

How can BVDV and other extraneous agents end up into bovine serum?

Paul Becher

Institute of Virology

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Bovine Serum, particularly FBS

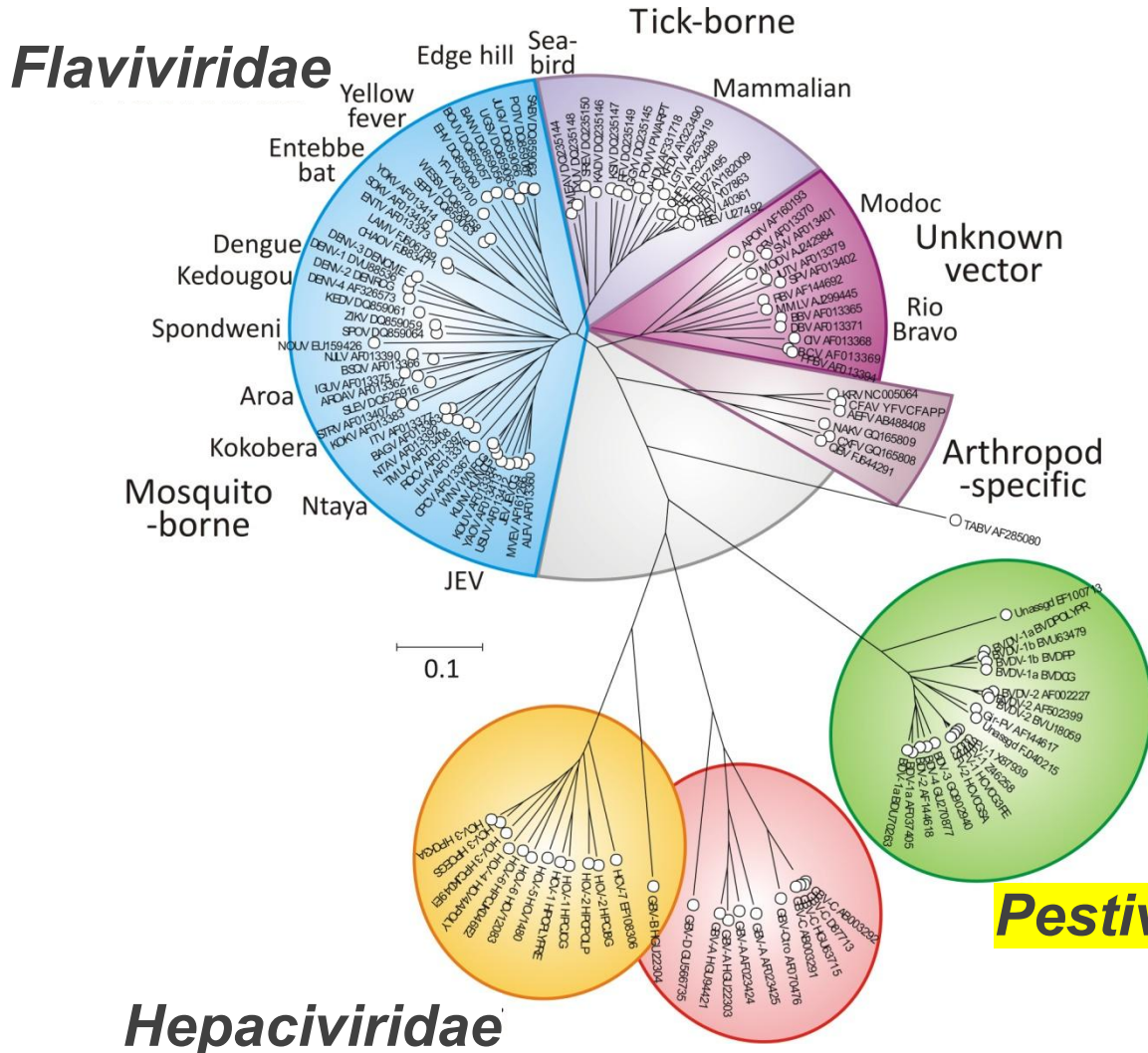
- unique growth-promoting properties for a wide range of viruses and other microorganisms
- is used in research and manufacturing of biomedical products
- **Major source of contamination of bovine serum are viruses that can be transplacentally transmitted to the fetus (most illustrative example: BVDV)**
- **Contamination of bovine serum by BVDV, BVD-associated viruses and several other viruses has resulted in contamination of biological products that use FBS in production, including vaccines for animal and human use.**

Contamination of bovine serum with viruses

- **Bovine viral diarrhea virus (BVDV-1, -2, other pestiviruses)**
- Bovine herpesvirus-1 (BHV-1)
- Parainfluenzavirus-3
- Bluetongue virus (BTV)
- Bovine enterovirus-type 4
- Bovine parvovirus
- Bovine polyomavirus
- Bovine hepacivirus
- Bovine pegivirus
- Schmallenberg virus (SBV)
- HPAIV H5N1
- **other known viruses**
- **and unknown viruses**

This list is not complete!

BVDV: Taxonomy



Order: Amarillovirales

Family **Pestiviridae**
Genus **Orthopestivirus**

Family **Flaviviridae**

Family **Hepaciviridae**

Bovine viral diarrhea virus (BVDV)

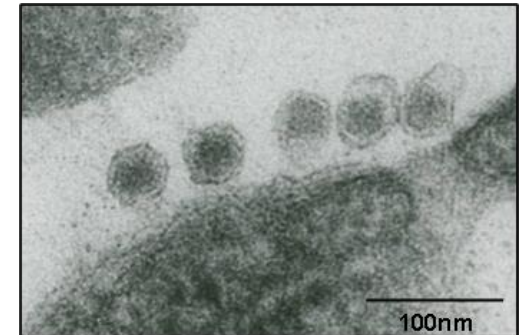
Family *Pestiviridae* (belonging to the order *Amarillovirales*)

Genus *Orthopestivirus*

Species	<i>Orthopestivirus bovis</i>	Bovine viral diarrhea virus-1	BVDV-1
	<i>Orthopestivirus tauri</i>	Bovine viral diarrhea virus-2	BVDV-2
	<i>Orthopestivirus suis</i>	Classical swine fever virus	CSFV
	<i>Orthopestivirus ovis</i>	Border Disease Virus	BDV
	<i>Orthopestivirus brazilense</i>	Hobi-like pestivirus	(BVDV-3)
	<i>Orthopestivirus aydinense</i>	Aydin-like pestivirus	

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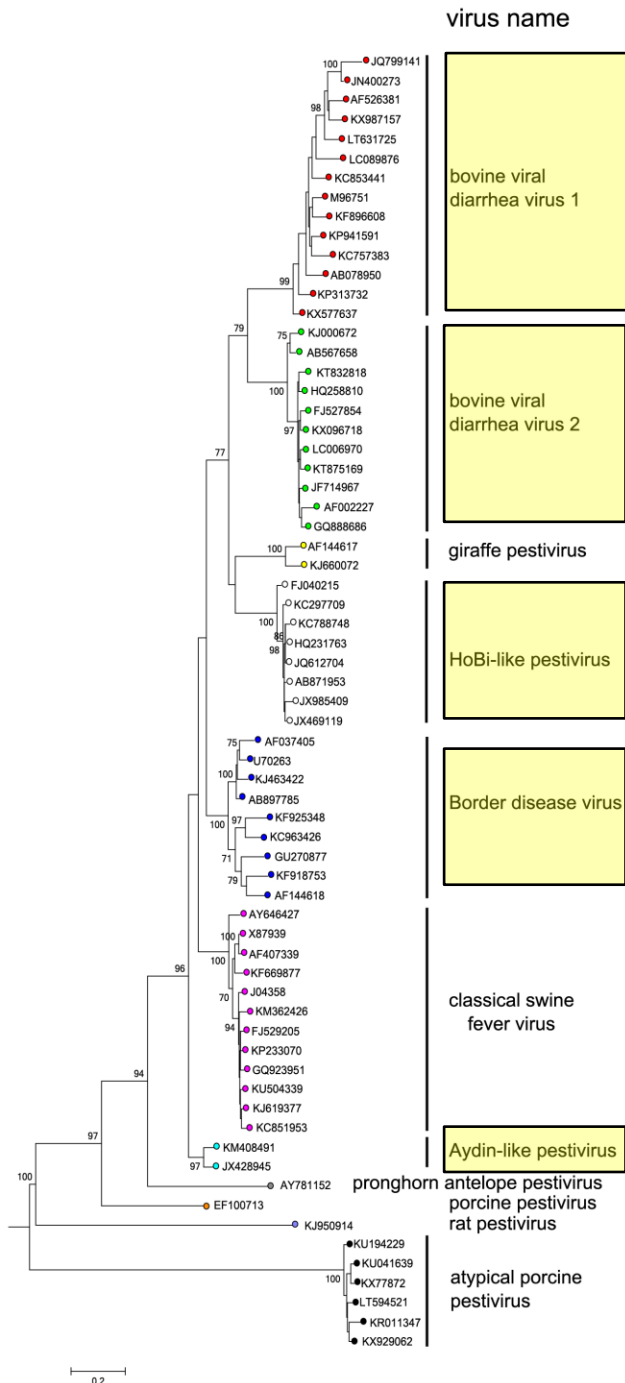
Genome: ss (+) RNA
small enveloped viruses
capsid protein C and
three envelope glycoproteins



(Stefanie Schmeiser, Hannover)



structural proteins



Pestiviruses infecting cattle

At least five different pestivirus species can infect cattle and cause intrauterine infections.

Different prevalences of these pestiviruses in different countries

BVDV control/ eradication programs in some countries. However, no control of the other ruminant pestiviruses!

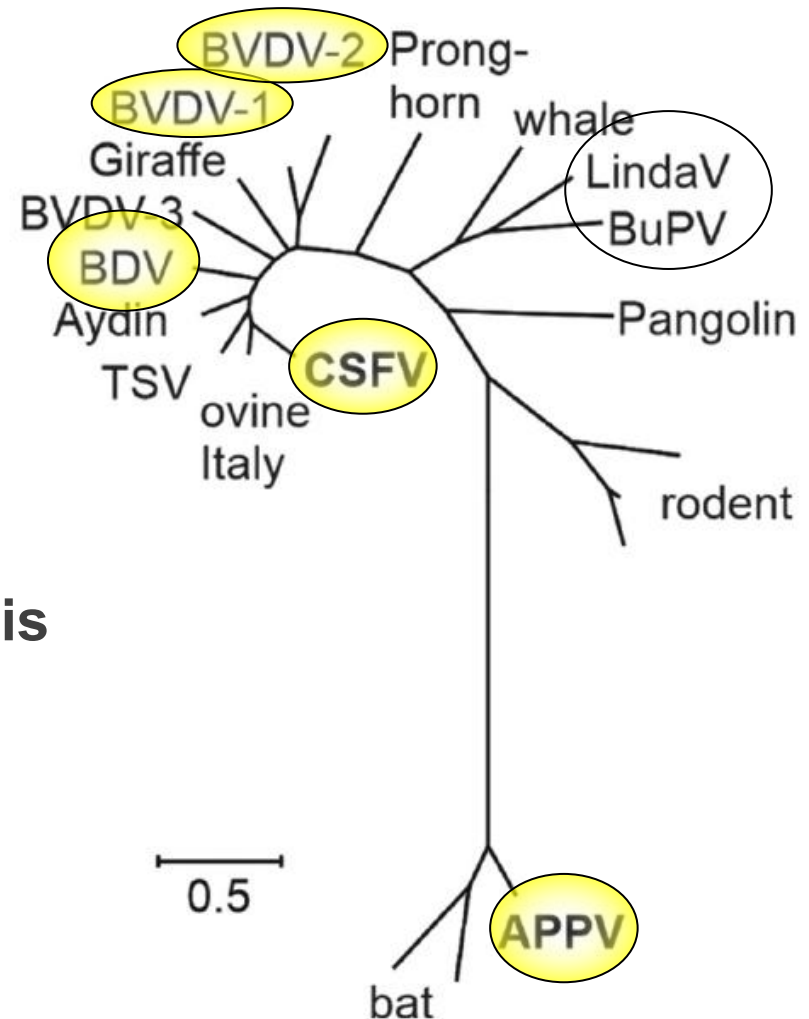


Risk assessment and testing should not only cover BVDV, but also other ruminant pestiviruses.

Contamination of vaccines with BVDV and other pestiviruses - Consequences

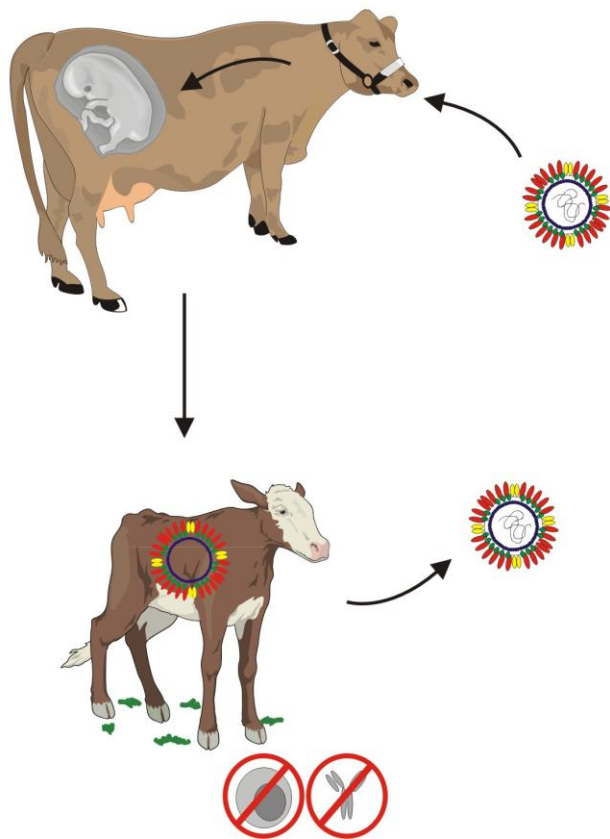
1. Disease in vaccinated animals

2. Cross-reacting antibodies in pigs -> interference with CSF diagnosis



How can BVDV end up into bovine serum?

-> Establishment of persistent infections



infection during pregnancy
with noncp BVDV

⇒ viremia (cow)

⇒ diaplacental infection (fetus)

during days 40 - 125 of gestation

⇒ **persistent infection**

⇒ **acquired immunotolerance**

**persistently infected calf
(p.i. animal)**

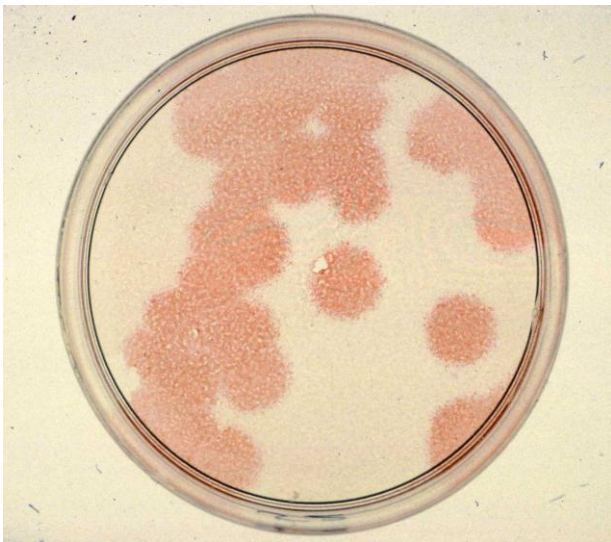
may be clinically unaffected



BVDV: Two Biotypes

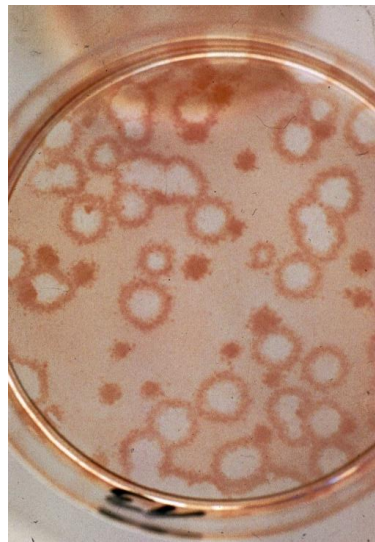
- BVDV field strains are usually noncp.
- Viral genome load in serum of PI animals: 2.2×10^6 - 7.4×10^8 per ml
ACTA VET. BRNO 2019, 88: 361–367; <https://doi.org/10.2754/avb201988040361>
- cp BVDV arise spontaneously in animals persistently infected with noncp BVDV and cause fatal Mucosal disease.

PI animals



noncp BVDV

animals with Mucosal Disease



virus pair
noncp + cp BVDV



cp BVDV

BVD Diagnosis

Virus Detection

- Virus isolation in cell culture followed by IF
- RT-PCR, real time RT-PCR (highest sensitivity)
- Antigen-capture-ELISA

**-> Many sensitive methods are available to detect BVDV.
Some do not detect other ruminant pestiviruses.**

Epidemiology and Control of BVDV

Worldwide distribution

Control of BVDV can be achieved at herd and national level;
Key: detection and elimination of PI animals

Progress towards eradication of BVDV in many European countries

Bluetongue Virus

Family *Reoviridae*, Genus *Orbivirus*

Species *Bluetongue virus (BTV)*

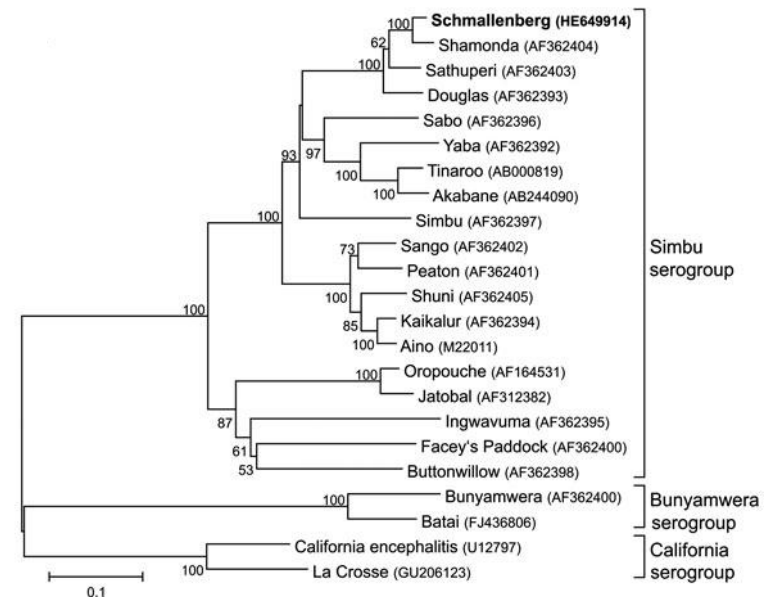
ds RNA, 10 segments, >27 serotypes

- Arbovirus, transmitted by midges
- Hosts: cattle, sheep, goat, other ruminants, camelids
- Africa, North- and Central America, Asia, Australia, Europe
- can cause intrauterine infections, abortions, congenital disorders

Schmallenberg Virus (SBV)

Family *Peribunyaviridae*,
Genus *Orthobunyavirus*

(-)ss RNA, 3 segments



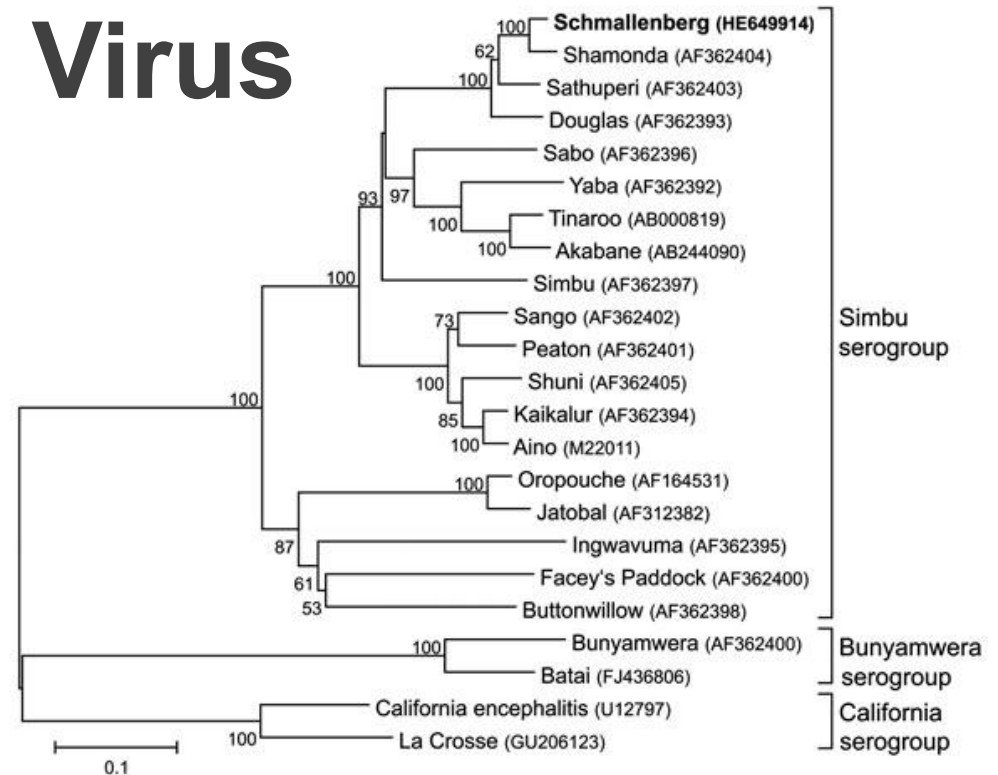
- Arbovirus, transmitted by blood-suckling insects
- Hosts: cattle, sheep, goats, other ruminants, camelids
- First detected in Germany in 2011, followed by rapid spread to large parts of Europe
- Infections of cattle during days ~75 to ~175 of pregnancy can cause intrauterine infections and damage of the fetus

Shamonda-like Virus

Family *Peribunyaviridae*,
Genus *Orthobunyavirus*

(-)ss RNA, 3 segments

**First detected
in Europe in
August 2026**



- Arbovirus, transmitted by blood-suckling insects
- Hosts: cattle, horses, sheep, goats
- First cases in Summer 2026: Switzerland, Germany, France, and spread to other countries in Europe
- Intrauterine infection of the bovine fetus (personal comm.)

Contamination of bovine serum with viruses

- **Bovine viral diarrhea virus (BVDV-1, -2, other pestiviruses)**
- Bovine herpesvirus-1 (BHV-1)
- Parainfluenzavirus-3
- **Bluetongue virus (BTV)**
- Bovine enterovirus-type 4
- Bovine parvovirus
- Bovine polyomavirus
- Bovine hepatitis virus, bovine pegivirus,
- **Schmallenberg virus (SBV)**
- **Shamonda-like bunyavirus**
- HPAIV H5N1
- **other known and unknown virus**

This list is not complete!

The application of advanced molecular methods for virus testing in starting materials and finished products enables the detection of both known and unknown viruses.

Thank you for your attention



Selected References

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