PENNSYLVANIA GAME COMMISSION
BUREAU OF WILDLIFE MANAGEMENT
ANNUAL PROJECT REPORT

PROJECT CODE NO.: 05140

TITLE: Ringneck Propagation - Operations

JOB CODE NO.: 14001

TITLE: Surveillance for chronic carriers of *Pasteurella multocida* in captive Ring-necked Pheasants (*Phasianus colchicus*) after an outbreak of avian cholera

PERIOD COVERED: 1 July 2013 to 30 June 2014

COOPERATING AGENCIES: Animal Diagnostic Laboratory, Pennsylvania State University
WORK LOCATION(S): Loyalsock Game Farm

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DATE: 21 May 2014

ABSTRACT Avian cholera is a significant disease of domestic and wild birds caused by the bacteria *Pasteurella multocida*. In poultry, a major source of *P. multocida* infection is chronic carriers; domestic birds that have become infected and recovered or had subclinical infections. Although outbreaks of avian cholera in pheasants are not uncommon, the potential for chronic carriers (relative to domestic galliforms) is not well known. We conducted surveillance for *P. multocida* in a captive Ring-necked Pheasant (*Phasianus colchicus*) population after an outbreak of avian cholera that responded positively to antibiotic treatment. At approximately 1-month post-antibiotic treatment, oropharyngeal swabs were collected from 299 hen pheasants (out of a total population of about 2,300 hens) in a single winter holding pen at the Loyalsock Game Farm. All samples were tested for *P. multocida* through routine bacterial culture and identification conducted at the Animal Diagnostic Laboratory at Pennsylvania State University. None of the 299 samples were positive for *P. multocida*, providing no evidence for chronic carriers in this pheasant flock. Future outbreaks of avian cholera will need to be similarly investigated in order to expand on these results and obtain a more complete understanding of *P. multocida* infection and epidemiology in pheasants.

OBJECTIVE

To determine the prevalence of asymptomatic carriers of *Pasteurella multocida* in an infected flock of pheasants after antibiotic treatment.

INTRODUCTION

Avian cholera is a significant bacterial disease of wild and domestic birds caused by *Pasteurella multocida* (Glisson et al. 2008). Clinical presentations of disease related to *P. multocida* in birds vary from acute septicemic disease associated with high morbidity and mortality to localized chronic infections to subclinical infections. Variation in clinical presentation is complex and influenced by multiple factors, including host species, bacterial strain, age of birds, and occurrence of other stressors (i.e. nutrition, crowding, climate, etc.) (Christensen and Bisgaard 2000). Within gallinaceous poultry, turkeys are highly susceptible to *P. multocida* with outbreaks characterized by acute hemorrhagic septicemia and high mortality. Chickens are less susceptible to *P. multocida* and outbreaks are more commonly associated with low mortality, decreased production, and localized infections. Treatment in domestic poultry involves administration of antibiotics based on laboratory sensitivity testing (Glisson et al. 2008). While antibiotic treatment may reduce or eliminate mortality, it reportedly does not eliminate bacterial infection within the flock and chronic carriers are likely. The primary route of *P. multocida* excretion from chronic carriers is the nasal cleft and upper respiratory tract (Glisson et al. 2008). Existing literature on *P. multocida* in chickens indicates that asymptomatic carriers can serve as an enzootic source or reservoir for future infections. In wild birds, avian cholera has historically been a significant disease primarily of waterbirds and scavenging or predatory birds (Samuel et al. 2007). Although avian cholera is a well-studied disease in domestic poultry, the epidemiology and pathobiology of *P. multocida* in wild bird populations is poorly understood.

During December 2013 avian cholera was diagnosed in a single pen at the Loyalsock Game Farm (LGF) experiencing increased mortality, which held approximately 2,400 pheasants destined for release prior to Christmas. Peak daily mortality in this infected flock reached 30-35 birds. The source of *P. multocida* introduction was not identified; however, numerous fox tracks were present around and within the affected pen with evidence of associated predation. Antibiotic treatment was initiated (based on laboratory sensitivity) and carcasses were collected daily in order to minimize bacterial contamination of the environment and reduce the risk of spread to adjacent pens. Due to the lack of data on *P. multocida* carriers in pheasants and in order to prevent the spread of *P. multocida* to the breeder flock on the farm, the decision was made to depopulate the infected pen. During January 2014, about 10 days after depopulation of the affected birds, a nearby (153 meters) winter holding pen at LGF containing approximately 2,300 pheasants experienced an increase in mortality and avian cholera was diagnosed. Subsequent ancillary diagnostics determined the outbreak was caused by *P. multocida* serotype 16. As this was 1 of 4 pens of hen breeders, the decision was made to quarantine the infected pen and treat the birds with antibiotics (based on laboratory sensitivity). The flock responded appropriately to the antibiotic treatment based on the return of mortality to baseline levels and the lack of subsequent detections of avian cholera through post-mortem examinations.

Current management options for captive-reared pheasants affected by avian cholera are limited due to unknowns relating to *P. multocida* infection and the potential for chronic carriers after antibiotic treatment. This dearth of information precludes any level of understanding on potential risks for wildlife associated with the release of pheasants after appropriate response to antibiotic treatment.

METHODS

At 1-month post-antibiotic treatment, oropharyngeal swabs were collected from 299 pheasants for bacterial culture and identification of *P. multocida*. Oropharyngeal swabs are commonly used to detect pathogens excreted via the upper respiratory or oral cavity. This sample size allowed for 95% confidence that a positive bird would be detected in the existing flock of 2,300 pheasants if the prevalence of carriers is about 1%. After collection, swab samples were placed in appropriate bacterial transport media and stored at 4^{o} C in the field. The samples were immediately delivered to the Animal Diagnostic Laboratory at Penn State University where bacterial culture and identification occurred following standardized procedures.

RESULTS

Pasteurella multocida was not identified from any of the oropharyngeal swab samples collected from the 299 pheasants. No additional morbidity or mortality associated with avian cholera was identified in the affected pheasant flock in the subsequent months after antibiotic treatment was completed. The breeding season started approximately 1-month post-antibiotic treatment (coinciding with our sampling effort) and we anticipated an increased likelihood of detecting positives due to the presence of multiple risk factors associated with disease (i.e. stress, crowding, increased nutritional demands, etc.). Consequently, the lack of positive surveillance results provided strong support for the absence of carrier birds in this flock.

Due to marked variation in the virulence and characteristics between strains of *P. multocida*, these results cannot be uniformly extrapolated to all outbreaks of avian cholera in pheasants. However, these results do provide valuable insights into *P. multocida* infection in pheasants and indicate chronic carriers may be less likely after apparent successful antibiotic treatment. Such results highlight the important, yet often forgotten concept, that avian species (including those taxonomically-related) are biologically diverse and may respond differently to diseases.

RECOMMENDATIONS

1. Additional outbreaks of avian cholera in captive pheasants must continue to be investigated in order to: 1) determine the serotype of the bacteria involved, 2) define the morbidity, mortality, epidemiology, and pathobiology of the given strain that caused the outbreak, and 3) monitor the effects of antibiotic treatment (based on sensitivity), to include changes in morbidity or mortality, as well as the prevalence of chronic carriers.

2. Expanding on these initial data presented herein is necessary to obtain a more complete understanding of avian cholera in pheasants and guide future management responses.

LITERATURE CITED

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