

# Avian Diseases

Vol. 63, No. 1

March 2019

## Table of Contents

### Historical Article—

- Early Poultry Vaccine Company Development: the Era of Entrepreneurs. JOHN P. DONAHOE ..... 1

### Regular Articles—

- Characterization of *Escherichia coli* Isolated from Day-old Chicken Fluff in Taiwanese Hatcheries. SHENGNAN ZHAO, CHIA-LAN WANG, SHAO-KUANG CHANG, YI-LUN TSAI, AND CHUNG-HSI CHOU ..... 9
- Environmental Sampling for Influenza A Viruses in Turkey Barns. JEANNETTE MUÑOZ-AGUAYO, CRISTIAN FLORES-FIGUEROA, EVAN VANBEUSEKOM, BRIAN MCCOMB, BEN WILEMAN, JANET ANDERSON, DAVID A. HALVORSON, MICHELLE KROMM, DALE LAUER, ROSEMARY MARUSAK, JILL NEZWORSKI, SHAUNA VOSS, AND CAROL CARDONA ..... 17
- Pathogenicity and Full Genome Sequencing of the Avian Influenza H9N2 Moroccan Isolate 2016. ZINEB BOUMART, ZAHRA BAMOUH, MOHAMMED JAZOULI, BIANCA ZECCHIN, ALICE FUSARO, ANNALISA SALVIATO, ISABELLA MONNE, KHALID OMARI TADLAOUI, AND MEHDI EL HARRAK ..... 24
- Isolation and Characterization of Avian *Chlamydia psittaci* from Symptomatic Pet Birds in Southern Hunan, China. CHUAN WANG, LI LI, YAFENG XIE, YUAN TAN, YATING WEN, QIAN CHEN, JIAN YU, YING SONG, AND YIMOU WU .... 31
- Early Vaccination of Chickens Induces Suboptimal Immunity Against Infectious Bronchitis Virus. F. SAIADA, F. ELDEMERY, R. A. ZEGPI, S. L. GULLEY, A. MISHRA, V. L. VAN SANTEN, AND H. TORO ..... 38
- The Effect of the Wooden Breast Fibrotic Myopathy in Broilers on Fibrillar Collagen Organization and Decorin-Collagen Binding. JEFFREY R. TONNIGES, DANIEL L. CLARK, AND SANDRA G. VELLEMAN ..... 48
- Single Immunization with Newcastle Disease Virus-Vectored H7N9 Vaccine Confers a Complete Protection Against Challenge with Highly Pathogenic Avian Influenza H7N9 Virus. LEI SHI, ZENGLI HU, JIAO HU, DONG LIU, LIHONG HE, JIAO LIU, HAN GU, JUNJI GAN, XIAOQUAN WANG, AND XIUFAN LIU ..... 61
- Outbreaks of Duck Hepatitis A Virus in Egyptian Duckling Flocks. SHIMAA M. G. MANSOUR, FAKRY F. MOHAMED, REHAM M. ELBAKREY, AMAL A. M. EID, SUNIL K. MOR, AND SAGAR M. GOYAL ..... 68
- Evaluation of Protective Efficacy When Combining Turkey Herpesvirus-Vector Vaccines. JOHN R. DUNN, KIRIL M. DIMITROV, PATTI J. MILLER, MARICARMEN GARCIA, KELLY TURNER-ALSTON, AMY BROWN, AND ANGELA HARTMAN ... 75
- Turkey Hemorrhagic Enteritis Virus Can Be Titrated but Not Propagated in Chicken Embryos. MOHAMMAD F. HOSSAIN, MARY MCMILLAN, MARGARET E. KATZ, STEPHEN W. WALKDEN-BROWN, AND PRISCILLA F. GERBER ..... 84
- Efficacy of Two Licensed Avian Influenza H5 Vaccines Against Challenge with a 2015 U.S. H5N2 clade 2.3.4.4 Highly Pathogenic Avian Influenza Virus in Domestic Ducks. MARY J. PANTIN-JACKWOOD, ERIC DEJESUS, MAR COSTA-HURTADO, DIANE SMITH, KLAUDIA CHRZASTEK, DARRELL R. KAPCZYNSKI, AND DAVID L. SUAREZ ..... 90

### Research Note—

- Effect of a Drinking Water Conditioner on Stability and Efficacy of Fluralaner in Laying Hens Infested with Poultry Red Mites. PETER DE HERDT, ANTHONY BOUTREUX, KRISTOF VAN HOYE, RIK KOOPMAN, STEFAAN VAN GORP, AND JOHAN VAN ERUM ..... 97

*Case Reports—*

Wooden Breast Syndrome in Gastrocnemius Muscle of Roaster Chickens Leading to Muscle-Tendon Rupture and Leg Condemnation. MARIE K. SEVERYN, ERIN M. BRANNICK, DANIEL A. BAUTISTA, AND MARK A. DEKICH .....	102
Emaciation and Sporadic Mortality in Older Laying Hens Caused by Intussusception of the Proventriculus. NANCY REIMERS, DONNA CARVER, AND H. JOHN BARNES .....	107
GUIDELINES FOR AUTHORS .....	111
LIST OF REVIEWERS FOR 2018 .....	115
<i>Avian Pathology</i> Volume 48 Number 2 April 2019 Table of Contents .....	116

# Avian Diseases

Vol. 63, No. 1

March 2019

## Table of Contents

### Introduction—

- Tenth International Symposium on Avian Influenza Introduction. DAVID L. SUAREZ AND MARY PANTIN-JACKWOOD .... 117  
Dedication of the Tenth International Symposium on Avian Influenza: David E. Swayne ..... 118

### Regular Articles—

- Avian Influenza Prevalence and Viral Shedding Routes in Minnesota Ring-Billed Gulls (*Larus delawarensis*). TODD FROBERG, FRANCESCA CUTHBERT, CHRISTOPHER S. JENNELLE, CAROL CARDONA, AND MARIE CULHANE ..... 120  
Prevalence of Influenza A Viruses in Ducks Sampled in Northwestern Minnesota and Evidence for Predominance of H3N8 and H4N6 Subtypes in Mallards, 2007–2016. LAURA P. HOLLANDER, ALINDE FOJTIK, CLARA KIENZLE-DEAN, NICK DAVIS-FIELDS, REBECCA L. POULSON, BRUCE DAVIS, CRAIG MOWRY, AND DAVID E. STALLKNECHT ..... 126  
Naturally Avian Influenza Virus-Infected Wild Birds Are More Likely to Test Positive for *Mycobacterium* spp. and *Salmonella* spp. OLALLA TORRONTEGI, VEGA ALVAREZ, ANA HURTADO, IKER A. SEVILLA, URSULA HÖFLE, AND MARTA BARRAL ..... 131  
Are Microneutralization and Hemagglutination Inhibition Assays Comparable? Serological Results from Influenza Experimentally Infected Mallard Ducks. KAREN M. SEGOVIA, MONIQUE S. FRANÇA, CHARLIE S. BAHNSON, NEUS LATORRE-MARGALEF, DAVID E. STALLKNECHT ..... 138  
Identifying Gaps in Wild Waterfowl Influenza A Surveillance in Ohio, United States. JACQUELINE M. NOLTING, SARAH E. LAUTERBACH, RICHARD D. SLEMONS, AND ANDREW S. BOWMAN ..... 145  
The Incursion and Spread of Highly Pathogenic Avian Influenza H5N8 Clade 2.3.4.4 Within South Africa. C. ABOLNIK, R. PIETERSE, B. M. PEYROT, P. CHOMA, T. P. PHIRI, K. EBERSOHN, C. J. VAN HEERDEN, A. A. VORSTER, G. VAN DER ZEL, P. J. GEERTSMA, A. T. LALEYE, K. GOVINDASAMY, AND D. L. RAUFF ..... 149  
Mortality-Based Triggers and Premovement Testing Protocols for Detection of Highly Pathogenic Avian Influenza Virus Infection in Commercial Upland Game Birds. AMOS SSEMATIMBA, PETER J. BONNEY, SASIDHAR MALLADI, KAITLYN M. ST. CHARLES, MARIE CULHANE, TIMOTHY J. GOLDSMITH, DAVID A. HALVORSON, AND CAROL J. CARDONA ..... 157  
Influenza A Prevalence and Subtype Diversity in Migrating Teal Sampled Along the United States Gulf Coast. DEBORAH CARTER, PAUL LINK, PATRICK WALTHER, ANDREW RAMEY, DAVID STALLKNECHT, AND REBECCA POULSON ..... 165  
Ducks Are Susceptible to Infection with a Range of Doses of H5N8 Highly Pathogenic Avian Influenza Virus (2016, Clade 2.3.4.4b) and Are Largely Resistant to Virus-Specific Mortality, but Efficiently Transmit Infection to Contact Turkeys. MAREK J. SLOMKA, ANITA PURANIK, SAHAR MAHMOOD, SAUMYA S. THOMAS, AMANDA H. SEEKINGS, ALEXANDER M. P. BYRNE, ALEJANDRO NÚÑEZ, CARLO BIANCO, BENJAMIN C. MOLLETT, SAMANTHA WATSON, IAN H. BROWN, AND SHARON M. BROOKES ..... 172  
Two Single Incursions of H7N7 and H5N1 Low Pathogenicity Avian Influenza in U.K. Broiler Breeders During 2015 and 2016. SCOTT M. REID, ALEJANDRO NÚÑEZ, AMANDA H. SEEKINGS, SAUMYA S. THOMAS, MAREK J. SLOMKA, SAHAR MAHMOOD, JANE R. CLARK, JILL BANKS, SHARON M. BROOKES, AND IAN H. BROWN ..... 181  
Virus-Like Particle Based Vaccine Provides High Level of Protection Against Homologous H5N8 HPAIV Challenge in Mule and Pekin Duck, Including Prevention of Transmission. TÍMEA TATÁR-KIS, ÁDÁM DÁN, BALÁZS FELPÖLDI, ÁDÁM BÁLINT, ZSUZSANNA RÓNAI, GWENAELE DAUPHIN, ZOLTÁN PÉNZES, JOHN EL-ATTRACHE, YANNICK GARDIN, AND VILMOS PALYA ..... 193

Rapid Construction and Immunogenicity Testing of a Novel H5 Virus-Like Particle Prototype Vaccine Against Clade 2.3.4.4 H5N8 Highly Pathogenic Avian Influenza Virus. ZOLTÁN PÉNZES, ALÍZ CZEGLÉDI, ZOLTÁN NAGY, ANNA KOLLÁR, ÁDÁM TÓTH, FERENC MISÁK, KATALIN RENDES, MARIANNA IVÓK, RÉKA GYIMESI, GEORGE LOVRE CZ, IRINA TRET YAKOVA, JOHN EL-ATTRACHE, VILMOS PALYA, AND PETER PUSHKO .....	203
Development and Application of Real-Time PCR Assays for Specific Detection of Contemporary Avian Influenza Virus Subtypes N5, N6, N7, N8, and N9. JOE JAMES, MAREK J. SŁOMKA, SCOTT M. REID, SAUMYA S. THOMAS, SAHAR MAHMOOD, ALEXANDER M. P. BYRNE, JAYNE COOPER, CHRISTINE RUSSELL, BENJAMIN C. MOLLETT, ÉRIC AGYEMAN-DUA, STEVE ESSEN, IAN H. BROWN, AND SHARON M. BROOKES .....	209
Efficacy of Clade 2.3.2 H5-Recombinant Baculovirus Vaccine in Protecting Muscovy and Pekin Ducks from Clade 2.3.4.4 H5N8 Highly Pathogenic Avian Influenza Infection. HESHAM A. SULTAN, ABD-ELSATAR ARAFA, SHAIMAA TALAAT, ALAA A. GABALIA, WALID H. KILANY, WAEL K. ELFEIL, AWAD A. SHEHATA, AND N. AMARIN .....	219
<i>Research Note—</i>	
The Pathogenesis of H7 Highly Pathogenic Avian Influenza Viruses in Lesser Scaup ( <i>Aythya affinis</i> ). CHRISTOPHER B. STEPHENS, DIANN J. PROSSER, MARY J. PANTIN-JACKWOOD, ALICIA M. BERLIN, AND ERICA SPACKMAN .....	230
Highly Pathogenic and Low Pathogenic Avian Influenza H5 Subtype Viruses in Wild Birds in Ukraine. DENYS MUZYKA, OLEKSANDR RULA, SEMEN TKACHENKO, NATALIA MUZYKA, SUSANNE KÖTHE, OLEKSANDR PISHCHANSKYI, BORYS STEGNIY, MARY PANTIN-JACKWOOD, AND MARTIN BEER .....	235
Exploring the Wind-Borne Spread of Highly Pathogenic Avian Influenza H5N8 During the 2016–2017 Epizootic in France. C. GUINAT, N. ROUCHY, F. CAMY, J. L. GUÉRIN, AND M. C. PAUL .....	246
Evaluating the Effect of the Within-Flock Disease Transmission Rate on Premovement Active Surveillance in Low Pathogenicity Avian Influenza-Infected Flocks. PETER J. BONNEY, SASIDHAR MALLADI, AMOS SSEMATIMBA, J. TODD WEAVER, MARIE R. CULHANE, TIMOTHY J. GOLDSMITH, DAVID A. HALVORSON, AND CAROL J. CARDONA .....	249
Identification of Areas at Increased Risk of Highly Pathogenic Avian Influenza Occurrence in Commercial Poultry in Poland. ANNA GIERAK, ŁUKASZ BOCIAN, AND KRZYSZTOF ŚMIETANKA .....	257
Mortality and Egg Production Patterns in the United States Prior to HP/LPAI H7N9 Detection. LINDSEY GARBER, SASIDHAR MALLADI, LORI GUSTAFSON, REBECCA JONES, KIMBERLY TSAO, AND MELISSA SCHOENBAUM .....	263
<i>Case Report—</i>	
Meeting Report: Global Alliance for Research on Avian Diseases 2018, International Conference, January 17 to 19, 2018, Hanoi, Vietnam. MUNIR IQBAL, DEIMANTE LUKOSAITYTE, MUHAMMAD MUNIR, AND VENUGOPAL NAIR .....	268