



ALMA MATER STUDIORUM
UNIVERSITÀ DI BOLOGNA

Turkey Haemorrhagic Enteritis: Updated Insights on Epidemiology, Diagnosis and Control

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Why Turkey Haemorrhagic Enteritis (THEV) Still Deserves Attention

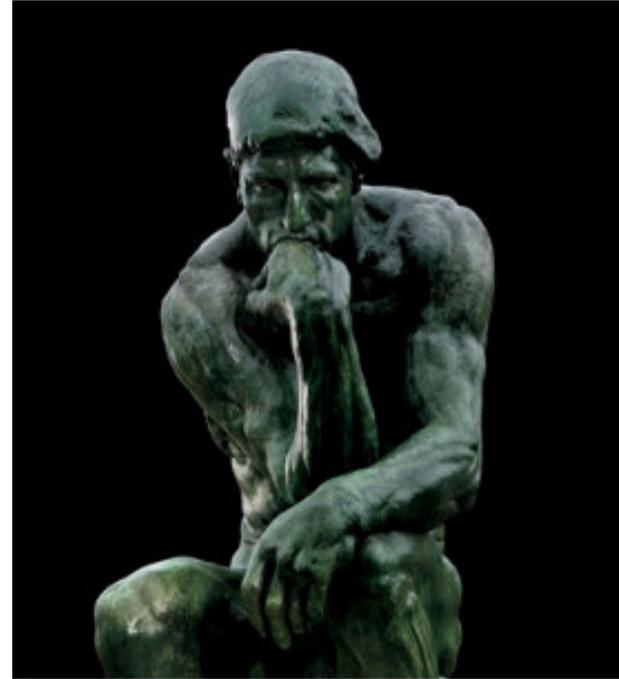
Reduced frequency of severe outbreaks

Widespread subclinical circulation

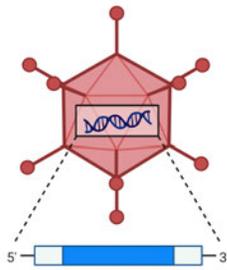
Immunosuppressive effects

Interaction with other pathogens

Impact on production performance



ETIOLOGY



Family *Adenoviridae*

Genus *Siadenovirus*,

Turkey siadenovirus A

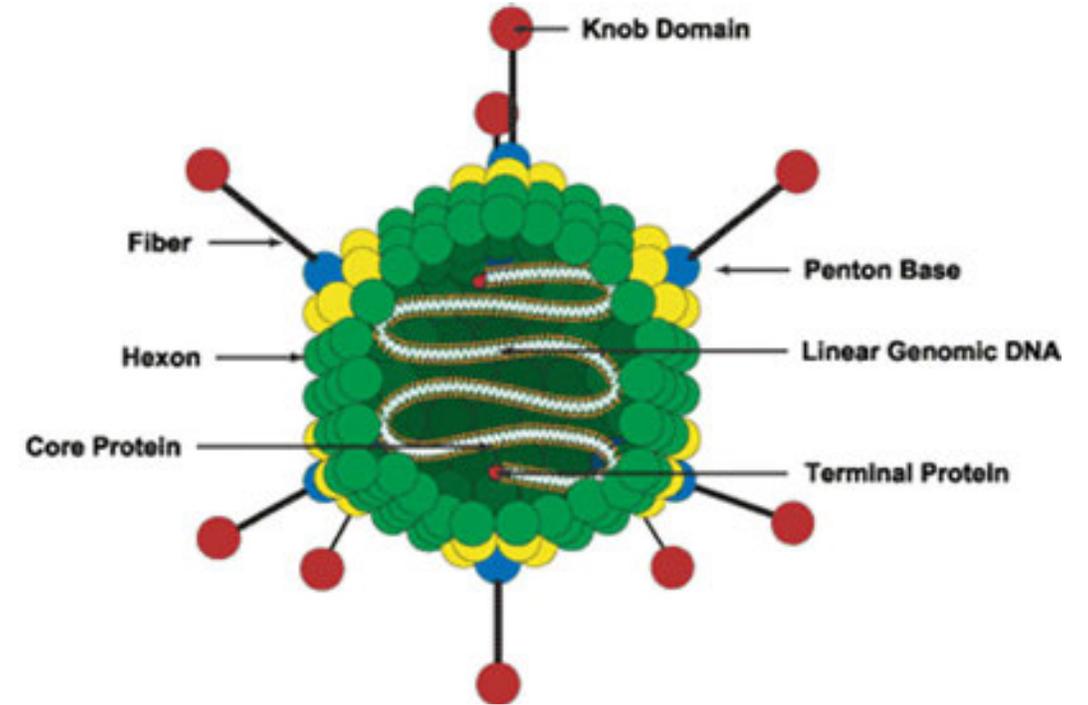
Turkey Hemorrhagic Enteritis (THEV)

Ex avian adenovirus group (type) II

Non-enveloped icosahedrons viral particles

One penton fiber at each vertex

60-90 nanometers

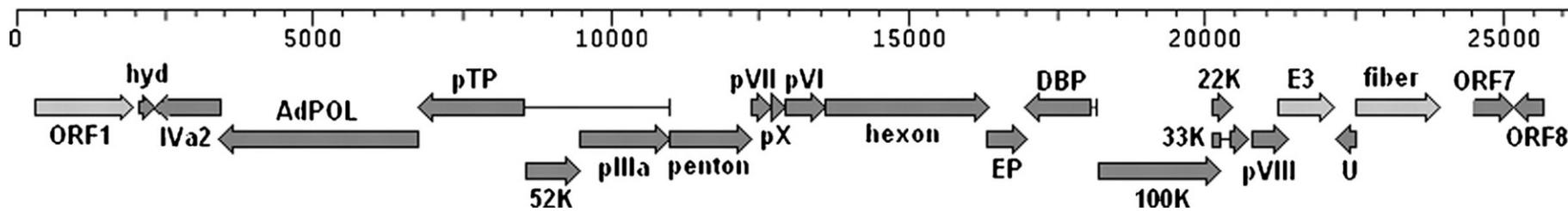


ETIOLOGY

Turkey siadenovirus A (THEV),

Linear, double stranded DNA viruses

Genome length 26.6 kb



Maps of the genome

- ✓ **Hexon protein:** main antigen
- ✓ **ORF1 and E3 regions and *fiber knob* domain:** genetic factors affecting virulence (Beach et al., 2009)

Strain classification

THEV virulent strains
THEV avirulent strains



High % identity at genome level
Different severity of lesions produced in turkeys



Virus replication

Primary target cells → Macrophages and IgM-bearing B lymphocytes (nuclei)

Major site of viral replication → SPLEEN

Viral distribution in a variety of tissues
(intestine, bursa of Fabricius, cecal tonsils, thymus, liver, kidney, lungs)

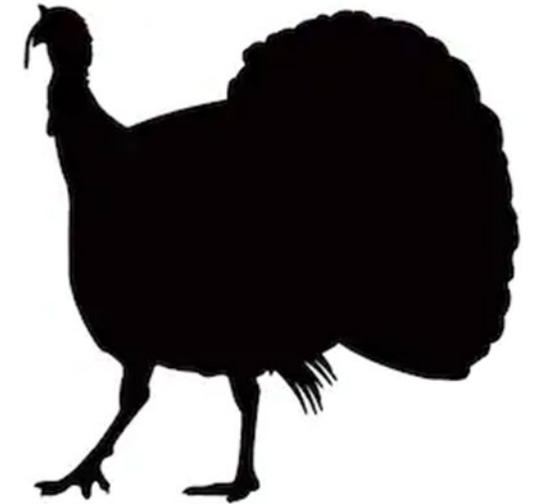
Pathogenicity

Mortality 0-100%

Most field cases between 6-11 weeks of age

Protection by maternal antibody (no intestinal lesions formation in seronegative poults)

Persistent infection in recovered birds



Clinicopathological Features

Blood-filled small intestine

Fibrino-necrotic membranes

Splenomegaly

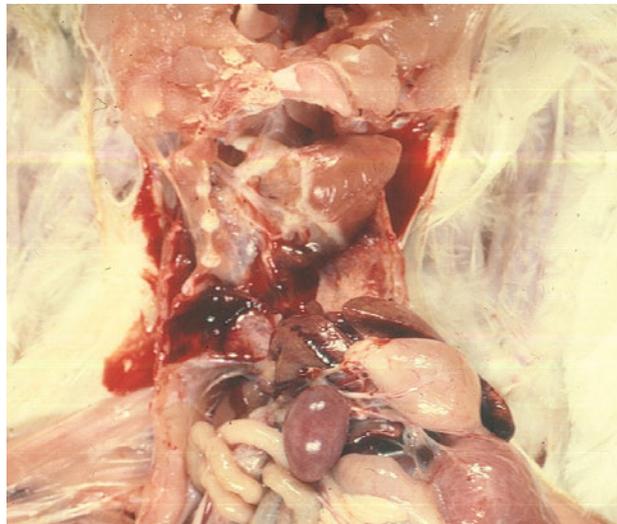
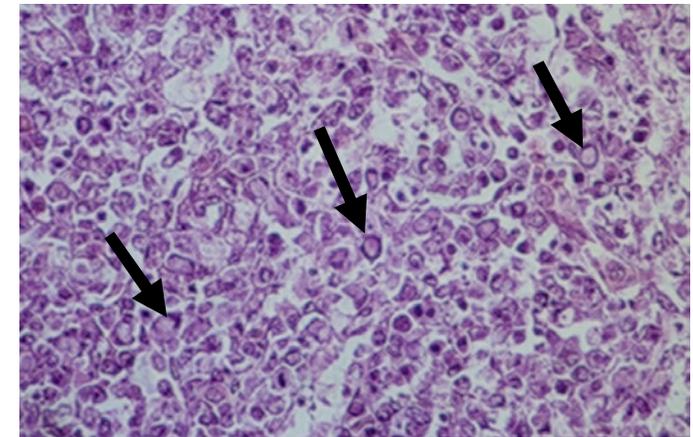
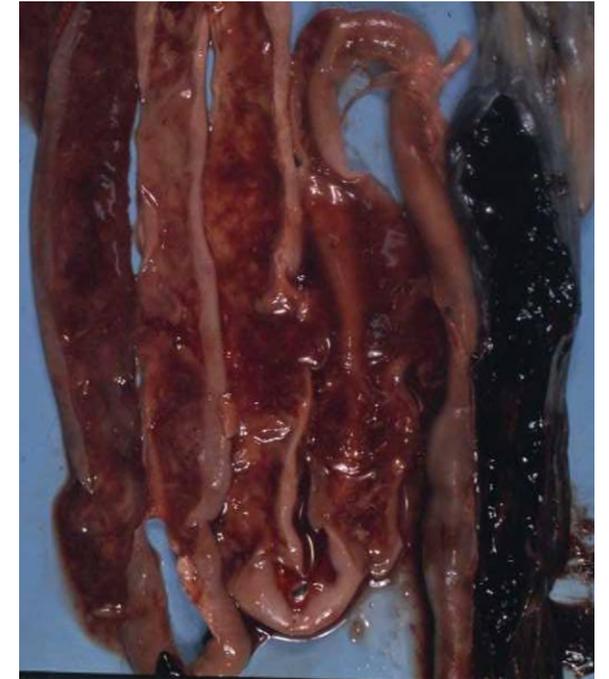
Birds often in good body condition

Subclinical forms common



Bloody droppings (6 weeks old turkey).

www.PoultryMed.com

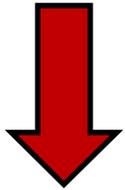


Lesions severity

Correlated with the virulence of the strain

Virulent THEV (severe intestinal lesions, spleen enlargement)

Avirulent THEV (spleen enlargement)



Immunosuppressive interaction

Lesions and mortality referred to *E. Coli* infection

Responses to vaccines impaired (ND)



Diagnosis

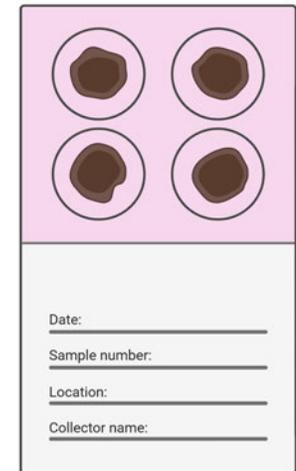
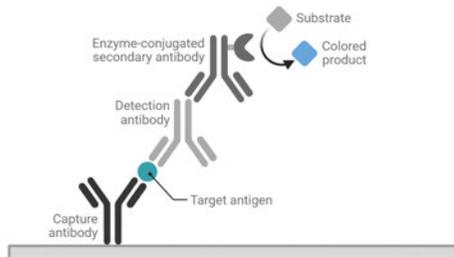
Identification of the causative agents

Standard, nested and real-time PCR assays

From spleen (organ samples or FTA cards), cloacal swabs



Serology (??)



Prevention and Control

Management procedures

Biosecurity protocols

Cleaning and disinfection

TOTAL ELIMINATION OF THEV IS CONSIDERED IMPRACTICAL



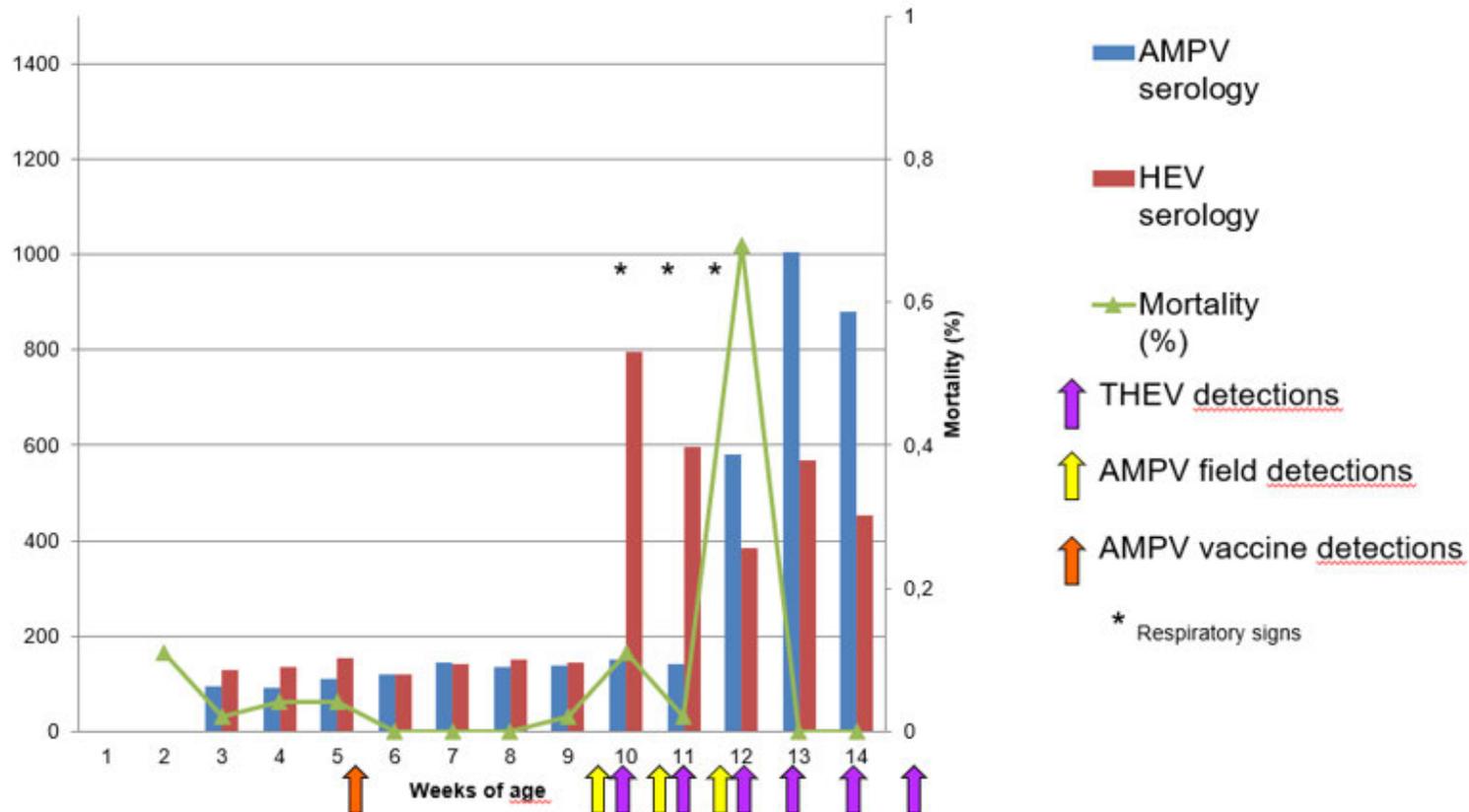
VACCINATION



Longitudinal field studies of Avian Metapneumovirus and Turkey Hemorrhagic Enteritis Virus in turkeys suffering from colibacillosis associated mortality

Davide Giovanardi • Caterina Lupini • Patrizia Pesente •
Giulia Rossi • Giovanni Ortali • Elena Catelli

THEV – aMPV – Colibacillosis
Consecutive commercial flocks
Weekly sampling
PCR detection (HEV, aMPV)
Mortality monitoring



Case Report—

Concurrent *Histomonas meleagridis* and Hemorrhagic Enteritis Virus Infection in a Turkey Flock with Recurrent History of Blackhead Disease

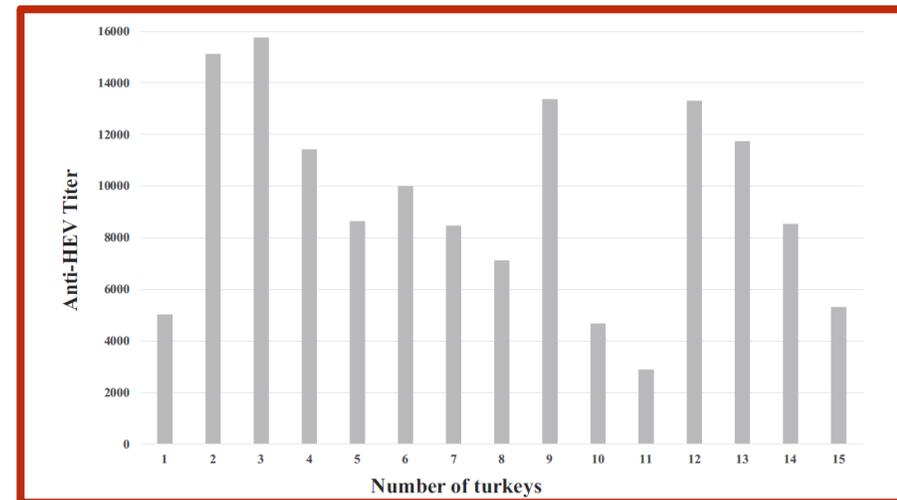
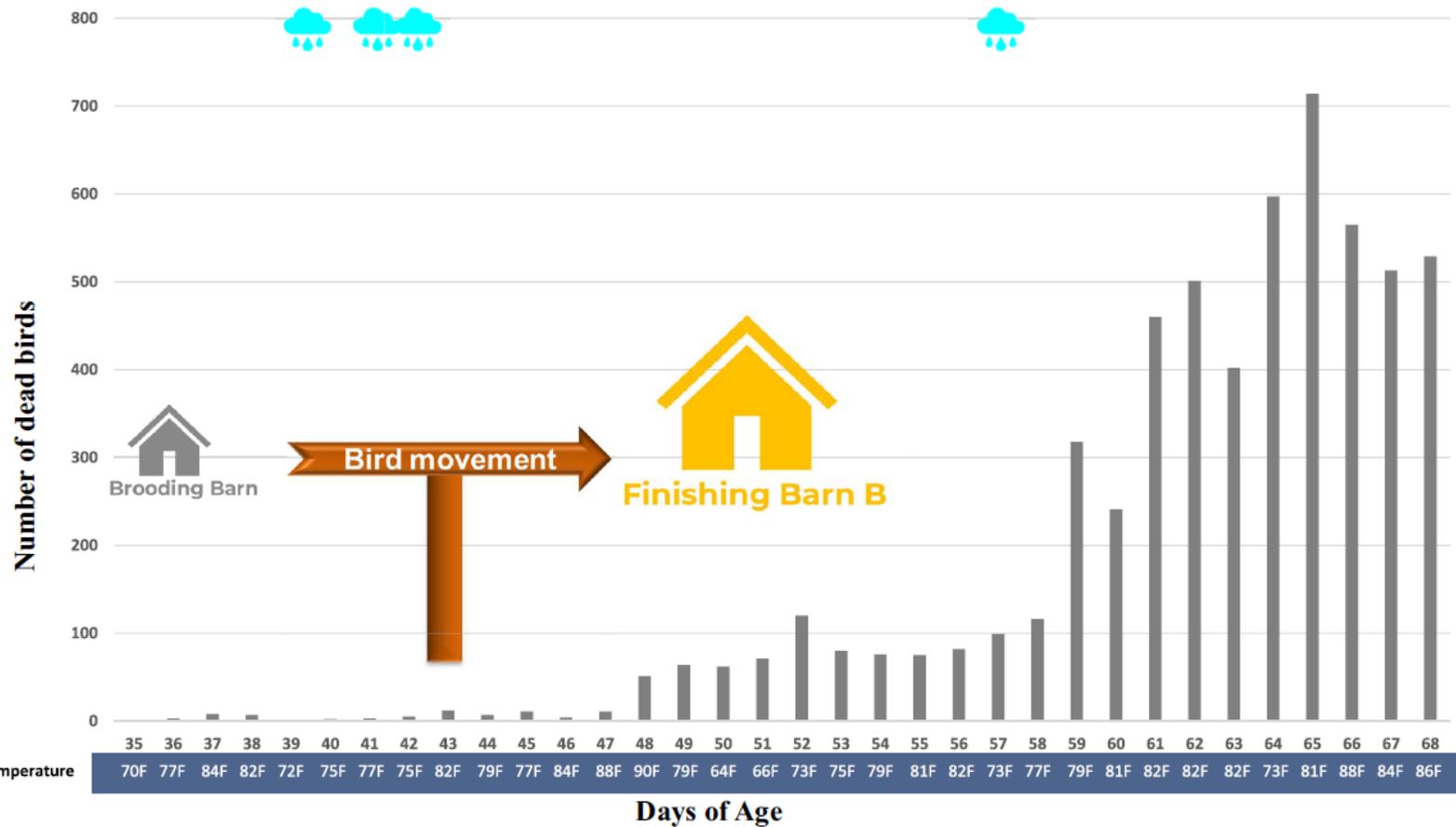
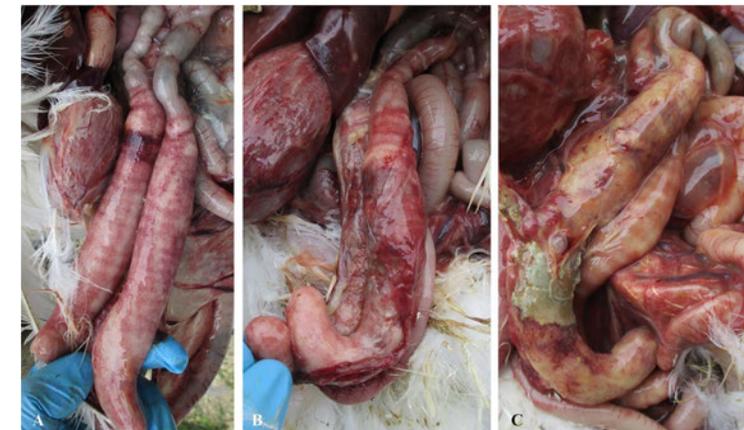
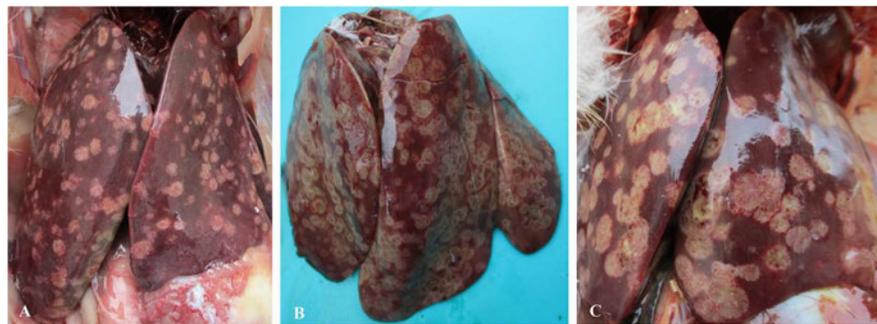
Vijay Durairaj,^{AE} Jill Nezworski,^B Mary Drozd,^C Steven Clark,^D and Ryan Vander Veen^A

^AHuvepharma, Inc., Lincoln, NE 68528

^BBlue House Veterinary, 145 West Yellowstone Trail, Buffalo, MN 55314

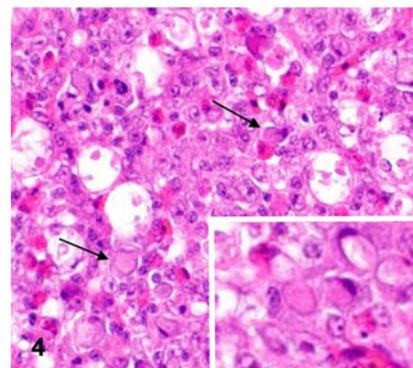
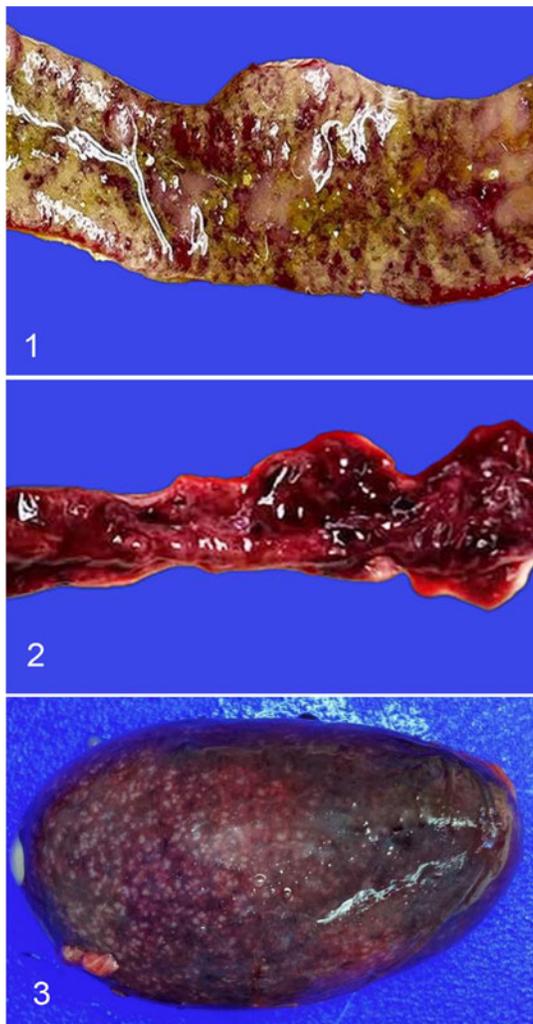
^CSchool of Veterinary Medicine and Biomedical Sciences, University of Nebraska–Lincoln, Lincoln, NE 68503

^DHuvepharma, Inc., Peachtree City, GA 30269



Necrotic enteritis in a commercial turkey flock coinfecting with hemorrhagic enteritis virus

Shayne Ramsubeik, Carmen Jerry, Francisco A. Uzal,  Simone Stoute¹ 



First documented case of NE associated with *Clostridium perfringens* **type F** in turkeys.

- ✓ **Acute THEV Infection:** High viral load with classic splenic intranuclear inclusions and severe intestinal damage.
- ✓ **Pathogenesis Link:** **THEV-induced immunosuppression** likely enabled *C. perfringens* overgrowth and NE development.
- ✓ **Vaccine Concern:** Lack of THEV seroconversion despite vaccination suggests possible **vaccine failure or management issues.**

BRIEF REPORT

Turkey adenovirus 3: ORF1 gene sequence comparison between vaccine-like and field strains

Giulia Quaglia¹ · Antonietta Di Francesco¹ · Elena Catelli¹ · Giulia Mescolini¹ · Caterina Lupini¹

Sequence analysis of the regions **ORF1, E3, Fiber knob domain** ed **hexon**

Genetic stability of THEV over the years (>10)

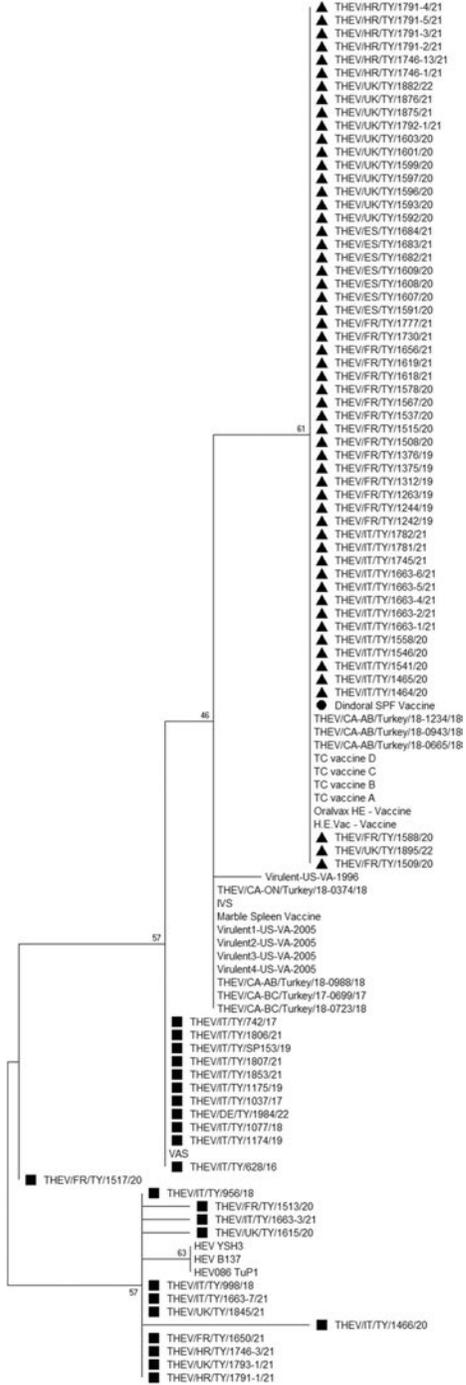
Vaccine and field strains differentiation

Hexon: peculiar mutations in field strains

ORF1 3' region: vaccine marker

Usefull in **field studies** in flocks THEV-vaccinated with live or inactivated vaccines

✓ monitor vaccine take and field virus circulation





Field longitudinal studies were carried out to monitor vaccine-take and field virus circulation:

- *in vivo* and *post-mortem* scoring of clinical sign, macroscopic lesions, microscopic lesions (in spleen)
- combined PCR and sequencing protocol for vaccine or field strain differentiation

Study sites

FARM A - female turkeys

Shed 1 = CONTROL GROUP

Shed 4 = VACCINATED GROUP

108 days of age



FARM B - male turkeys

Shed 1 = CONTROL GROUP

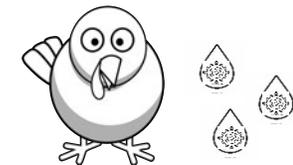
Shed 4 = VACCINATED GROUP

136 days of age



at 4 weeks of age

THEV-live vaccinated



THEV characterization in spleen and cloacal swabs

FARM A

FARM B

UN-VACCINATED
GROUP

VACCINATED
GROUP

UN-VACCINATED
GROUP

VACCINATED
GROUP

DOL



21	negative																			
28	negative																			
35	negative	field	negative	negative	negative	vaccine	vaccine	vaccine	vaccine	vaccine	negative	negative	negative	negative	negative	vaccine	negative	vaccine	negative	vaccine
42	negative	negative	negative	negative	negative	vaccine	vaccine	negative	vaccine	vaccine	field	negative	field	negative	negative	vaccine	vaccine	vaccine	vaccine	vaccine
49	field	field	field	field	field	vaccine	vaccine	vaccine	vaccine	vaccine	field	field	field	field	field	vaccine	vaccine	field	field	vaccine
56	field	field	field	field	field	vaccine	vaccine	vaccine	vaccine	field	vaccine	vaccine	vaccine	vaccine						
63	field	field	field	field	field	vaccine	vaccine	vaccine	vaccine	field	field	field	field	field	field	vaccine	field	vaccine	vaccine	vaccine
77	field	field	field	field	field	vaccine	vaccine	vaccine	vaccine	vaccine	field	field	field	field	field	vaccine	vaccine	vaccine	vaccine	vaccine
91	field	field	field	field	field	vaccine	vaccine	vaccine	vaccine	vaccine	field	field	field	field	field	vaccine	vaccine	vaccine	vaccine	vaccine
104	field	field	field	field	field	vaccine	vaccine	field	vaccine	vaccine	field	field	field	field	field	negative	field	field	vaccine	negative
118											negative	field	field	field	negative	vaccine	vaccine	field	vaccine	vaccine
130											field									

UN-VACCINATED GROUPS

Field strain detected starting from 35-49 (Farm A) and 42 days of age (Farm B) up to the end of the production cycle

VACCINATED GROUPS

Vaccine detected from 1 week after vaccination in spleens (2 weeks in cloacal swabs)

Vaccine persisted up to the end of the production cycle (Farm A) or 118 days of life (Farm B)

Field strain detected in limited number of birds during the production cycle (3/50 Farm A; 12/65 Farm B)



THEV characterization in spleen and cloacal swabs

FARM A

FARM B

UN-VACCINATED
GROUP

VACCINATED
GROUP

UN-VACCINATED
GROUP

VACCINATED
GROUP

DOL

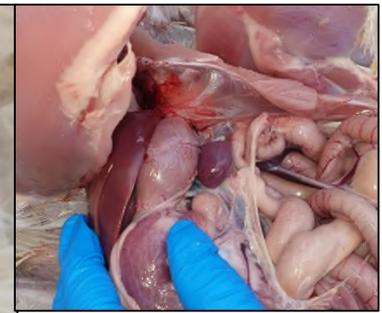
21	negative																			
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49	field	field	field	field	field	vaccine	vaccine	vaccine	vaccine	vaccine	field	field	field	field	field	vaccine	vaccine	field	field	vaccine
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63	field	field	field	field	field	vaccine	vaccine	vaccine	vaccine	field	field	field	field	field	field	vaccine	field	vaccine	vaccine	vaccine
77	field	field	field	field	field	vaccine	vaccine	vaccine	vaccine	vaccine	field	field	field	field	field	vaccine	vaccine	vaccine	vaccine	vaccine
91	field	field	field	field	field	vaccine	vaccine	vaccine	vaccine	vaccine	field	field	field	field	field	vaccine	vaccine	vaccine	vaccine	vaccine
104	field	field	field	field	field	vaccine	vaccine	field	vaccine	vaccine	field	field	field	field	field	negative	field	field	vaccine	negative
118											negative	field	field	field	negative	vaccine	vaccine	field	vaccine	vaccine
130											field									

NGS on field strains detected in vaccinated groups:

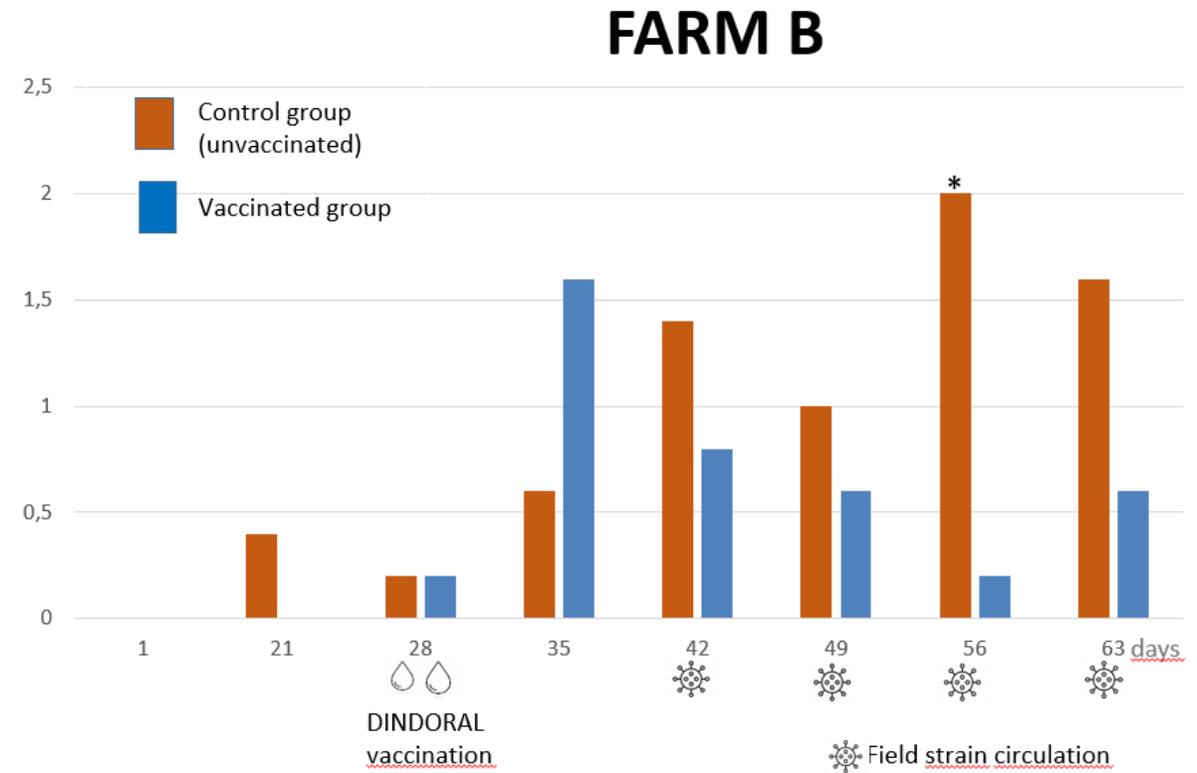
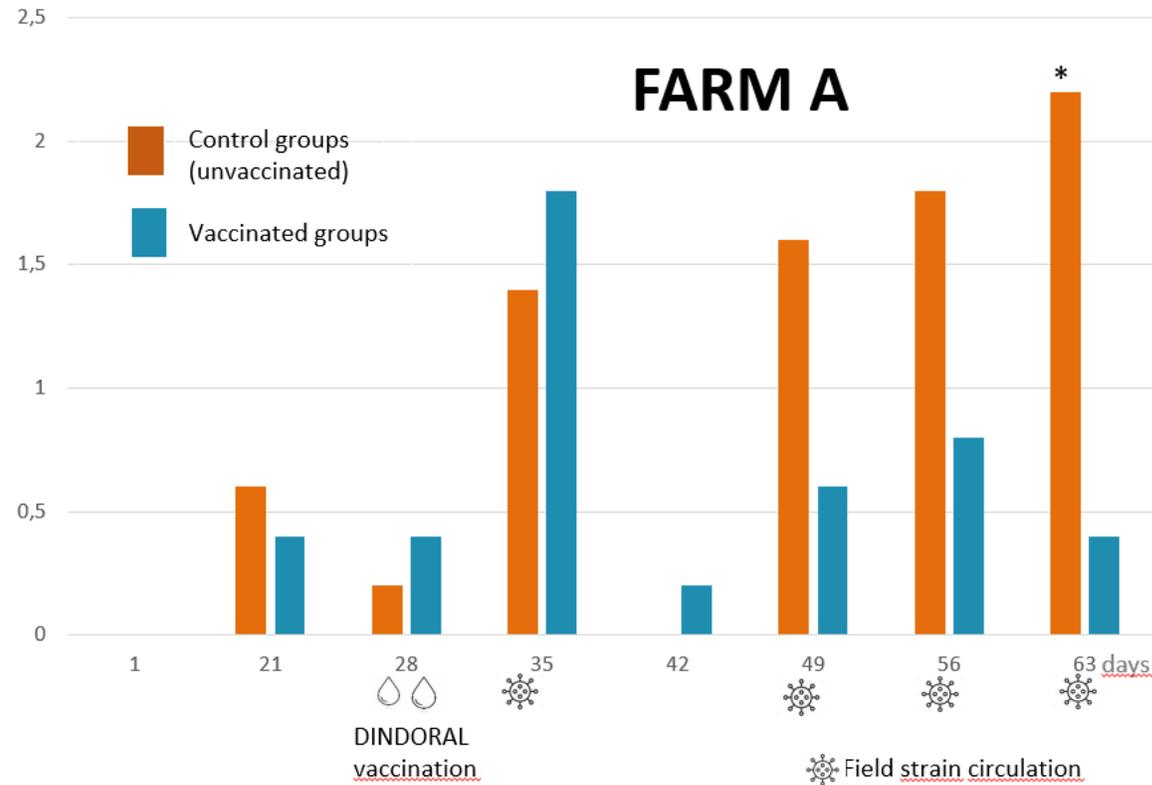
100% field strains, NO concomitant infection field/vaccine



Clinical Signs & Macroscopic Lesion

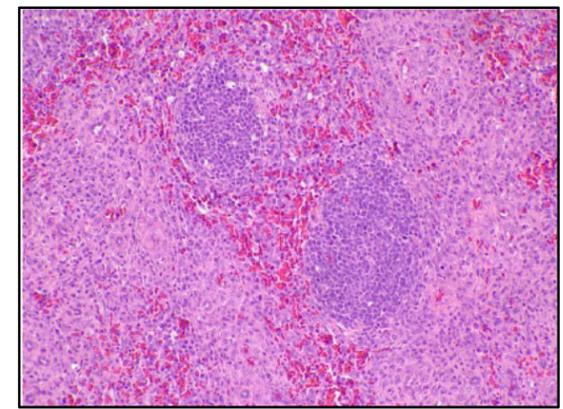


Turkey male at 56 days of age
 Photo: dr. Valentina Benedetti
 BI Animal Health Italia S.p.A.

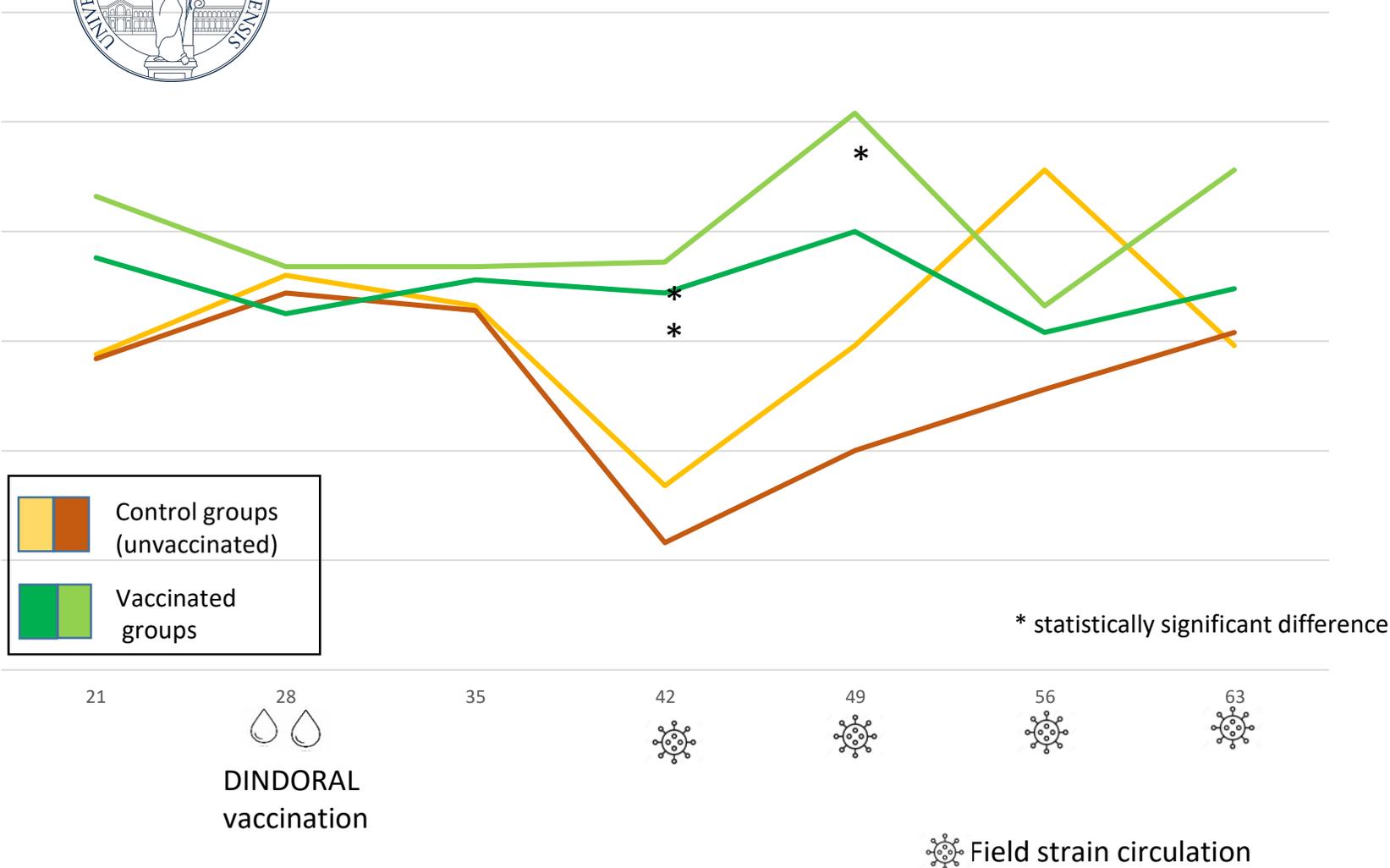




Histological Evaluation



Spleen follicles
Photo: University of Milan;
prof. Chiara Giudice



- ✓ Vaccine does not reduce numbers of follicles in vaccinated animals
- ✓ Control groups showed decreasing in mean follicle numbers after THEV field strain infection compared to vaccinated groups
- ✓ After field infection, overall mean number of follicles in vaccinated groups was always maintained to higher levels if compared to control groups.



- ✓ THEV still circulates in modern turkey production, often subclinically.
- ✓ Immunosuppression is central to disease impact and secondary infections.
- ✓ Field virus circulation can persist in flocks.
- ✓ Live vaccination helps limit field strain circulation and lesions.





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THANK YOU FOR YOUR ATTENTION

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