

# The Poultry Informed Professional®



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## Recent Isolation and Characterization of Nephrotropic and Variant Infectious bronchitis Virus Isolates from Georgia

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Infectious bronchitis (IB) continues to cause disease in many parts of the world, including the United States. IB is typically thought of as a highly contagious disease of chickens that usually results in a mild self-limiting infection of the upper respiratory tract. Clinical signs include conjunctivitis, a mild to moderate snick, tracheal rales, nasal discharge, mild sinusitis, and mild airsacculitis. IBV often spreads rapidly through a flock due to the relatively short incubation period (48-72 hours). In the United States, field isolates of IBV typically have an upper respiratory tract tropism, but nephropathogenic strains of IBV (NIBV) occasionally appear and cause renal disease in commercial poultry. In the field, the clinical signs include flushing (uremia) and mortality ranging

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Broiler Live Production Cost	Average Company
Feed Cost/ton w/o color (\$)	269.79
Feed cost /lb meat (c)	24.95
Days to 4.6 lbs	42
Chick cost / lb (c)	4.73
Vac-Med cost/lb (c)	0.08
WB & ½ parts condemn. Cost/lb	0.30
% mortality	5.66
Sq.Ft. @ placement	0.82
Lbs/sq. ft.	7.13
Downtime (days)	14

Data for week ending 15 March, 2008

from 5-90%. Histologic lesions observed in the kidneys include tubular epithelial degeneration, necrosis and sloughing, along with a lymphocytic to lymphoplasmacytic interstitial nephritis.

Between May and August of 2007, severe flushing in 25-35 day-old broilers was reported on several farms in Northeast Georgia. Kidneys were submitted to PDRC for histopathology and virus isolation. Histologic evaluation of the kidneys from affected flocks revealed lesions suggestive of nephropathogenic IBV (Figure 1). In addition, IBV was isolated from the kidneys. As with all clinical IBV isolations, molecular characterization was performed using PCR to amplify a region within the S1 subunit of the spike glycoprotein. It has been well documented that the sequence of the hypervariable region of the IBV S1 gene correlates well with virus neutralization tests and can be reliably used to type IBV isolates (8). The amino acid sequences of the field isolates from these flocks were 85% similar to NIBV isolates from Australia, specifically the N1-62 strain. The closest match to any U.S. commercial vaccine, was to MASS (80% similar). Cross neutralization studies in SPF embryos using several of these recent isolates in combination with the US vaccine strains (MASS, Conn, DE072 and ARK) showed little to no neutralization, suggesting these viruses are antigenically unrelated. Based on this information we concluded that the isolates were likely a new serotype of IBV. In November of 2007, a similar case was submitted to the lab from 33 week old broiler breeder hens. IBV was isolated from the kidneys and characterization of the virus revealed its high degree of similarity (98%) to the isolates from the summer (GA 07 viruses). No additional reports of severe flushing or variant IBV isolations were made for several months.

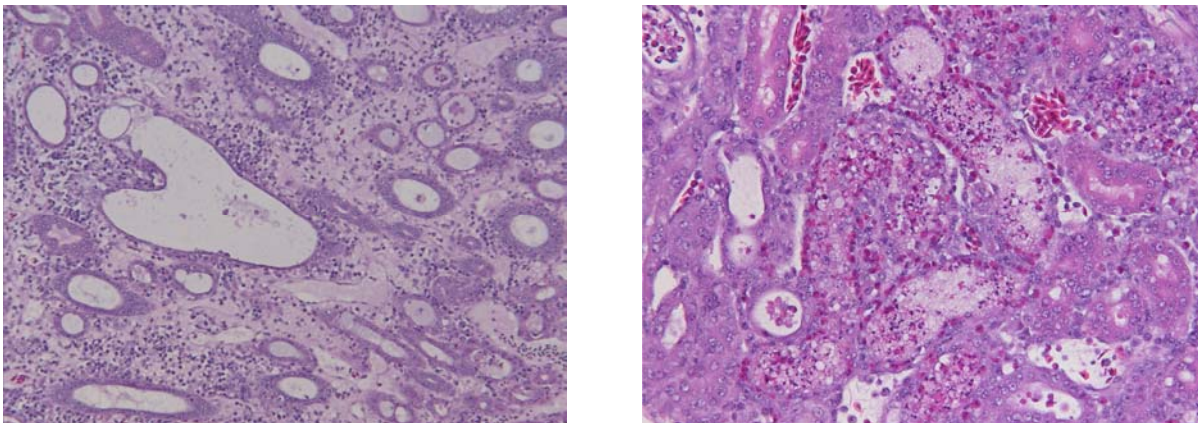
In January 2008, additional clinical cases were submitted to the diagnostic lab from approximately 35 day old broiler flocks. Clinical signs ranging from excessive flushing, to respiratory disease, to a combination of the two have been reported in these flocks. In many of the affected flocks, excessive mortality often accompanies the clinical signs. Most of the mortality appears to be from secondary issues, such as *E. coli* infections, following the original viral infection. Oftentimes elevated mortality is accompanied by high condemnations at the processing plant due to airsacculitis. The airsacculitis ranges from a mild "sudsy" airsacculitis to a more chronic appearing caseous airsacculitis. In two cases submitted with a primary complaint of severe flushing, IBVs were isolated from the kidneys. In addition to histologic lesions suggestive of NIBV, molecular characterization of the viruses resulted in 98% similarity with IBV isolates from the summer of 2007. In addition, a second distinct group of IBVs has been isolated from either the tracheas or kidneys or both on farms with respiratory disease and high condemnations. Molecular characterization of this group of viruses reveals an 83% amino acid similarity to the GA07 IBVs, 80% similarity to MASS and 87% similarity to NIBV N1-62. This group of viruses is now referred to as GA08.

While serological evaluation of GA08 flocks using IBV ELISA detected positive geometric mean titers (GMT), the serotype specific hemagglutination inhibition (HI) results were inconclusive. Attempts to produce HI antigen to the new serotypes of IBV were not successful as these isolates do not hemagglutinate chicken red blood cells following treatment with neuraminidase. These viruses replicate in primary chicken embryo kidney cells causing characteristic IBV cytopathic effect and thus it may be possible to perform virus neutralization characterization.

Throughout the world there have been a number of reported NIBV field isolates. A few of the more recent outbreaks have been reported from Australia, China, India, Europe, and the United States (1-6). Several of these isolates resulted in both respiratory and renal clinical signs in infected birds. A recent IBV isolate in Egypt caused moderate to severe respiratory and renal signs with up to 20% mortality in broilers (7). Among 25 strains of IBV isolated within Australia from 1961 to 1994, twelve strains were nephropathogenic with mortality ranging from 5-90%, ten resulted only in respiratory disease with no mortality, and three exhibited microscopic lesions in both the respiratory and renal systems with no mortality(4).

Control of IBV relies primarily on the use of mass applied modified live vaccines. Poultry producers face several challenges when trying to control IBV infections in the field. First, very little to no cross-protection is afforded between serotypes of IBV. Therefore, successful vaccination programs must include the serotypes of the prevailing IBV field challenge. Second, IBVs are prone to genetic variation through several distinct genetic mechanisms that may or may not give rise to a new serotype. A few changes in the sequence of the spike glycoprotein can result in a new serotype. It has been documented that as little as a 5% difference in the S1 sequence of IBV can result in a loss of cross-protection between otherwise similar isolates (10). In the case of NIBV, several outbreaks have occurred worldwide in vaccinated flocks (1, 2, 6). Report of protection against NIBV resulted when the birds were primed with live respiratory strains of IBV and then vaccinated with an autogenous inactivated version of the NIBV challenge virus (11). Cook et al., were successful in protecting birds from renal damage using live-attenuated 4/91 vaccine alone (variant strain IBV vaccine, Intervet International) or in combination with Ma5 vaccine (Massachusetts serotype vaccine), but not with Ma5 vaccine alone (12).

At this time, two genetically distinct groups of IBVs have been isolated from vaccinated broilers experiencing renal and respiratory disease. The isolates are not similar to endemic IBVs in the U.S. based on sequence analysis of the hypervariable region of S1. While the most similar match is to known nephropathogenic IBVs, the similarity for these is still less than what would be considered the same serotype. Currently, cross protection studies with commercial vaccine combinations are in progress to determine the degree of any protection which may be provided. In addition, determination of how wide spread the disease is in the field is underway. There is a possibility that these viruses will disappear as others before them have with the change of season. However, there is no guarantee and so the process of attenuating a representative from each serotype is underway in the event that it will be needed for commercial vaccine production.



**Figure 1.** Representative kidneys from GA07 flocks, stained with hematoxylin and eosin. **A** Edema and lymphocytic infiltration around medullary cones (100X). **B** Evidence of tubular necrosis, heterophilic infiltrates and accumulation of inflammatory cells within the tubules (200X).

#### References:

1. Bayry, J., M. S. Goudar, P. K. Nighot, S. G. Kshirsagar, B. S. Ladman, J. Gelb, Jr., G. R. Ghalsasi, and G. N. Kolte Emergence of a nephropathogenic avian infectious bronchitis virus with a novel genotype in India. *J Clin Microbiol* 43:916-918. 2005.

2. Ziegler, A. F., B. S. Ladman, P. A. Dunn, A. Schneider, S. Davison, P. G. Miller, H. Lu, D. Weinstock, M. Salem, R. J. Eckroade, and J. Gelb, Jr. Nephropathogenic infectious bronchitis in Pennsylvania chickens 1997-2000. *Avian Dis* 46:847-858. 2002.
3. Bing, G. X., X. Liu, J. Pu, Q. F. Liu, Q. M. Wu, and J. H. Liu Different genotypes of nephropathogenic infectious bronchitis viruses co-circulating in chicken population in China. *Virus Genes* 35:333-337. 2007.
4. Ignjatovic, J., D. F. Ashton, R. Reece, P. Scott, and P. Hooper Pathogenicity of Australian strains of avian infectious bronchitis virus. *J Comp Pathol* 126:115-123. 2002.
5. Meulemans, G., M. C. Carlier, M. Gonze, P. Petit, and M. Vandebroek Incidence, characterisation and prophylaxis of nephropathogenic avian infectious bronchitis viruses. *Vet Rec* 120:205-206. 1987.
6. Liu, S., and X. Kong A new genotype of nephropathogenic infectious bronchitis virus circulating in vaccinated and non-vaccinated flocks in China. *Avian Pathol* 33:321-327. 2004.
7. Abdel-Moneim, A. S., M. F. El-Kady, B. S. Ladman, and J. Gelb, Jr. S1 gene sequence analysis of a nephropathogenic strain of avian infectious bronchitis virus in Egypt. *Virol J* 3:78. 2006.
8. Lee, C. W., D. A. Hilt, and M. W. Jackwood Typing of field isolates of infectious bronchitis virus based on the sequence of the hypervariable region in the S1 gene. *J Vet Diagn Invest* 15:344-348. 2003.
9. Ladman, B. S., A. B. Loupos, and J. Gelb, Jr. Infectious bronchitis virus S1 gene sequence comparison is a better predictor of challenge of immunity in chickens than serotyping by virus neutralization. *Avian Pathol* 35:127-133. 2006.
10. Cavanagh, D. Severe acute respiratory syndrome vaccine development: experiences of vaccination against avian infectious bronchitis coronavirus. *Avian Pathol* 32:567-582. 2003.
11. Ladman, B. S., C. R. Pope, A. F. Ziegler, T. Swieczkowski, C. J. Callahan, S. Davison, and J. Gelb, Jr. Protection of chickens after live and inactivated virus vaccination against challenge with nephropathogenic infectious bronchitis virus PA/Wolgemuth/98. *Avian Dis* 46:938-944. 2002.
12. Cook, J. K. A., J. Chesher, W. Baxendale, N. Greenwood, M. B. Huggins & S. J. Orbell Protection of chickens against renal damage caused by nephropathogenic infectious bronchitis virus. *Avian Pathology* 30:423-426. 2001.

Presented at the Western Poultry Disease Conference/ANECA, April 9-12, 2008, Puerto Vallarta, Mexico.

**Excerpts from the latest USDA National Agricultural Statistics Service (NASS) “Broiler Hatchery,” “Chicken and Eggs” and “Turkey Hatchery” Report and Economic Research Service (ERS) “Livestock, Dairy and Poultry Situation Outlook”**

**Chickens and Eggs**

Released March 24, 2008, by NASS, Agricultural Statistics Board, USDA

**February Egg Production Up 3 Percent**

U.S. egg production totaled 7.13 billion during February 2008, up 3 percent from last year. Production included 6.05 billion table eggs, and 1.07 billion hatching eggs, of which 1.01 billion were broiler-type and 64 million were egg-type. The total number of layers during February 2008 averaged 343 million, down 2 percent from last year. February egg production per 100 layers was 2,075 eggs, up 4 percent from February 2007. All layers in the U.S. on March 1, 2008 totaled 343 million, down 2 percent from last year. The 343 million layers consisted of 282 million layers producing table or market type eggs, 57.6 million layers producing broiler-type hatching eggs, and 2.84 million layers producing egg-type hatching eggs. Rate of lay per day on March 1, 2008, averaged 72.3 eggs per 100 layers, up 1 percent from March 1, 2007.

**Egg-Type Chicks Hatched Up 2 Percent**

Egg-type chicks hatched during February 2008 totaled 37.5 million, up 2 percent from February 2007. Eggs in incubators totaled 36.5 million on March 1, 2008, down 5 percent from a year ago. Domestic placements of egg-type pullet chicks for future hatchery supply flocks by leading breeders totaled 280 thousand during February 2008, up 69 percent from February 2007.

**Broiler-Type Chicks Hatched Up 7 Percent**

Broiler-type chicks hatched during February 2008 totaled 777 million, up 7 percent from February 2007. Eggs in incubators totaled 679 million on March 1, 2008, up 2 percent from a year earlier. Leading breeders placed 7.43 million broiler-type pullet chicks for future domestic hatchery supply flocks during February 2008, up 5 percent from February 2007.

**Turkey Hatchery**

Released March 14, 2008, NASS, Agricultural Statistics Board, USDA

**Turkey Eggs in Incubators on March 1 Up 2 Percent from Last Year**

Turkey eggs in incubators on March 1, 2008, in the United States totaled 31.9 million, up 2 percent from March 1, 2007. Eggs in incubators were up 1 percent

from the February 1, 2008 total of 31.5 million eggs. Regional changes from the previous year were: East North Central down 7 percent, West North Central unchanged, North and South Atlantic up 7 percent, and South Central and West up 8 percent. .

**Poults Hatched During February Up 4 Percent from Last Year**

Turkey poults hatched during February 2008, in the United States totaled 25.8 million, up 4 percent from February 2007. Poults hatched were down 5 percent from the January 2008 total of 27.0 million poults. Regional changes from the previous year were: East North Central up 2 percent, West North Central up 4 percent, North and South Atlantic up 12 percent, and South Central and West down 10 percent.

**Net Poults Placed During February Up 3 Percent from Last Year**

The 25.0 million net poults placed during February 2008 in the United States were up 3 percent from the number placed during the same month a year earlier. Net placements were down 4 percent from the January 2008 total of 26.1 million

**Broiler Hatchery**

Released April 2, 2008, by NASS, Agricultural Statistics Board, USDA.

**Broiler-Type Eggs Set In 19 Selected States Down Slightly**

The 25.0 million net poults placed during February 2008 in the United States were up 3 percent from the number placed during the same month a year earlier. Net placements were down 4 percent from the January 2008 total of 26.1 million .

**Broiler Chicks Placed Up 3 Percent**

The 25.0 million net poults placed during February 2008 in the United States were up 3 percent from the number placed during the same month a year earlier. Net placements were down 4 percent from the January 2008 total of 26.1 million .

## Current Month Charts

Broiler Performance Data Live Production Cost	Region					Average Company
	SW	Midwest	Southeast	Mid-	S-Central	
Feed Cost/ton w/o color (\$)	270.9	247.28	267.72	265.41	264.85	266.50
Feed cost /lb meat (c)	24.81	22.56	24.57	25.51	24.95	24.65
Days to 4.6 lbs	42	41	42	41	41	42
Chick cost / lb (c)	4.61	4.68	4.90	4.07	4.43	4.69
Vac-Med cost/lb (c)	0.07	0.04	0.08	0.09	0.04	0.08
WB & ½ parts condemn. Cost/lb	0.23	0.28	0.34	0.30	0.24	0.29
% mortality	5.74	5.53	5.48	5.51	5.45	5.54
Sq.Ft. @ placement	0.78	0.79	0.81	0.89	0.82	0.82
Lbs/sq. ft.	7.20	7.01	6.98	7.53	7.57	7.13
Downtime (days)	14	13	15	17	13	14

Broiler Whole Bird Condemnation	Region					Average Company
	SW	Midwest	Southeast	Mid-Atlantic	S-Central	
% Septox	0.156	0.321	0.183	0.199	0.127	0.198
% Airsac	0.047	0.108	0.385	0.163	0.98	0.164
% I.P.	0.011	0.036	0.009	0.077	0.37	0.032
% Leukosis	0.000	0.001	0.001	0.002	0.001	0.001
% Bruises	0.011	0.002	0.007	0.003	0.003	0.005
% Other	0.010	0.009	0.011	0.009	0.011	0.011
% Total	0.234	0.476	0.595	0.453	0.276	0.410
% ½ parts condemns	0.352	0.335	0.297	0.392	0.393	0.368

Data for week ending 07 March, 2008

## Previous Month Charts

Broiler Performance Data Live Production Cost	Region					Average Company
	SW	Midwest	Southeast	Mid-Atlantic	S-Central	
Feed Cost/ton w/o color (\$)	255.33	233.01	254.97	252.22	248.41	251.87
Feed cost /lb meat (c)	23.48	21.13	23.4	24.15	23.23	23.28
Days to 4.6 lbs	43	42	41	41	41	42
Chick cost / lb (c)	4.66	4.55	4.86	4.10	4.36	4.66
Vac-Med cost/lb (c)	0.07	0.04	0.07	0.08	0.04	0.08
WB & ½ parts condemn. Cost/lb	0.22	0.29	0.26	0.29	0.26	0.27
% mortality	5.85	5.30	5.05	5.42	4.83	5.35
Sq.Ft. @ placement	0.77	0.79	0.81	0.89	0.81	0.81
Lbs/sq. ft.	7.16	7.06	6.98	7.38	7.49	7.08
Downtime (days)	14	13	17	17	14	15

Broiler Whole Bird	Region					Average Company
	SW	Midwest	Southeast	Mid-Atlantic	S-Central	
% Septox	0.179	0.309	0.230	0.214	0.154	0.216
% Airsac	0.045	0.123	0.175	0.147	0.086	0.130
% I.P.	0.011	0.026	0.008	0.094	0.096	0.046
% Leukosis	0.001	0.001	0.001	0.002	0.001	0.001
% Bruises	0.010	0.002	0.007	0.004	0.006	0.006
% Other	0.009	0.003	0.012	0.009	0.012	0.009
% Total	0.254	0.463	0.433	0.047	0.354	0.407
% ½ parts condemns	0.352	0.388	0.271	0.407	0.395	0.367

Data for week ending 09 February 2008

# Meetings, Seminars and Conventions

**2008**  
**April**

**April 1-3: National Institute for Animal Agriculture Meeting**, Indianapolis Indiana. The theme is *Animal Care and Wellbeing: Facts not Fiction*. A schedule of events for NIAA's annual meeting and the 2008 ID•INFO Workshop, meeting registration, list of NIAA committees and hotel information are available at the NIAA website: [www.animalagriculture.org](http://www.animalagriculture.org). Students are also welcome to call NIAA at (270) 782-9798

**April 9-12: 57th Western Poultry Disease Conference**, 2008 in conjunction with the XXXIII Convención Anual ANECA at the Sheraton Baganvillas Resort, Puerto Vallarta, Jalisco, Mexico. Information can be found at [Western Poultry Disease Conference](#).

**April 14-17 AICAP/CEIRS Joint Meeting** at Memphis, TN, hosted by Dr. Robert Webster at St Jude Children's Research Hospital. Program on Prevention and Control of Avian Influenza in the US (AICAP) supported by the CSREES-USDA will have a joint meeting with the recently established 6 Centers of Excellence on Influenza Research and Surveillance (CEIRS) supported by the NIAID-NIH. April 14th will be dedicated to the AICAP and April 15-17, to CEIRS. For further details contact Michelle Wilson, AICAP Program, Dept. of Veterinary Medicine, University of Maryland, 8075 Greenmead Drive, College Park, MD 20742. Phone: 301-314-6833 (or 7345); Fax: 301-314-6855; e-mail: [aicap@umd.edu](mailto:aicap@umd.edu) or connect [www.aicap.umd.edu](http://www.aicap.umd.edu)

**April 15-18: Expoviga**, Barcelona, Spain. Contact: [www.expoviga.com](http://www.expoviga.com) or [expoviga@firabca.es](mailto:expoviga@firabca.es)

**2008**  
**May**

**May 27- 28: Ontario Association of Poultry Practitioners (OAPP) Technical Symposium**. Holiday Inn, Scottsdale Drive, Guelph, Ontario. Day 1 - antimicrobial use, development of antimicrobial resistance and alternatives for poultry production. Day 2- emerging diseases and animal welfare. For registration information contact Dr. Emily Martin at [emartin@lsd.uoguelph.ca](mailto:emartin@lsd.uoguelph.ca)

**2008**  
**June**

**June 4-7: NPIP Biennial Conference** in Portland, ME. Contact: C. Stephen Roney, National Poultry Improvement Plan, 1498 Klondike Road, Ste. 101, Conyers, GA 30094, phone: 770-922-3496 x17, fax: 770-922-3498

**June 29—July 4: XXIII World's Poultry Congress**, Convention and Exhibition Centre, Brisbane, Australia. Contact: WPC 2008 Congress, Intermedia Convention & Event Management, P.O. Box 1280, Milton, Queensland 4064, Australia, Phone: +61 7 3858 5594; Fax: +61 7 3858 5510; Email: [wpc2008rim.com.au](mailto:wpc2008rim.com.au); Website: [www.wpc2008.com](http://www.wpc2008.com)

**2008**  
**July**

**July 6-10: 8th International Marek's Disease Symposium**, Townsville, Queensland, Australia. Contact: Dr. G. Burgess, School of Veterinary & Biomedical Sciences, James Cook University, Townsville, Queensland 4811, Australia. Phone: +61 7 4781 5472; Fax: +61 7 4781 6833; Email: [graham.burgess@jcu.edu.au](mailto:graham.burgess@jcu.edu.au)

**July 20-23: American Association of Avian Pathologists annual meeting**, New Orleans, Louisiana. Email: [aaap@uga.edu](mailto:aaap@uga.edu)

**2008**  
**September**

**September 16-18: Combined North-eastern Conference on Avian Diseases (NECAD) / Pennsylvania Poultry Sales and Service Conference (PSSC)** at the Penn State Conference Center Hotel, State College, Pa. Contact Bill Pierson tel 540-231-7823

**2009**  
**January**

**January 28-30: International Poultry Expo 2009**, Georgia World Congress Center, Atlanta, Georgia. Contact: US Poultry & Egg Association, 1530 Cooledge Road, Tucker, Georgia 30084-7804. Phone: +1-770-493-9401; Fax: +1-770-493-9257; Email: [expogenerator@poultryegg.org](mailto:expogenerator@poultryegg.org); Website: [www.poultryegg.org](http://www.poultryegg.org)

**2010 April**

**April 20-23: VIV Europe 2010**, Utrecht, The Netherlands. Contact: XNU Exhibitions Europe B.V, P.O. Box 8800, 3503 RV Utrecht, The Netherlands, Fax: +31 302-952-809; Website: [www.viv.net](http://www.viv.net)



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