Assessment Of Changes In The Commercial Layer Health Program Through Production-integrated Pathology

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Abstract

Scheduled quarterly mortality surveys were conducted in a commercial layer company with ongoing field trials. Diagnostic categories for spontaneous mortality were analyzed using a Trials feature in a poultry mortality analytics program (PathPro, pathpro.vetdx.com/), in which flocks were assigned to treatment or control groups.

- Trial A involved a change in the composition of an autogenous bacterin, with the previous, same-house flock as the study control.
- Trial B involved a change in the Mycoplasma gallisepticum (MG) vaccine (treatment) and the previous same-house flock served as the control (prior MG vaccine).
- Trial C involved laryngotracheitis vaccine program change (treatment) with flocks on the same farm and prior vaccination program as controls.
- Trial D involved a nutritional supplementation program with a focus on bone health and reduced mortality, with the control flocks being those on the same farm without the supplement.

The number of hens examined, representing daily mortality, were unequal between treatment and control trials. Mortality was recorded by major diagnostic lesion as cause of death, as counts of positive and negative lesion occurrence in treatment and control flocks. These data were organized by contingency table (control, treatment by same diagnosis +/-) and analyzed by Chi-square test to determine whether the discrepancy between diagnostic counts was more than expected by chance (P≤ 0.05). These same flocks were analyzed for cumulative mortality by age, by pivot table analysis of data in the weekly production database (FlockTrak, www.metafarms.com).

- Trial A vaccine was associated with lower cumulative morality with a corresponding decrease in peritonitis and salpingitis.
- Trial B vaccine was associated with lower mortality through peak production with a corresponding decrease in peritonitis and pneumonia.
- Trial C vaccine was associated with lower mortality through peak production with a corresponding decrease in peritonitis.
- Trial D nutritional program was associated with lower cumulative mortality through peak production with a corresponding decrease in peritonitis. Effects on bone and metabolic issues were equivocal and subject to ongoing analysis.

Paired analysis of cumulative mortality and the diagnosis of spontaneous mortality observed at quarterly scheduled mortality surveys was useful in determining outcomes of four trials involving flocks while in production.

Introduction

Ongoing assessment of changes in management, health programs, and nutrition is required in commercial poultry production. The reduction of antibiotic usage has resulted in many field trials to assess a variety of feed additives, many generally recognized as safe, but of uncertain effectiveness in disease mitigation. Measuring these factors from a flock health perspective was the purpose of this pilot study (which is ongoing in the second year) combining two database programs. Four examples are provided.
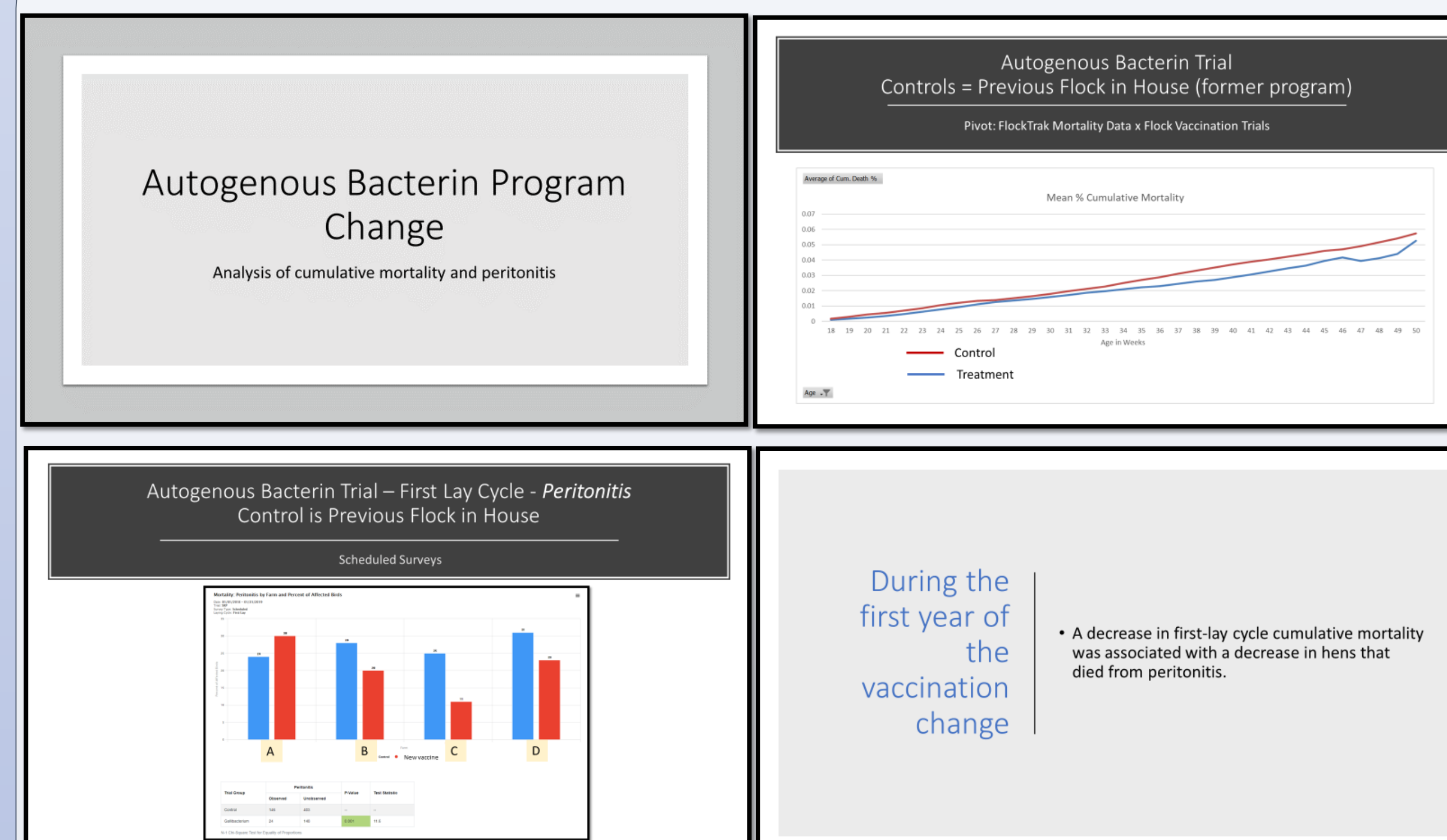
Methods

Quarterly (every 3 months) scheduled mortality surveys were conducted on farms belonging to a commercial egg producer in the USA. Many genetic strains are represented, as are conventional cage and aviary housing systems. Genetic strains were not separated but housing systems were appropriately filtered for uniformity of comparison in these analyses.

Two database programs were used. PathPro (pathpro.vetdx.com, Veterinary Diagnostic Pathology), is a mortality analytics program for recording and analyzing commercial layer mortality and measures of well-bird assessment. FlockTrak (www.metafarms.com, MetaFarms) is a management database for commercial laying hens. Trials is a recent addition to PathPro, and allows trials to be designed by the user, with assignment of flocks (current and archived in the database) to one or more trials. Identification of controls is at the discretion of the investor, such as previous flock in a specific house (drawing from archived flock data), untreated flocks on the same farm, or untreated flocks in similar housing system. PathPro Trials assigns the selected parameters (peritonitis, tetany, bone condition) to contingency table (control, treatment) and analyzed by Chi-square test to determine whether the discrepancy between diagnostic counts was more than expected by chance (P≤ 0.05). Data can be analyzed by counts of diagnoses or percentage of total diagnoses. Flock identifiers in PathPro were edited to the reflect the same format as used in FlockTrak.
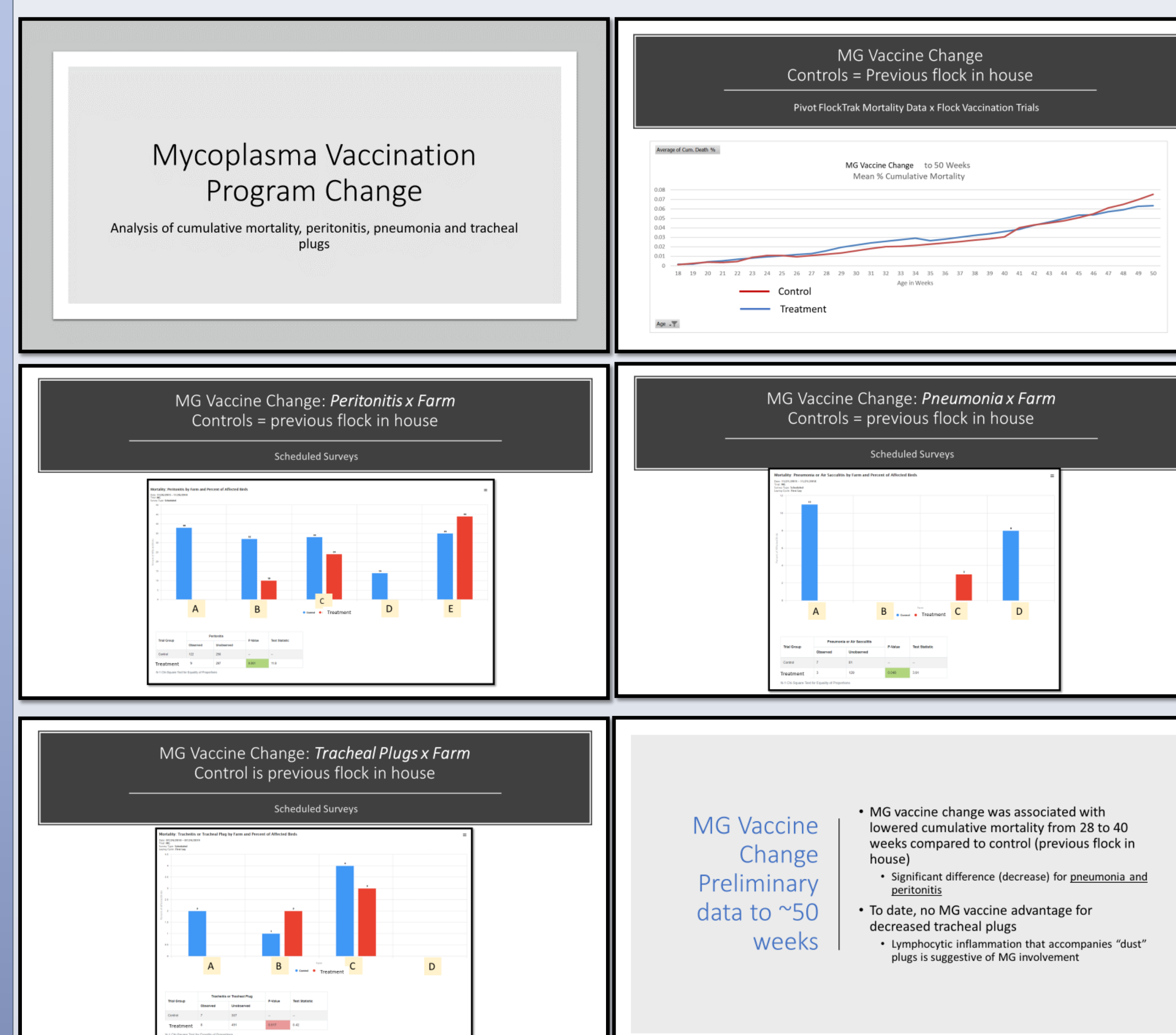
The Flock Explorer dataset within FlockTrak was downloaded to Excel and formatted to include floc \k identification, age, and cumulative mortality, with all other columns removed excluded. Columns were added for Trials assignments in PathPro. Cumulative mortality by age (weeks) was acquired for treatment and control flocks by pivot table analysis and graphing in Excel. Selected mortality parameters were analyzed in PathPro Trials, as an adjunct to the cumulative mortality.

Data was analyzed for four pilot trials. **Trial A** involved autogenous vaccine composition (treatment), with the previous, same-house flock as the prior vaccine control. **Trial B** involved a new Mycoplasma gallisepticum (MG) vaccine (treatment) and the previous same-house flock as the conventional MG program control. **Trial C** involved laryngotracheitis vaccine program change (treatment) with conventional LT program flocks on the same farm as controls. **Trial D** involved a nutritional supplementation program with a focus on bone health and reduced mortality.
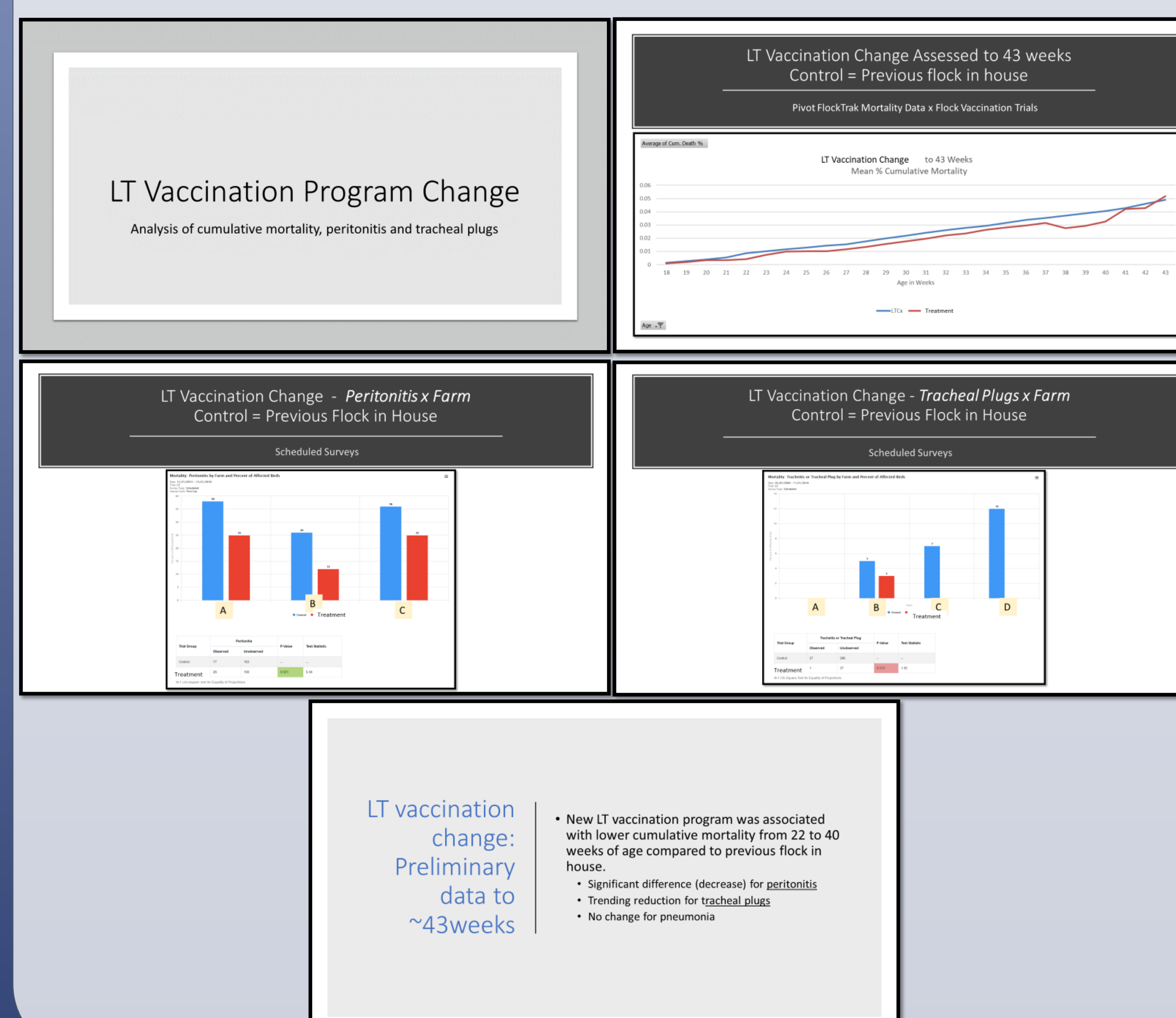
Trial A - Autogenous Bacterin

Autogenous Bacterin Program Change
Analysis of cumulative mortality and peritonitis

Autogenous Bacterin Trial
Controls = Previous Flock in House (former program)
Pivot: FlockTrak Mortality Data x Flock Vaccination Trials
Mean % Cumulative Mortality
Control / Treatment

Autogenous Bacterin Trial – First Lay Cycle – *Peritonitis*
Control is Previous Flock in House
Scheduled Surveys

During the first year of the vaccination change

- A decrease in first-lay cycle cumulative mortality was associated with a decrease in hens that died from peritonitis.

Trial B - Mycoplasma Vaccination

Mycoplasma Vaccination Program Change
Analysis of cumulative mortality, peritonitis, pneumonia and tracheal plugs

MG Vaccine Change
Controls = Previous flock in house
Pivot FlockTrak Mortality Data x Flock Vaccination Trials
MG Vaccine Change – to 50 Weeks
Mean % Cumulative Mortality
Control / Treatment

MG Vaccine Change: *Peritonitis x Farm*
Controls = previous flock in house
Scheduled Surveys

MG Vaccine Change: *Pneumonia x Farm*
Controls = previous flock in house
Scheduled Surveys

MG Vaccine Change: *Tracheal Plugs x Farm*
Control is previous flock in house
Scheduled Surveys

MG Vaccine Change Preliminary data to ~50 weeks

- MG vaccine change was associated with lowered cumulative mortality from 28 to 40 weeks compared to control (previous flock in house)
  - Significant difference (decrease) for pneumonia and peritonitis
- To date, no MG vaccine advantage for decreased tracheal plugs
  - Lymphocytic inflammation that accompanies "dust" plugs is suggestive of MG involvement

Trial C - LT Vaccination

LT Vaccination Program Change
Analysis of cumulative mortality, peritonitis and tracheal plugs

LT Vaccination Change Assessed to 43 weeks
Control = Previous flock in house
Pivot FlockTrak Mortality Data x Flock Vaccination Trials
LT Vaccination Change – to 43 Weeks
Mean % Cumulative Mortality

LT Vaccination Change - *Peritonitis x Farm*
Control = Previous Flock in House
Scheduled Surveys

LT Vaccination Change - *Tracheal Plugs x Farm*
Control = Previous Flock in House
Scheduled Surveys

LT vaccination change: Preliminary data to ~43 weeks

- New LT vaccination program was associated with lower cumulative mortality from 22 to 40 weeks of age compared to previous flock in house.
  - Significant difference (decrease) for peritonitis
  - Trending reduction for tracheal plugs
  - No change for pneumonia

Trial D - Nutritional Supplementation Program

Nutritional Supplementation Trial
Analysis of cumulative mortality, bone, peritonitis, tetany, and prolapses

Pre-existing trauma – Aviaries
Hard bone, not soft; not included in this analysis

Rubbery soft bones in daily mortality – conventional cages
Focus of analysis

Supplementation and Mortality
Controls: All other current flocks on farms that do not receive supplement
Pivot: FlockTrak Mortality Data x Supplementation Trial
Supplementation to 60 Weeks
Mean % Cumulative Mortality
Treatment / Control

Nutritional Trial: Six Months
Soft bones and tetany by farm
Controls: Untreated flocks on the farm during the same time period
Scheduled surveys

Nutritional Trial: Six months
Peritonitis and Prolapse
Controls: Untreated flocks on the farm during the same time period
Scheduled surveys

Supplementation Program

- Decreased cumulative mortality
- Mortality survey findings
  - Significant change (decrease) in peritonitis
  - Trending decrease in prolapse
  - Significant change (increase) in soft bones
  - No effect on tetany
- The apparent discrepancy could have one or more explanations
  - The program is working and preventing an even more severe bone/metabolism problem
  - The mortality sparing effect is due to reductions in peritonitis and prolapse, not by soft bones or tetany
  - The importance of soft bones as a cause of death is overstated or misinterpreted

Discussion

Commercial poultry producers today have ongoing field tests and program evaluations for a variety of products. Reduction in antibiotic usage has been accompanied by many new health products for administration by feed or water. Many have scanty data on efficacy. This pilot study involves three vaccine program changes, and a nutritional supplementation program, but could have application in the assessment of myriad probiotics, essential oils, and phytogenic compounds that are now on the market. Frequent questions about these products in a production environment are 1) is it effective, 2) how is it effective, and 3) will it be consistently effective?

These questions can be better answered if there is a uniform way of assessing understanding product efficacy. Cumulative mortality is a basic production parameter, but a clear understanding of the causes of mortality and associated trends requires a disciplined approach of data gathering. is important to mitigation of health threats. This can be accomplished by scheduled well-bird or clinical examinations and mortality surveys, which provide a frame of reference of investigations of spikes in morbidity and mortality. This data can be paired with cumulative mortality and other measures of production, for a better understanding of existing problems, and identifying targets for mitigation.

Acknowledgements

Veterinary Diagnostic Pathology, LLC