

# Intranasal vaccination of calves at day of birth with a live attenuated vaccine against BRSV and BPIV3 and a live attenuated vaccine against respiratory coronavirus

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## INTRODUCTION

Bovine Respiratory Disease (BRD) is a major cause of calfhood mortality.

Main viral pathogens:

- ▶ Bovine Respiratory Syncytial Virus (BRSV)
- ▶ Bovine Parainfluenza 3 Virus (BPIV3)
- ▶ Bovine Corona Virus (BCoV)

Partial protection of newborn calves is commonly provided by colostrum, but the importance of active vaccination as additional preventive measure is undoubted.

## OBJECTIVE

To investigate safety and efficacy of a commercial intranasal live BRSV-BPIV3 combination vaccine and a intranasal live BCoV vaccine in calves at day of birth.

## MATERIALS AND METHODS

Four studies in colostrum deprived calves – see table 1 for study design

**Vaccines:**

- ▶ Bovilis® INtranasal RSP™ Live (MSD Animal Health)
- ▶ Bovilis® Nasalgen®-C (MSD Animal Health)

**Parameters:**

- ▶ Adverse effects after vaccinations
- ▶ Clinical disease after challenge infection
- ▶ Virus specific RNA in samples (nasal swabs, rectal swabs (only study 4))
- ▶ Lung lesions (only study 2)

## Vaccination of calves at day of birth:

- ▶ No noteworthy adverse events
- ▶ Protective immune response against BRSV, BPIV3 and BCoV challenge
- ▶ Lower clinical scorings
- ▶ Significantly reduced amount of viral RNA in swab samples



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## RESULTS

- ▶ Only few mild symptoms post vaccination (Table 2) → vaccines very well tolerated
- ▶ After challenge infection scores for upper respiratory tract disease in vaccinates lower than in controls [differences notable, but not significant] (Fig 1)
- ▶ Lung consolidation scores after BRSV challenge notably (not significantly) lower in intranasally vaccinated animals (Fig 2)
- ▶ Virus load in nasal swabs significantly lower in the intranasal vaccinates (all three challenges) (Fig 3 a-c)
- ▶ BCoV virus load in rectal swab samples significantly lower in vaccinates (Fig 3d)

TABLE 1. Overview study design

Study / Group	Number of animals	Vaccination			Challenge	
		Study day	Vaccine	Route	Study day	Virus
Safety study						
1	10*	D0	BRSV/BPIV3 + BCoV	IN		Not challenged
Efficacy studies						
2 A	6		Not vaccinated		D 6	BRSV
2 B	6**	D0	BRSV/BPIV3	IN		
2 C	5			Oral		
3 A	5		Not vaccinated		D 7	BPIV3
3 B	5	D0	BRSV/BPIV3	IN		
4 A	5		Not vaccinated		D 5	BCoV
4 B	5	D0	BCoV	IN		

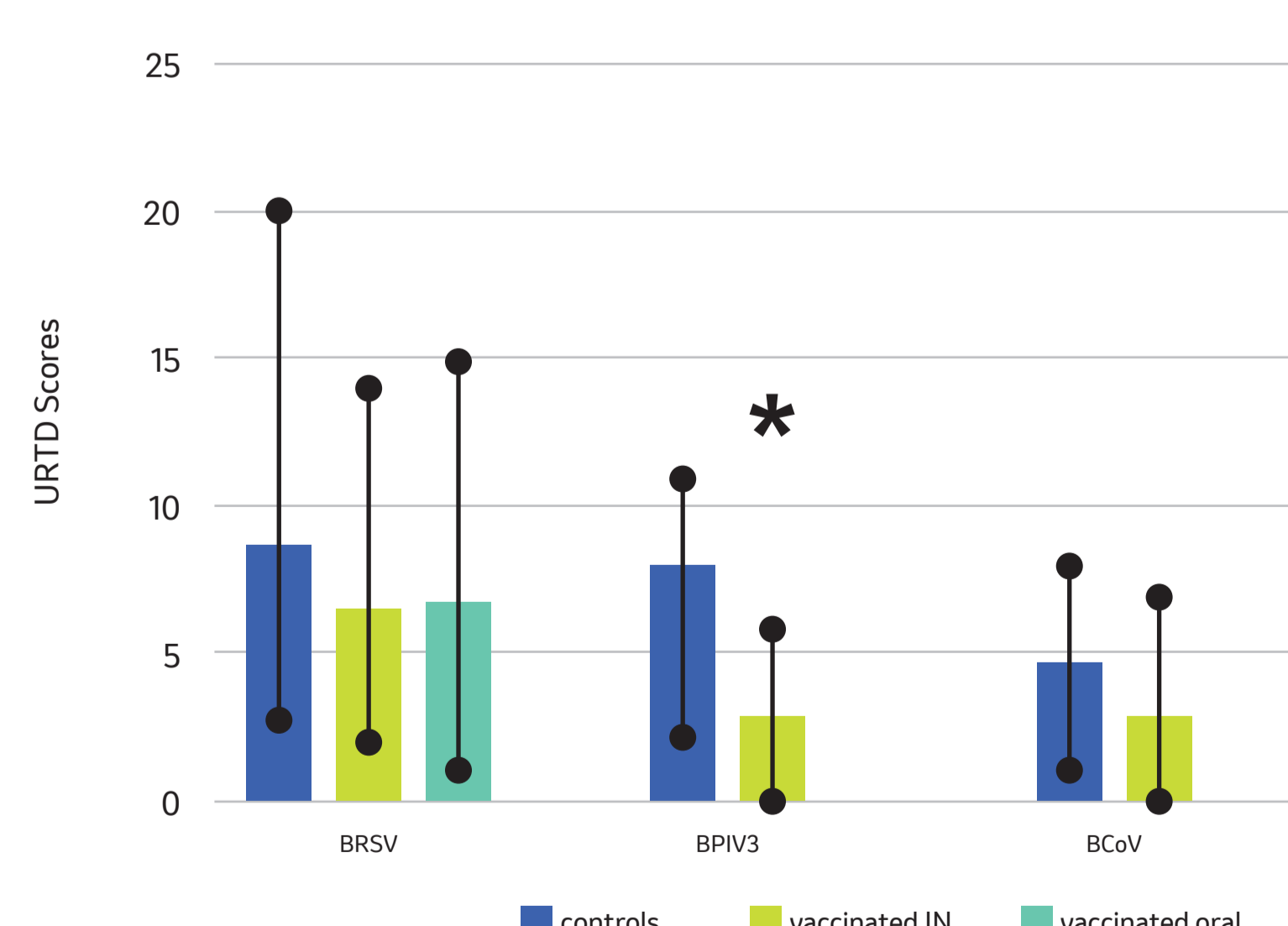
\* Two animals excluded from study because they were positive for BRSV or BCoV specific antibodies and / or RNA prior to vaccination  
\*\* One animal excluded from study because of maternal antibodies

TABLE 2. Average clinical scores and rectal temperatures with ranges in study 1

Parameter	10x Max dose		Repeated dose	
	Average	Range	Average	Range
General impression	0.14	0-0.6	0.07	0-0.4
Appetite	0.16	0-0.6	0.03	0-0.3
Nasal discharge	0.05	0-0.3	0.01	0-0.1
Ocular discharge	0	0-0	0	0-0
Coughing	0	0-0	0	0-0
Breathing	0.09	0-0.7	0.03	0-0.3
Feces	0.2	0-0.5	0.01	0-0.1
Number of days with pyrexia*	1.4	0-4	0.8	0-3
Temperature [°C]	39.7	39.3 – 40.5	39.5	39.0 – 40.2

\*: rectal temperature above 39.5°C

FIGURE 1. Scores of upper respiratory tract disease after challenge infection six (BRSV, study 2), seven (BPIV3, study 3) and five (BCoV, study 4) days post vaccination.



The columns represent the average value per group and the bars mark the minimal and maximal value per group. \* significant reduction

FIGURE 2. Extent of gross pneumonic consolidation 14 days post BRSV challenge expressed as percentage affected area per lung lobe

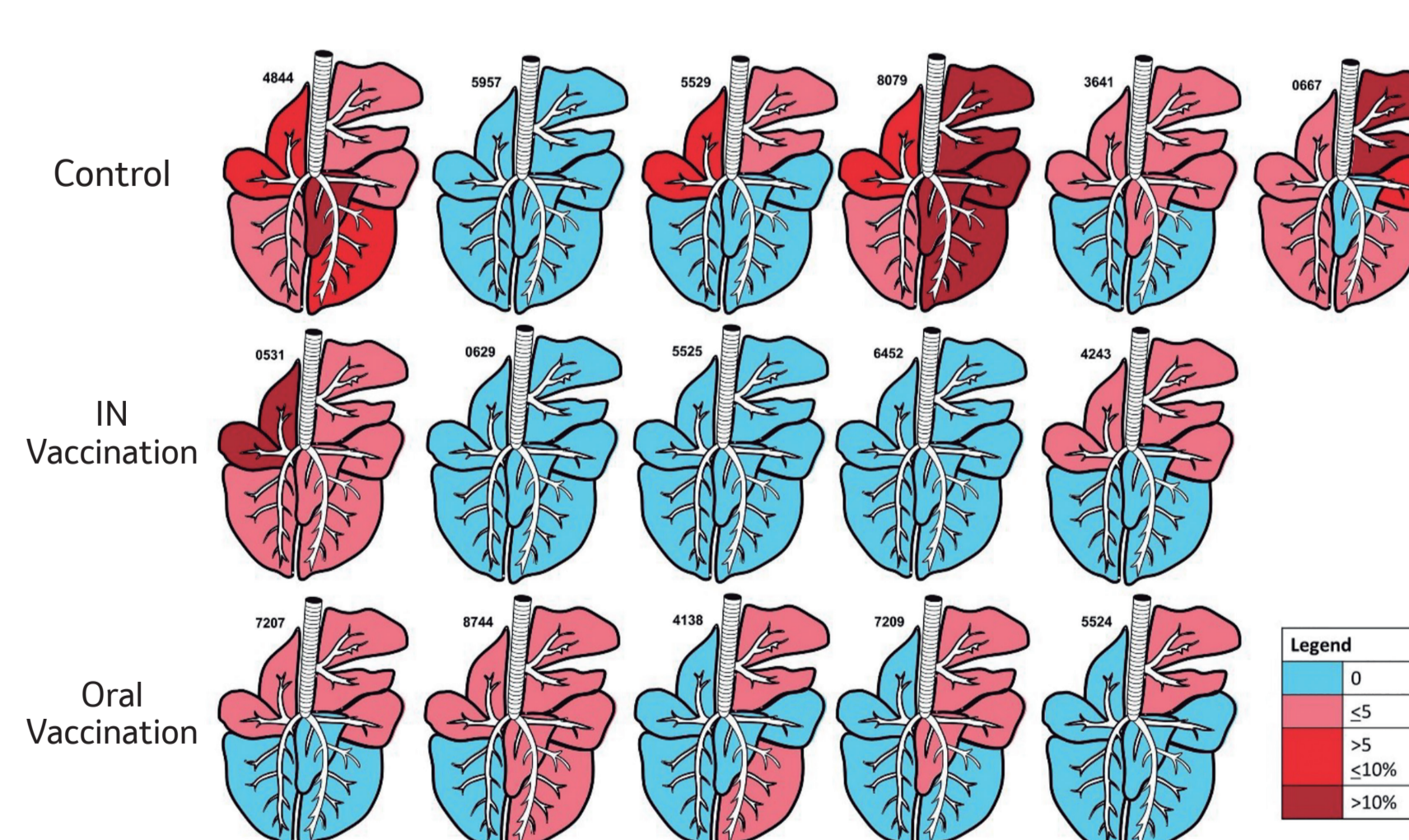
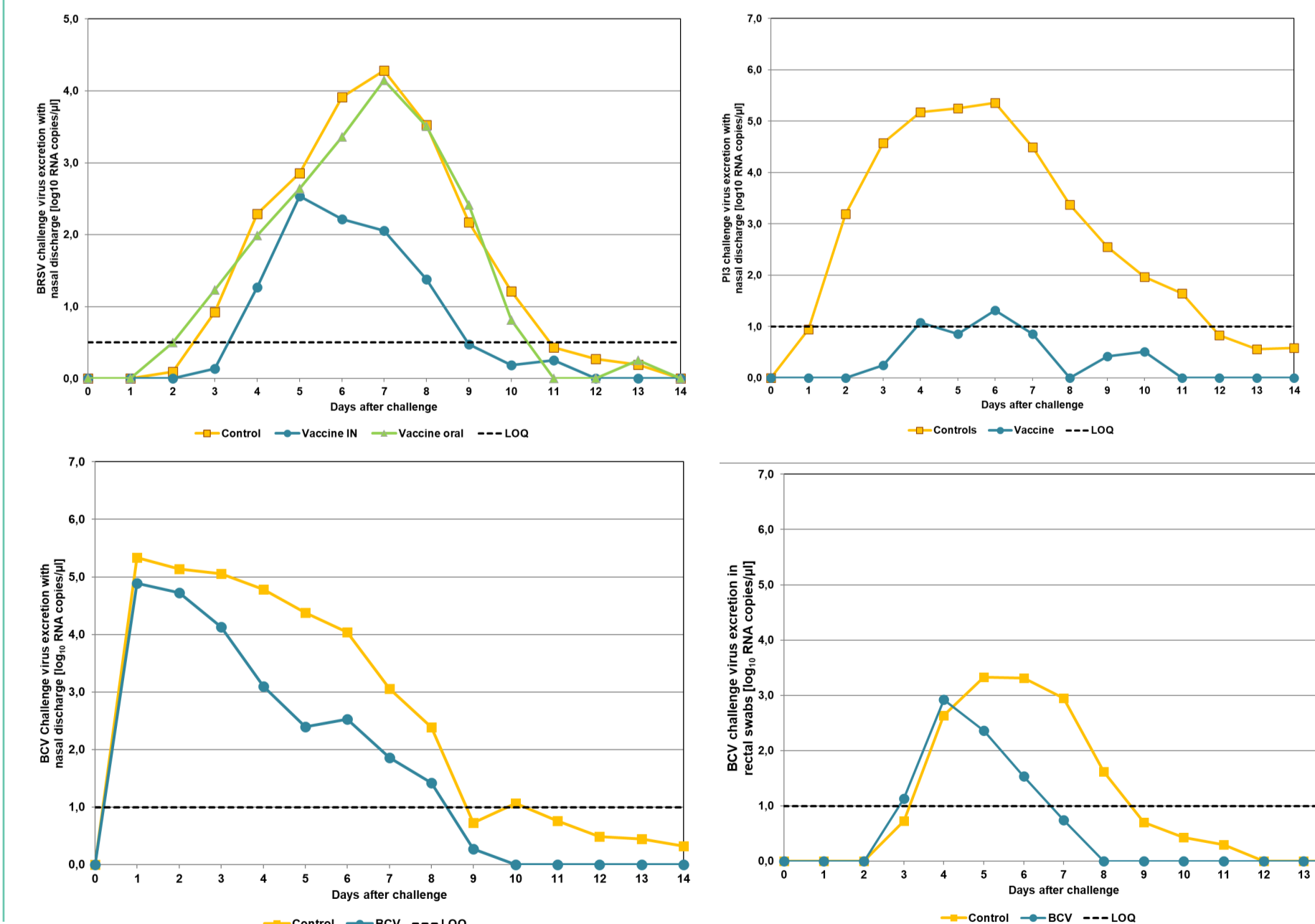


FIGURE 3. Group average of BRSV (a), BPIV3 (b) and BCoV (c) challenge virus in nasal (a-c) or rectal (d) swabs at different sampling times



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## REFERENCES

- ▶ Mark H. van Rooij, Mélodie Schmitz, Joris M.H. Meessen, Pieter A.W.M. Wouters, Mieke P. Vrijenhoek, Birgit Makoschey. 2023. Vaccination of calves at day of birth with attenuated vaccines against bovine respiratory syncytial virus, bovine parainfluenza type 3 virus and respiratory bovine coronavirus. Veterinary Vaccine, Volume 2, Issue 1. <https://doi.org/10.1016/j.vetvac.2023.100014>.

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