the most prominent are climate change and urban sprawl. Climate change causes increased temperatures that lead to droughts, which creates dry vegetation that is more likely to set fire. Climate change also causes more severe weather events like storms, which may cause wildfires through lightning strikes. Strong winds, another consequence of climate change, may cause wildfires to spread further once they have started.

Urban sprawl brings people and infrastructure closer to nature, increasing the likelihood that wildfires will impact humans and cause both physical harm and economic losses. Additionally, as humans live and work closer to flammable vegetation, there is an increased risk of human activities starting wildfires. In addition to physical and economic losses, wildfires also cause air pollution.
Three air pollutants from wildfires that are included in EPA National Ambient Air Quality Standards (NAAQS) are carbon monoxide, particulate matter, and ground level ozone. To protect yourself from air pollutants in wildfire smoke, you should use a fitted respirator when outside and utilize a well-maintained air filtration system when inside a building.

In some circumstances, wildfires may actually benefit the environment. Wildfires allow for new plant growth by freeing up space and resources once used by old vegetation. Wildfires also return carbon from vegetation back to the soil to support new plant growth. This new plant growth can provide food and habitat for animals. This allows for increased biodiversity, which is the number of species of plants, animals and microbes living in the environment. Furthermore, some species of plants require fire to allow their seeds to grow. While wildfires have benefits to the environment, they also have severe consequences for human health. Wildfires are increasing in frequency and severity, so it is important to take measures to prepare for another fire in our community. Lassen County public health officials and first responders are working hard to support community wildfire preparations and keep people safe.

For more information about wildfire protection, visit www.lassen.com/wildfires.
Presence of bronchial nodules, younger age, and heavier body weight are associated with a diagnosis of eosinophilic lung disease in dogs with cough

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OBJECTIVE
To describe the association between a diagnosis of eosinophilic lung disease (ELD) in dogs with signalment and bronchoscopic features and evaluate the accuracy of visualization of nodules for the diagnosis of ELD.

ANIMALS
703 dogs with cough that underwent bronchoscopy between 2014 and 2016.

PROCEDURES
Data were extracted from the medical records of each included dog. Multivariable logistic regression was performed to investigate associations between ELD and patient characteristics.

RESULTS
ELD was diagnosed in 113 (14.5%) dogs. More than 3 nodular lesions of the bronchial mucosa were detected in 64 (8.2%) dogs. The odds of having ELD were greater in dogs with nodules (adjusted OR [aOR], 26.0; 95% CI, 13.0 to 52.0) and static bronchial collapse (aOR, 2.3; 95% CI, 1.1 to 4.6), and lower in dogs having focal versus diffuse inflammation (aOR, 0.05; 95% CI, 0.01 to 0.37). The odds of having ELD decreased for each 1-year increase in age (aOR, 0.86; 95% CI, 0.80 to 0.92), and increased for each 1-kg increase in weight (aOR, 1.04; 95% CI, 1.01 to 1.06). Visualization of nodules during bronchoscopy had a high overall accuracy of 99.4% (95% CI, 97.0% to 99.4%), sensitivity of 91.4% (95% CI, 90.5% to 92.4%), and specificity of 99.5% (96.6% to 99.8%) for a diagnosis of ELD.

CLINICAL RELEVANCE
On the basis of high specificity and negative predictive value, lack of visualization of bronchial nodules during bronchoscopy can be used to preliminarily rule out ELD. However, visualization of bronchial nodules does not imply presence of ELD. This could be especially relevant when results of BAL cytology are available several days after the actual bronchoscopy.
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### Diagnostic accuracy of nodule visualization for diagnosis of ELD

Considering visualization of > 3 nodules as the index test, 47 dogs would have been correctly diagnosed with ELD, 651 dogs would have been correctly diagnosed without ELD, 66 dogs would have been false negatives, and 17 dogs would have been false positives. Therefore, visualization of nodules during bronchoscopy had a sensitivity of 41.6% (95% CI, 32.4% to 51.2%), specificity of 97.5% (96.0% to 98.5%), positive likelihood ratio of 16.3 (9.7 to 27.4), and negative likelihood ratio of 0.60 (0.51 to 0.70).

Based on the prevalence of ELD in this population, the overall accuracy of bronchoscopic visualization of nodules was 89.4% (95% CI, 87.0% to 91.4%), the positive predictive value was 73.4% (62.2% to 82.3%), and the negative predictive value was 90.8% (89.4% to 92.0%).

### Associations between individual factors and ELD

Of the 12 variables that were tested for inclusion in the multivariable model, only age, sex, body weight, cough duration, distribution of inflammation, presence of static bronchial collapse and presence of > 3 nodules were entered in the final model.

Regarding bronchoscopic results, the odds of having ELD were 26 times the odds in dogs presenting nodules (aOR, 26.0; 95% CI, 13.0 to 52.0; \( P < 0.001 \)), 20 times lower in dogs presenting focal rather than diffuse inflammation (aOR, 0.05; 95% CI, 0.01 to 0.37; \( P = 0.003 \)), and twice the odds in dogs presenting with static bronchial collapse (aOR, 2.3; 95% CI, 1.1 to 4.6; \( P = 0.025 \)). Regarding dog signalment, for each 1-year increase in age the odds of having ELD decreased by 14% (aOR, 0.86; 95% CI, 0.8 to 0.92; \( P < 0.001 \)), and for each 1-kg increase in body weight the odds of having ELD...
increased by 4% (aOR, 1.04; 95% CI, 1.01 to 1.06, \( P = 0.002 \)). Dogs with cough for < 1 month had approximately twice the odds of having ELD as dood dogs with cough for longer (aOR, 1.98; 95% CI, 1.10 to 3.54, \( P = 0.022 \)). Sex had a nonsignificant effect on the odds of having ELD (aOR, 0.78; 95% CI, 0.47 to 1.3, \( P = 0.34 \)). A further assessment of the final logistic regression model gave the following results (Figure 4): a) Hosmer-Lemeshow test, \( P = 0.19 \), b) Nagelkerke \( R^2=0.41 \), and the AUC of the ROC curve built from the predicted probabilities of the model was 0.85 (95% CI, 0.82 to 0.89).

**Question:**
Considering visualization of > 3 nodules as the index test, interpret the following terms to a high school student as they relate to the diagnosis of ELD in the study (Provide separate responses for questions A through K):

A. What is meant by “overall accuracy of 89.4%”?
B. What is meant by “sensitivity of 41.6%”?
C. What is meant by “negative predictive value of 90.8%”?
D. What is meant by “positive likelihood ratio of 16.3”?
E. Define Type 1 error and how much of this error was made
F. What is the apparent prevalence of ELD in the population?
G. Justify the specific type of epidemiological study that was utilized by the authors.
H. Irrespective of the study utilized above, describe and justify the best study that would best support a causal link between heavier body weight and diagnosis of eosinophilic lung disease in dogs?
I. Sex had no statistically significant effect on the odds of having ELD; yet the authors included sex in the final multivariable model (see underlined in the results section). Explain 2 possible reasons why the authors could have included sex in the final model even when it was not statistically significant.
J. What was the main purpose of applying Hosmer-Lemeshow test on the final model and what is the interpretation of the obtained result?
K. What is the interpretation of the obtained Nagelkerke \( R^2=0.41 \) in relation to the final model?

**Example Answer:**

A) Overall accuracy of 89.4%: Using visualization of > 3 nodules in the study, 89.4% of the dogs were correctly identified as having either a positive or negative diagnosis of eosinophilic lung disease (ELD).

B) Sensitivity of 41.6%: Sensitivity is the probability of visualization of nodules giving a positive diagnosis of ELD among dogs who are truly have ELD. Hence, 41.6% of dogs who truly have ELD received a positive ELD diagnosis using visualization of nodules.

C) Negative predictive value of 90.8%: NPV is the probability of dogs not having ELD among those with visualization of <= 3 nodules. Hence, 90.8% of dogs who have <= 3 nodules DO NOT truly have ELD.
D) Positive likelihood ratio of 16.3: $LR^+$ is the probability of dogs with ELD had > 3 nodules compared to the probability of dogs without ELD had > 3 nodules. Hence, a dog with ELD is 16.3 times more likely to have > 3 nodules compared to a dog without ELD.

E) Type 1 error: Type 1 error occurs when a truly healthy dog was erroneously given a positive diagnosis of ELD after visualization of nodules. Thus, there would be a 2.5% chance of Type I error (concluding that a dog has ELD when in fact the dog truly DOES NOT have ELD).

F) Based on visualization, 47 + 17 dogs have a positive diagnosis of ELD. Hence the apparent prevalence of ELD is 64/781 *100 = 8.19%.

G) Cross-sectional study was used because the dogs with cough were examined over a short period of time and the examination was done at a point in time for each dog.

H) A cohort study will be appropriate to best established causal link. Two cohorts of dogs with heavier and lesser body weight can be followed over time for the development of eosinophilic lung disease in the dogs. All dogs in the study must be free of eosinophilic lung disease at the beginning of the study.

I) Possible reasons for including sex in the final model are:
   a. Sex was a variable of interest to the authors
   b. Sex improved the overall fit of the model
   c. Sex was a confounding variable in the model

J) The main purpose of Hosmer-Lemeshow test on the final model is to be determined and tested for the goodness of fit of the model to the data used in the study. Since the P-value of 0.19 is greater than 0.05, then we believe the model fits the data and goodness of fit test is passed.

K) The Nagelkerke R²=0.41 is a proxy measure of coefficient of determination for logistic test. The interpretation is that 41% of the variation in the data and model were explained by the independent variable included in the model.

Question:

After reading a paper, a colleague emailed that he has always been confused about the difference between “associations” and “causations”. In 500 words or less, write an email response to your colleague that explains the distinctions between these two epidemiologic terms and provide 4 criteria that could be used to infer causation between an exposure and an outcome.
Example Answer:

Dear Colleague,

Thank you for reaching out. The difference between "associations" and "causation" is a question I get asked a lot! First, it's important to note that when we observe a relationship between an exposure and an outcome, it may not necessarily mean that the exposure caused the outcome. When we see a relationship between an exposure and an outcome, we can say it is "associated". However, that association may not be a true association, and it may not be causal. True associations is a different conversation, but briefly, associations could exist for several reasons such as: 1) there could be a true association, 2) the association that we have observed may have happened by chance alone, or 3) the association may be masked by bias or confounding. If we are certain there is a true association, we may be able to identify that it is causal.

Causality is quite difficult to prove, however there are some criteria that we can use to help us establish that. You may have heard of Bradford-Hill's criteria when searching for your answer. There are several criteria, but I will list four that will help with your understanding.

Temporal relationship: an exposure must occur before an outcome for it to be causal. This is one of the most important criteria to prove. Studies such as prospective cohort studies provide evidence for these criteria.

Strength of association: An exposure is more likely to be causal if there is a large strength of association. Strength of association includes odds ratios and relative risks. As these increase, you can be more confident that the association is causal. However, it is important to note that strengths of associations may be caused by bias or confounding.

Dose-response gradient: If an individual receives an increasing dose of exposure, we should see an increase in the outcome. This isn't true for all causal relationships (e.g., when there is a dose-plateau effect like radiation cascade poisoning), but it does provide evidence.

Analogy: This is one of the weaker criteria. This might be better explained by a brief example. If we observe a causal relationship in a rat, it may provide evidence of a causal relationship in people. However, we both know that rats and people are very different and so you can understand why this might only provide weak evidence.

I know that this particular topic can be quite confusing. Hopefully the information I have provided has given you some clarity. There is a lot of great information on the internet about Bradford-Hill's criteria and I recommend reading around the topic. Please reach out if you would like some further explanation.

Always happy to help!

Kind regards,

John Snow
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Food Protection

Question:
You and a public health professional colleague are discussing the CDC report indicating that foodborne illnesses caused by enteric pathogens tracked by FoodNet surveillance changed by 26% in 2020. Describe the direction of this change and its significance. Identify and discuss three likely reasons for this change as described in the CDC’s Morbidity and Mortality Weekly Report. Do not exceed 250 words. All answers must be complete sentences.

Example Answer:
The direction of the change in foodborne illnesses caused by enteric pathogens tracked by FoodNet was downwards - that is, these illnesses decreased in number. A 25% drop in foodborne illnesses is significant because many U.S. agencies work on foodborne disease prevention, but illness rates, especially for enteric bacterial pathogens, have been pretty static over the past few years despite great efforts to reduce them. However, during the pandemic, these illness rates decreased significantly. One example of a likely explanation is that during the pandemic, eating out at restaurants greatly decreased because of the lockdown. This would lead to a reduction in illnesses because fewer people would be exposed to food prepared and handled by strangers. Most people would prepare their own food at home and had more control over its handling. A second reason for the decrease would be that, also because of lockdowns, people may not have gone to the hospital as frequently during the pandemic. They may have believed that authorities did not want them to leave their house for any reason, including gastrointestinal illness, and so they may have chosen to deal with foodborne illnesses at home. A third possibility is that people may have believed that hospitals were overloaded with cases of COVID-19, and so they may have specifically chosen not to go to the doctor if they were feeling sick in order to decrease the case load on hospital personnel.

Infectious and Parasitic Diseases

Question:
Recent outbreaks of African Swine Fever in the Dominican Republic and Haiti have sparked concern in US pork producers on the potential for an outbreak of this disease in the US. You have been asked to prepare a brief statement to be delivered at a National Pork Producers meeting. Compose a professional and concise statement (300 words maximum) on why African Swine Fever is a disease that US producers should be concerned about. Describe three significant impacts that the disease will have if it reaches the US. Include at least three clinical signs of the disease, and three common methods of disease transmission. Discuss three steps that producers can take to reduce the risk of introduction into their herds.
Example Answer:

African Swine Fever (ASF) is the only double-stranded DNA arbovirus known to cause severe mortality losses in swine up to 100%. Although it is not zoonotic or transmissible to people, it is a grave concern should it reach mainland U.S. due to the economic consequences of swine loss. The top three significant impacts that the disease will have if it reaches the U.S. are the following: high chance of cross-over into wild boar populations, which would propagate the disease throughout the country; severe production losses, wreaking economic havoc on producers, especially small operations; and the inability of U.S. pork products to have open worldwide export without an "ASF-free" status. As producers, you can look out for this important disease that is indistinguishable from Classical Swine Fever (CSF), and report directly to your state public health veterinarian immediately if there is any concern of introduction into your swine. Clinical signs to look out for include a high fever >105 degrees Fahrenheit, petechiation or rash-like lesions on the skin, mucocutaneous ulcer-like lesions around the snout and hooves, and general unthriftiness and inappetence. Three common methods of transmission include via soft ticks, via fomites such as farm equipment, boots, and vehicles, and via direct close contact of swine (oral-nasal). In order to protect your herds, please enact first and foremost strict biosecurity protocols by limiting the number of visitors to the farm and ensuring any transportation of swine is done in properly washed vehicles (1:20,000 bleach solution). Moreover, try to keep a closed herd if possible and minimize contact with feral swine. Do not feed swine garbage product to your pigs per the Swine Health Protection Act. As leaders in the pork industry, please take this statement seriously as ASF has devastating economic consequences.

Question:

Your state department of agriculture has been receiving many questions from veterinarians who have clients wishing to know dosages of ivermectin that they have purchased from a local feed store for the treatment of Covid 19 in humans.

Prepare a brief statement (200 words maximum), suitable for veterinarians to give to their clients. Describe the formulations and use of ivermectin in veterinary medicine, and list three reasons why it should not be used as a self-treatment option for Covid 19. Describe two reasons why a shortage of veterinary ivermectin can affect animal health. Provide a medical or scientific resource that would be appropriate for people seeking more information on human use of ivermectin.
Example Answer:

Ivermectin is primarily used as a parasite prevention and treatment medication in veterinary patients. It is often formulated as an oral paste or tablet or as an injectable medication and is commonly used to prevent heartworm and intestinal worm infections in small animals and to prevent or treat intestinal worm infections in small ruminants and in larger animals such as horses and cattle. One reason that it should not be used to self-treat for COVID-19 is that there is no research data showing that it is effective in doing so, so patients are putting themselves at risk needlessly. Second, animal medications are not licensed for human use, so such use is illegal and will likely have unintended side effects. Third, veterinary ivermectin products are not designed or safe for human use so it is possible and even likely that uncontrolled personal use could result in severe illness or even death. One reason it should be reserved for animal use is its importance in heartworm disease prevention - a shortage of ivermectin could lead to huge increases in the numbers of heartworm-positive small animal cases which would require long, painful, difficult and expensive treatment to resolve. Additionally, ivermectin may be a critical part of maintaining health of farm animals as well. Small ruminants such as goats in particular may become severely ill or die from blood loss caused by intestinal worm infections if they cannot be treated to decrease their burden of infection. For more information, readers should consult the Centers for Disease Control website on COVID-19 to learn more about safe and better-researched treatment options for this disease.

Question:

It is February 2022. Your state department of agriculture received an email from the new county emergency manager in the largest poultry producing county in the state. Please respond to the email in a concise (400 words max) and professional manner. Do NOT include your real name in your response.

Dear Doctor,

Last year, before I came on board as EM, I heard about an outbreak of Avian Influenza in one of our turkey farms. Everyone said it was not a big deal, just low pathogenicity AI. Those same folks this year are really worried about this H5N1 AI that is showing up in wild birds this year. I'm hoping you can answer some questions for me.

What are the key components of a response when LPAI is diagnosed in a flock? Why/how is it different than a response to an HPAI outbreak?
What are the clinical signs of avian influenza, and how is it transmitted?
Why are people so worried about this H5N1 Eurasian strain that is found in wild birds?
Can people get sick from H5N1?
If we get this H5N1 in our poultry, will it still be safe for people to handle them or consume poultry products?
Dear Mason Jones,

Thank you for reaching out to me regarding this matter. I hope I can address your concerns.
1. The key components of a response when LPAI is diagnosed in a flock are to contain the infection and monitor for spread.

2. It is different than a response to an HPAI outbreak because an HPAI outbreak requires larger monitoring areas and depopulation.

3. Some clinical signs of avian influenza are respiratory signs such as coughing and sneezing, diarrhea, torticollis (a twisted neck), cyanosis (bluish coloration) of the wattles and combs, and possibly high mortality rates. It is transmitted by direct transmission (droplets from sneezing and coughing) and fomites (contaminated equipment).

4. People are worried about this H5N1 Eurasian strain that is found in wild birds because it is highly contagious and can cause HPAI.

5. Rarely, people can get sick from H5N1. This usually occurs in people working closely with infected birds.

6. If we get this strain of H5N1 in our poultry, people can safely handle and consume poultry products if certain precautions are taken. People handling the birds should wear personal protective equipment such as a respirator, safety classes, gloves, and protective clothing to prevent them from contracting avian influenza or spreading it to other flocks. Poultry products can be eaten if cooked to meet certain specifications which will inactivate the virus.

7. Producers can protect their birds through rigorous biosecurity. Secure buildings to prevent the entrance of wild birds. Use separate personal protective equipment for each house and take time to thoroughly wash your hands before and after entering the houses. Also use separate equipment, such as shovels and buckets, for each house. Minimize the amount of people, equipment, and vehicles entering the property.

Please let me know if there is anything else I can help you with in regard to this matter.

Kind regards, Dr. XY
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Public Health Administration and Education

Question:

On July 21, 2021, the Colorado Department of Public Health and Environment issued a press release, “Plague activity identified in Colorado,” following the death of a 10-year-old resident of LaPlata County.

A. You work for the state department of agriculture and have been asked by senior management to prepare an executive brief on this disease. In your brief, be sure to include:
1. identify the causative agent and one important reservoir host species
2. describe three ways plague can be transmitted to humans
3. describe three principal forms of the disease – include which form is most common.
4. describe two prevention and control measures

B. After receiving your brief, a member of senior management (a non-veterinarian) in your department is convinced that this is the start of the next pandemic, and we are in for a repeat of the “Black Death.” Describe two reasons why this is unlikely

C. Describe three characteristics of the organism that make it a category A bioterrorism agent.

Example Answer:

A. Yersinia pestis is a bacteria that is the causative agent of Plague. This was the agent that resulted in the well-known historical event of the "Black Death". The most important reservoir for this disease are rodents. Plague can be transmitted to humans through the bite of an infected flea, inhalation of materials infected with rodent droppings, and from handling infected rodents. There are several different forms of this disease that people can get sick with. The most common form of plague is the bubonic form. This results in extremely swollen and enlarged lymph nodes all over the body. The second form that can occur is the pneumonic form. This form results in a bad pneumonia and is more deadly than the bubonic form. The third form is a cutaneous form that results in skin lesions. Rodent control is important in the prevention of this condition. Good pest management and hygienic living conditions can decrease rodent infestations in your home. In addition, if you do spend time working with rodents, it is important to wash your hands well prior to eating or drinking.

B. There are two reasons why it is unlikely that Plague will be the next pandemic. First, not all forms of this disease result in person to person spread like with our current pandemic caused by COVID-19. Since this disease depends on the reservoir species and fleas for infection, it is less likely to spread rapidly from place to place. Secondly, we have much better hygiene practices and living conditions today than we did during
the period of the "Black Death". Sanitary and less crowded living conditions decrease the presence of rodents and subsequently risk of this disease.

C. Three characteristics that make this organism a Category A bioterrorism agent are: High potential for deliberate misuse, high infectivity and/or mortality rates, and would result in significant consequences to economy, infrastructure, and public health.

Question:

The following excerpt is from a press release issued by the Centers for Disease Control and Prevention (CDC) on January 6, 2022:

*The Centers for Disease Control and Prevention (CDC) is raising awareness of the risks of rabies from bats in the U.S. after three people, including one child, died from rabies between late September and early November 2021. The three cases, described in the January 6, 2022, Morbidity and Mortality Weekly Report, bring the total number of cases in 2021 to five, compared to no reported rabies cases in people during 2019 and 2020.*

You are working at a local health department and receive four calls about rabies on a Friday afternoon. As a public health official, describe the recommended actions from the Compendium for Animal Rabies Prevention and Control for each of the following scenarios:

A. An owner reported that her dog was bitten by a skunk while at the dog park. She has proof that her dog is current on rabies vaccination.

B. The neighbor’s dog was also bitten by the same skunk referred to in Part A. She has proof the dog was vaccinated for rabies previously but is now overdue for a booster vaccination.

C. An owner reported that her cat was seen outside carrying a bat in its mouth. The cat has never been vaccinated.

D. A neighbor’s dog that appears to be healthy bites a child. The owner of the dog is able to produce proof of current rabies vaccination.

**Example Answer:**

A. This animal's rabies vaccination status is current. The owner should seek veterinary care for her dog, including wound treatment a booster rabies vaccination. The dog should be observed for 45 days for any signs of illness immediately reported to the veterinarian and local state animal health official.

B. This animal's rabies vaccination status is overdue. The owner should seek veterinary care for her dog, including wound treatment a booster rabies vaccination. In addition, the dog should have blood drawn prior to booster vaccination, to demonstrate an
anamnestic response in rabies antibody titer in response to a booster vaccination. The dog should be observed for 45 days for any signs of illness immediately reported to the veterinarian and local state animal health official.

C. This animal's rabies vaccination status is not current. If available, the dead bat should be submitted for rabies testing. In this situation, it is recommended to euthanize the cat. Should the owner not wish to proceed with euthanasia, the cat should receive a primary course of rabies vaccine (including booster), strictly quarantined for 6 months, and any signs of illness immediately reported to the veterinarian and local state animal health official.

D. This animal's rabies vaccination status is current. It should be observed for 10 days to rule out any signs of illness, in which case it should be immediately reported to the veterinarian and local state animal health official. The circumstances leading to the dog biting the child should be discussed by the veterinarian to determine what preventive actions to take or if more substantive action (e.g., euthanasia) is warranted if deemed a dangerous dog.

Question:

You work for the state department of agriculture. On September 7, 2021, a professional colleague sent you an email with a link to a news article titled, “Nipah Virus Kills 12-Year-Old Boy in India, Raising Outbreak Concerns.” In the email, he comments that Nipah virus is remarkably similar to SARS-CoV-2, the virus that causes Covid-19. In an email response to your colleague (300-word max), discuss a similarity and a difference between Nipah virus infection and Covid-19 for three (3) of the following categories:

- Species affected
- Geographic distribution
- Transmission characteristics
- Clinical signs in humans
- Morbidity and Mortality in humans
- Prevention and Control Methods

Do not include your real name in your email response.

Example Answer:

Thank you for sharing this report of Nipah virus. Nipah is a very interesting virus that shares some similarities, but also some differences, with SARS-CoV-2, the virus that causes COVID-19. Nipah primarily circulates in fruit bats and can also infect domestic pigs that are raised outside and might come into contact with infected bats and their excrement. While predominantly an animal disease, people can become infected when they drink raw palm sap collected from containers that bats have eliminated in, or from coming into close contact with infected pigs that amplify the virus. SARS-CoV-2 is
similar in that it we believe it also has a bat host, though genomic surveillance has not yet found the original wild-type Wuhan strain of SARS-CoV-2 in wild bat populations. In contrast to Nipah, SARS-CoV-2 is primarily a disease of people with occasional spillover to animals. Pigs are not known to be susceptible to SARS-CoV-2. While both Nipah virus and SARS-CoV-2 exist in southeast Asia, Nipah is geographically confined to this region, whereas SARS-CoV-2 has a global distribution. When it comes to viral transmission, both viruses are zoonotic (shared between people and animals). As mentioned, Nipah is transmitted to people through consumption of raw palm sap and contact with swine. SARS-CoV-2 is primarily transmitted person-to-person though respiratory droplets and aerosols. Both are fascinating viruses -- thank you again for sharing this report!