NC1180: CONTROL OF EMERGING AND RE-EMERGING POULTRY RESPIRATORY DISEASES IN THE UNITED STATES

DECEMBER 2013 MEETING MINUTES (SEE END OF DOCUMENT) AND NC1180'S TERMINATION REPORT

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ACCOMPLISHMENTS

Objective I: Identify reservoirs of infectious respiratory disease agents in wild birds and poultry.

1. Isolation and characterization of avian influenza viruses (AIV) from wild birds, which include hunter-killed or nesting waterfowl and shorebirds, starlings, and raptors and from commercial poultry flocks (live bird markets and backyard) were accomplished. The enormous data obtained from different states (AL, DE, GA, MN, OH) were shared. . No AIV activity using USDA NAHLN-approved agent detection (real time RT-PCR and antigen capture on oropharyngeal swabs) were seen in commercial flocks (CT, DE).
2. Surveillance activities on the Delmarva Peninsula have yielded infectious laryngotracheitis (LT) virus and infectious bronchitis virus isolates of Arkansas, Massachusetts, and Delaware from commercial broiler chickens and Newcastle disease virus isolates from wild birds.
3. Delmarva has observed continuously ILT activity. The severity of LT clinical signs and lesions are mild to moderate, very similar to that seen in adverse CEO vaccine reactions. All suspect LT cases are evaluated by real time PCR and histopathology of eyelid and trachea for confirmation.
4. GA isolated and characterized current pathogenic respiratory viruses, bacteria, and mycoplasmas circulating within the poultry industry in Georgia. Identified at least 41 MG genotypes that are distinguishable from live vaccines and unique to individual countries or regions.
5. Using gene targeted sequencing and random amplified polymorphic DNA analysis, GA identified the circulation of field strains within complex and companies and analyzed numerous MG and MS strains.
6. SEPRL (USDA) characterized new avian paramyxovirus isolated from penguins. It was determined that the viruses corresponded to a new serotype (serotype 10).
7. SEPRL (USDA) obtained Newcastle disease viruses from Mexico, China, Pakistan, Indonesia, Malaysia, Venezuela, Pakistan, Vietnam, Belize, Dominican Republic, South Africa, Peru and from U.S. wild birds; the viruses then have been sequenced and characterized phylogenetically. The sequence data has allowed the improvement of the current diagnostic tests for NDV to ensure that the circulating viruses can be diagnosed.
8. SEPRL on their international surveillance and characterization of avian influenza H5N1 subtypes indicated that Egypt remains one of a handful of countries where the H5N1 bird flu continues to infect poultry.
9. SEPR determined the recent H5N1 highly pathogenic avian influenza (HPAI) viruses circulating in Vietnam was evaluated in domestic ducks. One of the viruses, A/duck/Vietnam/NCVD-672/2011 (clade 2.3.2B), was highly virulent for ducks but the other virus, A/chicken/Vietnam/NCVD-675/2011 (clade 2.3.2A) was moderately pathogenic.
10. SEPRL conducted a wild bird surveillance study in the Black Sea region in Ukraine to identify avian influenza viruses. A total of 3634 samples were collected from 66 different species of birds. Sixty seven viruses were isolated covering many low pathogenicity avian influenza (LPAI) virus subtypes. The LPAI viruses were isolated mostly from mallard ducks, but also from shellducks, shovelers, teals, and whitefronted geese.

11. SEPRL conducted a study of active and passive surveillance for HPAIV subtype H5N1 in Mongolia from 2005-2011, together with the results of five outbreak investigations. In total eight HPAIV outbreaks were confirmed in Mongolia during this period. Three outbreaks were recorded in the neighboring Tyva Republic of Russia on a lake that bisects the international border. No HPAIV was isolated (cultured) from 7,855 environmental fecal samples (primarily from ducks), or from 2,765 live, clinically healthy birds captured during active surveillance (primarily shelducks, geese and swans), while four HPAIVs were isolated from 141 clinically ill or dead birds located through active surveillance.
12. MN studied the matrix (M) gene of avian influenza viruses isolated from wild birds and live bird markets in the USA. Phylogenetic analysis of the M-gene showed a high degree of nucleotide sequence identity with US isolates of AIVs but not with those of Asian or European lineages.
13. DE continued subtyping the hemagglutinin (HA) and neuraminidase (N) genes of isolates previously recovered from Delmarva wild bird surveillance submissions. From 2006 - 2010, 46 low path (LP) isolates were obtained. The most commonly isolated hemagglutinin subtype was H6 (nine isolates) while the most common N subtype was N2 (nine isolates). Isolates carrying the H6NX subtype and the HXN2 subtype were isolated each sampling year.
14. DE noted an increased isolation of IBV related to the Delaware 072 (DE/072/92) genotype in 2012-2013 with 30 isolates determined to be of the Delaware 072 genotype, nine of which have been confirmed by sequence to be highly related to DMV/2392/12 (90-91% S-1 amino acid identity with reference strains Delaware 072 and Georgia 98.
15. SEPRL examined the genetic diversity of APMV-1 isolated from migratory birds sampled in Alaska, Japan, and Russia and assessed the evidence for intercontinental virus spread. Phylogenetic analysis of wild-bird isolates provided evidence for intercontinental virus spread, specifically viral lineages of APMV-1 class II genotype I sub-genotypes Ib and Ic. This result supports migratory bird movement as a possible mechanism for the redistribution of APMV-1.

Objective II. Develop improved diagnostic capabilities including real time PCR as well as other rapid on-farm tests for economically important respiratory diseases.

1. AL developed a TaqMan® real time polymerase chain reaction (PCR) and loop-mediated isothermal amplification (LAMP) assays. Both assays were specific, sensitive, and reproducible for ILTV detection. Although the sensitivity of LAMP was lower than real time PCR, it was faster, had a lower cost, and did not require a temperature cycler.
2. CT designed nine pairs of neuramidinase (NA) subtype-specific primers using Primer Hunter design tool and successfully used in real time RT-PCR with four primer-pool reactions to differentiate nine NA subtypes of AIV.
3. GA developed an indirect N1 and N2 ELISAs which were proven to be effective and rapid assay to identify exposure to challenge virus during a DIVA vaccination strategy. In addition, a species–independent competitive ELISA (cELISA) for the detection of H6, H7, H9 antibodies in several species was developed.
4. MN developed degenerate primer set for full-length amplification of four genes of influenza A viruses in a single reaction.
5. OH established the chloroform-Mag MAXTM method of viral RNA extraction followed by RRT-PCR which can be used as rapid and sensitive test to determine the titer of the viral RNA. Using this method, it was found that different commercial vaccines contain varied antigen contents.

6. SEPRL (USDA) developed two real time RT-PCR assays that allow the differentiation of North American H1N1 from pandemic H1N1. In addition, the current H7 RRT-PCR was improved to detect a broader range of H7 viruses that are found in Western hemisphere.
7. SEPRL demonstrated that NDV Matrix assay failed to detect a virulent NDV. If genotype VII virus was found in North America this assay could be used in the NALHN laboratories.
8. AL developed a method to detect CEO ILTV vaccines in drinking water lines which detects ILTV DNA in the biofilm collected from the water system by real-time PCR.
9. AK and DE used next generation sequencing technologies (Illumina) which permit the relatively rapid determination of the primary sequence of the ILTV genome. AK determined genomes of one wild type and two vaccine ILTV strains.
10. GA developed a multiplex detection of avian influenza HA (H5 & H7) and NA (N1 & N2) subtypes using a microsphere assay.
11. GA developed a species–independent competitive ELISA (cELISA) for the detection of influenza A antibodies directed to H6, H7, and H9.
12. IL developed a photolase gene specific PCR. Based on sequence information, avian pox viruses could be differentiated into four different groups.
13. OH developed 19-plex assay which can differentiate different HA subtypes of avian influenza viruses.
14. SEPRL developed an enzyme-linked immunospot assay which can detect avian influenza specific antibody-secreting B cells in chickens.
15. CT in collaboration with Guangxi Veterinary Institute, China developed loop-mediated isothermal amplification (LAMP) assays to detect the H3 subtype AIVs visually and rapid detection of group I avian adenoviruses and Mycoplasma gallisepticum isolates. The newly developed H3-RT and group I avian adenoviruses LAMP assays are simple, sensitive, rapid and can identify H3 subtype AIVs and group I avian adenoviruses visually. Consequently, they will be very useful screening assays.
16. GA developed a rapid multiplex microsphere assay for the simultaneous detection of all avian influenza viruses (AIV) as well as differentiation of H5, H7, N1 and N2 subtypes.
17. GA developed and validated N1 and N2 ELISAs as the assays that will be required for the implementation of a DIVA control strategy for H5N1, H5N2, H9N2, H3N2 and H1N1 poultry infections that will be required for the implementation of a DIVA control strategy for H5N1, H5N2, H9N2, H3N2 and H1N1 poultry infections.
18. GA developed a multiplex assay to detect avian infectious bronchitis virus types. Four most common IBV serotypes diagnosed in the USA; Arkansas (Ark), Connecticut (Conn), Delaware (DE).
19. SEPRL evaluated numerous elements of the sample collection procedure for avian influenza virus with chickens including: swab construction type, transport media, transport of dry versus wet, the effect of removing the swabs in the field versus the lab, and the number of swabs which could be placed in a single vial to be test together. Some of the alternative procedures and materials were found to improve sensitivity over current methods.

Objective III. Investigate the pathogenesis and polymicrobial interactions of specific infectious agents associated with poultry respiratory diseases (this includes interactions with underlying immunosuppressive agents).

1. DE isolated 5038 IBDV isolate from commercial broiler chickens. Although unique based on VP2 sequencing and monoclonal antibody testing, may not be capable of breaking through maternal immunity in a laboratory designed trial may not be able to break through in real world progeny challenges.
2. GA identified that temperature plays a pivotal role in the survivability of LPAI virus in feces and in contact with litter. GA also identified that a percentage of chickens receiving recombinant or TCO vaccines carry a significant amount of virulent ILTV in the trachea in the absence of clinical signs after being challenged with virulent ILTV.
3. Comparative genomic analysis of IBV indicates that the replicase protein in addition to the already recognized spike gene of coronaviruses plays a key role in pathogenicity. GA have identified regions in the replicase that likely effects cleavage and assembly of the enzyme.
4. OH identified amino acids contributing to antigenic drift in the Del-E infectious bursal disease virus. The short term implication this has for the poultry industry is that diagnostic assays designed to identify the 254 and 222 amino acids will discover viruses that have antigenically important mutations.
5. OH showed that two virulent infectious bursal disease viruses (vvIBDV) from California are identical and meet all the characteristics of a vvIBDV. Because they have the potential to spread rapidly and cause high mortality in chickens, the impact of these viruses on the U.S. broiler and layer industries could be considerable.
6. OH detected low pathogenic influenza viruses in albumin of eggs using real time RT-PCR and virus isolation in embryonated chicken eggs. Swabs from egg shells were also found positive by RRT-PCR.
7. GA conducted comparative genomic analysis of IBV which indicates that the replicase protein in addition to the already recognized spike gene of coronaviruses plays a key role in pathogenicity. GA have identified regions in the replicase that likely effects cleavage and assembly of the enzyme.
8. MN studied the host:pathogen interactions during E. coli infection in the broiler chicken. The genes differentially expressed in air sac tissue did not involve any of the typical APEC virulence factors, and instead involved a large number of chromosome-encoded transport system genes and genes of unknown function.
9. OH studied two isolates of vvIBDV from California which were identified to contain a vvIBDV genome segment A but instead of a serotype 1 vvIBDV genome segment B, their genome segment B was most closely related to a serotype 2 IBDV.
10. OH studied the persistence of classical (STC) and variant (IN) IBDVs and the two strains were detected much longer in bursal tissues (up to 8 weeks) followed by spleen, thymus and bone marrow. In non-lymphoid tissues both of the strains persisted longer in cecum followed by liver, kidney, pancreas, lungs, thigh and breast muscles.
11. SEPRL demonstrated that the pandemic H1N1 influenza virus does not easily infect young poultry. However, laying turkey hens were susceptible to pandemic H1N1 virus by reproductive tract exposure.
12. SEPRL demonstrated that aMPV-C wild bird isolates induced typical aMPV/C disease in the domestic turkeys. This result suggests that the wild birds may play a role in the spread of the aMPV-C virus. They also showed that the M2-2 gene is not essential for virus replication in cell culture, but required for efficient virus replication in turkeys to counteract the host's natural defenses and immunity.

13. AL investigated venereal transmission of IBV by artificially inseminating old hens either with semen from IBV infected roosters or with IBV suspended in naïve semen. IBV RNA was detected in the trachea of all hens inseminated with IBV-spiked semen and in 50% of hens inseminated with semen from IBV-infected males. These results provide experimental evidence for IBV venereal transmission.
14. AL investigated that the dominant genotype of the vaccine strain of IBV was rapidly negatively selected in all chicken groups [CAV, IBDV, CAV+IBDV, and immunocompetent]. These results suggest that the generation of genetic diversity in IBV is constrained. This finding constitutes further evidence for phenotypic drift occurring mainly as a result of selection.
15. OH studied maternal immunity in limiting the spread or reducing the severity of the clinical disease caused by very virulent infectious bursal disease virus (vvIBDV).
16. OH investigated Fas/FasL and perforin systems as important mechanisms of T cell-mediated cytotoxicity in infectious bursal disease virus infected chickens.
17. MN genetically analyzed the matrix (M) gene of avian influenza viruses isolated from wild birds and from the live bird markets indicated that independent evolution of M gene in the absence of antiviral drugs will lead to mutation causing resistance.
18. OH investigated the replication of swine and human influenza A viruses in juvenile and layer turkeys. OH noticed an enhanced replication of swine influenza viruses in immune compromised (dexamethasone-treated) juvenile and layer turkeys.
19. OH demonstrated persistence and tissue distribution of infectious bursal disease virus in experimentally infected SPF and commercial broiler chickens
20. OH showed the molecular evidence for a geographically restricted population of infectious bursal disease viruses.
21. OH demonstrated the diversity of genome segment B from infectious bursal disease viruses in the United States.
22. SEPRL identified genetic and biological determinants of tissue tropism and transmission of avian influenza virus in chickens.
23. SEPRL studied a new avian influenza virus, H7N9 that was identified as causing human infections and based on sequence information the virus was suspected to have come from a poultry source. In laboratory experiments, chickens, quail, muscovy ducks, Pekin ducks, Embed geese, and pigeons were challenged with the H7N9 virus. Birds from each group challenged became infected although none became ill, but quail and chickens shed large amounts of virus.
24. SEPRL the pathologic and immune characteristics of chicken dendritic cells (DC) following infection with high and low pathogenic avian influenza viruses were determined. Chicken DCs were determined to take up avian influenza virus, and supported replication of both high and low pathogenic influenza viruses. The DCs mounted a robust antiviral immune response, including interferon alpha.
25. SEPRL determined that of interferon gamma (IFN-γ) expression during Newcastle disease virus (NDV) infection results in a marked decrease of pathogenicity in 4-week-old chickens, as evidenced by lack of mortality, decreased disease severity, virus shedding, and antigen distribution.
26. OH conducted an antigenic analysis of 18 H5N1 isolates from 2006 to 2012 that represent different clusters using hemagglutination inhibition (HI) and virus neutralization (VN) assays. Antigenic relatedness of ancestral Egyptian H5N1 isolate (459-3/06) with other isolates ranged from 30.7% to 79.1% indicating significant antigenic drift of the H5N1 viruses from the ancestral strains.

27. OH evaluated the pathogenicity induced by co-challenge with the rB strain of very virulent infectious bursal disease virus (vvIBDV) and IBDV pathotypes endemic in the United States in specific pathogenic free (SPF)chickens. Co-challenge with rB and the antigenically similar STC strain did not result in a significant decrease in mortality compared to challenge with the pathogenic rB strain at 4 weeks of age but a significant reduction in the mean bursa lesion score was observed.
28. OH studied the antigen persistence and cytotoxic T cells response in infectious bursal disease virus infected SPF chickens. Gradual reduction in viral RNA load but persistent detection of IBDV-STC was confirmed up to 56 DPI by real-time quantitative RT-PCR.
29. MN determined the effect of avian influenza virus NS1 allele on virus replication and innate gene expression in avian cells. Replication of two reassortant viruses demonstrated that the B allele virus replicates more and to higher titers than the A allele virus in duck cells; however, the A allele virus replicates more in the cells from chickens and turkeys.
30. MN studied the expression profiles for genes in the turkey major histocompatibility complex B-locus. Most MHC-B genes were broadly expressed across tissues. Previously undescribed splice variants were also detected and sequenced from 3 genes.
31. MN determined the role of enteric viruses in Light Turkey Syndrome (LTS), which is characterized by lower weight in market age turkeys than their standard breed character. In the surveillance study astrovirus, rotavirus, and reovirus were detected alone or in various combinations in both LTS and non-LTS flocks.

Objective IV. Develop new prevention and control strategies for poultry respiratory diseases.

1. AL developed two recombinant vaccines against H1N1 AIV (one DNA and the other in yeast) and found to induce a measurable immune response in young chickens. The DNA vaccine was given by injection and the yeast vaccine in the drinking water.
2. CT tested in ovo vaccination of recombinant DNA plasmid containing IBV spike gene with interferon-a which showed over 98% of protection rate against M41 field isolate challenge.
3. DE developed a second generation escape resistant RNAi constructs against avian influenza virus and found that avian-specific RNAi constructs against avian influenza virus did not increase the efficiency of RNAi inhibition.
4. IN demonstrated that IBDV large segment gene-based DNA can elicit specific immune response and provide protection of broiler chickens with maternally derived antibody against infection challenge.
5. OH developed NA- and NS-based DIVA vaccine strains using traditional reassortment as well as reverse genetics methods against H3N2 influenza in turkeys. The reassortant DIVA vaccines significantly reduced challenge virus shedding in the oviduct of breeder turkeys as well as trachea and cloaca of both young and old breeder turkeys, suggesting that proper vaccination could effectively prevent egg production drop and potential viral contamination of eggs in infected turkeys.
6. SERPL demonstrated that H7 AI vaccine may not protect against intercontinental H7 field viruses and vaccine may need to be from the same H7 lineage as field viruses to provide protection. In addition, turkeys vaccinated with commercial H1N1 vaccine have a low chance of being protected against swine-origin H1N1 infection.

7. SEPRL developed a model system for NDV vaccination which mimic egg production losses seen in Asia and Mexico in vaccinated poultry were developed and this system will allow the comparison of vaccines.
8. DE are utilizing both traditional and recombinant-based approaches for the construction of the next generation of ILTV live vaccines.
9. OH used in vitro analysis of virus particle subpopulations in candidate live-attenuated influenza vaccines which could distinguish effective from ineffective vaccines.
10. SEPRL showed that intranasal administration of alpha interferon reduced morbidity associated with low pathogenic avian influenza virus infection.
11. SEPRL demonstrated that commercial influenza vaccines have variable efficacy for protecting chickens and ducks against H5N1 highly pathogenic avian influenza (HPAI) viruses.
12. AL showed for the first time that a DNA vaccine containing an HA gene of an AIV produced cellular immune responses in chickens with a T-helper 1 (Th1) preference. AL also developed an H1 vaccine in transgenic Arabidopsis thallenia. Arabidopsis is a commonly used small weed, whose genome has been sequenced.
13. CT developed nanoparticle based vaccines carrying M2e of influenza virus and demonstrated the immunogenicity and protection induced by M2e-based vaccine by challenge studies.
14. IN showed that a prime-boost approach for protection of broiler chickens with maternally derived antibody against IBDV infection by DNA vaccination can be achieved by priming with a high dose of DNA carrying IBDV large segment gene and boosting with a single dose of killed IBD vaccine.
15. IN showed that DNA vaccination confers protection against IBDV challenge by delayed appearance and rapid clearance of the invading viruses.
16. GA determined the baseline coverage of four different commercial IBV vaccines (Ark, Mass, GA98 and Mass/Conn) tested at a full dose in 1-day old broilers.
17. GA studied aerosol delivery of a virus-like-particle (VLP) vaccine against H5N1 avian influenza in Poultry which showed for the first time that non-replicating influenza VLPs might be used for mass aerosol vaccination in chickens.
18. AL evaluated protection conferred by mucosal vaccination with replication competent adenovirus (RCA)-free recombinant adenovirus expressing a codon-optimized avian influenza (AI) H5 gene from A/turkey/WI/68 (AdTW68.H5ck).
19. AL developed a DNA vaccine consisted of the entire HA gene of an AIV H1N1 subtype (A/bluewinged teal/ AL/167/2007) cloned into the eukaryotic expression vector. The immunological responses induced by DNA vaccine against AIV were also investigated.
20. AR made comparison of ILTV genome sequences of two US CEO vaccines.
21. CT evaluated the level of protection of M2e-nanopartle based vaccine using quantitative real time PCR at 4, 6, and 8 days post-challenge with H5N2 LPAI by measuring virus shedding from trachea and cloaca.
22. IN conducted studies to determine if the combination of chicken calreticulin (CRT) gene and infectious bursal disease virus (IBDV) large segment (VP243) gene in a fusion gene or a chimeric DNA could enhance protection against IBD by DNA vaccination.
23. MN Correlated between virulence and MDR in avian E. coli and characterized the biology of the emergent IncA/C plasmid group.

24. OH in collaboration with the University of Cincinnati utilized flexible norovirus P particle as a novel influenza vaccine platform in vitro analysis of virus particle subpopulations in candidate live-attenuated influenza vaccines which could distinguish effective from ineffective vaccines.
25. SEPRL showed that a single vaccination can protect ducks and geese from avian influenza virus if the virus and vaccine are related. Reduction of pandemic H1N1 avian influenza growth with use of chicken interferon was investigated.
26. SEPRL generated and evaluated a bivalent vaccine against avian metapneumovirus and Newcastle disease viral diseases.
27. AL developed a transgenic plant vaccine against avian influenza.
28. CT generated throughput gene sequence data of IBV field isolates from the commercial poultry flocks vaccine with various IBV vaccines.
29. DE generated a new generation ILT vaccine containing deletions in essential genes.
30. GA examined the dynamics of IBV vaccination and protecting poultry against Arkansas field strains of IBV. GA developed mutant vaccine against infectious laryngotracheitis infection.
31. IN investigated the infectious bursal disease kinetics using DNA vaccine in chickens.
32. SEPRL performed vaccine efficacy studies using circulating AI viruses from Vietnam.
33. SEPRL developed new vaccine platforms to control and prevent avian influenza outbreaks.
34. SEPRL determined the AI vaccine efficacy following vaccination with recombinant herpesvirus of turkey-vectored avian influenza vaccine against highly pathogenic H5N1 challenge.
35. IN characterized the role of the chicken melanoma differentiation-associated gene 5 in innate immune response to IBDV infection.
36. OH developed an universal flu vaccine using influenza matrix protein 2 (M2e-P) particle platform in chicken.
37. OH showed that multivalent virus-like particle vaccine protects against classic and variant IBDV infections.
38. DE performed vaccination-challenge trial to evaluate the efficacy of current vaccines against infectious bronchitis virus challenge of DMV/2392/12 and found that Shore-Bron-D and Mildvac-GA-98 provided the best protection.
39. SEPRL studied vaccine protection of poultry against the 2012 H7N3 highly pathogenic avian influenza virus currently circulating in Mexico and demonstrated that several available vaccine viruses can provide complete protection of poultry from clinical disease but not infection.
40. SEPRL showed that maternal antibody to avian influenza virus suppresses the immune response to viral vectored vaccines to avian influenza virus.
41. SEPRL examined the level of cross reactive immunity in a live recombinant avian influenza vaccine (H5 subtype) against the heterologous H7N3 HPAI from Mexico. Following challenge with a lethal dose of H7N3 HPAI all birds vaccinated with the recombinant H5 vaccine died. However, cross reactive cellular immunity was observed in H5 vaccinated birds.
42. SEPRL studied the effects of Newcastle disease virus vaccine antibodies on the shedding and transmission of challenge viruses and revealed that it was possible to significantly decrease viral replication and shedding with high levels of antibodies and those levels could be more easily reached with vaccines formulated with NDV of the same genotype as the challenge viruses.

IMPACT STATEMENTS

1/1. Wild birds are a reservoir of AIVs and some species may serve as potential intermediate host. Viral detection should be done by passage of fecal swab material in embryos first then by RRT-PCR and should exclude AC-ELISA.
1/2. Low pathogenic influenza viruses were detected from internal egg contents following experimental infection in turkeys. The possibility of hatchery contamination by egg borne influenza viruses and spread of virus during movement of contaminated cracked eggs and egg flats pose concerns regarding influenza viral dissemination
1/3. ILTV is present in commercial poultry houses causing mild outbreaks. The viruses were found in the dust, litter, beetles, water, and rats. Heating of the house to 1000 F for 100 hours, composting of the litter for 3 days, improved beetle control, treatment of the drinking water system with commercial biofilm removers, and rodent control will reduce the amount of virus in the house.
1/4. Wild birds are a reservoir of AIVs and some species may serve as potential intermediate host. Viral detection should be done by passage of fecal swab material in embryos first then by RRT-PCR and should exclude AC-ELISA.
1/5. Avian influenza subtype H5 and H7 were negative from the LBM and domestic poultry birds in New England states and in Delaware commercial farms. However wild birds do carry H5 subtypes in their population.
1/6. Infectious laryngotracheitis virus and infectious bronchitis viruses circulating in commercial broiler chickens flocks in Delaware.
1/7. Continuous surveillance and characterization of ILTV's from poultry house environments would help in the understanding of the origin, evolution, transmission and control of present and future ILTV outbreaks. Composting litter, a through cleanout out and disinfection of a house, and possibly the use of commercial recombinant vaccines given in ovo, will reduce the incidence and severity of subsequent ILTV outbreaks.
1/8. Infectious laryngotracheitis virus and infectious bronchitis virtues circulating in commercial broiler chickens flocks in Alabama, Delaware, and Georgia states. Surveillance activities on the Delmarva Peninsula have yielded infectious laryngotracheitis virus (ILTV) and infectious bronchitis virus (IBV) isolates from commercial broiler chickens and an avian paramyxovirus (APMV)-4 isolate from wild birds.
1/9. Continuous surveillance and characterization of MG from poultry would help in the understanding of the origin, evolution, transmission and control of present and future. Development of rapid tool loop mediated isothermal polymerase to identify MG infection will be very cost effective without the use of sophisticated and expensive thermal cyclers.
1/10. Independent evolution of M-gene of avian influenza in the absence of any antiviral drugs leading to mutations causing resistance indicating the need for continued active surveillance of AIVs.

2/1. Composting of AIV infected eggs for as early as 24 hours and late as 52 hours can inactivate AIV. The internal temperature of the pile must reach 560 F for the inactivation to occur. The temperature is a function of the amount of pile turning and moisture. Presently, 7 days are used in the industry to perform this function.
2/2. Two real time RT-PCR assays that allow the differentiation of North American H1N1 from pandemic H1N1 were developed. The National Animal Health Laboratory Network adopted these tests.

2/3. A new diagnostic tests developed for ILTV, AIV and avian adenoviruses using loop-mediated isothermal amplification (LAMP) techniques will be faster, specific, sensitive and cost effective will not require sophisticated equipment.
2/4. Multiplex microsphere assay for detection of avian influenza viruses provides a rapid tool to identify multiple avian influenza types in the same sample.
2/5. Development of faster high-throughput serological assays for avian influenza (AI) that can complement a vaccination strategy to allow the rapid identification of infected flocks within large populations of vaccinated poultry. Identification of infected flocks is critical for control of AI outbreaks especially when vaccines are used.
2/6. Successfully developed 19-plex assay which can differentiate different HA subtypes of avian influenza viruses. With the multiplex capacity and feasibility of the assay, the multiplex branched DNA assay has a great potential in influenza research in addition to rapid diagnosis.
2/7. Study validated that the use of glycoprotein specific ELISAs as a tool to discriminate ILTV sero-conversion due to vaccination from infection. This work involves the serological differentiation of vaccinated and field virus exposed chickens which is critical for controlling ILTV epidemics.
2/8. Multiplex assay to detect avian infectious bronchitis virus serotypes. For an additional $0.21 per reaction, multiplexing a Arkansas genotype specific with the universal infectious bronchitis virus (IBV) rRT-PCR assay permitted detection of the most common genotype in Delmarva broilers without impacting test sensitivity. Monitoring infectious bronchitis viruses from commercial broiler chickens is important for evaluating the effectiveness of vaccination programs and to isolate and characterize field viruses that break through vaccine induced immunity.
2/9. Quantitative tool to detect ILTV in birds can be used to establish the viral load in chickens, which provides valuable data for estimating transmission and control.
2/10. Next generation sequencing technologies permit the relatively rapid determination of the primary sequence of the ILTV genome from egg-passaged material.

3/1. Genomic characterization of fowlpox virus and other avianpox viruses for specific virulence markers e.g. full length REV can be done by PCR amplification of the genetic fragments with specific primers. In this regard, DNA isolated from formalin fixed paraffin-embedded tissue sections can be used effectively.
3/2. Molecular epidemiology reinforces the importance of surveillance for MG and MS isolates in poultry for the control of avian mycoplasmas.
3/3. The sequence data has allowed the improvement of the current diagnostic tests for NDV to ensure that the circulating viruses can be diagnosed.
3/4. Utilization of next generation sequencing technologies now permits the relatively rapid determination of the primary sequence of the ILTV genome.
3/5. The egg internal and external quality was negatively affected in hens inseminated with semen containing IBV. These results provide experimental evidence for IBV venereal transmission.
3/6. Chickens infected with IBV and co-infected with CAV+IBDV will generate genetic diversity in IBV. This finding constitutes further evidence for phenotypic drift occurring mainly as a result of selection.
3/7. Examine and compare gammacorona virus genomes for recombination, comparison data indicate that reticulate evolutionary change due to recombination in IBV, likely plays a major role in the origin and adaptation of the virus leading to new genetic types and strains of the virus. These

data constitute a significant step forward in identifying pathogenicity genes in avian coronavirus infectious bronchitis.

3/8. In vitro expression of avian pathogenic Escherichia coli (APEC) genes . This genome-wide analysis provides novel insight into processes that are important to the pathogenesis of APEC O1. Overall, these results indicate that a number of novel APEC virulence factors exist in APEC O1 that mediate systemic infection in the chicken host.

3/9. It was confirmed the susceptibility of both juvenile and layer turkeys to swine influenza viruses (SIVs) while the viruses replicated more efficiently in the reproductive tract of turkey hens compared to respiratory or digestive tracts.

3/10. An increase in pathogenicity of AI in ducks observed with H5N1 HPAI viruses has implications for the control of the disease since vaccinated ducks infected with highly virulent strains shed more viruses and for longer periods of time, perpetuating the virus in the environment and increasing the possibility of transmission to susceptible birds.

3/11. Determining the unique sequences for chicken embryo origin (CEO) vaccines will enhance our ability to control the re-emerging epidemics ILTV in commercial chickens caused by CEO-related vaccines.

3/12. Evidence is mounting that IncA/C plasmids are widespread among enteric bacteria of production animals and these emergent plasmids have flexibility in their acquisition of MDR-encoding modules, necessitating further study to understand the evolutionary mechanisms involved in their dissemination and stability in bacterial populations.

3/13. Swine influenza viruses (SIVs) continue to be a threat for turkey industry and immunosuppression of the bird may enhance the transmission and adaptation of swine influenza viruses in turkeys through enhancement of virus replication, prolonged virus shedding, and possible decrease of infectious dose required to initiate infection.

3/14. Virus histochemistry can be applied as a useful in vitro screening tool to predict the in vivo replication of influenza virus which may help to reduce the use of live animals and research cost.

3/15. Studies provide new insights into the pathogenesis of IBDV and provide mechanistic evidence that the cytotoxic T cells may act through both Fas-FasL and perforin-granzyme pathways in mediating the clearance of virus-infected cells. The findings can be used to develop novel target for IBDV control.

3/16. IBDV RNA can be detected in thigh and breast muscles for short period of time. However, the presence of vRNA is not indicative of the presence of the infectious virus and does not necessarily correlate with virus isolation data. The first detailed report on the persistence and distribution of classic and variant strains of IBDV in different tissues of SPF and commercial chickens will be useful for risk assessment and develop prevention strategy.

3/17. The phylogeographic data suggest specific population of IBDV has been restricted for over 14 years to Northeast Ohio. Since commercially available classic and variant vaccines do not effectively control this population of IBDV, other alternatives are needed.

3/18. Molecular epidemiology study of IBDV shows the evidence of recombination events, in addition to reassortment, in creating genetic diversity both in variant and classic strains. Furthermore, the study shows importance and usefulness of analyzing genome segment B during routine molecular diagnosis of all IBDV strains.

3/19. Gene mutations detected in AIV in Egypt is more difficult to control outbreaks, because the vaccine is less effective against these mutant groups of AIV.

3/20. Information has implications for infection through artificial insemination and shows that the AI virus can replicate in the reproductive tract, which may mean the virus can be found in or on eggs.
3/21. Proper identification of the disease signs, which are crucial to quickly preventing the spread NDV. The virulent NDV that are found in the U.S. in pigeons (genotype VIb) and cormorants (genotype V) and the virulent NDV (genotype V) from the last 2002 U.S. outbreak also produces few gross lesions upon infection of poultry, unlike what is seen world-wide from other virulent NDV (genotypes VII-X111).
3/22. The cross reactivity between the co-circulating H5N1 strains may not be adequate for protection against each other and it is recommended to test vaccines that contain isolates from different antigenic groups in experimental infection trials for the selection of vaccine seed strain.
3/23. vvIBDV can be present but unrecognized in commercial poultry flocks for prolonged periods. These factors emphasize the need for continued active surveillance in the field.
3/24. Persistence of IBDV antigen causing a persistent infection in bursal tissues of SPF chicken is highly significant in the elucidation of virus pathogenesis, immunology and epidemiology and it raises questions that need to be answered in the future studies.
3/25. Chickens and quail likely played a critical role of virus spread from poultry to humans in the Chinese H7N9 avian influenza outbreak and supported the control program in poultry to eliminate the human health risk.
3/26. Early expression of IFN-γ had a significant protective role against the effects of highly virulent NDV infection in chickens, and further suggests that the level and timing of expression of this cytokine may be critical for the disease outcome.

4/1. Factors hindering control of ILT may be suboptimal immunization against ILT resulting from multivalent vaccinations. Reducing the number and diversity of live virus vaccines given concomitantly with ILT vaccines may optimize protection against ILTV and possibly against other viral respiratory diseases.
4/2. A high titer of ILTV vaccine is required for a prompt neutralizing immune response. Thus, vaccine fractionation would seem counterproductive.
4/3. Monitoring the ability of infectious bursal disease virus (IBDV) to break through maternal immunity in young broiler chickens is important to assess the immunosuppressive potential of the viruses.
4/4. IBDV large segment gene-based DNA vaccine has the potential for practical application to confer protection of chickens with maternal antibodies against IBD in the poultry industry.
4/5. Monitoring infectious bronchitis viruses from commercial broiler chickens is important for monitoring the effectiveness of vaccination programs and to isolate and characterize field viruses that break through vaccine induced immunity.
4/6. In-ovo DNA immunization may become one of the most important innovation in the DNA vaccination of poultry against IBV, allowing it to be used in commercial in-ovo vaccination as a much safer vaccine than the attenuating live IBV vaccines used currently.
4/7. Factors hindering control of ILT may be suboptimal immunization against ILT resulting from multivalent vaccinations. Reducing the number and diversity of live virus vaccines given concomitantly with ILT vaccines may optimize protection against ILTV and possibly against other viral respiratory diseases.
4/8. A high titer of ILTV vaccine is required for a prompt neutralizing immune response. Thus, vaccine fractionation would seem counterproductive.

4/9. Poor vaccination against IBV infection contributes to the emergence of new IBV strains via mutation and/or selection. Under these conditions only IBV virus populations identical to the challenge virus was identified. From a broad perspective it indicates that selection is an important force driving IBV evolution.
4/10. Studies indicate the ability of vvIBDV to infect chickens is not affected by maternal immunity to IBDV strains typically found in commercial U.S. chickens. However maternal immunity did reduce the severity of the clinical signs and macroscopic lesions. These data suggest vvIBDV might be infecting chickens in California and other regions of the U.S. but they are going unnoticed because maternal immunity affects the clinical picture which does not include mortality and macroscopic lesions typical of a vvIBDV infection.
4/11. Data indicated that activated T cells may be involved in antiviral immunity and mediation of virus clearance from the bursa and spleen of IBDV-infected chickens. The findings of this study will help understanding the role of T cells in the pathogenesis of IBDV and designing effective control strategies against this immunosuppressive viral disease of chickens.
4/12. Further comparison of US CEO vaccines to several ILTV genome sequences revealed that US CEO vaccines are genetically distinct from the two Australian-origin CEO vaccines, SA2 and A20, which showed close similarity. This information can be used to discriminate between vaccine ILTV strains and further, to identify newly emerging mutant strains of field isolates.
4/13. Preliminary studies suggest that the self-assembling polypeptide nanoparticle shows promise as a potential platform for a development of a universal vaccine against avian influenza type A.
4/14. It was shown that recombinant vaccines against ILTV provide some protection but do not prevent shedding, which can lead to continued spread of the virus, whereas the chicken embryo origin vaccine protected against both disease and virus shedding. This study is extremely important in the control of ILTV especially in the face of an outbreak.
4/15. IBDV large segment gene-based DNA can elicit specific immune response and provide protection of specific-pathogen-free and broiler chickens against infection challenge. The impact is that IBDV large segment gene-based DNA vaccine has the potential for practical application in providing protection of chickens against IBD in the poultry industry.
4/16. Studies demonstrate that chicken interferon is biologically active against the pandemic H1N1 virus, is active in other avian species, and may be useful as therapy against avian influenza infection.
4/17. Potential bivalent recombinant vaccine candidate for NDV and aMPV was safe, stable and provided a complete protection against virulent NDV challenge and decreased the aMPV disease severity following experimental aMPV-C infection in turkeys.
4/18. Method of delivery of Ark vaccines fully protects broilers. This is important for control of IBV Ark type viruses in the field.
4/19. Both traditional and recombinant-based approaches for the construction of the next generation of infectious laryngotracheitis virus (ILTV) live vaccines. Infectious laryngotracheitis is an economic disease that also has important trade implications for the U.S. poultry industry. Vaccination using CEO and recombinant vaccines is helping control the disease but more research is warranted to develop improved vaccines and control strategies.
4/20. IBDV large segment gene-based DNA vaccination in inhibiting and/or eliminating infectious bursal disease virus infection as illustrated by DNA vaccination kinetics and bursal transcriptome has the great potential for practical use in the field for protection of chickens against infectious bursal disease in the poultry industry

4/21. Serious concern for the control of H5N1 in Vietnam must consider the important role of domestic ducks in the epidemiology of H5N1 HPAI
4/22. An edible transgenic plant vaccine against the H5 and H7 AIV subtypes, which could be mixed in poultry feed, could be farther developed for use in controlling AIV in chickens, in 3rd world countries. This is important since these poorer countries are a constant source of AIV infections in poultry and swine populations. In addition, vaccines against animals are needed to prevent future pandemics in humans, which contain triple reassortments of AIVs from birds, humans, and swine. Recombinant vaccine can be used as an aid during AI eradication efforts in turkey species.
4/23. New vaccine candidates are being evaluated by a vaccine company for distribution worldwide to improve NDV control. The benefit of these vaccines is their ability to decrease the amount of virus put into the environment by vaccinated birds infected with virulent NDV.
4/24. Chicken MDA5-related innate immunity has the potential for practical application to combat IBDV infection in the poultry industry by its antiviral activity and amplification of adaptive immunity.
4/25. Multivalent virus-like proteins expressed in baculovirus maintained the antigenic integrity of the variant and classic viruses and have the potential to serve as a multivalent vaccine for use in breeder flock vaccination programs.
4/26. The fact that maternal antibody to avian influenza virus suppresses the immune response to viral vectored vaccines to avian influenza virus shows that the new generation of vaccines does not resolve the vaccine suppression issue.
4/27. Effective levels of humoral antibodies against NDV could be increased by (1) increasing the homology of the vaccine to the challenge virus, or (2) allowing optimal time for the development of the immune response.

PUBLICATIONS IN JOURNALS

1. Dormitorio, T. V., J. J. Giambrone, K. Guo, and G. R. Hepp. Detection and characterization of avian influenza and other avian paramyxoviruses from wild waterfowl in parts of the southeastern United States. Poult Sci. 88:851-855. 2009.
2. Dormitorio, T. V., J. J. Giambrone, K. Guo, and G. R. Hepp. Evaluation of field and laboratory protocols to detect avian influenza viruses in wild aquatic birds. Poult. Sci. 88:1852-1831. 2009.
3. Babapoor, S., D.A. Almeida, J. J. Fabis, Z. H. Helal, X. Wang, T. Girshick, M. I. Khan. Protective effect of in ovo vaccination with IBV-spike-recombinant DNA and chicken interferon as an adjuvant. Int J. Pout Sci. 8 (11) :1034-1041. 2009.
4. Duitama, J., D. M. Kumar, E. Hemphill, M. Khan, I. I. Mandoiu, and C. E. Nelson. PrimerHunter: a primer design tool for PCR-based virus subtype identification. Nucleic Acid Research.37 (8):2483-2492. 2009.
5. Huang, Y, B. Hu, X. Wen, S. Cao, D. Xu, X. Zhang, M. I. Khan. Evolution analysis of the matrix (M) protein genes of 17 H9N2 chicken influenza viruses isolated in northern China during 1998-2008. Virus Genes. 38:398-403. 2009.

6. Zhu, W., J. Dong, Z. Xie, Q. Liu, M. I. Khan. Phylogenetic and pathogenetic analysis of Newcastle disease virus isolated from house sparrow (Passer domesticus) living around poultry farm in southern China. Virus Genes. 38:11262-009. 2009.
7. Warke, A., and Mundt, E. Prevalence of Antibodies to different Avian Paramyxoviruses in Commercial Poultry in the USA. Avian Dis. 52:694-697. 2008.
8. Mundt, E., Gay, L., Jones, L., Saavedra, G., Tompkins, S. M. and Tripp, R. A. Replication and Pathogenesis Associated with H5N1, H5N2 and H5N3 Low Pathogenic Avian Influenza Virus Infection in Chickens and Ducks. Arch. in Virol. 154:1241-1248. 2009.
9. Chin, R. P. M. García, C. Corsiglia, S. Riblet, R. Crespo, H. L. Shivaprasad, A. Rodriguez-Avila, P. Woolcock, and M. França. Intervention Strategies for Laryngotracheitis: Impact of Extended Downtime. Avian Dis. 53:574-577. 2009.
10. Williams, S. M., J. A. Smith, M. García, D. Brinson, M. Kiupel, C. Hofacre. Histiolymphocytic and heterophilic bronchopneumonia as a severe reaction to in ovo fowl-pox vaccination. Vet. Pathology. 47(1):176-179.2009.
11. Callison, S. A‡, S. M. Riblet, A. Rodriguez-Avila, and M. García*. Reverse Restriction Fragment Length Polymorphism (RRFLP) Assay: A novel technique and its application to the rapid genotyping of infectious laryngotracheitis virus (ILTV) live attenuated vaccines. Journal Virol. Methods. 160:119-124. 2009.
12. Waidner, L., R. Morgan, M. García, A. Anderson, E. Bernberg, S. Kamboj, M. Ouyang, G. Isaacs, M. Markis, B. Meyers, P. Green, and J. Burnside. Novel ILTV and HVT microRNAs have conserved genomic locations with those of other Gallid and Meleagrid herpesvirus microRNAs. Virology. 388:128-36. 2009.
13. Oldoni, I‡, A. Rodriguez-Avila, S. M. Riblet, G. Zavala, and M. García*. Pathogenicity and Growth Characteristics of Infectious Laryngotracheitis Virus (ILTV) Isolates from United States. Avian Pathology. 38:47-53. 2009.
14. Jackwood, M. W., D. A. Hilt, A. W. McCall, C. N. Polizzi, E. T. McKinley, and S. M. Williams. Infectious Bronchitis Virus Field Vaccination Coverage, Vaccine Levels, and Persistence of Arkansas Type Viruses in Commercial Broilers. Avian Dis. 53:175-183. 2009.
15. Morales, A. C., Jr., D. A. Hilt, S. M. Williams, M. J. Pantin-Jackwood, d. L. Suarez, E. Spackman, D. E. Stallknecht, and M. W. Jackwood. Biological Characterization of H4, H6, and H9 type Low Pathogenicity Avian Influenza Viruses from wild Birds in Chickens and Turkeys. Avian Dis. 53:552-562. 2009.
16. Jackwood, M. W., S. Bogoch, E. S. Bogoch, D. Hilt, and S. M. Williams. Efficacy of a Replikin Peptide Vaccine Against Low-Pathogenicity Avian Influenza H5 Virus. Avian Dis. 53:613-617. 2009.
17. Shivprasad, H.L., Kim, T., Tripathy, D.N. Woolcock, P.R. and Uzal, F. Unusual pathology of canarypox virus infection associated with high mortality in young and adult breeder canaries (Serinus canaria). Avian Pathology, 38: 311-316, 2009.
18. Jadhao SJ, Lee CW, Sylte M, Suarez DL. Comparative efficacy of North American and antigenically matched reverse genetics derived H5N9 DIVA marker vaccines against highly pathogenic Asian H5N1 avian influenza viruses in chickens. Vaccine. 27(44):6247-60. 2009.
19. Yassine HM, Khatri M, Zhang YJ, Lee CW, Byrum BA, O'Quin J, Smith KA, Saif YM. Characterization of triple reassortant H1N1 influenza A viruses from swine in Ohio. Vet Microbiol. 139:132-9. 2009.
20. L. Wang & Lee CW. Sequencing and Mutational Analysis of the Non-Coding Regions of Influenza A Virus. Veterinary Microbiology. 30;135(3-4):239-247. 2009.

21. SPS Pillai, M Pantin-Jackwood, SJ Jadhao, DL Suarez, L Wang, HM Yassine, YM Saif, CW Lee. Pathobiology of triple reassortant H3N2 influenza viruses in breeder turkeys and its potential implication for vaccine studies in turkeys. Vaccine. 27: 819-824. 2009.
22. Stoute, S. T., D. J. Jackwood, S. E. Sommer-Wagner, G. L. Cooper, M. L. Anderson, P. R. Woolcock, A. A. Bickford, C. G. Senties-Cue, and B. R. Charlton. The diagnosis of very virulent infectious bursal disease in California Pullets. Avian Dis. 53:321-326. 2009.
23. Jackwood, D. J., S. E. Sommer-Wagner, S. T. Stoute, P. R. Woolcock, B. M. Crossley, S. K. Hietala and B. R. Charlton. Characteristics of a very virulent infectious bursal disease virus from California, USA. Avian Dis. 53:592-600. 2009.
24. Lipatov, A. S., Kwon, Y. K., Pantin-Jackwood, M. J. and Swayne, D. E., Pathogenesis of H5N1 influenza virus infections in mice and ferret models differs according to respiratory tract or digestive system exposure. J Infect Dis 199(5):717-25, 2009.
25. Peterson, A. T., Bush, S. E., Spackman, E., Swayne, D. E. and Ip, H. S., Influenza A virus infections in land birds, People's Republic of China. Emerg Infect Dis 14(10):1644-6, 2008.
26. Pfeiffer, J., Pantin-Jackwood, M., To, T. L., Nguyen, T. and Suarez, D. L., Phylogenetic and biological characterization of highly pathogenic H5N1 avian influenza viruses (Vietnam 2005) in chickens and ducks. Virus Res 142(1-2):108-20, 2009.
27. Spackman, E., Ip, H. S., Suarez, D. L., Slemons, R. D. and Stallknecht, D. E., Analytical validation of a real-time reverse transcription polymerase chain reaction test for Pan-American lineage H7 subtype Avian influenza viruses. J Vet Diagn Invest 20(5):612-6, 2008.
28. Spackman, E., Pantin-Jackwood, M., Swayne, D. and Suarez, D. L., An Evalution of Avian Influenza Diagnostics Methods with Domestic Duck Specimens. Avian Dis 53(2):276-280, 2009.
29. Swayne, D. E. and Slemons, R. D., Using mean infectious dose of high- and low-pathogenicity avian influenza viruses originating from wild duck and poultry as one measure of infectivity and adaptation to poultry. Avian Dis 52(3):455-60, 2008.
30. Wasilenko, J. L., Sarmento, L. and Pantin-Jackwood, M. J., A single substitution in amino acid 184 of the NP protein alters the replication and pathogenicity of H5N1 avian influenza viruses in chickens. Arch Virol 154(6):969-79, 2009.
31. Sarmento, L., C.L. Afonso, C. Estevez, Wasilenko, J.L., and M. Pantin-Jackwood. 2008. Differential host gene expression in cells infected with highly pathogenic H5N1 avian influenza viruses. Veterinary Immunology and Immunopathology, 25(3-4):291-302.
32. Sarmento, L., M. Pantin-Jackwood, D.R. Kapczynski, D.E. Swayne, and C.L. Afonso. Immediate early responses of avian tracheal epithelial cells to infection with highly pathogenic avian influenza virus. Dev Biol (Basel).132:175-83, 2008.
33. Kapczynski, D.R., Gonder, E., Liljebjelke, K.A., Lippert, R., Petkov, D., and B. Tilley. Vaccine induced protection from egg production losses in commercial turkey breeder hens following experimental challenge with a triple reassortant H3N2 avian influenza virus. Avian Dis. 53:7-15. 2009.
34. Bogoyavlenskiy, A., Berezin, V.E., Prilipov, A.G., Usachev, E.V., Lyapina, O.V., Korotetskiy, I.S., Zaitceva, I.A., Asanova, S.E., Kydyrmanov, A., Daulbaeva, K., Shakhvorostova, L.M., Sayatov, M.K., King, D.J. Newcastle disease outbreaks in Kazakhstan and Kyrgystan during 1998, 2000, 2001, 2003, 2004 and 2005 were caused by viruses of the genotypes VIIb and VIId. Virus Genes. 39:94-101. 2009.
35. Chakrabarti, S., King, D.J., Cardona, C.J., Gerry, A.C. 2008. Persistence of exotic Newcastle disease virus (ENDV) in laboratory infected Musca domestica and Fannia canicularis. Avian Diseases. 52:375-379. 2008.

36. Miller, P.J., Estevez, C., Yu, Q., Suarez, D.L., King, D.J. Comparison of viral shedding following vaccination with inactivated and live Newcastle disease vaccines formulated with wild-type and recombinant viruses. Avian Diseases. 53:39-49. 2009.
37. Miller, P.J., DeCanini, E.L., Afonso, C. L. Newcastle disease: Evolutionary dynamics of genotypes and the related diagnostic challenges. 10 (1) 26-35. 2010.
38. Miller, P.J., Kim, L.M., Afonso, C.L., Ip, H.S. Evolutionary dynamics of Newcastle disease virus. Virology. 391:64-72. 2009.
39. Perozo, F., Merino, R., Afonso, C.L., Villegas, P., Calderon, N. Biological and phylogenic characterization of virulent Newcastle disease virus circulating in Mexico. Avian Diseases. 52(3):472-479. 2008.
40. Perozo, F., Villegas, P., Afonso, C.L. Genomic comparison of the complete coding and intergenic regions of the VG/GA Newcastle disease virus and its respirotropic clone 5. Virus Genes. 37(2):161-167. 2008.
41. Jindal N, Patnayak DP, Chander Y, Ziegler AF, Goyal SM. Detection and molecular characterization of enteric viruses from poult enteritis syndrome in turkeys. Poult Sci. 89:217-26. 2010.
42. Ramakrishnan MA, Gramer MR, Goyal SM, Sreevatsan S. A Serine12Stop mutation in PB1-F2 of the 2009 pandemic (H1N1) influenza A: a possible reason for its enhanced transmission and pathogenicity to humans. J Vet Sci. 10:349-51. 2009.
43. Jindal N, Chander Y, Chockalingam AK, de Abin M, Redig PT, Goyal SM. Phylogenetic analysis of Newcastle disease viruses isolated from waterfowl in the upper midwest region of the United States. Virol J. 5:191. 2009.
44. Ramakrishnan MA, Tu ZJ, Singh S, Chockalingam AK, Gramer MR, Wang P, Goyal SM, Yang M, Halvorson DA, Sreevatsan S. The feasibility of using high resolution genome sequencing of influenza a viruses to detect mixed infections and quasispecies. PLoS One. 4:e7105. 2009.
45. Jindal N, Chander Y, de Abin M, Sreevatsan S, Stallknecht D, Halvorson DA, Goyal SM. Amplification of four genes of influenza A viruses using a degenerate primer set in a one step RT-PCR method. J Virol Methods. 160:163-6. 2009.
46. Johnson TJ, Nolan LK. Plasmid replicon typing. Methods Mol Biol. 551:27-35. 2009.
47. Johnson TJ, Wannemuehler Y, Doetkott C, Johnson SJ, Rosenberger SC, Nolan LK. Identification of minimal predictors of avian pathogenic Escherichia coli virulence for use as a rapid diagnostic tool. J Clin Microbiol. 46:3987-96. 2008.
48. Johnson TJ, Wannemuehler Y, Johnson SJ, Stell AL, Doetkott C, Johnson JR, Kim KS, Spanjaard L, Nolan LK. Comparison of extraintestinal pathogenic Escherichia coli strains from human and avian sources reveals a mixed subset representing potential zoonotic pathogens. Appl Environ Microbiol. 74:7043-50. 2008.
49. Ammayappan, A., C. Upadhyay, J. Gelb, Jr., and V. N. Vakharia. Complete genomic sequence analysis of infectious bronchitis virus Ark DPI strain and its evolution by recombination. Virology Journal 5:157. 2008.
50. Ammayappan, A., C. Upadhyay, J. Gelb, Jr., and V. N. Vakharia. Identification of sequence changes responsible for the attenuation of avian infectious bronchitis virus strain Arkansas DPI. Archives of Virology 154:495-499. 2009.
51. Arumugaswami, V., P. M. Kumar, V. Konjufca, R. L. Dienglewicz, S. M. Reddy and M. S. Parcells. Latency of Marek's Disease Virus (MDV) in a Reticuloendotheliosis Virus-Transformed T-cell Line. I: Uptake and Structure of the Latent MDV Genome. Avian Dis. 53:149-155. 2009.

52. Arumugaswami, V., P. M. Kumar, V. Konjufca, R. L. Dienglewicz, S. M. Reddy and M. S. Parcells. Latency of Marek's Disease Virus (MDV) in a Reticuloendotheliosis Virus-Transformed T-cell Line. II: Expression of the Latent MDV Genome. Avian Dis. 53:156-165. 2009.
53. Ladman, B. S., S. C. Rosenberger, J. K. Rosenberger, C. R. Pope, and J. Gelb, Jr. Virulence of low pathogenicity H7N2 avian influenza viruses from the Delmarva peninsula for broiler and leghorn chickens and turkeys. Avian Diseases 52:623-631. 2008.
54. Wood, M. K., B. S. Ladman, L. A. Preskenis, C. R. Pope, D. A. Bautista, and J. Gelb, Jr. Massachusetts live vaccination protects against a novel S1 genotype infectious bronchitis virus DMV/5642/06. Avian Diseases 53:119-123. 2009.
55. Arusyak Abrahamyan, Éva Nagy, and Serguei P. Golovan. Human H1 promoter expressed short hairpin RNAs (shRNAs) suppress avian influenza virus replication in chicken CH-SAH and canine MDCK cells. Antiviral Research 84: 159-167. 2009.
56. Kim, C.-H., H.S. Lillehoj, Y.-H. Hong, C.L. Keeler, Jr. and E.P. Lillehoj. Comparison of global transcriptional responses to primary and secondary Eimeris acervulina infections in chickens. Developmental and Comparative Immunology 34:344-351. 2010.
57. Kim, D.K., Kim, C.H., Lamont, S.J., Keeler, C.L. and H.S. Lillehoj. Gene expression profiles of two B-complex disparate, genetically inbred Fayoumi chicken lines that differ in susceptibility to Eimeria maxima. Poultry Science 88:1565-1579. 2009.
58. McCarthy, F. M., T. J. Mahony, M. S. Parcells, and S. C. Burgess. Understanding Animal Viruses Using the Gene Ontology and AgBase. Trends in Microbiology, 17:328-35. 2009.
59. Tavlarides-Hontz, P., P. M. Kumar, J. R. Amortegui, N. Osterrieder, and M. S. Parcell. A deletion within glycoprotein L of Marek's disease virus (MDV) field isolates correlates with a decrease in bivalent MDV vaccine efficacy in contact-exposed chickens. Avian Dis.53:287-29. 2009.
60. Jindal N, Patnayak DP, Chander Y, Ziegler AF, Goyal SM. Detection and molecular characterization of enteric viruses from poult enteritis syndrome in turkeys. Poult Sci. 89:217-26. 2010.
61. Goyal S, Jindal N, Chander Y, Ramakrishnan M, Redig P, Sreevatsan S. Isolation of mixed subtypes of influenza A virus from a bald eagle (Haliaeetus leucocephalus). Virology Journal 7:174. 2010.
62. Ramakrishnan M, Wang P, Abin M, Yang M, Goyal S, Gramar M, Redig P, Fuhrman M, Sreevatsan S. Triple reassortment swine influenza A (H3N2) virus in waterfowl. Emerg Infect Dis. 16:728-729. 2010.
63. Ladman, B. S., C. P. Driscoll, C. R. Pope, R. D. Slemons, and J. Gelb Jr. Potential of low pathogenicity avian influenza viruses of wild bird origin to establish experimental infections in turkeys and chickens. Avian Diseases 54:1091–1094. 2010.
64. Spackman, Erica, Jack Gelb, Lauren Preskenis, Brian Ladman, Conrad Pope, Mary Pantin-Jackwood and Enid McKinley. The pathogenesis of low pathogenicity H7 avian influenza viruses in chickens, ducks and turkeys. Virology Journal 7:331 2010.
65. Marcus PI, Ngunjiri JM, Sekellick MJ, Wang L, Lee CW. In Vitro Analysis of Virus Particle Subpopulations in Candidate Live-Attenuated Influenza Vaccines Distinguishes Effective from Ineffective Vaccines. Journal of Virology. 84(21):10974-81. 2010.
66. Yassine HM, Khatri M, Lee CW, Saif YM. Characterization of an H3N2 triple reassortant influenza virus with a mutation at the receptor binding domain (D190A) that occurred upon virus transmission from turkeys to pigs. Virology Journal. 7(1):258. 2010.

67. Pillai SPS, Pantin-Jackwood M, Suarez DL, Saif YM , Lee CW. Pathobiological characterization of low pathogenicity H5 avian influenza viruses of diverse origins in chickens, ducks and turkeys. Arch Virol. 155(9): 1439-51. 2010.
68. W Cha, Y Ma, YM Saif, Lee CW. Development of microsphere-based multiplex branched DNA assay for the detection and differentiation of avian influenza virus. J Clin Microbiol. Vol. 7, no. 48: 2575-2577. 2010.
69. Pillai SPS, Saif YM, Lee CW. Detection of influenza A viruses in eggs laid by infected turkeys. Avian Dis. 54(2):830-3. 2010.
70. Pillai SPS & Lee CW. Species and age related differences in the type and distribution of influenza virus receptors in different tissues of chickens, ducks and turkeys. Virol J. 7:5. 2010.
71. Wang L, Yassine HM, Saif YM, Lee CW. Developing Live Attenuated Avian Influenza Virus In Ovo Vaccines for Poultry. Avian Dis. 54:297–301, 2010.
72. Pillai SPS, Pantin-Jackwood M, Yassine HM, Saif YM, Lee CW. The high susceptibility of turkeys to Influenza viruses of different origins implies their importance as potential intermediate hosts. Avian Dis. 54:522–526, 2010.
73. Avellaneda G, Mundt E, Lee CW, Jadhao S, Suarez DL. Differentiation of Infected and Vaccinated Animals (DIVA) Using the NS1 Protein of Avian Influenza Virus. Avian Dis. 54:278–286. 2010.
74. Avellaneda G, Lee CW, Suarez DL. A Heterologous Neuraminidase Subtype Strategy for the Differentiation of Infected and Vaccinated Animals (DIVA) for Avian Influenza Virus Using an Alternative Neuraminidase Inhibition Test. Avian Dis. 54:272–277. 2010.
75. Yassine HM, Lee CW, Gourapura R, Saif YM.. Review of Interspecies and Intraspecies Transmission of InfluenzaViruses: Viral, Host, and Environmental Factors. Animal Health Research Reviews. Vol. 1, no. 11: 53-72. 2010.
76. Thomas, C., Swayne, D.E. Thermal inactivation of H5N2 high pathogenicity avian influenza virus in dried egg white with 7.5% moisture. Journal of Food Protection. 72(9):1997-2000. 2009.
77. Swayne, D.E., Pantin Jackwood, M.J., Kapczynski, D.R., Spackman, E., Suarez, D.L. Limited susceptibility of Japanese quail (Coturnix japonica) and resistance of other poultry species to the 2009 novel H1N1 influenza A virus. Emerging Infectious Diseases. 15(12):2061-2063. 2009.
78. Spackman, E., Swayne, D.E., Joly, D., Gilbert, M., Karesh, W., Suarez, D.L., Sodnomdarjaa, R., Cardona, C. Characterization of low pathogenicity avian influenza viruses isolated from wild birds in Mongolia 2005 through 2007. Virology Journal. 6:190-198. 2009.
79. Kapczynski, D.R., Swayne, D.E. Influenza vaccines for avian species. In: Compans, R.W., Orenstein, W.A., editors. Vaccines for Pandemic Influenza, Current Topics in Microbiology and Immunology. Berlin: Springer-Verlag. p.133-152. 2009.
80. Petkov, D.I., Linneman, E.G., Kapczynski, D.R., Sellers, H.S. Identification and characterization of two distinct bursal B-cell subpopulations following infectious bursal disease virus infection of White Leghorn chickens. Avian Diseases. 53(3):347-355. 2009.
81. Das, A., Spackman, E., Pantin Jackwood, M.J., Suarez, D.L. Removal of real-time reverse transcription polymerase chain (RT-PCR) inhibitors associated with cloacal swab samples and tissues for improved diagnosis of avian influenza virus by RT-PCR. Journal of Veterinary Diagnostic Investigation. 21:771-778. 2009.
82. Sylte, M.J., Suarez, D.L. Influenza neuraminidase as a vaccine antigen. In: Compans, R.W., Orenstein, W.A., editors. Vaccines for Pandemic Influenza. New York, NY: Springer. p. 227-242. 2009.

83. Jadhao, S.J., Lee, C., Sylte, M.J., Suarez, D.L. Comparative efficacy of North American and antigenically matched reverse genetics derived H5N9 DIVA marker vaccines against highly pathogenic Asian H5N1 avian influenza in chickens. Vaccine. 27:6247-6260. 2009.
84. Pfeiffer, J., Suarez, D.L., Sarmento, L., To, T., Nguyen, T., Pantin Jackwood, M.J. Efficacy of commercial vaccines in protecting chickens and ducks against H5N1 highly pathogenic avian influenza viruses from Vietnam. Avian Diseases. 54:262-271. 2010.
85. Moresco, K.A., Stallknecht, D., Swayne, D.E. Evaluation and attempted optimization of avian embryos and cell culture methods for efficient isolation and propagation of low pathogenicity avian influenza viruses. Avian Diseases. 54:622-626. 2010.
86. Lira, J., Moresco, K.A., Stallknecht, D., Swayne, D.E., Fisher, D.S. Single and combination diagnostic test efficiency and cost analysis for detection and isolation of avian influenza virus from wild bird cloacal swabs. Avian Diseases. 54:606-612. 2010.
87. Kwon, Y., Thomas, C., Swayne, D.E. Variability in pathobiology of South Korean H5N1 high-pathogenicity avian influenza virus infection for 5 species of migratory waterfowl. Veterinary Pathology. 47(3):495-506. 2010.
87. Jadhao, S., Suarez, D.L. New approach to delist highly pathogenic avian influenza viruses from BSL3+ select agents to BSL2 non-select status for diagnostics and vaccines. Avian Diseases. 54:302-306. 2010.
88. Arafa, A., Suarez, D.L., Aly, M.M., Hassan, M.K. Phylogenetic analysis of hemagglutinin and neuraminidase genes of highly pathogenic avian influenza H5N1 Egyptian strains isolated from 2006 to 2008 indicates heterogeneity with multiple distinct sublineages. Avian Diseases. 54:345-349. 2010.
89. Wasilenko, J.L., Sarmento, L., Spatz, S.J., Pantin Jackwood, M.J. Cell surface display of highly pathogenic avian influenza hemagglutinin on the surface of Pichia pastoris cells using alpha-agglutinin for production of oral vaccines. Biotechnology Progress. 26(2):542-547. 2010.
90. Pantin Jackwood, M.J., Wasilenko, J.L., Spackman, E., Suarez, D.L., Swayne, D.E. Susceptibility of turkeys to pandemic H1N1 virus by reproductive tract insemination. Virology Journal. 7:27. 2010.
91. Eggert, D.L., Thomas, C., Spackman, E., Pritchard, N., R0jo, F., Bublot, M.,Swayne, D.E. Characterization and efficacy determination of commercially available Central American H5N2 avian influenza vaccines for poultry. Vaccine.28:4609-4615. 2010.
92. Abbas, M.A., Spackman, E., Swayne, D.E., Ahmed, Z., Sarmento, L., Siddique, N., Naeem, K., Hameed, A., Rehmani, S. Sequence and phylogenetic analysis of H7N3 avian influenza viruses isolated from poultry in Pakistan 1995-2004. Virology Journal. 7:137. 2010.
93. Avellaneda, G.E., Sylte, M.J., Lee, C., Suarez, D.L. A heterologous neuraminidase subtype strategy for the differentiation of infected and vaccinated animals (DIVA) for avian influenza virus using an alternative neuraminidase inhibition test. Avian Diseases. 54:272-277. 2010.
94. Liljebjelke, K.A., Petkov, D., Kapczynski, D.R. Mucosal vaccination with a codon-optimized hemagglutinin gene expressed by attenuated Salmonella elicits a protective immune response in chickens against highly pathogenic avian influenza. Vaccine. 28(27):4430-4437. 2010.
95. Avellaneda, G.E., Mundt, E., Lee, C., Jadhao, S., Suarez, D.L. Differentiation of infected and vaccinated animals (DIVA) using the NS1 protein of avian influenza virus. Avian Diseases. 54:278-286. 2010.
96. Sarmento, L., Wasilenko, J.L., Pantin Jackwood, M.J. The effects of NS gene exchange on the pathogenicity of H5N1 HPAI viruses in ducks. Avian Diseases. 54:532-537. 2010.

97. Suarez, D.L. Avian Influenza: Our current understanding. Animal Health Research Reviews. 11(1):19-33. 2010.
98. Miller, P.J., Decanini, E.L., Afonso, C.L. Newcastle disease: Evolution of genotypes and the related diagnostic challenges. Infection, Genetics and Evolution. 10(1):26-35. 2010.
99. Khan, T.A., Rue, C.A., Rehmani, S.F., Ahmed, A., Wasilenko, J.L., Miller, P.J., Afonso, C.L. Phylogenetic and pathological characterization of Newcastle disease virus isolates from Pakistan. Journal of Clinical Microbiology. 48(5):1892-1894. 2010.
100. Rue, C.A., Susta, L., Brown, C.C., Pasick, J.M., Swafford, S.R., Wolf, P.C., Killian, M.L., Pedersen, J.C., Miller, P.J., Afonso, C.L. Evolutionary changes effecting rapid diagnostics of 2009 Newcastle disease viruses isolated from Double-crested Cormorants. Journal of Clinical Microbiology. 48(7):2440- 2448. 2010.
101. Susta, L., Miller, P. J., Estevez, C., Yu, Q., Zhang, J., Brown, C.C. Pathogenicity evaluation of different Newcastle disease virus chimeras in 4-week-old chickens. Trop Animal Health Prod. 42(8):1785-95. 2010.
102. Miller, P. J., Afonso, C. L., Spackman, E., Scott, M. A., Pedersen, J. C., Senne, D. A., Brown, J. D., Fuller, C. M., Uhart, M. M., Karesh, W. B., Brown, I. H., Alexander, D. J., Swayne, and D. E. Evidence for a new avian paramyxovirus serotype-10 detected in Rockhopper Penguins from the Falkland Islands. Journal of Virology. 84(21): 11496-11504. 2010.
103. Susta, L., Miller, P.J., Afonso, C.L., and Brown, C.C. Clinicopathological characterization in poultry of three strains of Newcastle disease viruses isolated from recent outbreaks in four-week old SPF Leghorns. Veterinary Pathology. E pub, August 2010.
104. Toro, H., F.W. van Ginkel D.C. Tang, B. Schemera, S. Rodning, J. Newton. Avian Influenza Vaccination with in chickens and pigs with replication competent adenovirus free human recombinant adenovirus 5. Avian Diseases, Supplement 54: 224-231. 2010.
105. Toro, H. Infectious Bronchitis Virus: Dominance of ArkDPI-type Strains in the United States Broiler Industry during the Last Decade Brazilian Journal of Poultry Science 12: 79-86. 2010.
106. Gallardo, R. A.*, V. L. van Santen, H. Toro. Host Intraspatial Selection of Infectious Bronchitis Virus Populations. Avian Diseases 54: 807-813. 2010.
107. Arathy, D.S., Tripathy, D.N., Sabrinath, G.P., Bhaiyat, M.I., Chikweto, A. Mathew, V. and Sharma, R.N. Preliminary Molecular Characterization of a Fowl Poxvirus Isolate in Grenada. Avian Diseases, 54: 1081-1085. 2010.
108. Tripathy, D.N. Fowlpox. Chapter in the Merck Veterinary Manual, Tenth Edition, 2426-2429. 2010.
109. Xie, Z., C. Qina, L. Xie, J. Liua, Y. Pang, X. Deng, Z. Xie, M. I Khan. Recombinant protein-based ELISA for detection and differentiation of antibodies against avian reovirus in vaccinated and non-vaccinated chickens. J. Virol Meth.165: 108-111. 2010.

110. Wei Zhu • Jianbao Dong • Zhixun Xie Qi Liu • Mazhar I. Khan. Phylogenetic and pathogenic analysis of Newcastle disease virus isolated from house sparrow (Passer domesticus) living around poultry farm in southern China. Virus Genes. 231–235. 2010.
111. Susta, L., Miller, P. J., Afonso, C. L., Estevez, C., Yu, Q., Brown, C.C. Pathogenicity evaluation of different Newcastle disease virus chimeras in 4-week-old chickens. Trop.Anim.Health Prod. 42:1785-1795. 2010.

112.. Hsieh, M.K., Wu, C.C., and Lin, T.L. DNA-mediated vaccination conferring protection against infectious bursal disease in broiler chickens in the presence of maternal antibody. Vaccine, 28: 3936-3943. 2010.
113. Jackwood, M. W., D. L. Suarez, D. Hilt, M. J. Pantin-Jackwood, E. Spackman, P. Woolcock, and C. Cardona. Biological Characterization of Chicken-Derived H6N2 Low Pathogenic Avian Influenza Viruses in Chickens and Ducks. Avian Diseases 54:120-125, 2010.
114. Jackwood, M. W., T. O. Boynton, D. A. Hilt, E. T. McKinley, J. C. Kissinger, A. H. Paterson, J. Robertson, c. Lemke, A. W. McCall, S. M. Williams, J. W. Jackwood, and L. A. Byrd. Emergence of a Group 3 Coronavirus Through Recombination. Virology, 398:98-108. 2010.
115. Jackwood, M. W., R. Rosenbloom, M. Petteruti, D. A. Hilt, A. W. McCall, and S. M. Williams. Avian Coronavirus Infectious Bronchitis Virus Susceptibility to Botanical Oleoresins and Essential Oils In Vitro and In Vivo. Virus Research, 149:86-94. 2010.
116. Jackwood, M. W., D. A. Hilt, H. S. Sellers, S. M. Williams, and H. N. Lasher. Rapid Heat-Treatment Attenuation of Infectious Bronchitis Virus. Avian Pathology 39:227-233, 2010.
117. Panshin, A., N. Golender, I. Davidson, S. Nagar, M. Garcia, M. W. Jackwood, E. Mundt, A. Alturi, S. Perk. Variavility of NS1 proteins among H9N2 avian influenza viruses isolated in Israel during 2000-2009. Virus Genes 41:396-405, 2010.
118. Gay, L., and E. Mundt. Testing of a New Disinfectant Process for Poultry Viruses. Avian Diseases 54: 763–767. 2010.
119. Dlugolenski, D., Hauck, R., Hogan, R. J., Michel, F., and E. Mundt. Production of H5 specific monoclonal antibodies and the development of a competitive ELISA for detection of H5 antibodies in multiple species. Avian Diseases 54: 644–649. 2010.
120. Liu, Y., Mundt E., Mundt A., Sylte M., Swayne D., and M. García. Development and evaluation of an avian influenza (AI) neuraminidase subtype 1 (N1) based serological ELISA for poultry using the differentiation of infected and vaccinated animals (DIVA) control strategy. Avian Diseases 54: 613–621. 2010.
121. Avellaneda, G., Mundt, E., Lee, C-W, and Suarez, D. L. Differentiation of infected and vaccinated animals (DIVA) using the NS1 protein of avian influenza virus. Avian Diseases 54:278–286. 2010.
122. Vagnozzi A., M. García, S. M. Riblet, and G. Zavala*. Protection Induced by Infectious Laryngotracheitis Virus Vaccines Alone and Combined with Newcastle Disease Virus and/or Infectious Bronchitis Virus Vaccines. Avian Diseases 54, No. 4: 1210-1219. 2010.
123. Johnson D. I., A. Vagnozzi, F. Dorea, S. M. Riblet, A. Mundt, G. Zavala, and M. García*. Protection Against Infectious Laryngotracheitis by In Ovo Vaccination with Commercially Available Viral Vector Recombinant Vaccines. Avian Diseases, Vol. 54, No. 4: 1251-1259. 2010.
124. McKinley, E. T., D. A. Hilt, and M. W. Jackwood. Avian coronavirus infectious bronchitis attenuated live vaccines undergo selection of subpopulations and mutations following vaccination. Vaccine. 26:1274-1284, 2008.
125. Warke, A., L. Appleby, and E. Mundt. Prevalence of Antibodies to Different Avian Paramyxoviruses in Commercial Poultry in the United States. Avian Diseases 52:549, 2008.
126. Toro H., D.L. Suarez, D.C. Tang, F.W. van Ginkel, C. Breedlove. Avian influenza mucosal vaccination in chickens with replication-defective recombinant adenovirus vaccine. Avian Diseases, 55:43-47. 2001.
127. Gallardo R.A., F.J. Hoerr, W.D. Berry, V.L. van Santen, H.Toro. Infectious bronchitis virus in testicles and venereal transmission. Avian Diseases, 55:255-258. 2011.

128. Mesonero A., D.L. Suarez, E. van Santen, D.C. Tang, H. Toro. Avian influenza in ovo vaccination with replication-defective recombinant adenovirus in chickens: vaccine potency, antibody persistence, and maternal antibody transfer. Avian Diseases, 55:285-292. 2011.
129. Zhang J-F., E Bart Tarbet, H. Toro, D.C. Tang. Adenovirus-vectored drug-vaccine duoas a potential driver for conferring mass protection against infectious diseases. Expert Review of Vaccines, 10:1539-1552. 2011.
130. Wu. H,, K. Williams, S. R. Singh, K. S. Gunn, N. K. Singh, T. Shan-Chia-oh, and J. J. Giambrone. Yeast derived avian influenza virus hemagglutinin protein induced immune response in SPF chickens. J. Animal Sci. Vet. Adv. 10:999-1002. 2011.
131. Ou, S-C. J. J. Giambrone, and K. S. Macklin. Infectious laryngotracheitis vaccine virusdetection in water lines and effectiveness of sanitizers for inactivating the viruses. J. Appl. Poul. Res. 20:223-230. 2011.
132. Peng Y, Xie Z, Liu J, Pang Y, Deng X, Xie Z, Xie L, Fan Q, Feng J, Khan MI. Visual detection of H3 subtype avian influenza viruses by reverse transcription loop-mediated isothermal amplification assay. Virol. J. Jul 5;8:337-341. 2011.
133. Xie, Z., Yi Tang, Qing Feng, Jiabo Liu, Yaoshan Pang, Xianwen Deng, Zhiqin Xie, Yi Pang, Mazhar I. Khan. Development of loop-mediated isothermal amplification （LAMP) assay for the detection of group I avian adenoviruses. Avian Dis. 55:575–579, 2011. 2011.
134. Babapoor, S., T. Neef, C. Mittelholzer, T. Girshick, A. Garmendia, H. Shang, M.I. Khan and P. Burkhard. A novel vaccine using nanoparticle platform to present immunogenic M2e against avian influenza Infection. Influenza Research & Treatment. Volume 2011, Article ID 126794, 12 pages. 2011.
135. Mundt, A., E. Mundt, R. J. Hogan and M. García. Glycoprotein J of infectious laryngotracheitis virus us required for efficient egress of infectious virus from cells. J. Gen. Virol. 92:2586-2589. 2011.
136. Wang, L., Z. Qin, M. Pantin-Jackwood, M. García, B. Lupiani, Y. M. Saif, and C-W. Lee. Development of a DIVA (Differentiation of Infected from Vaccinated Animals) Vaccines for the Control of Triple Reassortant H3N2 Influenza in Turkeys. Vaccine. 45: 7966-7974. 2011.
137. Chen, Y.Y., Wu, C.C., and Lin, T.L. Infectious bursal disease DNA vaccination conferring protection by delayed appearance and rapid clearance of invading viruses. Archives of Virology, 156: 2241-2250. 2011.
138. Yassine HM, Lee CW, Saif YM. Interspecies Transmission of Influenza A Viruses Between Swine and Poultry. Curr Top Microbiol Immunol. 2011. Dec 14.
139. Wang L, Qin Z, Pantin-Jackwood M, Faulkner O, Suarez DL, Garcia M, Lupiani B, Reddy SM, Saif YM, Lee CW. Development of DIVA (differentiation of infected from vaccinated animals) vaccines utilizing heterologous NA and NS1 protein strategies for the control of triple reassortant H3N2 influenza in turkeys. Vaccine. 29(45):7966-74. 2011.
140. Eladl AE, El-Azm KI, Ismail AE, Ali A, Saif YM, Lee CW. Genetic characterization of highly pathogenic H5N1 avian influenza viruses isolated from poultry farms in Egypt. Virus Genes. 43(2):272-80. 2011.
141. Qin Z, Clements T, Wang L, Khatri M, Pillai SP, Zhang Y, Lejeune JT, Lee CW. Detection of influenza viral gene in European starlings and experimental infection. Influenza Other Respi Viruses. 5(4):268-75. 2011.
142. Yassine HM, Khatri M, Lee CW, Saif YM. Potential role of viral surface glycoproteins in the replication of H3N2 triple reassortant influenza A viruses in swine and turkeys. Vet Microbiol. 148(2-4):175-82. 2011.

143. Jackwood, D. J. Viral competition and maternal immunity influence the clinical disease caused by very virulent infectious bursal disease virus. Avian Dis. 55:398-406. 2011.
144. Rauf, A., Khatri, M., Murgia, M.V., Saif, Y.M. Expression of perforin-granzyme pathway genes in the bursa of infectious bursal disease virus-infected chickens. Dev Comp Immunol 35, 620-627. 2011.
145. Rauf A, Khatri M, Murgia MV, Jung K, Saif YM. Differential modulation of cytokine, chemokine and Toll like receptor expression in chickens infected with classical and variant infectious bursal disease virus. Vet Res 42, 85. 2011.
146. Swayne, D.E. Avian influenza (fowl plague). In: Kahn, C.M., editor. Merck Veterinary Manual. 10th edition. Whitehouse, NJ: Merck and Co., Inc. p. 2498-2500. 2010.
147. Swayne, D.E. Other avian paramyxovirus infections. In: Kahn, C.M., editor. Merck Veterinary Manual. 10th edition. Whitehouse, NJ: Merck and Co., Inc. p. 2458-2459. 2010.
148. Chmielewski, R.A., Swayne, D.E. Avian influenza: Public health and food safety concerns. Annual Review of Food Science & Technology. 2:37-57. 2011.
149. Slomka, M., Densham, A., Coward, V.J., Essen, S., Brookes, S.M., Irvine, R.M., Spackman, E., Ridgeon, J., Gardner, R., Hanna, A., Suarez, D.L., Brown, I. Real time reverse transcription (RRT)-polymerase chain reaction (PCR) methods for detection of pandemic (H1N1) 2009 influenza virus and European swine influenza A virus infections in pigs. Influenza and Other Respiratory Viruses. 4:277-293. 2010.
150. McKinley, E.T., Spackman, E., Pantin Jackwood, M.J. The pathogenesis of H3N8 canine influenza virus in chickens, turkeys and ducks. Influenza and Other Respiratory Viruses. 4:353-356. 2010.
151. Stittelaar, K.J., Lacombe, V., Van Lavieren, R., Van Amerongen, G., Simon, J., Cozette, V., Swayne, D.E., Poulet, H., Osterhaus, A.D. Cross-cloade immunity in cats vaccinated with a canarypox-vectored avian influenza vaccine. Vaccine. 28(31):4970-4976. 2010.
152. Kuiken, T., Van Den Brand, J., Van Riel, D., Pantin Jackwood, M.J., Swayne, D.E. Comparative pathology of select agent influenza A virus infections. Veterinary Pathology. 47(5):893-914. 2010.
153. Pillai, S.P., Pantin Jackwood, M.J., Suarez, D.L., Lee, C. Pathobiological characterization of low-pathogenicity H5 avian influenza viruses of diverse origins in chickens, ducks and turkeys. Archives of Virology. 115:1439-1451. 2010.
154. Eggert, D.L., Swayne, D.E. Single vaccination provides limited protection to ducks and geese against H5N1 high pathogenicity avian influenza virus. Avian Diseases. 54:1224-1229. 2010.
155. Chmielewski, R.A., Beck, J.R, Swayne, D.E. Thermal inactivation of avian influenza virus and Newcastle disease virus in a fat-free egg product. Journal of Food Protection. 74(7):1161-1168. 2011.
156. Wasilenko, J.L., Arafa, A.M., Selim, A.A., Hassan, M.K., Aly, M.M., Ali, A., Nassif, S., Elebiary, E., Balish, A., Klimov, A., Suarez, D.L., Swayne, D.E., Pantin Jackwood, M.J. Pathogenicity of two Egyptian H5N1 highly pathogenic avian influenza viruses in domestic ducks. Archives of Virology. 156(1):37-51. 2011.
157. Spackman, E., Gelb, J., Preskenis, L., Ladman, B., Pope, C., Pantin Jackwood, M.J., Mckinley, E.T. The pathogenesis of low pathogenicity H7 avian influenza viruses in chickens, ducks and turkeys. Virology Journal. 7:331. 2010.
158. Ewald, S.J., Kapczynski, D.R., Livant, E.J., Suarez, D.L., Ralph, J., Mcleod, S., Miller, C. Association of Mx1 Asn 631 variant alleles with enhanced resistance and altered cytokine response

in chickens infected with a highly pathogenic avian influenza virus. Immunogenetics. 63(6):363-375. 2011.
159. Belisle, S.E., Tisonciki, J.R., Korth, M.J., Carter, V.S., Proll, S.C., Swayne, D.E., Pantin Jackwood, M.J., Tumpey, T.M., Katze, M.G. Genomic profiling of TNT-alpha receptor and IL1 receptor knockout mice reveals a link between the TNF-alpha signaling and increased severity of 1918 pandemic influenza virus infection. Journal of Virology. 84(24):12576-12588. 2010.
160. Rue, C.A., Susta, L., Edwards, I.C., Brown, C.C., Kapczynski, D.R., Suarez, D.L., King, D.J., Miller, P.J., Afonso, C.L. Virulent Newcastle disease virus elicits a strong innate immune response in chickens. Journal of General Virology. 92:931-939. 2011.
161. Susta, L., Miller, P.J., Afonso, C.L., Estevez, C., Yu, Q., Brown, C.C. Pathogenicity evaluation of different Newcastle disease virus chimeras in 4¬week-old chickens. Tropical Animal Health and Production. 42(8):1785-1795. 2010.
162. Susta, L., Miller, P.J., Afonso, C.L., Brown, C.C. 2011. Clinicopathological characterization in poultry of three strains of Newcastle disease viruses isolated from recent outbreaks. Veterinary Pathology. 48(2):349-360.
163. Miller, P.J., Afonso, C.L., Spackman, E., Scott, M.A., Pedersen, J.C., Senne, D.A., Brown, J.D., Fuller, C.M., Uhart, M.M., Karesh, W.B., Brown, I.H., Alexander, D.J., Swayne, D.E. Evidence for a new avian paramyxovirus serotype-10 detected in Rockhopper penguins from the Falkland Islands. Journal of Virology. 84(21):11496-11504. 2010.
164. Ecco, R., Susta, L., Afonso, C.L., Miller, P.J., Brown, C.C. Neurological lesions in chickens experimentally infected with virulent Newcastle disease virus isolates. Avian Pathology. 40(2):145-152. 2011.
165. King, D.J. Newcastle disease. In: Kahn, C.M., editor. Merck Veterinary Manual. 10th edition. Whitehouse Station, NJ: Merck & Co., Inc. p. 2457-2458. 2010.
166. Coffee, L.L., Hanson, B.A., Luttrell, M., Swayne, D.E., Senne, D.A., Goekjian, V.H., Niles, L.J., Stallknecht, D.E. Avian paramyxoviruses in charadriiform birds. Journal of Wildlife Diseases. 46(2):481-487. 2010.
167. Ecco, R., Brown, C.C., Susta, L., Cagle, C.A., Edwards, I.C., Pantin Jackwood, M.J., Miller, P.J., Afonso, C.L. In vivo transcriptional cytokine responses and association with clinical and pathological outcomes in chickens infected with different Newcastle disease virus isolates using formalin-fixed paraffin-embedded samples. Veterinary Immunology and Immunopathology. 141:221-229. 2011.
168. Miller, P.J., Afonso, C.L. Newcastle disease virus. Encyclopedia of Life Sciences. In: eLS, 2010, John Wiley & Sons, Ltd: Chichester. [online only]. http://www.els.net/ [DOI: 10.1002/9780470015902.a0001077.pub3.] 2011.
169. Yu, Q., Estevez, C.N., Roth, J.P., Hu, H., and Zsak, L. Deletion of the M2-2 gene from avian metapneumovirus subgroup C impairs virus replication and immunogenicity in turkeys. Virus Genes, 42:339–346. 2011.
170. Estevez, C., King, D.J., Luo, M., and Yu, Q. A Single Amino Acid Substitution in the Hemagglutinin-Neuraminidase Protein of Newcastle Disease Virus Results in Increased Fusion promotion and Decreased Neuraminidase Activities without Changes in Virus Pathotype. Journal of General Virology, 92: 544 - 551. 2011.
171. Weng, Y., Lu, W., Harmon, A., Xiang, X., Deng, Q., Song, M., Wang, D., Yu, Q., and Li, F. The cellular ESCRT pathway is not involved in avian metapneumovirus budding in a virus-like-particle expression system. Journal of General Virology, 92: 1205-13. 2011.

172. Hu, H, Roth, J.P., Estevez, C.N., Zsak, L., Liu, B., and Yu, Q. Generation and evaluation of a recombinant Newcastle disease virus expressing the glycoprotein (G) of avian metapneumovirus subgroup C as a bivalent vaccine in turkeys. Vaccine, 29: 8624-8633. 2011.
173. Shah, M. S., A. Ashraf, M. I. Khan, M. Rehman, M. Habib, S. Babapoor, A. Ghaffar, I. R. Malik, S. A. Khannum, and J. A. Qureshi. Molecular characterization of fowl adenoviruses associated with hydro-pericardium syndrome in broilers. African J. of Micro. Research. 5: 5407-5414. 2011.
174. Danzeisen, J.L., Kim, H.B., Isaacson, R.E., Tu, Z.J., and Johnson, T.J. Modulations of the chicken cecal microbiome and metagenome in response to anticoccidial and growth promoter treatment. PLoS ONE 6:e27949. 2011.
175. Sandford, E.E., Orr, M., Balfanz, E., Bowerman, N., Li, X., Zhou, H., Johnson, T.J., Kariyawasam, S., Liu, P., Nolan, L.K., and Lamont, S.J. Spleen transcriptome response to infection with avian pathogenic Escherichia coli in broiler chickens. BMC Genomics 12:469. 2011.
176. Fernandez-Alarcon, C., Singer, R.S., and Johnson, T.J. Comparative Genomics of Multidrug Resistance-Encoding IncA/C Plasmids from Commensal and Pathogenic Escherichia coli from Multiple Animal Sources. PLoS One 6:e2341. 2011.
177. Li, G., Tivendale, K.A., Liu, P., Feng, Y., Wannemuehler, Y.M., Cai, W., Mangiamele, P., Johnson, T.J., Penn, C.W., and Nolan, L.K. Transcriptome analysis of avian pathogenic Escherichia coli O1:K1:H7 in chicken serum reveals adaptive responses to systemic infection. Infect Immun 79:1951-1960. 2011.
178. Van Ginkel F.W., S.L. Gulley, A. Lammers, F. Hoerr, R. Gurjar, H. Toro. Conjunctiva associated lymphoid tissue in avian mucosal immunity. Comparative & Developmental Immunology, 36:289-297. 2012.
179. Kapczynski, D.R., Martin, A., Haddad, E.E., King, D.J. Protection from clinical disease against three highly virulent strains of Newcastle disease virus following in ovo application of an antibody-antigen complexed vaccine in maternally-antibody positive chickens. Avian Dis. 56(3):555-560. 2012.
180. Mesonero, A., Suarez, D.L., Van Santen, E., Tang, D., Toro, H. Avian influenza in ovo vaccination with replication defective recombinant adenovirus in chickens: Vaccine potency, antibody persistence, and maternal antibody transfer. Avian Dis. 55:285-292. 2011.
181. Sylte, M.J., Suarez, D.L. Vaccination and acute phase mediator production in chickens challenged with low pathogenic avian influenza virus; novel markers for vaccine efficacy. Vaccine. 30(2012):3097–3105. 2012.
182. Hai, R., Garcia-Sastre, A., Swayne, D.E., Palese, P. A reassortment- incompetent live attenuated influenza virus vaccine for use in protection against pandemic virus strains. J. Virol. 85(14):6832-6843. 2011.
183. Cilloniz, C., Pantin Jackwood, M.J., Ni, C., Carter, V.S., Korth, M.J.,Swayne, D.E., Tumpey, T.M., Katze, M.G. Molecular signatures associated with Mx-1 mediated resistance to highly pathogenic influenza virus infections: mechanisms of survival. J Virol. 86:2437-2446. 2012.
184. Jiang, H., Yang, H., Kapczynski, D.R. Chicken interferon alpha pretreatment reduces virus replication of pandemic H1N1 and H5N9 avian influenza viruses in different avian species lung cell cultures. Virol. J.8:447. 2011.
185. Swayne, D.E., Pavade, G., Hamilton, K., Vallat, B., Miyagishima, K. Assessment of national strategies for control of high pathogenicity avian influenza and low pathogenicity notifiable avian influenza in poultry, with emphasis on vaccines and vaccination. OIE Sci. Tech. Rev.30(3):839-870. 2011.

186. Swayne, D.E., Eggert, D.L., Beck, J.R. Reduction of high pathogenicity avian influenza virus in eggs from chickens once or twice vaccinated with an oil-emulsified inactivated H5 avian influenza vaccine. Vaccine. 30:4964-4970. 2012.
187. Pantin Jackwood, M.J., Smith, D.M., Wasilenko, J.L., Spackman, E.V. Low pathogenicity avian influenza viruses infect chicken layers by different routes of inoculation. Avian Dis. 56:276-281. 2012.
188. Wasilenko, J.L., Pantin Jackwood, M.J., Khan, T., Ahmed, A., Rehmani, S., Lone, N., Swayne, D.E., Spackman, E. Characterization of H5N1 highly pathogenic avian influenza viruses isolated from poultry in Pakistan 2006-2008. Virus Genes. 44:247-52. 2012.
189. Cagle, C.A., To, T., Nguyen, T., Wasilenko, J.L., Adams, S.C., Cardona, C.J., Spackman, E., Suarez, D.L., Pantin Jackwood, M.J. Pekin and Muscovy ducks respond differently to vaccination with a H5N1 highly pathogenic avian influenza (HPAI) commercial inactivated virus. Vaccine. 29(38):6549-6557. 2011.
190. Belser, J., Gustin, K.M., Maines, T.R., Pantin Jackwood, M.J., Katz, J.M., Tumpey, T.M. Influenza virus respiratory infection and transmission following ocular inoculation in ferrets. PLoS Path. 8(3):e1002569. 2012.
191. Pearce, M.B., Belser, J., Gustin, K.M., Pappas, C., Houser, K.V., Sun, X., Maines, T.R., Pantin Jackwood, M.J., Katz, J.M., Tumpey, T.M. Seasonal trivalent inactivated influenza vaccine protects against 1918 Spanish influenza virus in ferrets. J. Virol.13:7118-7125. 2012.
192. Sa E Silva, M., Mathieu, C.M., Kwon, Y., Pantin Jackwood, M.J., Swayne, D.E. Experimental infection with low and high pathogenicity H7N3 Chilean avian influenza viruses in Chiloe Wigeon (Anas sibilatrix) and Cinnamon Teal (Anas cyanoptera). Avian Dis. 55(3):459-461. 2011.
193. Wang, L., Qin, Z., Pantin Jackwood, M.J., Faulkner, O.B., Suarez, D.L., Garacia, M., Lupiani, B., Reddy, S., Saif, Y., Lee, C. Development of DIVA (differentiation of infected from vaccinated animals) vaccines utilizing heterologous NA and NS1 protein strategies for the control of triple reassortant H3N2 influenza in turkeys. Vaccine. 29:7966-7974. 2011.
194. Josset, L., Belser, J., Chang, J., Pantin Jackwood, M.J., Chang, S., Belisle, S., Tumpey, T.M., Katze, M.G. Implication of inflammatory macrophages, nuclear receptors and interferon regulatory factors in increased virulence of pandemic 2009 H1N1 influenza a virus after host adaptation. J. Virol. 86:7192-7206. 2012.
195. Ladman, B., Spackman, E., Gelb, J. Comparison of pooling eleven and five oropharyngeal swabbings for detecting avian influenza virus by real-time RTPCR in broiler chickens. Avian Dis. 56(1):227-229. 2012.
196. Abbas, M.A., Spackman,E., Fouchier, R., Smith, D., Ahmed,Z., Siddique,N., Sarmento,L., Naeem,K., McKinley, E.T., Hameed,A., Rehmani,S., Swayne, D.E. H7 avian influenza virus vaccines protect chickens against challenge with antigenically diverse isolates. Vaccine. 29(43):7424-7429. 2011.
197. Wilcox, B.R., Knutsen, G.A., Berdeen, J., Goekjian, V., Poulson, R., Goyal, S., Sreevastan, S., Cardona, C., Berghaus, R., Swayne, D.E., Yabsley, M., Stallknecht, D. Influenza-A viruses in ducks in northwestern Minnesota: fine scale spatial and temporal variation in prevalence and subtype diversity. PLoS One. 6(9):e24010. 2011.
198. Chmielewski, R.A., Day, J.M., Spatz, S.J., Yu, Q., Gast, R.K., Zsak, L., Swayne, D.E. Thermal inactivation of avian viral pathogens in an effluent treatment system within a biosafety level 2 and 3 enhanced facility. Applied Biosafety. 16(4):206-217. 2011.

199. Pavade, G., Awada, L., Hamilton, K., Swayne, D.E. Analysis of economic indicators, poultry density and performance of veterinary services for control of high pathogenicity avian influenza in poultry. OIE Sci. Tech. Rev. 30(3):661-671. 2012.
200. Harrison, L., Brown, C.C., Afonso, C.L., Zhang, J., Susta, L. Early occurrence of apoptosis in lymphoid tissues from chickens infected with strains of Newcastle disease virus of varying virulence. J. Comp. Pathol. 145:327-335. 2011.
201. Diel, D.G., Miller, P.J., Wolf, P.C., Mickley, R.M., Musante, A.R., Emanueli, D.C., Shively, K.J., Afonso, C.L. Characterization of Newcastle disease virus isolated from cormorant and gull species in the United States in 2010. Avian Dis. 56:128-133. 2012.
202. Perozo, F., Marcano, R., Afonso, C.L. Biological and phylogenetic characterization of a genotype VII Newcastle disease virus from Venezuela: Efficacy of vaccination. J. Clin. Microbiol. 50:1204-1208. 2012.
203. Edwards, I.C., Miller, P.J., Afonso, C.L. Characterization of the live LaSota-vaccine strain-induced protection in chickens upon early challenge with a virulent Newcastle disease virus of heterologous genotype. Avian Dis.56:464-470. 2012.
204. Diel, D.G., Susta, L., Cardenas, S., Brown, C.C., Miller, P.J., Afonso, C.L. Complete genome and clinicopathological characterization of a virulent Newcastle disease virus isolate from South America. J. Clin. Microbiol. 50:378-387. 2012.
205. Deng, Q., Weng, Y., Lu, W., Demers, A., Song, M., Wang, D., Yu, Q., and Li, F. Topology and cellular localization of the small hydrophobic protein of avian metapneumovirus. Virus Research. 160:102-107. 2011.
206. Deng, Q., Song, M., Weng, Y., Demers, A., Lu, W., Wang, D., Kaushik, R.S., Yu, Q., Li, F. Biochemical Characterization of the Small Hydrophobic Protein of Avian Metapneumovirus. Virus Research. 167, 297-301. 2012.
207. Hu, H., Zhao, W., Yu, Q. Avian metapneumovirus molecular biology and development of genetically engineered vaccines. China Poultry. Vol.34,No.12, page:1-5. 2012.
208. Liu, Y, E. Mundt, A. Mundt, M. Sylte, D. L. Suarez, D. E. Swayne, and M. García*. Development and Evaluation of an Avian Influenza (AI) Neuraminidase Subtype 1 (N1) Based ELISA for Poultry Using the Differentiation of Infected and Vaccinated Animals (DIVA) Approach. Avian Dis. 54: 613-621. 2011.
209. Wang, L., Z. Qin, M. Pantin-Jackwood, M. García, B. Lupiani, Y. M. Saif, and C-W. Lee. Development of a DIVA (Differentiation of Infected from Vaccinated Animals) Vaccines for the Control of Triple Reassortatn H3N2 Influenza in Turkeys. Vaccine. 45: 7966-7974. 2011.
210. Mundt, A., E. Mundt, R. J. Hogan and M. García. Glycoprotein J of infectious laryngotracheitis virus us required for efficient egress of infectious virus from cells. J. Gen. Virol. 92:2586-2589. 2011.
211. El Gazzar, M., Laibinis V., and Ferguson-Noel N. Characterization of a ts-11-like Mycoplasma gallisepticum Isolate From Commercial Broiler Chickens. Avian Dis 55:569-574. 2011.
212. Gharaibeh S, Laibinis V, Wooten R, Stabler L and Ferguson-Noel N. Molecular Characterization of Mycoplasma gallisepticum isolates from Jordan. Avian Dis. 55:212-216. 2011.
213. McKinley, E. T., M. W. Jackwood, D. A. Hilt, J. C. Kissinger, J. S. Robertson, C. Lemke, and A. H. Paterson. Attenuated live vaccine usage affects accurate measures of virus diversity and mutation rates in avian coronavirus infectious bronchitis virus. Virus Research. 158:225-234. 2011.
214. Thor, S. W., D. A. Hilt, J. C. Kissinger, A. H. Paterson, and M. W. Jackwood. Recombination in Avian Gamma-Coronaviruses. Viruses. 3:1777-1799. 2011.

215. OU, Shan-Chia, J. J. Giambrone and K. S. Macklin. Comparison of a TaqMan Real time PCR with a loop-mediated isothermal amplification assay for detection of infectious laryngotracheatis virus. J. Vet. Diagn. Invest. 24: 138-141. 2012.
216. OU, Shan-Chia, J. J. Giambrone and K. S. Macklin. Detection of infectious laryngotracheatis virus from darkling beetles and their immature stage (lesser mealworm) by quantitative polymerase chain reaction and virus isolation. J. Appl Poult Res. 21: 33-38. 2012.
217. Gunn, N. K. S., J. J. Sing, J. Giambrone and H. Wu. Using transgenic plants as bioreactors to produce bioreactors to produce edible vaccines. J. Biotec. 4: 92-99. 2012.
218. Chen, Y.Y., Wu, C.C., and Lin, T.L. Infectious bursal disease DNA vaccination conferring protection by delayed appearance and rapid clearance of invading viruses. Archives of Virology,156: 2241-2250. 2011.
219. Shah, M. S., Ashraf, A., Khan, M. I., Rahman, M., Habib, M., Babapoor, S., Ghaffar, A., Malik, I. R., Khannum, S. A. and Qureshi, J. A. Molecular characterization of fowl adenoviruses associated with hydro-pericardium syndrome in broilers. African Journal of Microbiology Research 5: 5407-5414. 2011.
220. Shah, M.S., .A. Ashraf, M. Rahman, M.I. Khan, J.A. Qureshi. A subunit vaccine against hydropericardium syndrome using adenovirus penton capsid protein. Vaccine 30:7153–7156. 2012.
221. Almeida D O, Tortelly, R, Nascimento E R,Chagas M A, Khan M I, Pereira V L. Avian infectious bronchitis and deep pectoral myopathy--A case control study. Poult Sci. 91(12):3052-6. doi: 10.3382/ps.2012-02476. 2012.
222. Spatz, S. J., J. D Volkening, and C. L Keeler, G. F. Kutish, S. M. Riblet, C. M. Boettger, K. F. Clark, L. Zsak, C. L. Afonso, E. S. Mundt, D.L. Rock, and M. Garcia. Comparative full genome analysis of four infectious laryngotracheitis virus (Gallid herpesvirus-1) virulent isolates from the United States. Virus Genes 44:273-285. 2012.
223. Ngunjiri JM, Lee CW, Ali A, Marcus PI. Influenza virus interferon-inducing particle efficiency is reversed in avian and mammalian cells, and enhanced in cells co-infected with defective-interfering particles. J Interferon Cytokine Res. 2012 Jun;32(6):280-5. 2012.
224. Rauf A, Khatri M, Murgia MV, Saif YM. Fas/FasL and perforin systems as important mechanisms of T cell-mediated cytotoxicity in infectious bursal disease virus infected chickens. Results in Immunology. http://dx.doi.org/10.1016/j.rinim.2012.05.003 2012.
225. Jackwood DJ, Crossley BM, Stoute ST, Sommer-Wagner S, Woolcock PR, Charlton BR. Diversity of genome segment B from infectious bursal disease viruses in the United States. Avian Dis. 56:165-172. 2012.
226. Jackwood DJ. Molecular epidemiologic evidence of homologous recombination in infectious bursal disease viruses. Avian Dis. 56: 574-577. 2012.
227. Anil J. Thachil, B. McComb, M.M. Early, C.Heeder, and K. V. Nagaraja. A bivalent Clostridium perfringens and Clostridium septicum toxoid to control cellulitis in turkeys . J. Appl. Poult. Res. vol. 21 no. 2 358-366. 2012.
228. Wongphatcharachai M, Wang P, Enomoto S, Webby RJ, Gramer MR, Amonsin A, Sreevatsan S. Neutralizing DNA Aptamers Against Swine Influenza H3N2 Viruses. J Clin Microbiol. 2012.
229. Chander Y, Jindal N, Sreevatsan S, Stallknecht DE, Goyal SM. Molecular and phylogenetic analysis of matrix gene of avian influenza viruses isolated from wild birds and live bird markets in the USA. Influenza Other Respi Viruses. 2012.

230. Lebarbenchon C, Yang M, Keeler SP, Ramakrishnan MA, Brown JD, Stallknecht DE, Sreevatsan S. Viral replication, persistence in water and genetic characterization of two influenza A viruses isolated from surface lake water. PLoS One. 6(10):e26566. 2011.
231. Johnson TJ, Fernandez-Alarcon C, Bojesen AM, Nolan LK, Trampel DW, Seemann T. Complete genome sequence of Gallibacterium anatis strain UMN179, isolated from a laying hen with peritonitis. J Bacteriol. 193(14):3676-7. 2011.
232. Wannemuehler Y, Kariyawasam S, Johnson JR, Logue CM, Nolan LK. Prevalence of avian-pathogenic Escherichia coli strain O1 genomic islands among extraintestinal and commensal E. coli isolates.. J Bacteriol. 194(11):2846-53. 2012.
233. Danzeisen JL, Kim HB, Isaacson RE, Tu ZJ, Johnson TJ. Modulations of the chicken cecal microbiome and metagenome in response to anticoccidial and growth promoter treatment. PLoS One. 6(11):e27949. 2011.
234. Johnson TJ, Logue CM, Johnson JR, Kuskowski MA, Sherwood JS, Barnes HJ, DebRoy C, Wannemuehler YM, Obata-Yasuoka M, Spanjaard L, Nolan LK. Associations between multidrug resistance, plasmid content, and virulence potential among extraintestinal pathogenic and commensal Escherichia coli from humans and poultry. Foodborne Pathog Dis. 9(1):37-46. 2012.
235. Breedlove C., J. K. Minc , D. C. Tang, V. L. van Santen , F. W. van Ginkel, H. Toro. Avian influenza adenovirus-vectored in ovo vaccination: target embryo tissues and combination with Marek's disease vaccine. Avian Diseases 55:667-673. 2012.
236. Afonso, C.L., Miller, P.J. Newcastle Disease: Progress and gaps in the development of vaccines and diagnostic tools. Developments in Biologicals. 135:95-106. 2013.
237. Cardenas-Garcia, S., Navarro, R., Morales, R., Olvera, M., Marquez, M., Merino, R., Miller, P.J., Afonso, C.L. Molecular epidemiology of Newcastle disease in Mexico and the potential spillover of viruses from poultry into wild bird species. Applied and Environmental Microbiology. 79(16):4985-4992. 2013.
238. Cornax, I., Diel, D.G., Rue, C.A., Estevez, C., Yu, Q., Miller, P.J., Afonso, C.L. Newcastle disease virus fusion and haemagglutinin-neuraminidase proteins contribute to its macrophage host range. J. Gen. Virol. 94(Pt 6):1189-94. 2013.
239. Courtney, S.C., Gomez, D., Hines, N.L., Pedersen, J.C., Miller, P.J., Afonso, C.L., Susta, L., Brown, C. Highly divergent virulent isolates of newcastle disease virus from the Dominican Republic are members of a new genotype that may have evolved unnoticed for over two decades. Journal of Clinical Microbiology. 51(2):508-517. 2013.
240. Courtney, S.C., Gomez, D., Killian, M.L., Pedersen, J.C., Miller, P.J., Afonso, C.L. Complete genome sequencing of a novel Newcastle disease virus isolate circulating in chicken layers in the Dominican Republic. Journal of Virology. 86(17):9550. 2012.
241. Kapczynski, D.R., Afonso, C.L., Miller, P.J. Immune responses of poultry to Newcastle disease virus. Dev. Comp. Immunol. 41(3):447-53. 2013.
242. Li, J., Hu, H., Yu, Q., Diel, D.G., Li, D., Miller, P.J. Generation and characterization of a recombinant Newcastle disease virus expressing the red fluorescent protein for use in co-infection studies. Virology Journal. 9:227. 2012.
243. Liu, H., Lv, Y., Afonso, C.L., Ge, S., Zheng, D., Zhao, Y., Wang, Z. 2013. Complete genome sequences of new emerging newcastle disease virus strains isolated from china. Genome Announc. Jan;1(1). 2013.
244. Miller, P.J., Afonso, C.L., El Attrache, J., Dorsey, K.M., Courtney, S.C., Guo, Z., Kapczynski, D.R. Effects of Newcastle disease virus vaccine antibodies on the shedding and transmission of challenge viruses. Dev. Comp. Immunol. 41(4):505-13. 2013.

245. Pchelkina, I.P., Manin, T.B., Kolosov, S.N., Starov, S.K., Andriyasov, A.V., Chvala, I.A., Drygin, V.V., Yu, Q., Miller, P.J., Suarez, D.L. Characteristics of pigeon paramyxovirus serotype-1 isolates (PPMV-1) from the Russian Federation from 2001 to 2009. Avian Dis. 57:2-7. 2013.
246. Ramey, A.M., Reeves, A.B., Ogawa,H., Ip, H.S., Imai, K., Bui,V.N., Yamaguchi, E., Silko, N.Y., Afonso, C. L. Genetic diversity and mutation of avian paramyxovirus serotype 1 (Newcastle disease virus) in wild birds and evidence for intercontinental spread. Arch Virol. 158(12):2495-503. 2013.
247. Susta, L., Cornax, I., Diel, D.G., Garcia, S.C., Miller, P.J., Liu, X., Hu, S., Brown, C.C., Afonso, C.L. Expression of interferon gamma by a highly virulent strain of Newcastle disease virus decreases its pathogenicity in chickens. Microb. Pathog. 61-62:73-83. 2013.
248. Wu, Y., Yan, S., Lv, Z., Chen, L., Geng, J., He, J., Yu, Q., Yin J., Ren G., Li D. Recombinant Newcastle Disease virus Anhinga Strain (NDV/Anh-EGFP) for Hepatoma Therapy. Technol. Cancer Res. Treat. Jun 24. 2013,
249. Zhao, W., Hu, H., Zsak, L., Yu, Q., Yang, Z. Application of the ligation-independent cloning (LIC) method for rapid construction of a minigenome rescue system for Newcastle disease virus VG/GA strain. Plasmid. 70:314-20. 2013.
250. Zhao, W., Zhang, Z., Zsak, L., Yu, Q. Effects of the HN gene C-terminal extensions on the Newcastle disease virus virulence. Virus Genes. September 14. 2013.
251. Gelb, J. Jr., B. S. Ladman, C. R. Pope, J. M. Ruano, E. M. Brannick, D. A. Bautista, C. M. Coughlin, and L. A. Preskenis. Characterization of nephropathogenic infectious bronchitis virus DMV/1639/11 recovered from Delmarva broiler chickens in 2011. Avian Dis. 57:65-70. 2013.
252. Gelb, J. Jr., D. J. Jackwood, E. Mundt, C. R. Pope, R. Hein, G. Slacum, J. M. Harris, B. S. Ladman, P. Lynch, D. A. Bautista, J. M. Ruano and M. M. Troeber. Characterization of infectious bursal disease viruses isolated in 2007 from Delmarva commercial broiler chickens. Avian Dis. 56:82-89. 2012.
253. Maughan, Michele N., Lorna S. Dougherty, Lauren A. Preskenis, Brian S. Ladman, Jack Gelb, Jr, Erica Spackman and Calvin L. Keeler, Jr. Transcriptional analysis of the innate immune response of ducks to different species-of-origin low pathogenic H7 avian influenza viruses. Virology Journal. Mar 23;10:94. doi: 10.1186/1743-422X-10-94. 2013.
254. Parthiban, M., K. Manimaran, S. Xiao, B. Nayak, A. Paldurai, S. Kim, B. S. Ladman, L. A. Preskenis, J. Gelb Jr., P. L. Collins and S. K Samal. Complete genome sequence of an avian paramyxovirus type 4 from North America reveals a shorter genome and new genotype. Genome Announcements (genome A). vol. 1 no. 1 e00075-12. 2013.
255. Spackman E, J. C. Pedersen, E. T. McKinley, and J. Gelb, Jr. Optimal specimen collection and transport methods for the detection of avian influenza virus and Newcastle disease virus. BMC Vet Res. 9:35. doi: 10.1186/1746-6148-9-35. 2013.
256. Wang, Y., B. Ladman, C. Wu, J. Gelb, Jr., and S. Golovan. Comparison of vRNA and cRNA based reporters for detection of influenza replication. Antiviral Research. 98: 76-84. 2013.
257. Gondal, M. A., M. Rabbani, K. Muhammad, T. Yaqub, M. E. Babar, A. A. Sheikh, A. Ahmad, M. Z. Shabbir and M. I. Khan. Antibodies response of broilers to locally prepared oil based Mycoplasma gallisepticum vaccine. Journal of Animal and Plant Sciences, 23(4). 1094-1098. 2013.
258. Huang Y, Khan M, Măndoiu II. Neuraminidase Subtyping of Avian Influenza Viruses with PrimerHunter-Designed Primers and Quadruplicate Primer Pools. PLoS ONE 8(11): e81842.doi:10.1371/journal.pone.0081842. 2013.

259. Gondal, M. A., M. Rabbani, K. Muhammad, T. Yaqub, M. E. Babar, A. A. Sheikh, A. Ahmad, M. Z. Shabbir and M. I. Khan. Characterization of Mycoplasma gallisepticum isolated from Commercial Poultry Flocks. Journal of Animal and Plant Sciences, 23(5). In press, 2013.
260. Lee, C.H., Wu, C.C., and Lin, T.L. Molecular identification and characterization of a chicken innate immunity sensor: melanoma differentiation-associated gene 5 (MDA5). Comparative Immunology, Microbiology and Infectious Diseases, 35: 335-343. 2012.
261. Y.Y. Chen-Mosley, Wu, C.C., and Lin, T.L. Infectious bursal disease virus rescued efficiently with 3' authentic RNA sequence induces humoral immunity without bursal atrophy. Vaccine, 31 (4): 704-710. 2013.
262. Mor SK, Sharafeldin TA, Porter RE, Ziegler A, Patnayak DP, et al. Isolation and characterization of a turkey arthritis reovirus. Avian Dis. 57: 97-103. 2013.
263. Johnson TJ, Danzeisen JL, Trampel D, Nolan LK, Seemann T, et al. Genome analysis and phylogenetic relatedness of Gallibacterium anatis strains from poultry. PLoS One 8: e54844. 2013.
264. Adams S, Xing Z, Li J, Mendoza K, Perez D, et al. The effect of avian influenza virus NS1 allele on virus replication and innate gene expression in avian cells. Mol Immunol 56:358-368. 2013.
265. Bauer MM, Miller MM, Briles WE, Reed KM. Genetic variation at the MHC in a population of introduced wild turkeys. Anim Biotechnol 24:210-228. 2013.
266. Monson MS, Mendoza KM, Velleman SG, Strasburg GM, Reed KM. Expression profiles for genes in the turkey major histocompatibility complex B-locus. Poult Sci 92:1523-1534. 2013.
267. Mor SK, Sharafeldin TA, Abin M, Kromm M, Porter RE, et al. The occurrence of enteric viruses in Light Turkey Syndrome. Avian Pathol 42:497-501. 2013.
268. Johnson TJ, Abrahante JE, Hunter SS, Hauglund M, Tatum FM, et al. Comparative genome analysis of an avirulent and two virulent strains of avian Pasteurella multocida reveals candidate genes involved in fitness and pathogenicity. BMC Microbiol 13:106. 2013.
269. Danzeisen JL, Wannemuehler Y, Nolan LK, Johnson TJ. Comparison of multilocus sequence analysis and virulence genotyping of Escherichia coli from live birds, retail poultry meat, and human extraintestinal infection. Avian Dis. 57:104-108. 2013.
270. Ibrahim M, Eladl AF, Sultan HA, Arafa AS, Abdel Razik AG, Abd El Rahman S, El-Azm KI, Saif YM, Lee CW. Antigenic analysis of H5N1 highly pathogenic avian influenza viruses circulating in Egypt (2006-2012). Vet Microbiol. 167(3-4):651-61. 2013.
271. Ali A, Yassine H, Awe OO, Ibrahim M, Saif YM, Lee CW. Replication of swine and human influenza viruses in juvenile and layer turkey hens. Vet Microbiol. 163(1-2):71-8. 2013.
272. Ali A, Ibrahim M, Eladl AE, Saif YM, Lee CW. Enhanced replication of swine influenza viruses in dexamethasone-treated juvenile and layer turkeys. Vet Microbiol. 162(2-4):353-9. 2013.
273. Yassine HM, Lee CW, Saif YM. Interspecies transmission of influenza a viruses between Swine and poultry. Curr Top Microbiol Immunol. 370:227-40. 2013.
274. Rauf A, Murgia M, Rodriguez-Palacios A, Lee CW, Saif YM. Persistence and tissue distribution of infectious bursal disease virus in experimentally infected SPF and commercial broiler chickens. Avian Dis. In press.
275. Jackwood DJ. Multivalent virus-like-particle vaccine protects against classic and variant infectious bursal disease viruses. Avian Dis. 57:41-50. 2013.
276. Jackwood DJ and Stoute ST. Molecular evidence for a geographically restricted population of infectious bursal disease viruses. Avian Dis. 57:57-64. 2013.

277. Stoute ST, Jackwood DJ, Sommer-Wagner SE, Crossley BM, Woolcock PR, Charlton BR. Pathogenicity associated with coinfection with very virulent infectious bursal disease and infectious bursal disease virus strains endemic in the United States. J Vet Diag Invest. 25:352-358. 2013.

Abstracts, Presentations, etc:

1. Huang, Yanyan., Xiumei Zhang, Xintian Wen, Sanjie Cao, Xiumei Zhang, and Mazhar I. Khan. Studies of phylogeny and sequence analysis of H9N2 avian influenza viruses. 146th AVMA Annual Convention, Seattle, WA. July 11-14, 2009. CDROM. 7703. 2009.
2. Huang, Yanyan., Beixia Hu, Xintian Wen, Sanjie Cao, Xiumei Zhang, and Mazhar I. Khan Genomic analysis of seventeen H9N2 chicken influenza viruses isolated in northern China during 1998–2008. 16th World Veterinary Poutry Association Congress, Marrakesh, Morocco, November 8-12, 2009.P13-AI.p 322.
3. Tripathy, D.N. and Bahaaa, A.F.A. Genetic Characterization of avianpox viruses using DNA isolated from formalin fixed tissue sections. AAAP, AVMA Conference, Seattle, WA, July, 2009.
4. Chen, Y. Y., Wu, C. C., and Lin, T. L. Generation and characterization of reverse-genetic infectious bursal disease virus. The Proceedings of the 60th North Central Avian Disease Conference, Page 16, 2009.
5. Wu, C. C., Chen, Y. Y., and Lin, T. L. Specific humoral immunity elicited by DNA encoding infectious bursal disease virus large segment gene and avian influenza virus hemagglutinin gene. The Proceedings of the 146st Annual Meeting of the American Veterinary Medical Association, Page 23, 2009.
6. Strother M, Cha W, Saif YM, Lee CW. Microsphere-based multiplex branched DNA assay for the detection and differentiation of influenza virus. 7th International Symposium on Avian Influenza. April 5-8, 2009. Athens, GA.
7. Wang L, Saif YM, Lee CW. Developing live attenuated influenza in ovo vaccines for poultry. 7th International Symposium on Avian Influenza. April 5-8, 2009. Athens, GA.
8. Pillai SPS, Suarez DL, Pantin-Jackwood M, Lee CW. The high susceptibility of turkeys to low pathogenic avian influenza viruses of different origins imply their importance as intermediate hosts. 7th International Symposium on Avian Influenza. April 5-8, 2009. Athens, GA.
9. Saif, Y.M. Influenza Vaccines for Turkeys. Proc. 5th Intl. Veterinary Vaccines and Diagnostics Conference, Madison, WI, July 19-23, 2009.
10. Yassine, H.M., M. Khatri, C.W. Lee, and Y.M. Saif: Interspecies Transmission of Triple Reassortant H3N2 Influenza Viruses between Swine and Turkeys: Molecular Studies. Proc. American Association of Avian Pathologists (AAAP-AVMA) Annual Meeting. Poster, Seattle, WA, July, 2009.
11. Khatri, M., H.M. Yassine, Y.M. Saif, and C.W. Lee: Susceptibility of Chicken T Cells to Low Pathogenic H5 Influenza Viruses. Proc. American Association of Avian Pathologists (AAAP-AVMA) Annual Meeting. Abstract, Seattle, WA, July, 2009.
12. Wang, L., H.M. Yassine, S. Pillai, Y.M. Saif, and C.W. Lee: Development of DIVA Vaccines for the Control of Triple Reassortant H3N2 Influenza in Turkeys. Proc. American Association of Avian Pathologists (AAAP-AVMA) Annual Meeting. Abstract, Seattle, WA, July, 2009.

13. Yassine, H.M., M. Khatri, C.W. Lee, and Y.M. Saif: Studies on Interspecies Transmission of Triple Reassortant H3N2 influenza A Viruses. Proc. 7th International Symposium on Avian Influenza., Abstract, Athens, GA, April, 2009.
14. Jackwood, D. J. Current status of infectious bursal disease. Proceedings of the XXXIV Annual Asociacion Nacional de Especialistas en Ciencias Avicolas de Mexico, A. C. (ANECA) Convention. Acapulco, Mexico. August 2009.
15. Gelb, J., Jr., D. J. Jackwood, E. Mundt, C. R. Pope, R. Hein, G. Slacum, J. M. Harris, B. S. Ladman, P. Lynch, D. Bautista, M. Ruano, and M. Troeber. Antigenic Characterization and VP2 Analysis of Delmarva IBD Field Viruses. Proc. 146th American Veterinary Medical Assn./ American Assn. Avian Pathologists Ann. Mtg. Seattle, Washington. July 11-14, 2009.
16. Harris, J. M., J. Gelb, Jr., D. J. Jackwood, E. Mundt, B. S. Ladman, C. R. Pope, R. Hein, G. Slacum, P. Lynch, M. RuanoA, M. Troeber, and D. Bautista. Characterization of Infectious Bursal Disease Viruses Isolated from Commercial Chickens. Eighty-first Northeastern Conference on Avian Diseases. Grantville, Pennsylvania. September 17-18, 2009.
17. Preskenis, L. A., J. Gelb, Jr., E. Spackman, and C. R. Pope. Characterization of LPAI H7 Isolates in Three Species of Birds. Eighty-first Northeastern Conference on Avian Diseases. Grantville, Pennsylvania. September 17-18, 2009.
18. Golovan, S. P., Abrahamyan, A., Duvanov, S. Nagy, E., Sharif, S., Bedecarrats, G. Application of RNA Interference Methodology to Inhibit Avian Influenza Virus Replication in Vitro. Max Planck Institute for Developmental Biology. Tübingen, Germany. June 12, 2009.
19. Golovan, S. P., Abrahamyan, A., Duvanov, S. Nagy, E., Sharif, S., Bedecarrats, G. Application of RNA Interference Methodology to Inhibit Avian Influenza Virus Replication in Vitro. Poultry Research Institute. Kharkov. Ukraine. June 23, 2009.
20. Golovan, S. P., Abrahamyan, A., Duvanov, S. Nagy, E., Sharif, S., Bedecarrats, G. Application of RNA Interference Methodology to Inhibit Avian Influenza Virus Replication in Vitro. Institute for Experimental and Clinical Veterinary Medicine. Kharkiv. Ukraine. June 26, 2009.
21. Rauf Abdul, Maria V. Murgia, M. Khatri, A. Rodriguez-Palacios, C-W. Lee and Y.M. Saif. Distribution and Persistence of Infectious Bursal Disease Virus in Chickens. 61st North Central Avian Disease Conference. St. Paul, Minnesota. March 15 & 16. 2010.
22. Jackwood, D. J., S. E. Sommer-Wagner, S. T. Stoute, P. R. Woolcock, B. M. Crossley, S. K. Hietala and B. R. Charlton. The very virulent infectious bursal disease virus (vvIBDV) strain of birnavirus in California: Identification and pathogenicity of a reassortant virus. Abstr. #41, 29th Annual Am. Society for Virol. Meet. 2010.
23. Jackwood, D. J., S. E. Sommer-Wagner and S. T. Stoute. Morbidity, mortality and pathology caused by different challenge doses of vvIBDV. Abstr. 9370, Poster #51, 147th AVMA meeting. 2010.
24. Rauf A, Murgia MV, Rodriguez-Palacios A, Khatri M, Lee CW, Saif YM. Persistence and distribution of infectious bursal disease virus in SPF and commercial broiler chickens. OARDC Conference. Wooster, Ohio. April 22. 2010.
25. Ngunjiri JM, Marcus PI, Sekellick MJ, Wang L, Lee CW. In vitro analysis of virus particle subpopulations in candidate live-attenuated influenza vaccines distinguishes effective from ineffective vaccines. American Society of Virology Annual Meeting. Bozeman, Montana. 2010.
26. Rauf Abdul, Maria V. Murgia, Lee CW, M. Khatri, and Y.M. Saif. Persistence and distribution of infectious bursal disease virus in SPF and commercial broiler chickens. 147th AVMA Annual Convention. Atlanta, GA. July 30–August 4, 2010.

27. Lee CW, Qin Z, Clements T, Wang L, Khatri M, Zhang Y, LeJeune JT. Influenza infection in starlings. 147th AVMA Annual Convention. Atlanta, GA. July 30–August 4, 2010.
28. Rauf Abdul, Maria V. Murgia, C-W. Lee, M. Khatri and Y.M Saif. Persistence and distribution of infectious bursal disease virus in SPF and commercial broiler chickens. 147th AVMA Annual Convention. Atlanta, GA. July 30–August 4, 2010.
29. Rauf Abdul, M. Khatri, Maria V. Murgia and Y.M. Saif. Viral induced inflammatory cytokine, toll like receptors and cytotoxic T cells components in infectious bursal disease infected chickens. Conference for Research workers in animal science at Chicago, December 5 – 7, 2010.
30. Giambrone, K. Guo, and T. V. Dormitoriiso.2010. Detection and Differentiation of avian reoviruses using SYBER-Green I based two step real time RT-PCR with melting curve analysis. Southern Conference on Avian Diseases. Atlanta Ga. Jan 26.
31. Ou, Shan-Chia, T. V. Dormitorio, and J. J. Giambrone. 2010. Detection of infectious laryngotracheitis virus by loop mediated isothermal amplification (LAMP). Southern Conference on Avian Diseases. Atlanta Ga. Jan 26.
32. Dormitorio, T.V., Giambrone, J. J., and K. Guo. 2010. Isolation, characterization, inactivation of H1N1 viruses from wild water fowl. Poult Science Association. Annual Meeting. Denver, CO. July 19-21.
33. Dormitorio, T.V. and J. J. Giambrone. 2010. Limiting dilution studies to detect avian influenza viruses from questionable. American Association of Avian Pathologist Annual Meeting, Atlanta, GA. Aug 1-4.
34. Giambrone, J. J., Sc. Ou, N. K. Singh, K. S. Gunn, H. Wu, and R, Singh. 2010. AIV H1N1 DNA vaccine induced humoral and cell-mediated immunity in SPF chickens. American Association of Avian Pathologist Annual Meeting, Atlanta, GA. Aug 1-4.
35. Ndegwa, E.N. and V.L. van Santen. Specific immune responses associated with viral subpopulations selected in chickens after vaccination with Ark-type infectious bronchitis vaccines. American Association of Avian Pathologists Annual Meeting, Atlanta, GA, August 1-4, 2010.
36. Gallardo, R.A., V.L. van Santen, and H. Toro. Effects of CAV and/or IBDV on IBV Replication and Phenotypic Drift. American Association of Avian Pathologists Annual Meeting, Atlanta, GA, August 1-4, 2010.
37. Gallardo, R.A., V.L. van Santen, F.J. Hoerr, and H. Toro. Effects of Infectious Bronchitis Virus on Chicken Testicles. (Poster) American Association of Avian Pathologists Annual Meeting, Atlanta, GA, August 1-4, 2010.
38. van Santen, V.L. and E. N. Ndegwa. Highly Localized Infections with Ark-type IBV Vaccines. (Poster) American Association of Avian Pathologists Annual Meeting, Atlanta, GA, August 1-4, 2010.
39. Bartlett, S. and V. van Santen. Mass IBV serotype vaccine predominates in chickens simultaneously vaccinated with Mass and Ark serotype vaccines. (Poster) Annual Merial NIH National Veterinary Scholars Symposium, Athens, GA, August 5-8, 2010.
40. Ndegwa, E.N. and V.L. van Santen. Transmission of IBV Ark serotype type vaccine viral subpopulations to non-vaccinated contact birds. (Poster) Annual Southeastern Branch ASM Conference, Montgomery, AL, Nov. 5-6, 2010.
41. Toro, H. D. C. Tang, D. L. Suarez, F. W. van Ginkel. Avian Influenza Vaccination with Non-Replicating Adenovirus Vector: Assessment of Protection after either Mucosal Delivery or Decreasing Dose Applied by the In Ovo Route. American Association of Avian Pathologists Annual Meeting, Atlanta, GA, August 1-4, 2010.

42. Toro, H., Minc, K., C. Bowman, S. Gulley, D.C. Tang, J. Hathcock. Avian Influenza Vaccination with Non-Replicating Adenovirus Vector: Target Tissues in Chicken Embryo. (Poster) American Association of Avian Pathologists Annual Meeting, Atlanta, GA, August 1-4, 2010.
43. Breedlove, C., F. W. van Ginkel, D. C. Tang, and H. Toro. Combined In Ovo-Vaccination with Non-Replicating Adenovirus-Vectored Avian Influenza and Marek's Disease Vaccines. (Poster) American Association of Avian Pathologists Annual Meeting, Atlanta, GA, August 1-4, 2010.
44. Mesonero Alexander, De-chu C. Tang, and Haroldo Toro. In Ovo-Vaccination with Non-Replicating Adenovirus-Vectored Avian Influenza: Maternal Immunity and Effects on Vaccination. (Poster) American Association of Avian Pathologists Annual Meeting, Atlanta, GA, August 1-4, 2010.
45. Chandra YG, Lee JY, and Kong B-W. 2011. Characterization of sequence variation in the viral genomes of infectious larygotracheitis virus (ILTV) using next generation sequencing. International Poultry Science Forum (IPSF), Atlanta, GA. January 24-25.
46. Lee JY, and Kong B-W. 2010. The analysis of gene expression of infectious laryngotracheitis virus during lytic replication phase in cultured cells. 29th Annual meeting of American Society for Viology. Montana State University, Bozeman, Montana. July 17-21.
47. Tripathy, D.N. and Bahaa, A.F.A. 2010. Differentiation of Avianpox viruses by PCR amplification of specific genes. (Abstract) AAAP, AVMA Conference, Atlanta, GA.
48. Tripathy, D.N. 2010. Fowlpox Virus Immunity, Interest of using such virus as vector. Ceva Vector Vaccines Symposium, San Diego, California, pp. 47.
49. Hariastuti, N.I., Babapoor, S., Girshick, T., and Khan, M.I. In-vitro inactivation of avian influenza viruses using caprylic acid and its derivatives. Precede 14th International Congress on Infectious Diseases, Miami, Florida, March 9-12, 2010, CDROM.
50. Huang, Y., Khan, M.I., and Mandoiu, I.I. Development of real time RT-PCR assays for neuraminidase subtyping of avian influenza virus. Precede 6th International Symposium on bioinformatics research and applications. Storrs, Connecticut. May 23-26, 2010. P19.
51. Wu, C.C., Hsieh, M.K., and Lin, T.L. Protection of broiler chickens against infectious bursal disease by DNA vaccination in the face of maternally derived antibodies. The Proceedings of the 147th Annual Meeting of the American Veterinary Medical Association and the 53th Annual Meeting of the American Association of Avian Pathologists. Atlanta, Georgia, July-August, 2010.
52. Giambrone, J. J., S-C Ou, K. Macklin 2011. Infectious laryngotracheitis virus (ILTV) detection in drinking lines and effectiveness of sanitizers for inactivating the virus. 1st International Avian Respiratory Diseases Conference. May 15-18, 2011.
53. Giambrone, J. J., S-C Ou, K. Macklin 2011. Management procedures used to control ILT on commercial farms. American Association of Avian Pathologist Annual Meeting, St. Louis, MO. July 15-17.
54. Dormitorio, T.V., L. Donahue, J.J. Giambrone, 2011. Comparison of a rapid immunomigration based commercial kit and real time PCR for detection of avian influenza viruses in hunter-killed ducks. PSA Annual Meeting. St. Louis, MO. July 15-17.
55. Barns C, H. Wu, K. Gunn, N. Singh and J. J. Giambrone.2011. Expression of HA protein of Avian influenza virus in Arabidopsis thaliana. Annual biomedical research conference for minority students, Nov 9-12, Kansas, LA.
56. Toro, H. Evolutionary Mechanisms of Infectious Bronchitis Virus 1st International Meeting on Respiratory Diseases May 15-18, 2011 University of Georgia, Athens, GA

57. Toro Haroldo, Rodrigo Gallardo, Vicky van Santen, Frederic W. van Ginkel, Cassandra Breedlove, and Stephen Gulley Infectious Bronchitis Virus Selection in Vaccinated Chickens. 1st International Meeting on Respiratory Diseases May 15-18, 2011 University of Georgia, Athens, GA
58. Toro, H. Recombinant Adenovirus-Vectored Vaccine for Mass Immunization of Chickens Against Avian Influenza USDA AICAP meeting 30 Sept-01 Oct 2011 Buffalo, NY
59. Ginkel van, F.W., S.L. Gulley, A. Lammers, F.J. Hoerr, R. Gurjar, H. Toro. Conjunctiva-Associated Lymphoid Tissue in Avian Mucosal Immunity 1st International Meeting on Respiratory Diseases May 15-18, 2011 University of Georgia, Athens, GA
60. Toro, H. Recombinant Adenovirus-Vectored Vaccine for Mass Immunization of Chickens Against Avian Influenza 13th International Symposium of the Society of Chinese Bioscientists in America. July 25-29, 2011. Guangzhou, China.
61. Toro, H. Genetic diversity and selection regulates infectious bronchitis virus evolution Geflugelfachgesprach Herbst (German Annual Meeting of Poultry Veterinarians) 2011. Nov.3-4, 2011. Hannover, Germany.
62. van Santen, V.L., Bartlett, S., Ndegwa, E.N. Competition between Ark- and Mass-serotype infectious bronchitis virus vaccines. Presented at 1st International Avian Respiratory Disease Conference, Athens, GA, May 15-18, 2011.
63. Ndegwa, E.N., van Santen, V.L., Bartlett, S. Evaluation of possible interference between Arkansas and Massachusetts vaccine serotypes. Presented at American Association of Avian Pathologists annual meeting, St. Louis, MO, July 2011.
64. Gallardo, R.A., van Santen, V.L., Toro, H. Infectious Bronchitis Virus Variation in the Immunodeficient Host Presented at AFRI Project director¡¦s meeting, Arlington, VA April 19- 21, 2011.
65. van Santen, V.L., Ndegwa, E.N., Toro, H., Gallardo, R.A., Joiner, K.S., van Ginkel, F.W., Bartlett, S. How Virus Variation in Arkansas IBV Vaccines Affects Reactions and Immunity. Invited talk at US
66. Kong BW, Chandra YG, and Lee JY. 2011. Sequencing of Infectious Laryngotracheitis Virus (ILTV) Genomes using Illumina Platform. 30th Annual meeting of American Society for Viology. University of Minnesota, Minneapolis, MN. July 16-20.
67. Lee JY, Bottje WG, and Kong BW. 2011. Global expression of chicken genes responding to live attenuated infectious laryngotracheitis virus (ILTV) vaccine in chicken embryo lung cells. 30th Annual meeting of American Society for Viology. University of Minnesota, Minneapolis, MN. July 16-20.
68. Burkhard, Peter., David E. Lanar, Robert S. Hodges, Mazhar Khan. Self-Assembling Polypeptide Nanoparticle – A Potent Platform for Vaccine Design. Immunopotentiators in Modern Vaccines (IMV), TiaIara Park Hotel, Atlantico Hotel, Porto Portugal. April 6-8 2011.
69. Khan, Mazhar I., S. Babapoor, P. Burkhard, T. Girshick. Nanoparticle based vaccine representing specific genes peptides to protect avian influenza infection. 3rd Annual World Vaccine Congress, 241, March 24, 2011.
70. Ladman, B. S., G. V. Oldfield, C. R. Pope, L. A. Preskenis, S. K. Samal, and J. Gelb, Jr. Characterization of avian paramyxoviruses isolated from migratory waterfowl in chickens, turkeys and ducks. Proc. 148th American Veterinary Medical Assn./American Assn. Avian Pathologists Ann. Mtg. St. Louis, Missouri, July 16-19, 2011.
71. Ladman, B. S., J. Gelb, Jr., R. Slemons, C. R. Pope, & E. Spackman. Effects of Interspecies adaptation to different poultry on a wild bird origin H5N1 low path avian influenza viral genome.

Proc. 148th American Veterinary Medical Assn./American Assn. Avian Pathologists Ann. Mtg. St. Louis, Missouri, July 16-19, 2011.
72. Wu, C.C., Hsieh, M.K., and Lin, T.L. A prime-boost approach for DNA-mediated vaccination against infectious bursal disease in broiler chickens with maternal antibody. The proceedings of the 148st Annual Meeting of the American Veterinary Medical Association and the 54th Annual Meeting of the American Association of Avian Pathologists. St. Louis, Missouri, July, 2011.
73. Tripathy, D.N., Fadl-Alla, B and Robles, F. (2011). Genetic characterization of a vaccine strain of Fowlpox virus. Presented at the Poultry Science Association/American Association of Avian Pathologists, AVMA Convention, St. Louis, MO, July 16-19, 2011.
74. Ali A, Yassine HM, Saif YM, Lee CW. Differential susceptibility to turkeys to swine and human influenza A viruses. 62nd North Central Avian Disease Conference. March 14-15. 2011. St. Paul, Minnesota.
75. Lee CW, Ali A, Yassine HM, Saif YM. Replication of Swine-lineage Influenza Virus in Juvenile and Adult Turkey Hens. 148th AVMA Annual Convention. July 16–19, 2011. St. Louis, MO.
76. Yassine HM, Lee CW, Saif YM. Interspecies and intraspecies transmission of swine-lineage influenza viruses. 6th Annual AICAP Meeting - September 30th – October 1st, 2011. Buffalo, NY.
77. Ali A, Yassine HM, Saif YM, Lee CW. Experimental infection study of recent swine-lineage influenza viruses in Turkeys. 6th Annual AICAP Meeting - September 30th – October 1st, 2011. Buffalo, NY.
78. Lee CW, Cha W, Saif YM. Development and application of microsphere-based branched DNA assay. 6th Annual AICAP Meeting - September 30th – October 1st, 2011. Buffalo, NY.
79. Jackwood, D. J., and S. E. Sommer-Wagner. Molecular diversity in the hypervariable region of VP2 from infectious bursal disease viruses. Abstr. 480, 148th AVMA meet. 2011.
80. Abdul R, Khatri M, Murgia MV, Saif YM. Cytotoxic T cells responses in the spleen of Infectious bursal disease virus infected chickens. Conference for Research Workers in Animal Science. Chicago, IL. December 4 – 6, 2011.
81. Abdul R, M. Khatri, Maria V. Murgia and Y.M. Saif. Immunopathogenesis of Infectious bursal disease virus. 2011 AVMA convention held at St Louis, Missouri, July 16 July to July 19, 2011.
82. Abdul R, M. Khatri, Maria V. Murgia and Y.M. Saif. Persistence and Tissue Distribution of Infectious Bursal Disease Virus in SPF and Commercial Chickens: Experimental and Postharvest Studies. North central avian disease conference (62 Annual meeting, March 14 & 15, 2011), at St. Paul River center St. Paul Minnesota.
83. Abdul R, M. Khatri, Maria V. Murgia and Y.M. Saif. Expression of Toll-like Receptors and Perforin-Granzyme Pathway Genes in Infectious Bursal Disease Virus-Infected Chickens. North central avian disease conference, (62 Annual meeting March 14 & 15, 2011), at St. Paul River center St. Paul Minnesota.
84. Kapczynski, D.R., Liljebjelke, K.A., Kulkarni, G., Hunt, H.D., Jiang, H., Petkov, D. 2011. Cross reactive cellular immune responses in chickens previously exposed to low pathogenic avian influenza. Biomed Central (BMC) Proceedings. 5(Suppl 4):S13.
85. Lang, K., Danzeisen, J., Holtegaard, P., and Johnson, T. Genetic factors affecting the persistence and dissemination of blaCMY-2 positive IncA/C plasmids. Conference for Research Workers in Animal Diseases, Chicago, IL, December 2011.

86. Sandford, E., Orr, M., Li, X., Zhou, H., Johnson, T., Kariyawasam, S., Liu, P., Nolan, L., and Lamont, S. Insights from multi-tissue transcriptome analysis into the genomics of host resistance to avian pathogenic Escherichia coli. International Plant and Animal Genome Conference, San Diego, CA, January 2012.
87. Johnson, T.J. Transcriptional analysis of the worldwide emergent, multidrug resistance-encoding IncA/C plasmid. 71st Annual Meeting of the North Central Branch of the American Society for Microbiology, Des Moines, IA, October 2011.
88. Sandford, E., Orr, M., Zhou, H., Johnson, T.J., Kariyawasam, S., Liu, P., Nolan, L.K., and Lamont, S. Whole transcriptome response of peripheral blood leukocytes to avian pathogenic Escherichia coli infection in broiler chickens. 7th European Symposium on Poultry Genetics, Peebles Hydro, Scotland, October 2011.
89. Johnson, T.J., Bielak, E.M., Fortini, D., Danzeisen, J.L., Hansen, L., Norman, A., Hasman, H., and Carattoli, A. The IncX plasmid family: identification, typing and relevance in drug-resistant Enterobacteriaceae from animals. Symposium on Antimicrobial Resistance in Animals and the Environment, Tours, France, June 2011.
90. Sandford, E., Orr, M., Li, X., Zhou, H., Johnson, T., Kariyawasam, S., Liu, P., Nolan, L., and Lamont, S. Blood leukocyte transcriptomics of broiler chicks infected with avian pathogenic Escherichia coli. American Association for Avian Pathologists / Poultry Science Association, Saint Louis, MO, July 2011.
91. Johnson, T., Thorsness, J., Kim, H., and Isaacson, R. Analysis of changes in chicken gut microbial communities and metabolic potential in response to growth promoters. American Association for Avian Pathologists / Poultry Science Association, Saint Louis, MO, July 2011.
92. Wu, C.C., Hsieh, M.K., Feng, T.W., and Lin, T.L. Infectious bursal disease virus large segment gene in conjunction with chicken calreticulin gene in DNA vaccination against infectious bursal disease. The Proceedings of the 149th Annual Meeting of the American Veterinary Medical Association and the 55th Annual Meeting of the American Association of Avian Pathologists. San Diego, California, August, 2012 (Page 17).
93. Rabbani, M., K. Muhammad, A. A. Sheikh, A. Ahmad, M. Ahmad, R. K. Khalid, J. Muhammad, M. Asim and M. I. Khan. Isolation and identification of Mycoplasma gallisepticum from commercial poultry flocks in Pakistan.19th Congress of the International Organisation of Mycoplasmology IOM, Toulouse, France, July 15-20, 2012. Poster,68.
94. Khan, Mazhar I., S. Babapoor, P. Burkhard, T. Girshick. Nanoparticle based vaccine representing specific genes peptides to protect avian influenza infection. Guangxi Veterinary Research Institute, Nanning, Guangxi, China., March 14, 2012.
95. Khan, M.I., I. Mandoiu, R. O'Neil, C. Obergfell, H. Wang, A. Bligh, A. Zelikovsky2, B. Tork, and N. Mancuso.. Bioinformatics methods for reconstruction of Infectious Bronchitis Virus quasispecies from next generation sequencing data7th International Symposium on Avian Corona- and Metapneumoviruses and Complicating Pathogens Rauischholzhausen, Germany, 18-21 June 2012.
96. Khan, M. I., S. Babapoor, P. Burkhard, T. Girshick. Nanoparticle based vaccine representing specific genes peptides to protect avian influenza infection. Institute of Animal Husbandry and Veterinary Science, Beijing Municipal Academy of Agriculture, Beijing, China March 30, 2012.
97. Ali A, Ibrahim M, Eladl AH, Saif YM, Lee CW. Enhanced replication of mammalian influenza viruses in immune-compromised juvenile and layer turkeys. North Central Avian Disease Conference, 63rd annual meeting. St. Paul, Minnesota, March 12-13, 2012.

98. Rauf A, Khatri M, Murgia MV, Vlasova A, Saif YM. North Central Avian Disease Conference, 63rd annual meeting. St. Paul, Minnesota, March 12-13, 2012.
99. Stoute S, Jackwood DJ, Sommer-Wagner S, Crossley B, Woolcock P, Charlton B. Molecular and pathogenic investigation of reassortant very virulent infectious bursal disease virus in California, United States. 149th AVMA meeting, San Diego, CA. 2012.
100. Jackwood DJ. Production and use of a multivalent vaccine for infectious bursal disease using virus-like particles. 149th AVMA meeting, San Diego, CA. 2012.
101. Jackwood DJ. The molecular basis for pathogenicity and immunogenicity of IBDV: Link between molecular groups of field IBDV and their prevention. Proc. VII International Conference of Poultry Science, Sudak, Ukraine. September, 2012.
102. Mandoiu I., R. O'Neill, M. I. Khan, A. Zelikovsky, B. Tork*, N. Mancusoet al Bioinformatics methods for reconstruction of infectious bronchitis virus quasispecies from next generation sequencing data. 11th International Conference on Molecular Epidemiology and Evolutionary Genetics of Infectious Diseases, October 30 - November 2, 2012. New Orleans, USA. 59.3.
103. Ladman, B. S., L. A. Preskenis, M. Murphy, M. Ruano, B. F. Sample, D. A. Bautista and J. Gelb, Jr. Development and field evaluation of a multiplex real-time RT-PCR assay for detecting Arkansas infectious bronchitis virus. Proc. 149th American Veterinary Medical Assn./American Assn. Avian Pathologists Ann. Mtg. San Diego, California August 4-7, 2012.
104. Gelb, Jack, Jr., Brian Ladman, Conrad Pope, Miguel Ruano, Erin Brannick, and Daniel Bautista, Characterization of nephropathogenic infectious bronchitis virus from Delmarva broiler chickens-2011. Proc. 149th American Veterinary Medical Assn./American Assn. Avian Pathologists Ann. Mtg. San Diego, California, August 4-7, 2012.
105. Gelb, Jack, Jr., Brian Ladman, Conrad Pope, Miguel Ruano, Erin Brannick, Daniel Bautista, Marcy Troeber, and Lauren Preskenis. Nephrogenic bronchitis– Laboratory characterization. Proc. 46th National Mtg. on Poultry Health and Processing. Ocean City, Maryland. October 11-13, 2011.
106. Thachil, AJ. et al. Effects of immunosuppression on the development of cellulitis in turkeys. In: Proceedings of the 60th WPDC. p 30. 2011.15. Nagaraja, KV., et al. Dexamethasone model for cellulitis in turkeys. In: Proc. of AAAP. 2011.
107. Thachil AJ. et al. Effects of Coccidial Infection in the Development of Cellulitis in Turkeys. In: Proc. of AAAP. 2012.
108. Dormitorio, J. Giambrone J., and K. S. Macklin. Detection of infectious laryntrachitis virus from poultry house environments. PSA Annual Meeting, Athens, GA, July 9-12.2012.
109. Giambrone J.J., N, Sing, H. Wu and N.K. S. Gunn. Towards the development of transgenic edible plant vaccines against avian influenza virus in chickens. PSA, Annual Meeting, Athens, GA, July 9-12.2012.
110. Tripathy, D.N. and Fadl-Alla, B. (2012). Characterization of avianpox viruses from DNA isolated from formalin fixed tissue sections. Poster presentation (P410) –p 214. –"Host interaction", XIX International Poxvirus Asfarvirus and Iridovirus Conference, Salamanca, Spain, June 24-28, 2012.
111. Tripathy, D.N., Fadl-Alla, B and Kuklarni, A (2012). Molecular characterization of avianpox viruses using formalin fixed tissue sections. Presented at the American Association of Avian Pathologists, AVMA Convention, San Diego, August 4-8, 2012.
112. Lee, C.H., Lin, T.L., and Wu, C.C. Differentially expressed bursal transcriptome in chickens protected by DNA vaccine against infectious bursal disease. The Proceedings of the 56th Annual Meeting of the American Association of Avian Pathologists. Chicago, Illinois, July, 2013.

113. Tork, B., A. Zelikovsky, I. Mandoiu, E. Nenastyeva, A. Artyomenko, R. O'Neil, M. I. Khan and N. Mancuso. Reconstruction of infectious bronchitis virus quasispecies from NGS Data. Proc. 9th ionternational symposium on bioinformatics research and application. Charlotte, North Carolina, May 20-22, 2013. P20-23.
114. Ladman, B., J. Gelb, Jr., C. Pope, E. Brannick, E. Spackman, and R. Slemons. Evaluating the Genetic Diversity of a Wild Bird Origin H5N1 Low Path Avian Influenza Viral Genome After Adaptation to Different Poultry. Proc. 150th American Veterinary Medical Assn./American Assn. Avian Pathologists Ann. Mtg. Chicago, Illinois, July 21-23, 2013.
115. Ibrahim M, Eladl A, Sultan H, Arafa A, Rahman S, El-Azm K, Gaballah A, Saif YM, Lee CW. Antigenic analysis of different sublineages of avian influenza H5N1 viruses circulating in Egypt (2006-2012). 64th North Central Avian Disease Conference. March 11-12. 2013. St. Paul, Minnesota.
116. Ali A, Awe O, Shany SA, Tan M, Wang L, Xia M, Jiang X, and Lee CW. Immunogenicity and protective efficacy of the norovirus P particle-M2e chimeric influenza vaccine in chickens. 64th North Central Avian Disease Conference. March 11-12. 2013. St. Paul, Minnesota.
117. Lee CW, Ali A, Elaish M, Awe O, Xia M, Wang L, Tan M, Jiang X. Development of universal flu vaccine using M2e-P particle in chicken. 150th AVMA Annual Convention. July 20–23, 2013. St. Louis, Chicago.
118. Ibrahim M, Eladl A, Sultan H, Arafa A, Rahman S, El-Azm K, Gaballah A, Saif YM, Lee CW. Antigenic Analysis of Different Sublineages of Avian Influenza H5N1 Viruses Circulating in Egypt. 150th AVMA Annual Convention. July 20–23, 2013. St. Louis, Chicago.
119. Rauf A, Vlasova A, Murgia M, Jung K, and Saif YM. Transition from acute to persistent infection: antigen persistence and cytotoxic T cells response in infectious bursal disease virus infected SPF chickens. Journal of Immunology, 2013, 190, 173.18. The American Association of Immunologists Annual meeting Honolulu, Hawaii, May 3-7, 2013.
120. Rauf A, Murgia M, Rodriguez-Palacios A, Lee CW, Saif YM. Persistence and distribution of Infectious bursal disease virus antigen in chickens.). 64th North Central Avian Disease Conference. March 11-12. 2013. St. Paul, Minnesota.
121. Jackwood DJ and Stoute ST. The antigenic characteristics of very virulent infectious bursal disease viruses. Southern Conference on Avian Diseases. Abstr T90. 2013.

FUNDING

Grant supports.

1. Y.M Saif & C.W. Lee. USDA CSREES NRI Integrated Research (AI-CAP 20085520418863). 05/01/08 – 02/01/13. Molecular determinants of interspecies transmission of H3N2 triple reassortant influenza A viruses.
2. Jack Gelb, Jr. (Co-PI) with M. Khan (PI) and Peter Burkhard (Co-PI) University of Connecticut' Peptide nanoparticles a noval immunogens: Design and analysis of avian influenza vaccines. USDA-AFRI sub award to Delaware ($140,000) 12-1-11 to 11-30-14.
3. Jack Gelb, Jr. with Daral Jackwood (Ohio State University), Brian Ladman and Erin Brannick. "Studies on the efficacy of recombinant HVT-IBD vector vaccines". U.S. Poultry and Egg Assn. ($70,740) 8-1-11 to 7-31-13.

4. Mazhar Khan (CoPI) with Ion Mandiou (PI), Racheal ONeal (CoPI) University of Connecticut,: Alex (CoPI) Gerogia Tech. USDA- NIFA-Bioinformatic. ($425,000), 2010- 2012.
5. Joe Giambrone (PI) $20,000. Development of an edible transgenic plant vaccine against avian influenza virus. Alabama Agriculture Experiment Station Initiative grant

PATENTS

Golovan, S. P., Abrahamyan A., E. Nagy, Bedecarrats, G. Design of conservative and highly efficient anti-influenza short hairpin RNAs and microRNAs functional in avian and mammalian cells. Preliminary submission 2009. Patent application filed.

December 8, 2013 Meeting Minutes:

2013 ANNUAL NC1180, "CONTROL OF EMERGING AND RE-EMERGING POULTRY RESPIRATORY DISEASES IN THE UNITED STATES" MEETING MINUTES, DECEMBER 8, 2013
MEETING CALLED TO ORDER AT 8:00AM.

THE ANNUAL NC 1180 BUSINESS MEETING WAS HELD ON SUNDAY, DECEMBER 8, 2013 AT MARRIOT HOTEL, CHICAGO, IL. DR. LASZLO ZSAK, CHAIR OF NC 1180 OPENED THE MEETING AT 8:00 AM. HE WELCOMED THE STATION REPRESENTATIVES, PARTICIPATING SCIENTISTS. THE NAMES LISTED BELOW ARE THE STATION ATTENDEES.

STATE	STATION REPRESENTATIVES	PARTICIPATING SCIENTISTS
CONNECTICUT	MAZHAR KHAN	
DELAWARE		CALVIN KEELER, ERIN BRANNICK
INDIANA	TSANG LONG LIN	
ILLINOIS	ELIZABETH DRISKELL	
MINNESOTA	TIMOTHY JOHNSON	
OHIO	CHANG-WON LEE	MO SAIF
SEPRL-USDA	LASZLO ZSAK	DAVID SUAREZ
IOWA	DARRELL TRAMPEL	

DISCUSSION 1. MEETING LOCATIONS.
FUTURE LOCATIONS FOR THE NC-1180 MEETING WERE DISCUSSED. MAJOR CONCERNS PRESENTED WERE ACCOMMODATING FOR PARTICIPANTS IN THE SOUTHERN US AND THE GENERAL FORMAT OF THE MEETING. SEVERAL IDEAS FOR LOCATION WERE PROPOSED, AND NARROWED TO 1) HOLDING THE MEETING DURING THE USAHA CONFERENCE EACH YEAR, WHICH ALTERNATES LOCATIONS AND WILL BE HELD IN KANSAS CITY NEXT YEAR; 2) HOLDING THE MEETING

ANNUALLY IN ATHENS OR ATLANTA, GA; AND 3) ROTATING THE MEETING AMONG PARTICIPATING INSTITUTION SITES.

IT WAS MENTIONED THAT OPTION #3 MIGHT BE DIFFICULT BECAUSE OF THE REMOTE LOCATION OF MANY INSTITUTIONS AND DIFFICULTIES WITH TRAVEL. OPTIONS #1 AND #2 WERE BOTH CONSIDERED, AND THE CONSENSUS AT THE MEETING WAS THAT OPTION #1 WAS THE BEST CHOICE. IT WAS AGREED TO CONSULT WITH MEMBERS NOT PRESENT TO DETERMINE THE BEST FUTURE OPTIONS. HOLDING THE MEETING CONCURRENT TO ACVP WAS ALSO RETAINED AS A POSSIBLE OPTION. THE USAHA WAS STILL CONSIDERED DESIRABLE BECAUSE IT HAS A DEDICATED POULTRY SECTION IN THE MEETING ITSELF.

MEETING FORMAT WAS ALSO DISCUSSED. IT WAS AGREED THAT FUTURE MEETINGS SHOULD BE MORE INTERACTIVE IN NATURE AND INVOLVE BRIEF POWERPOINT PRESENTATIONS BY EACH PARTICIPATING GROUP INVOLVING RESEARCH DATA. THIS WILL FACILITATE BETTER INTERACTIVE DISCUSSION. ALSO, PROVIDING SKYPE OR TELECONFERENCE CAPABILITY FOR THOSE UNABLE TO ATTEND WAS PROPOSED.

DISCUSSION 2. NC-1180 RENEWAL.
THE RENEWAL WAS SUBMITTED BEFORE DEC. 1ST, IT IS CURRENTLY UNDER ADMINISTRATIVE REVIEW.

DISCUSSION 3. ANNUAL REPORT WITHIN 60 DAYS OF MEETING.
BECAUSE THIS IS OUR FINAL PROJECT YEAR, THE ANNUAL REPORT CAN BE COMBINED AS THE CUMULATIVE 5-YEAR REPORT. EACH PARTICIPANT IS REQUESTED TO SUBMIT 1-2 SENTENCE OUTCOMES AND 1-2 SENTENCE IMPACTS FOR THE 5 YEARS OF THE PROJECT. PEER-REVIEWED PAPERS SHOULD ALSO BE INCLUDED WITH NO SPACE LIMIT. WE WILL SEND AN EMAIL TO PARTICIPANTS REQUESTING THIS DOCUMENT. IT IS CRITICAL TO KNOW IMPACT, PUBLICATIONS, COLLABORATIVE WORK, AND FUNDING FOR THE GROUP.

DISCUSSION 4. STATION REPORTS.
THE ANNUAL PROGRESS REPORT FROM ALL STATIONS BEGAN IMMEDIATELY AFTER THE BUSINESS MEETING. THE MEMBERS WERE ACTIVELY ENGAGED IN THE DISCUSSIONS ON SURVEILLANCE, PATHOGENESIS, NEW DIAGNOSTICS TOOLS AND VACCINE/IMMUNOLOGY OF VARIOUS POULTRY RESPIRATORY AND IMMUNOSUPPRESSIVE DISEASES AND INFORMATION AND IDEAS WERE FREELY COMMUNICATED AND EXCHANGED.

THE ANNUAL PROGRESS MEETING ADJOURNED AT 4:00 PM, DECEMBER 8, 2013.

RESPECTFULLY SUBMITTED,

TIMOTHY JOHNSON, PHD
SECRETARY, NATIONAL COMMITTEE 1180

DECEMBER 8, 2013