Bluetongue and Epizootic hemorrhagic diseases in Israel from 2006 to day

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Dové Israele?

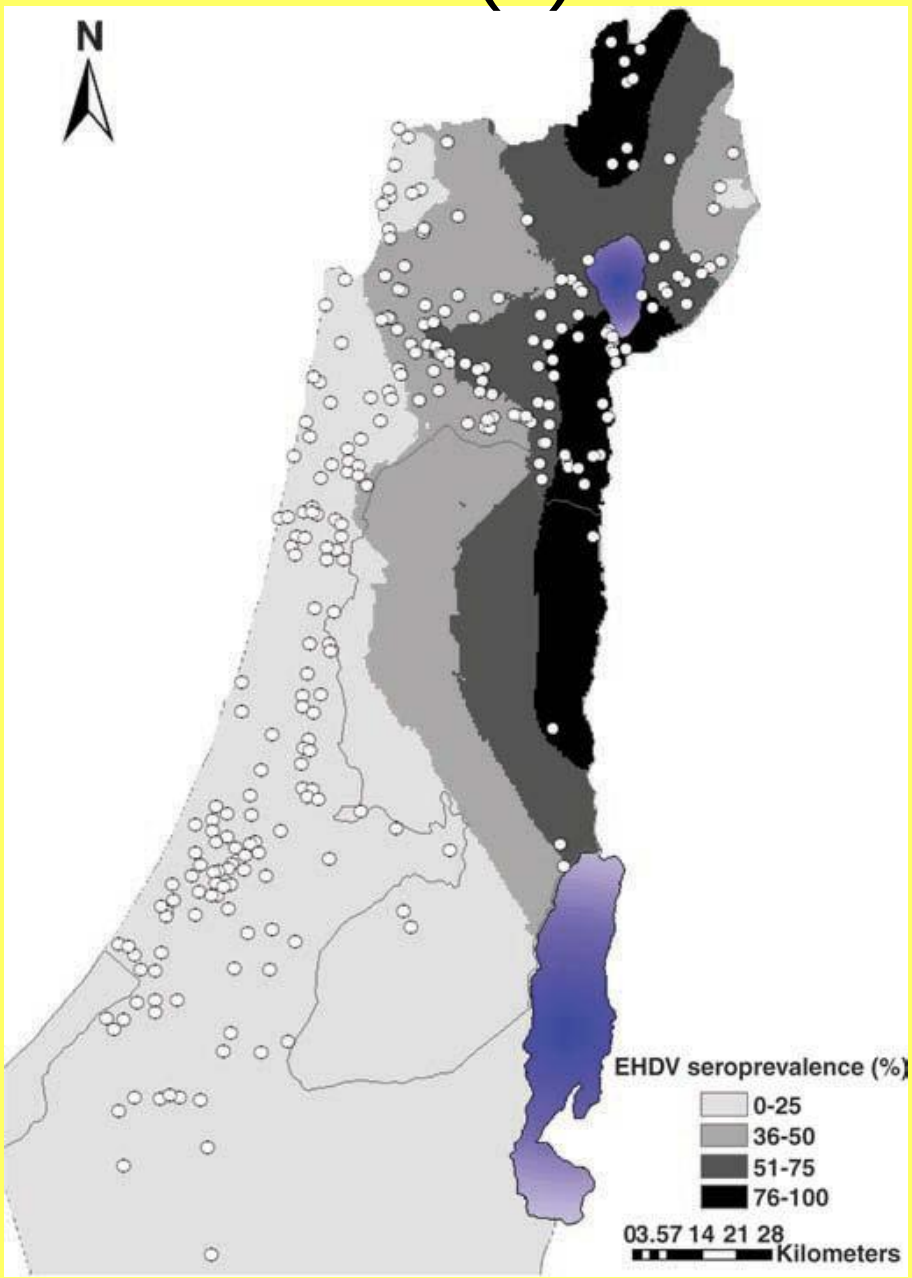
500, 000, 000 migratory birds via Israel

Historically: the first cow with hemorrhagic conjunctivitis in Israel, end of August 2006, firstly suspected as BEFV infection

EHDV7

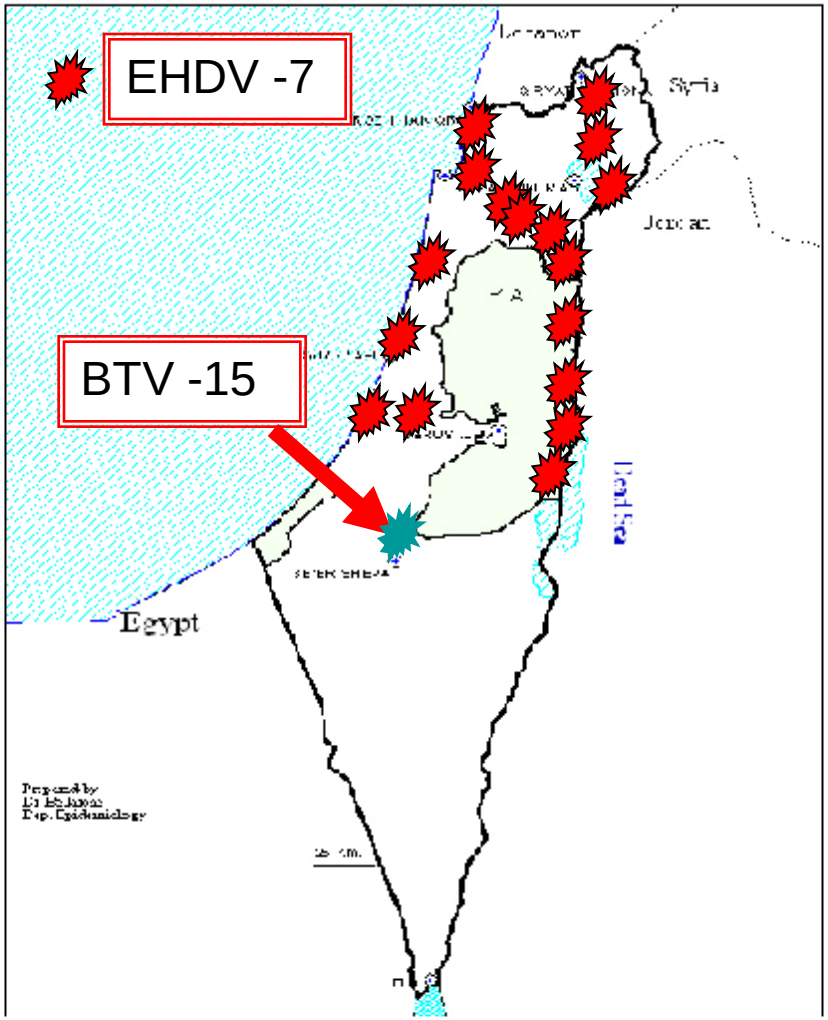
Historically: the first cow with bluetongue-like disease (HD). 6th September 2006 (the first EHDV-7 isolation/identification)

The EHD ended (?) in Israel (end of Nov. 2006)

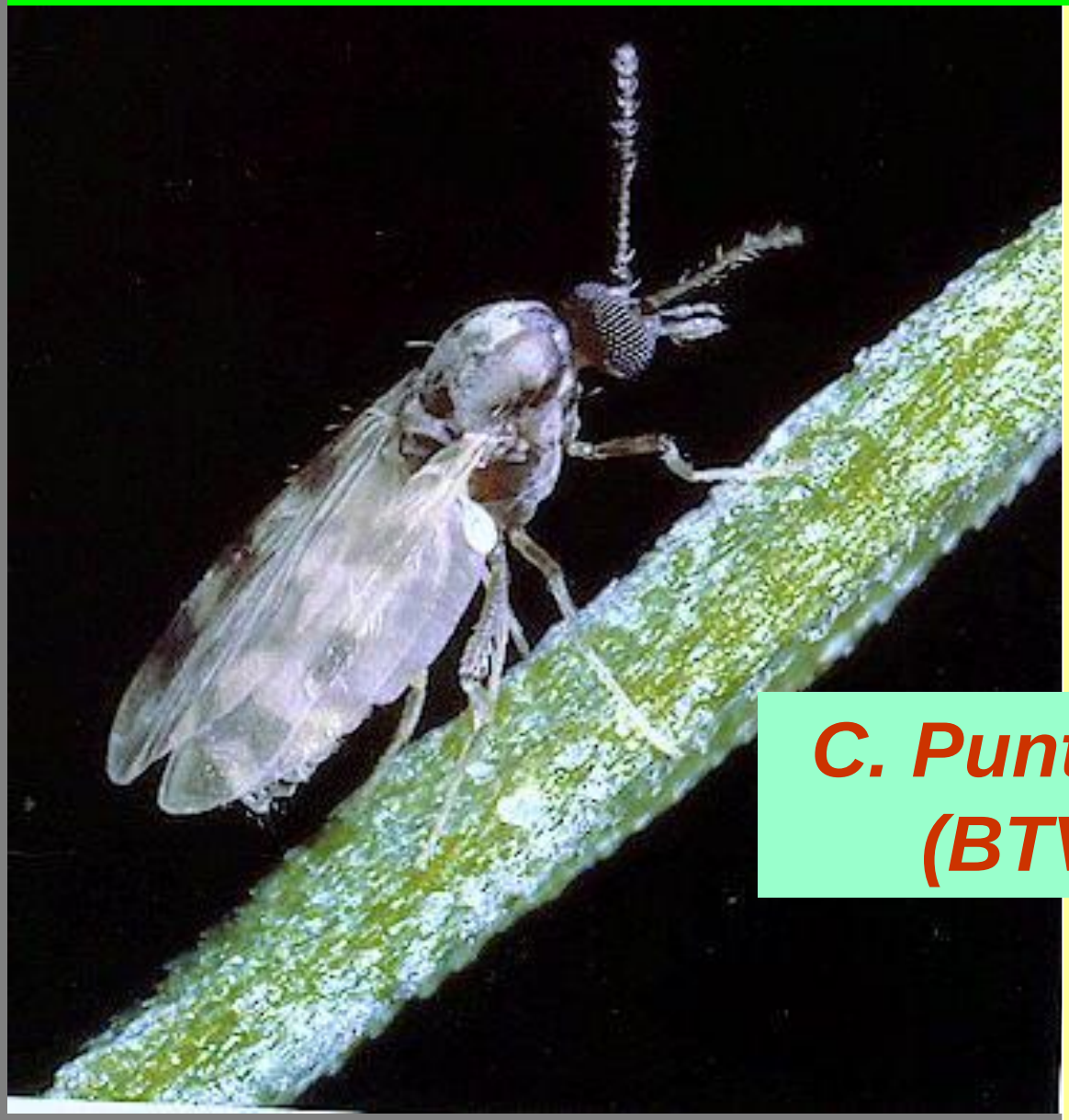


From: Kedmi et al., 2010 J Dairy SCI. 93: 2486

2006 Culicoides (?) activity EHDV infection



Culicoides imicola (1.5 mm)



C. Obsoletus
C. schlzei
C . oxystoma
C. newsteadi

C. Punticollis in (BTV-15?)

orbivirus (es) and *Culicoides* attacks (during the new millennium on the ruminant populations in Israel

*Akabane & Aino (?) viruses 2001/2002

Equine encephalosis virus -2008

Epizootic hemorrhagic disease virus 7-2006

Bluetongue virus 2006 (new type BTV15) 2008/11 (new types: BTV8, BTV 24 & BTV5 & old types BTV2, BTV4, BTV15 & BTV16)

*not orvbirus (Simbu serogroup)

Occurrence

EHDV in cattle has been isolated throughout the world in North America, Australia, Africa, Asia, and the Mediterranean (Israel, Turkey, Maghreb). Ibaraki disease has been reported from Japan, Korea, Taiwan

ETIOLOGY

Classification of the causative agent

EHD is caused by a virus of the family *Reoviridae*, genus *Orbivirus*; there are 8 or more serotypes and Ibaraki virus is a member of the EHD virus (EHDV) serogroup (serotype 2). EHDV demonstrates immunological cross reactivity with the bluetongue virus group.

EHDV Resistance to physical and chemical action
(adapted from Bluetongue virus)

Temperature:

Extremely unstable at high temperatures. Inactivated by 50°C (122°F)/3 hours; 60°C (140°F)/15 minutes or 121°C (249.8°F) /15 minutes.

pH:

Sensitive to pH <6.0 and >8.0.

EPIDEMIOLOGY

- EHD can infect most wild and domestic ruminants
- Historically EHD is a disease of wild ruminants, particularly white-tailed deer in North America, and rarely a clinical disease of cattle
- A notable exception is Ibaraki virus, which caused an extensive outbreak of disease in cattle in Japan in 1959, and continues to cause cattle disease in the Far East

EPIDEMIOLOGY (B)

- Recently EHD has become an emerging disease in cattle, and was added to OIE list of notifiable diseases in May 2008, following outbreaks in four Mediterranean countries
- Morbidity and mortality may be as high as 90% in white tailed deer; however severity varies between years and geographic locations

SURVIVAL:

Very stable in blood and tissue specimens at 20°C, 4°C, and –70°C, but not at –20°C. Resistant to ultraviolet and gamma irradiation due to its double-stranded RNA genome.

Hosts

- White-tailed deer mainly, with mule deer and pronghorn affected to a lesser extent
- Other wild ruminants, like black-tailed deer, red deer, wapiti, fallow deer, roe deer, elk, moose, and bighorn sheep may seroconvert
- Until recently, only rare outbreaks were reported in cattle, although infection is common and they may serve as temporary reservoir hosts. True persistent infection of ruminants does not occur

Hosts (B)

- Ibaraki disease is seen in cattle
- Sheep can be infected experimentally but rarely develop clinical signs, and goats do not seem to be susceptible to infection

Transmission

- **Virus is transmitted by biological vectors, usually biting midges of the genus *Culicoides*, after an external extrinsic period of 10-14 days**
- **In temperate regions infection is most common in the late summer and autumn during peak vector population, while infection occurs throughout the year in tropical regions**

Transmission (B)

- As in bluetongue infection, (pseudo) viremia can be prolonged beyond 50 days, despite the presence of neutralizing antibody, due to an intimate association between virus and erythrocytes.

Sources of virus

- **Blood of viremic animals infection in ruminants is not contagious – biological vectors (?) (*Culicoides* sp.) are required**
- **As the virus infects endothelium, all tissues of the body may be affected!!**

DIAGNOSIS

The incubation period for EHD is estimated at 2-10 days.

Clinical diagnosis

- **Domestic ruminants may be subclinically infected.**
- **In prolonged cases, oral ulcers on the dental pad, hard palate, and tongue may occur.**

- **Acute outbreaks in cattle: fever, anorexia, reduced milk, swollen conjunctivae, redness and scaling of the nose and lips, nasal and ocular discharge, stomatitis, salivation, lameness, swelling of the tongue, oral/nasal erosions, hemorrhages, erosions, and ulcerations may be seen around the coronets**
- **Abortions and stillbirths (?). Some affected cattle die (up to 10%)**

Laboratory diagnosis

Samples

Virus isolation and detection

- **Whole blood in EDTA and/or heparin (?)**
- **Spleen, Lungs, Lymph nodes, Liver**

Serological tests

- **Paired serum samples (3-5 ml each)**

also for seroconversion

PREVENTION AND CONTROL

Sanitary prophylaxis

Control *Culicoides* vectors with insecticides/ larvicides, insect repellents on susceptible ruminants, and management of *Culicoides* breeding areas.

Medical prophylaxis

- **No vaccine is commercially available for EHD viruses, however, a live attenuated Ibaraki disease vaccine is used in Japan**
- **EHDV vaccines could be produced but would need to be multivalent as humoral immunity is serotype specific**

PREVENTION AND CONTROL

Other than Ibaraki in cattle, treatment and control is limited for EHDV.

<u>Sanitary prophylaxis</u>

Control *Culicoides* vectors with insecticides/ larvicides, insect repellents on susceptible ruminants, and management of *Culicoides* breeding areas.

PREVENTION AND CONTROL

Medical prophylaxis

- No vaccine is commercially available for EHD viruses, a live attenuated IBD disease vaccine is used in Japan

- EHDV vaccines could be produced but would need to be multivalent as humoral immunity is serotype specific

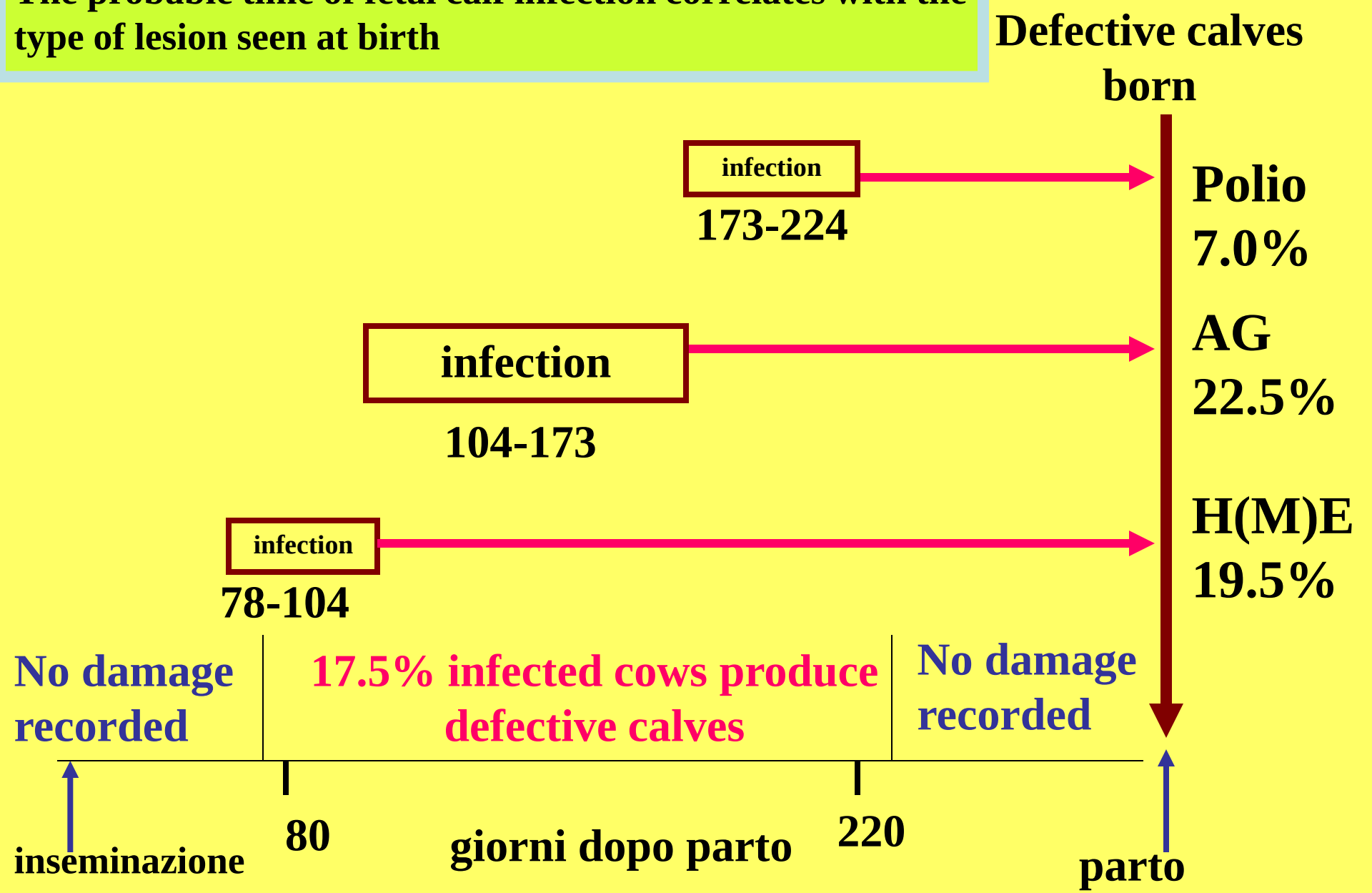
Chemicals/disinfectants:

Non-enveloped virus and thus relatively resistant to lipid solvents like ether and chloroform. Readily inactivated by beta-propiolactone, 2% w/v glutaraldehyde, acids, alkalis (2% w/v sodium hydroxide), 2%-3% w/v sodium hypochlorite, iodophores and phenolic compounds.

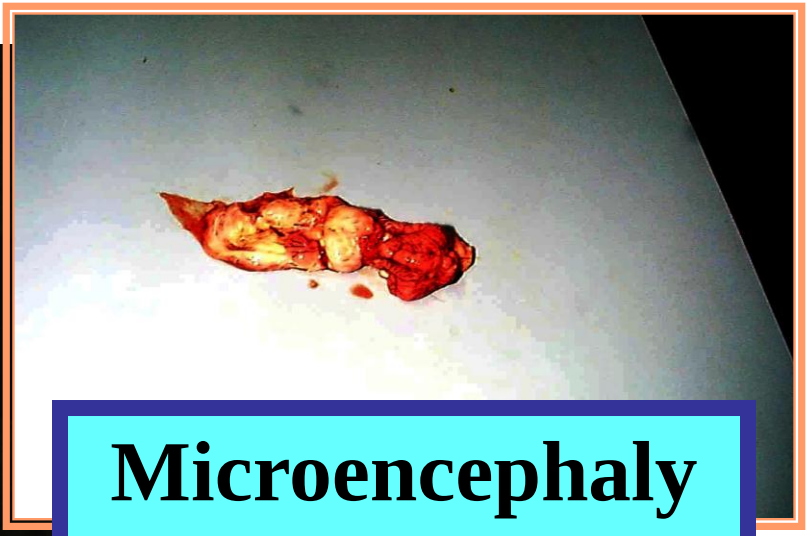
1... total loss of 26.5 US$/cow, i.e., 0.55% of the annual average total production value of a dairy cow

2...the epidemic, which lasted only 3 months, engendered a loss equal to 0.5% of the Israeli dairy cattle industry's annual production.

The probable time of fetal calf infection correlates with the type of lesion seen at birth



Hydranencephaly

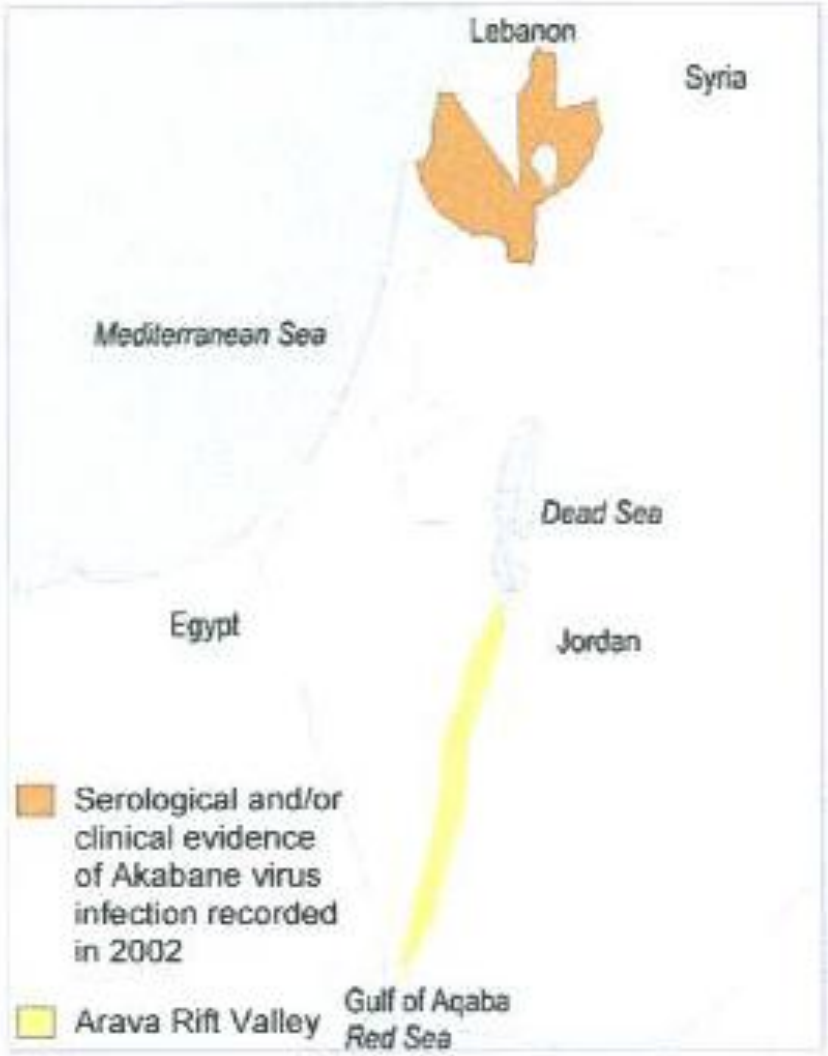


Microencephaly

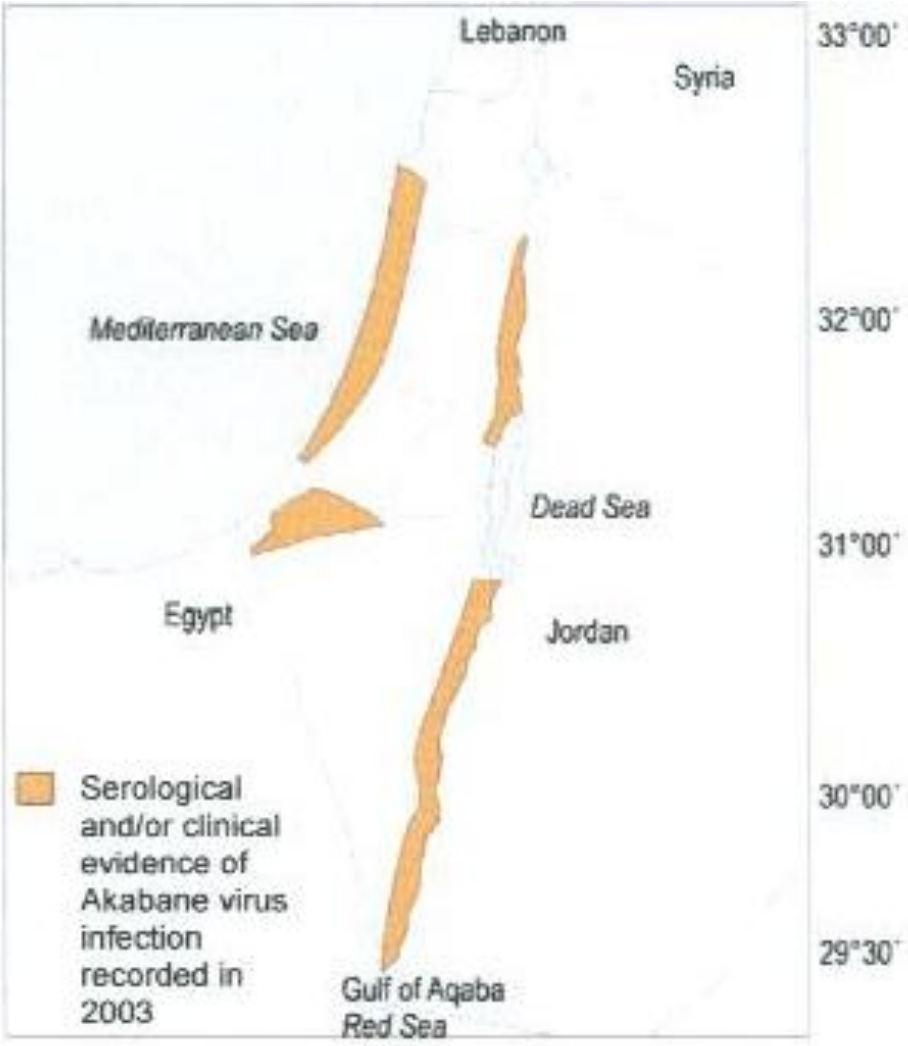
Arthrogryposis

Simbu serogroup infection

The epicenter of blind neonatal calves in the 2002 outbreak



The epicenter of blind neonatal calves in the 2003 outbreak



Rapid body weight loss

EHDV infection

EHDV infection: “parchment (pergamena) skin”

EHD: Cow, oral mucosa : mouth. Multiple blunted and congested papillae.

EHD: Cow, oral mucosa. Necrosis and blunting of the gingival papillae.

Cow, oral mucosa : hard palate. Multiple mucosal erosions.

Cow, oral mucosa. Necrosis and blunting of the gingival papillae. Necrotic lesion on the lingual tip & multiple blunted and congested papillae.

EHDV infection: bluetongue(-like)

Teats and udder petechia and discoloration

EHD 7: Vesicular stomatitis (-like)

EHD 7: Vesicular stomatitis (-like)

Teats and udder petechia and discoloration and tip necrosis

HD

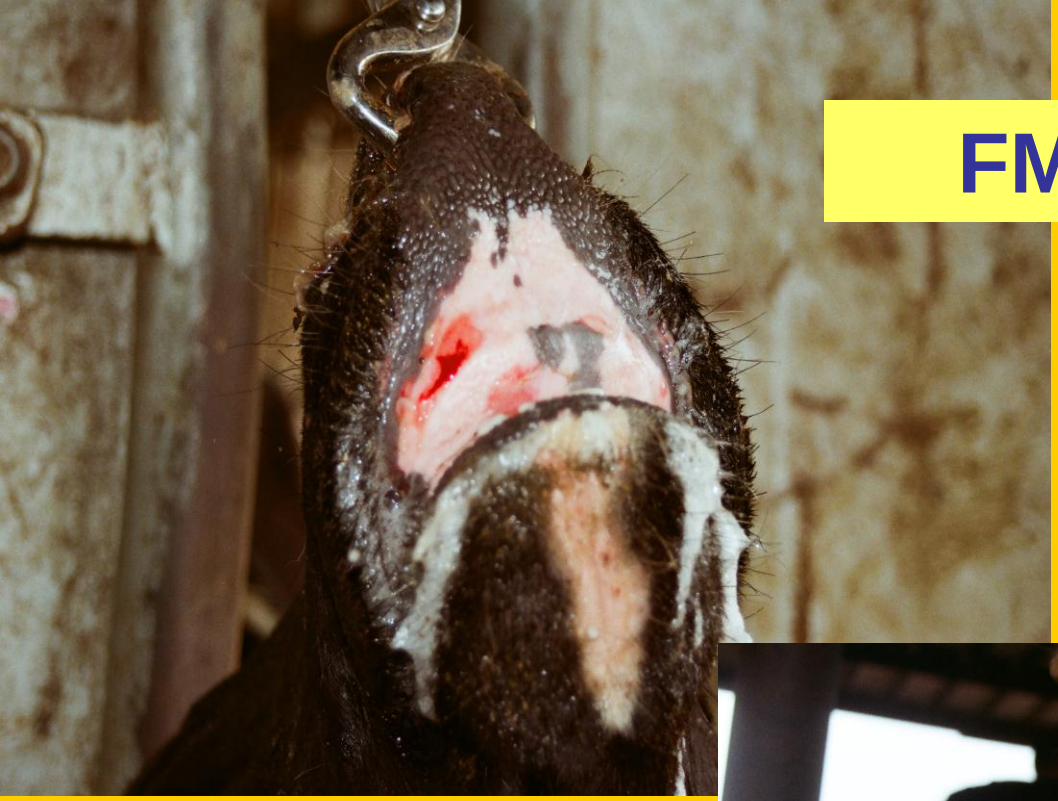
Teats and udder petechia and discoloration and tip necrosis

Differential diagnosis

- **Cattle:**

BT, BVD, FMD, IBR, VS, SA-MCF, BEF

FMD (O) 4/2011



SA-MCF head and eye form

BTV

Clinical syndromes associated with the circulation of multiple serotypes of Bluetongue Virus in dairy cattle in Israel

Brenner, J., Batten, C., Yadin, H., Rotenberg, D., Bumbarov, V., Friedgut, O., Rotenberg, D., Golender, N., Oura, C.A.L

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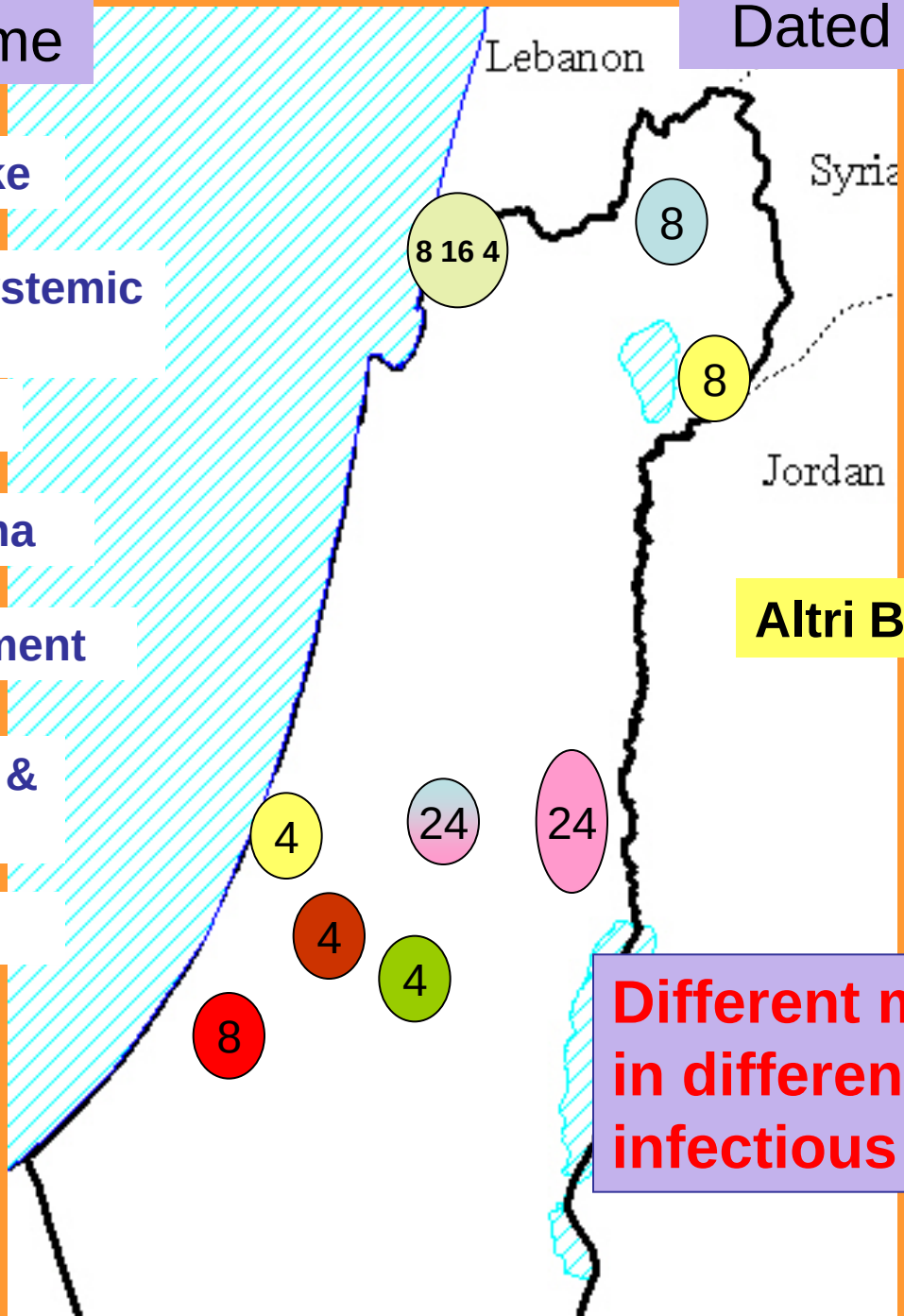
Vet Rec in press

BTV Syndrome

Dated 8/2008-3/2010

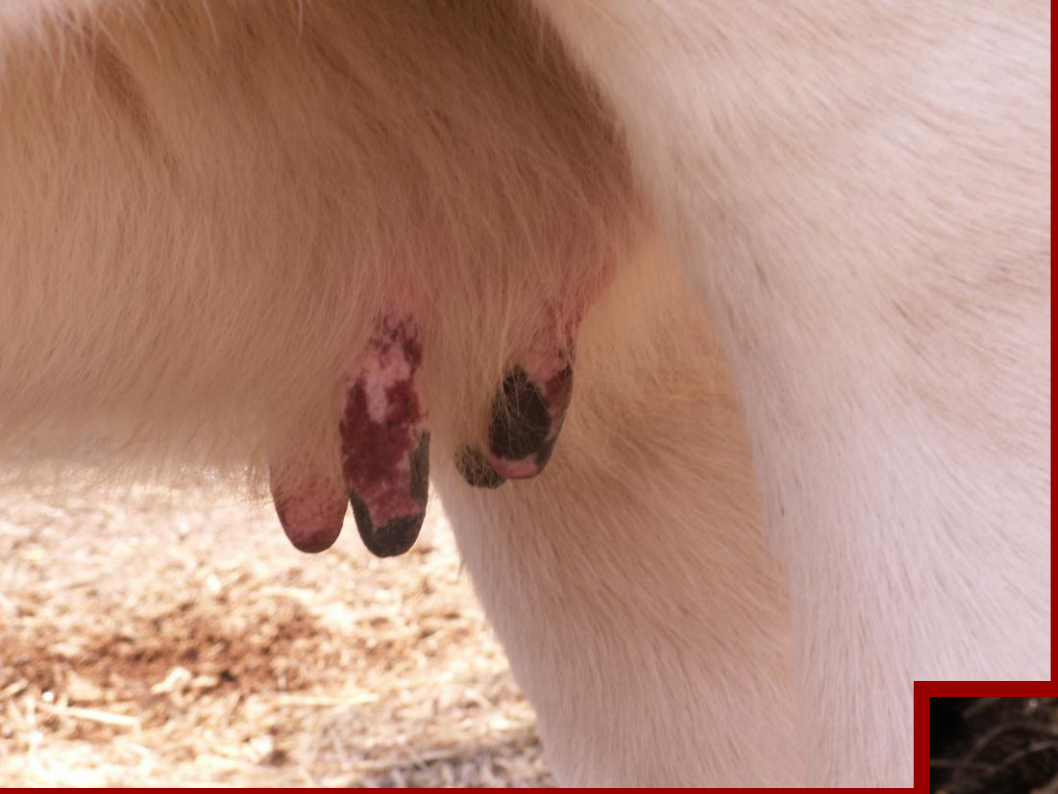
- 8 16 4 — **Foot rot-like**
- 24 — **BT/EHD systemic syndrome**
- 8 — **Red Udder**
- 4 — **Emphysema**
- 8 — **Maladjustment**
- 24 — **Red udder & EHD-like**
- 4 — **Sore nose**
- 4 8 — **Post BT ASPP?**



Altri BTV 2, 5, 15,

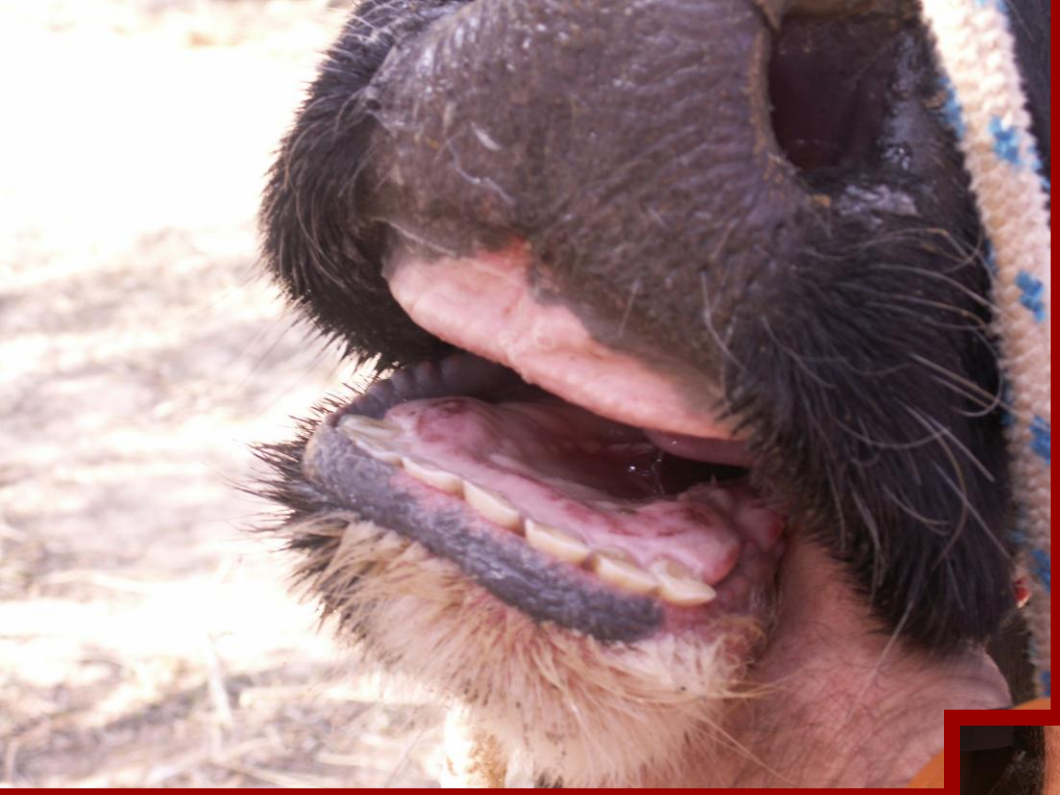
Different manifestations in different BTV-types infectious sites in Israel

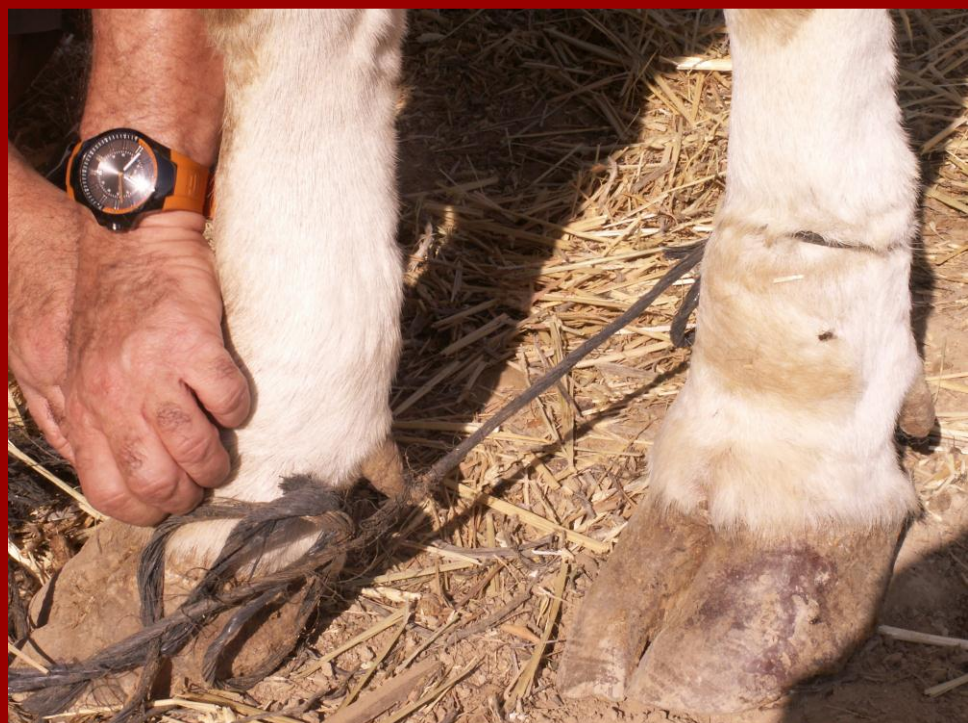
Cow: BTV24 BT/EHD systemic disease syndrome



BTV 24

BTV 24





BTV 24

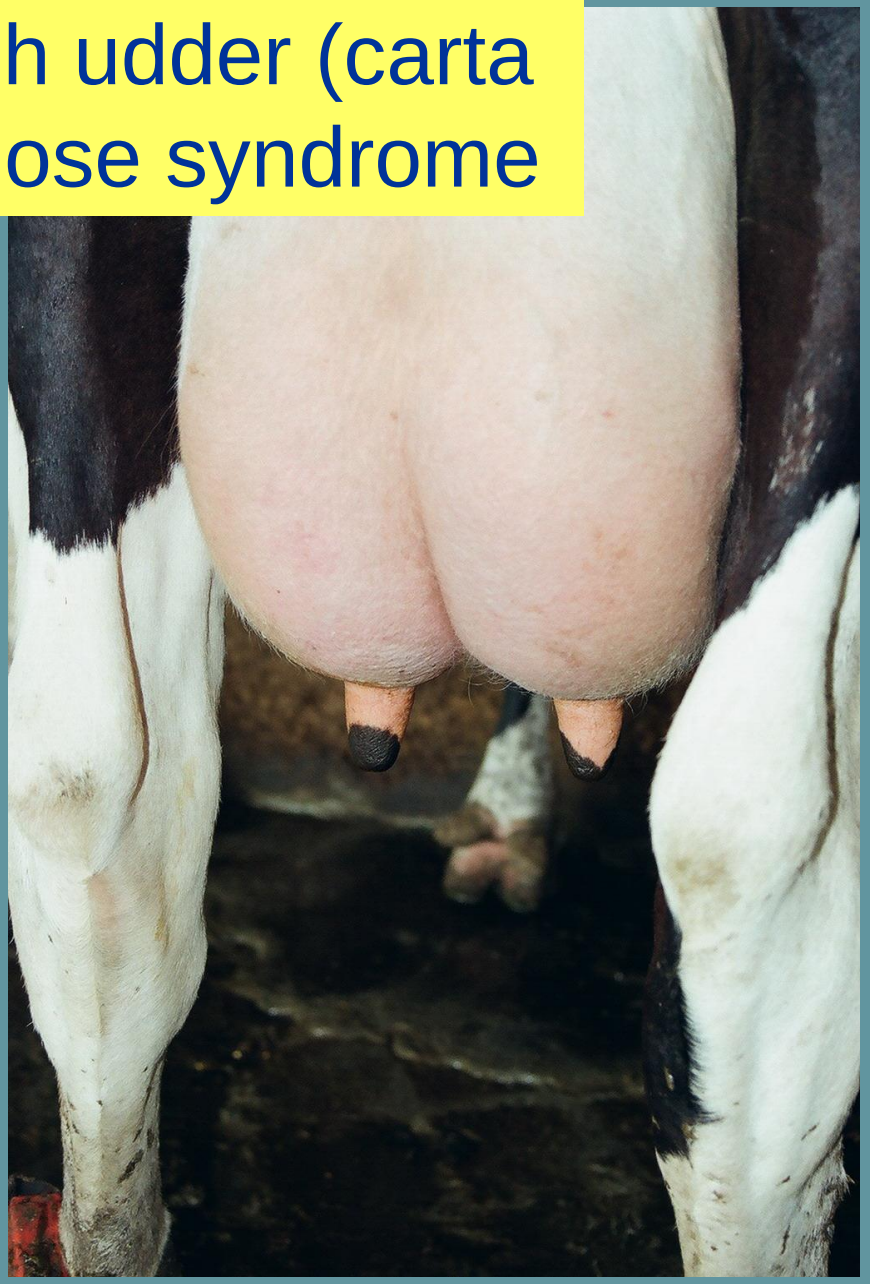
Cow: BTV8, BTV4 BT-post severe pleuropneumonia syndrome ?

Sore nose syndrome

Maladjustment (disadatto) syndrome

36 NATI DI VACCHE DI PRIMO PARTO; DI LORO 20 MORTI AL ETA DI 12-48 ORE

Red/rough udder (carta vetrata) nose syndrome



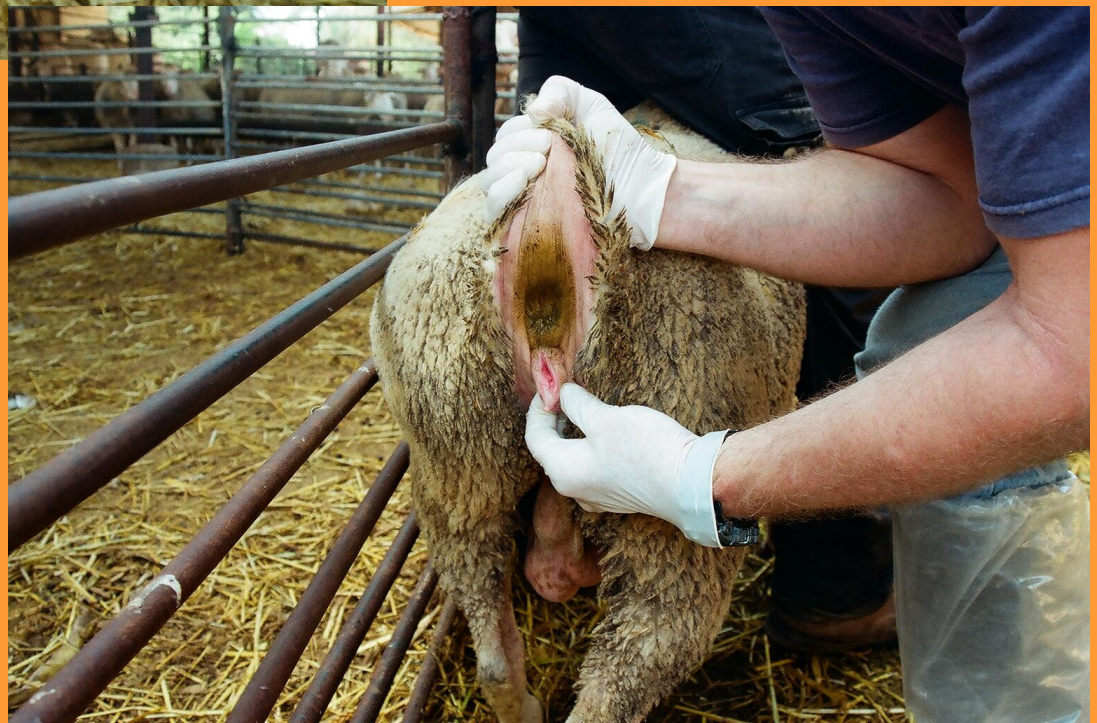
Fot rot-like syndrome

BTV24

BTV24

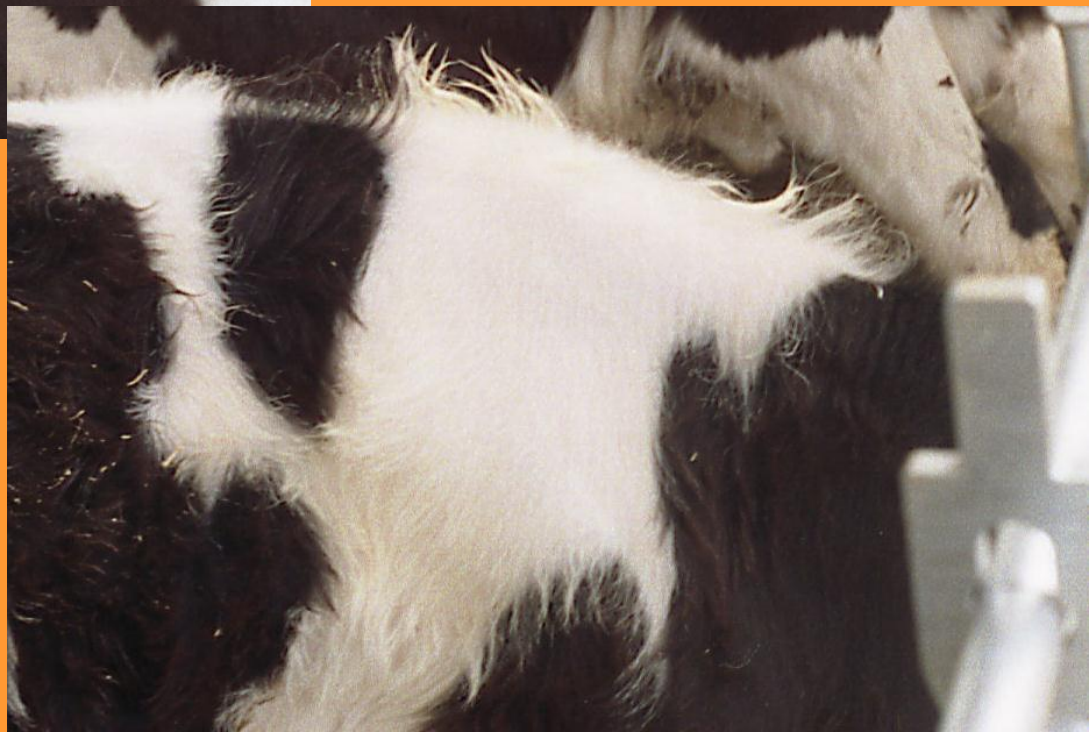
Animali vaccinati !!!

BTV4



BTV8

BTV8




BTV8

ovino BTV4

caprino BTV16

Holzhauer & Vos. 2009. “Blue eye” in newborn calves associate with BT infection. EHD viruses. Vet Rec 164: 403-404.

Blue eye: syndrome (CIECHI) BVT4

No eye BVT4

White eye syndrome BVT? NON SOLO

Renolds, Schmidz, Mattson, pielstick, Leudke 1985. “white eye calf’ syndrome in Oregon associate with Bt and EHD viruses. ” Prog. Clin Biol. Res 178:67-69

White eye syndrome BVT? NON SOLO

Figure 1: Comparison of Seg-2 nucleotide sequence of BTV-16 from Israel in 2008 (ISR2008/03): comparison to 25 BTV reference strains

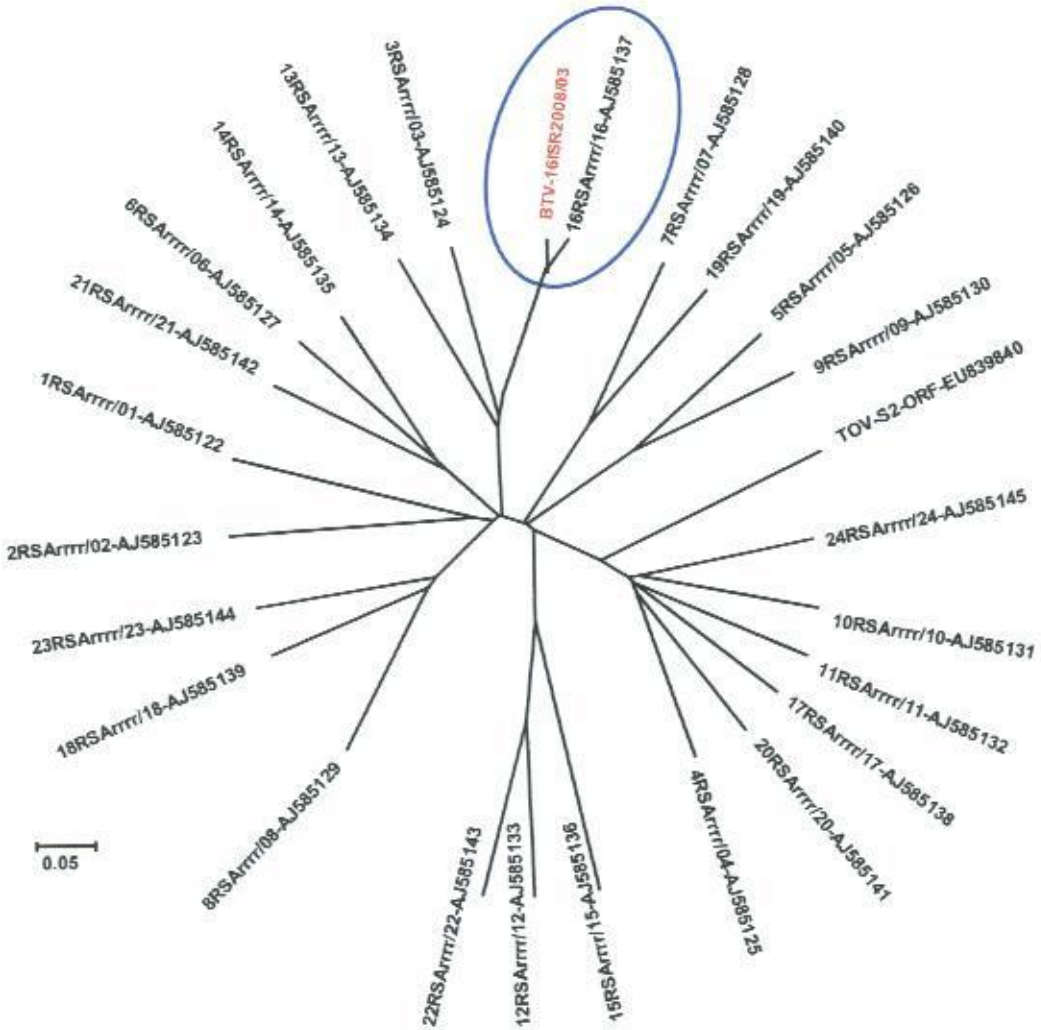


Figure 1: Comparison of Seg-2 nucleotide sequence of BTV-4 from Israel in 2008 (ISR2008/04): comparison to 25 BTV reference strains

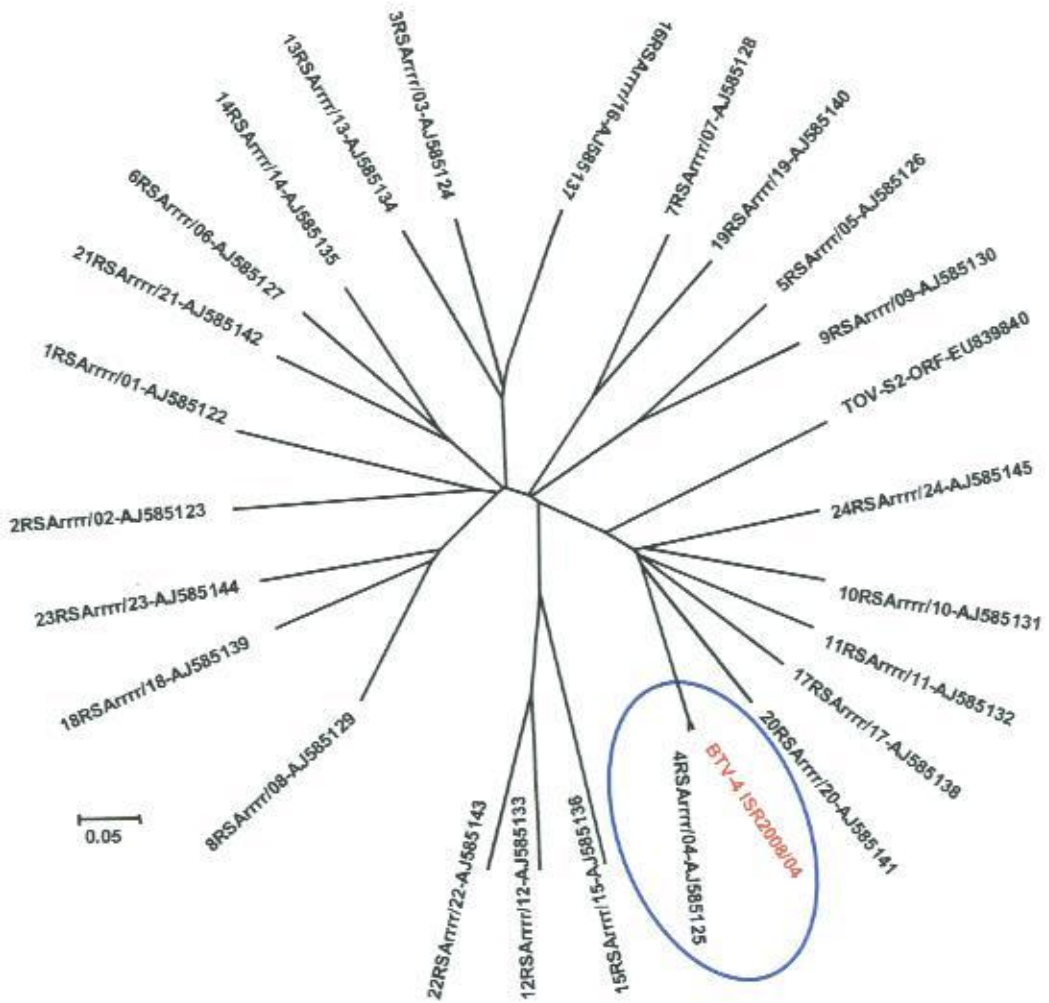


Figure 1: Comparison of Seg-2 nucleotide sequence from BTV-8 from Israel in 2008 (ISR2008/13): comparison to the 25 BTV reference strains

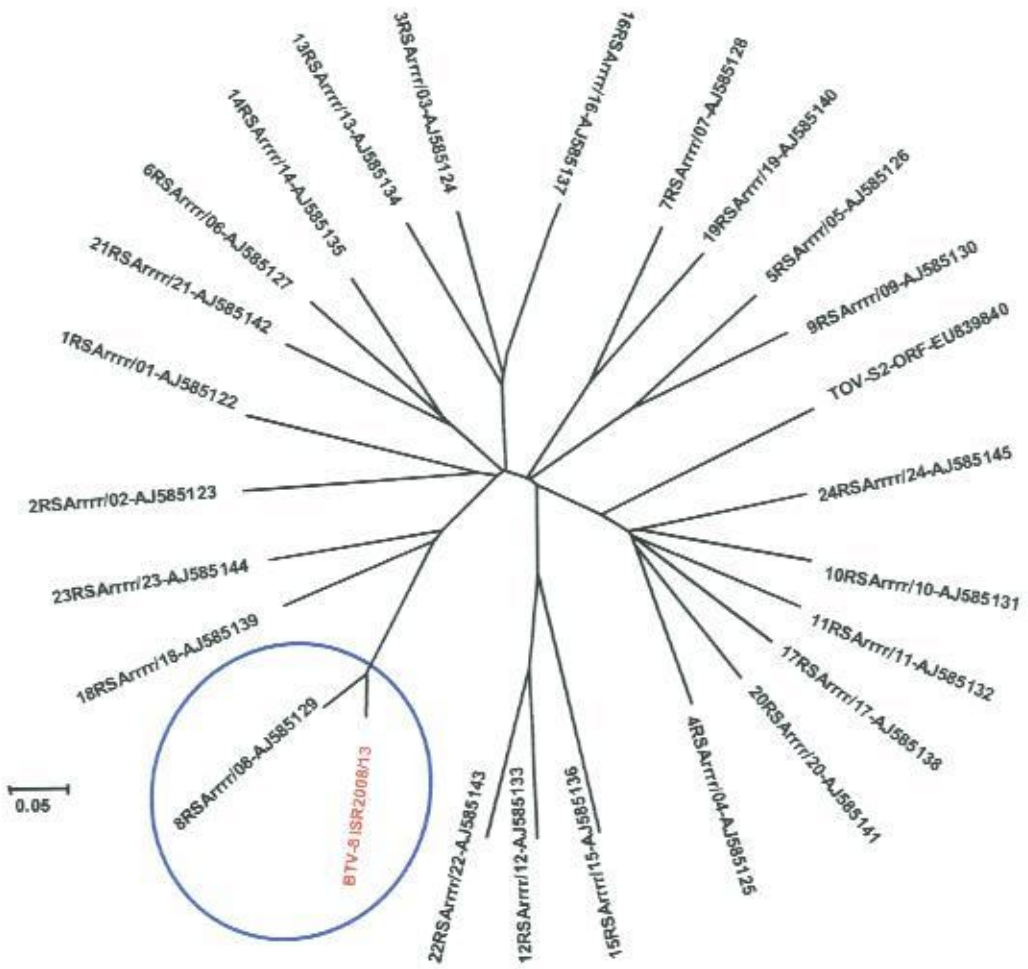


Figure 1: Comparison of Seg-2 nucleotide sequence of BTV-24 from Israel in 2008 (ISR2008/05): comparison to 25 BTV reference strains

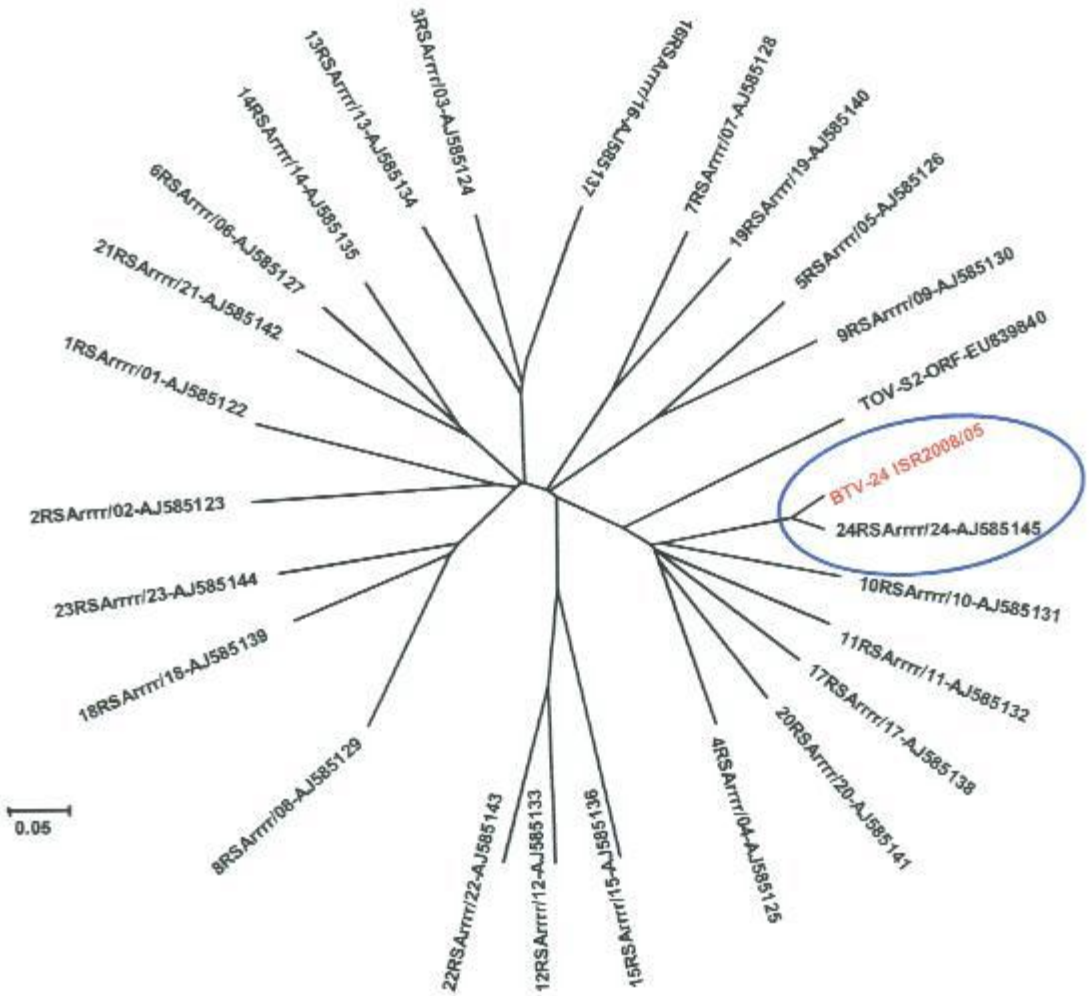
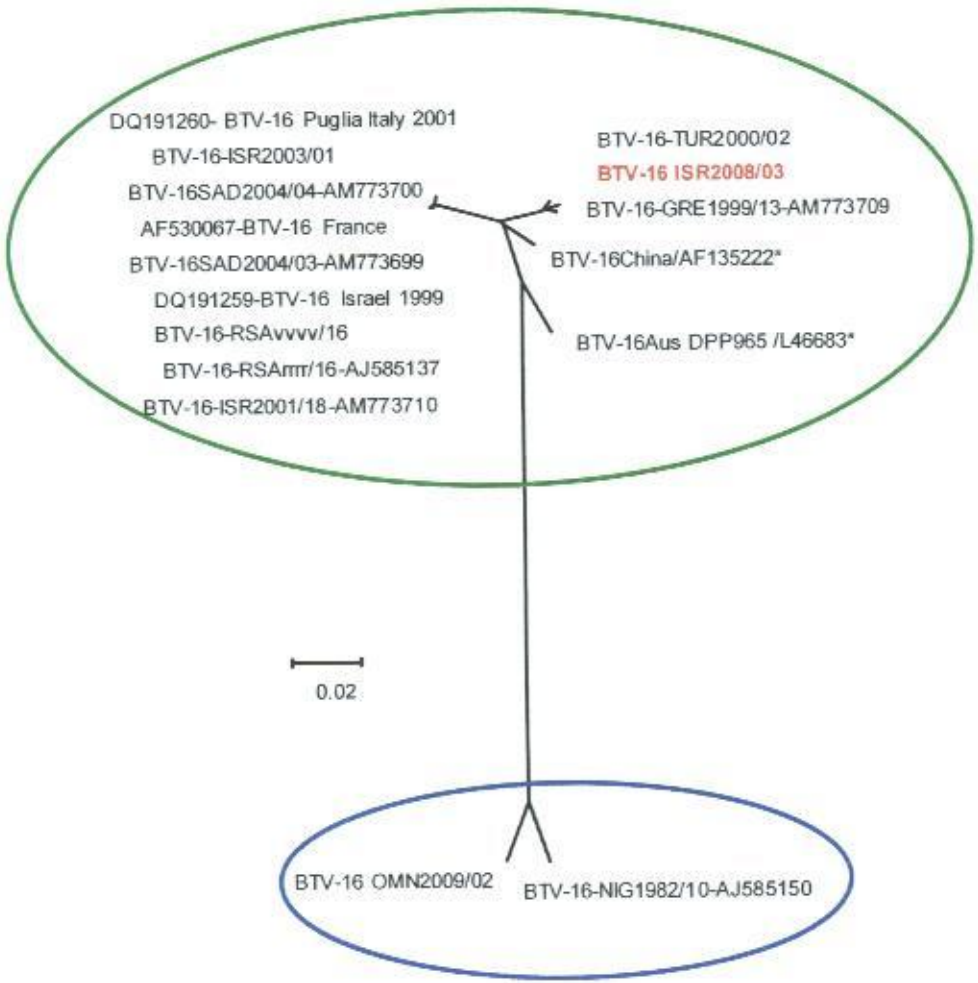
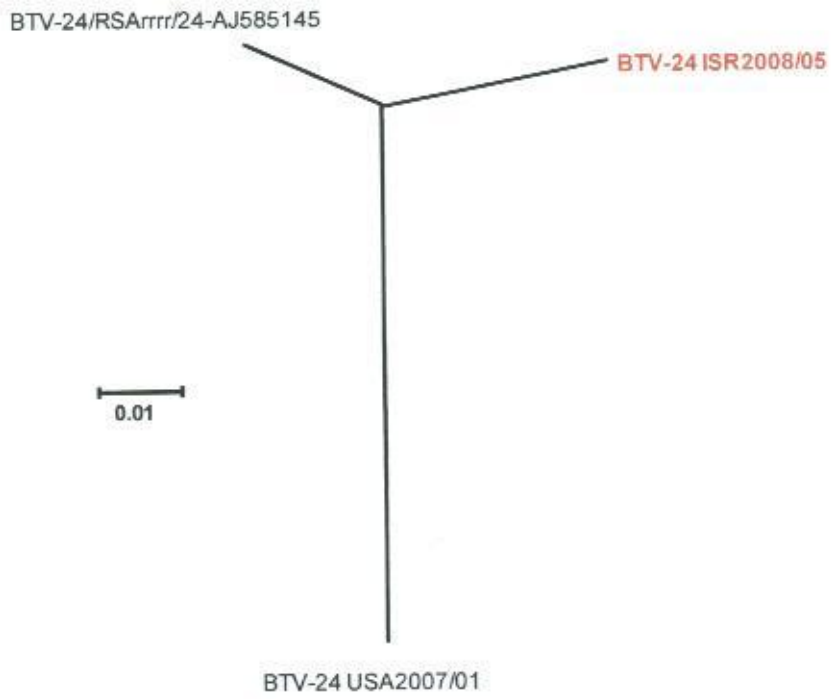


Figure 2: Comparison of Seg-2 nucleotide sequence of BTV-16 from Israel in 2008 (ISR2008/03), to other strains of BTV-16.



Blue oval represents western group and the green oval represents eastern group

Figure 2: Comparison of Seg-2 nucleotide sequence of BTV-24 from Israel in 2008 (ISR2008/05), to other strains of BTV-24.



All virus isolates in this analysis belong to western group; no sequence data or eastern virus isolates of BTV-24 were available for comparison.

Figure 2: Comparison of Seg-2 nucleotide sequence of BTV-4 from Israel in 2008 (ISR2008/04), to other strains of BTV-4.

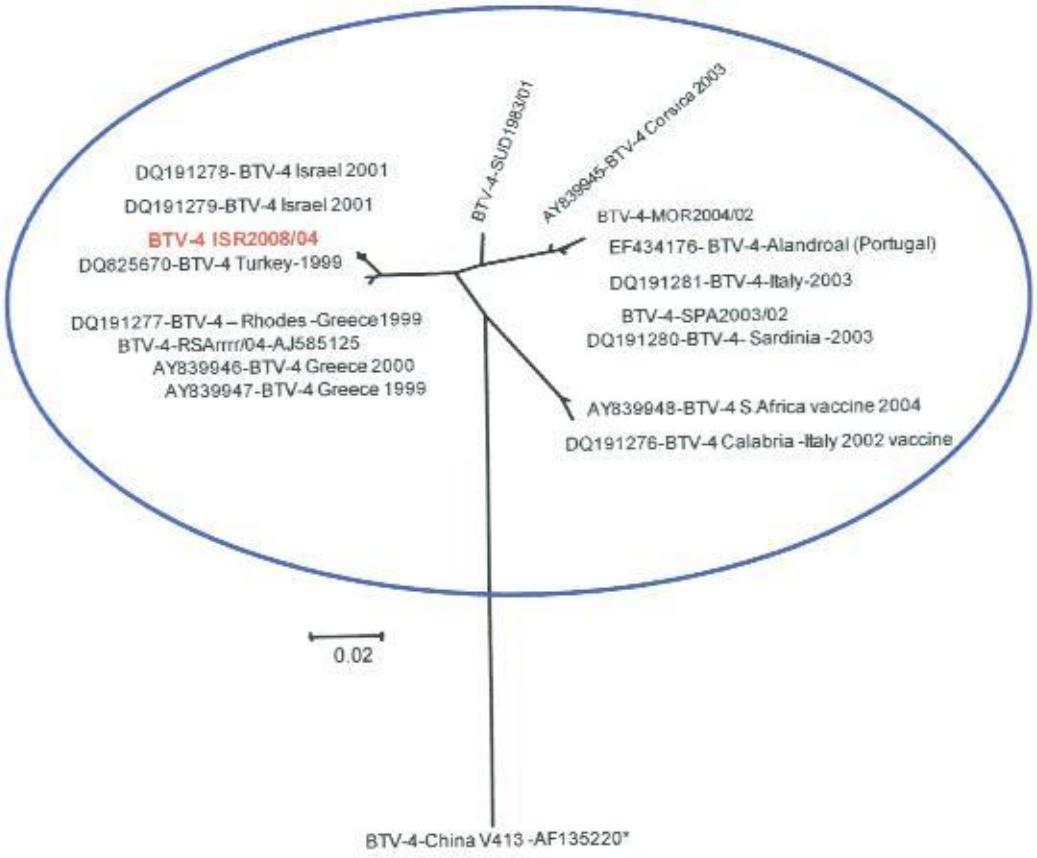


Figure 2: Comparison of Seg-2 nucleotide sequence of BTV-8 from Israel in 2008 (ISR2008/13), to other strains of BTV-8.