A bovine respiratory syncytial virus model with high clinical expression in calves with specific passive immunity

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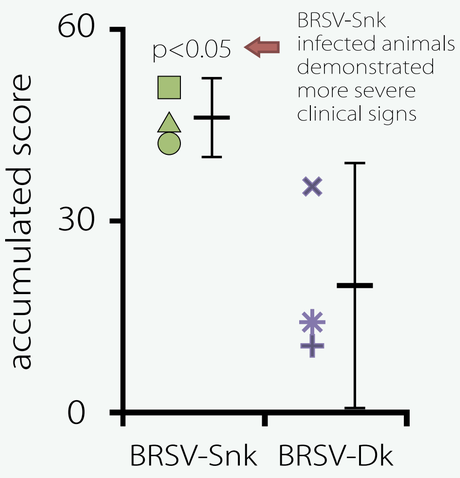
- Bovine respiratory syncytial virus (BRSV) is a highly prevalent virus worldwide with high economical impact and a negative effect on animal welfare, by causing enzootic calf pneumonia.
- There is no fully effective commercial vaccine against BRSV, with long protective duration in colostrum fed calves.
- Most published BRSV infection models demonstrate insufficient clinical signs to evaluate new vaccine candidates, or to study basic mechanisms of BRSV infection.
- Here, models from two laboratories (SLU/HPIG & Pirbright Institute) were combined and the robustness of the integrated model was evaluated.

Study 1: infecting calves with one of two virulent inocula

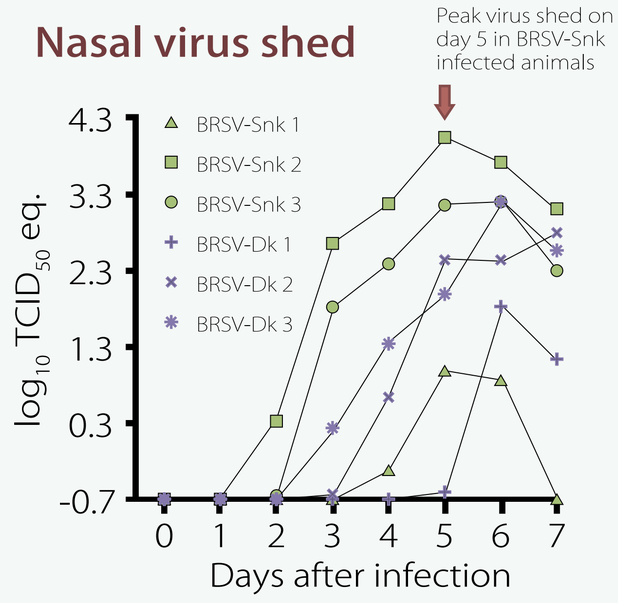
Methods, study 1

Six calves with low levels of anti-BRSV serum antibodies were inoculated by inhalation of aerosolized virulent BRSV, passaged either in vivo (BRSV-Snk) or in vitro (BRSV-Dk), and monitored for seven days.

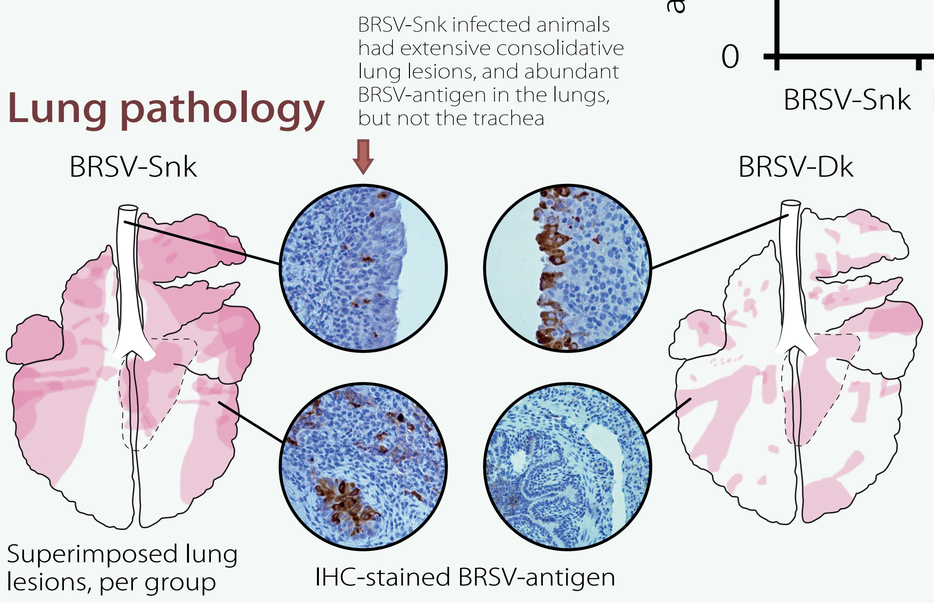
Clinical signs



Nasal virus shed



Lung pathology



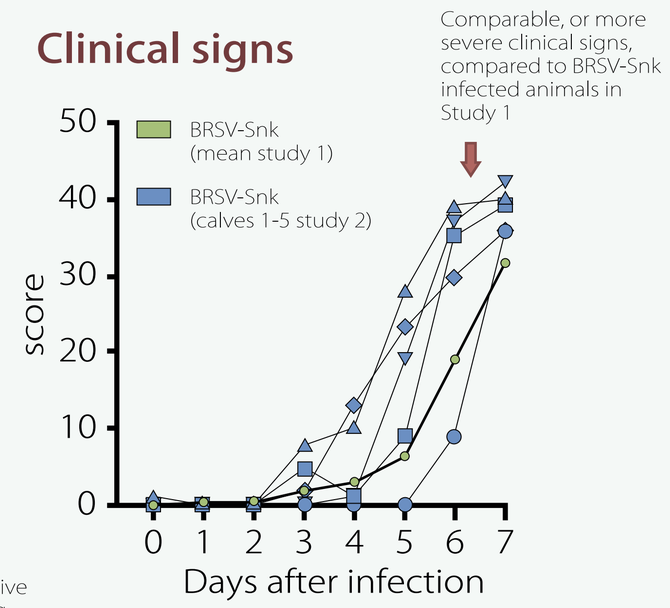
Aerosol inoculation with virulent BRSV passaged in vivo (BRSV-Snk) produced severe BRSV-specific clinical signs and lung pathology, along with high amounts of shed virus, in the upper and lower airways of infected calves.

Study 2: reproducing results with BRSV-Snk inoculum

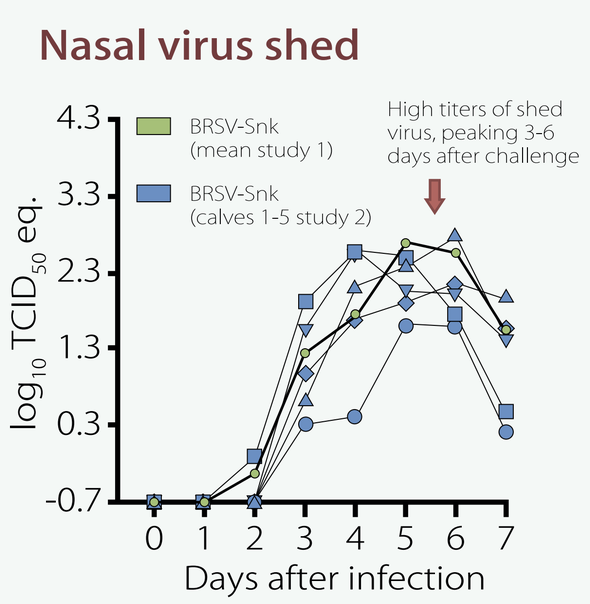
Methods, study 2

Five calves with moderate levels of anti-BRSV serum antibodies were inoculated by inhalation of aerosolized virulent BRSV, passaged in vivo (BRSV-Snk), and monitored for seven days. An additional three uninfected calves were sampled identically, including bronchoalveolar lavage.

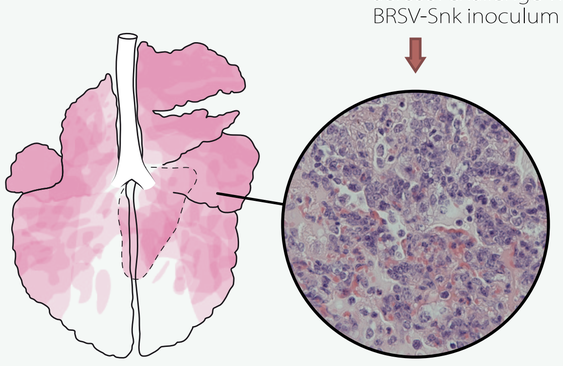
Clinical signs



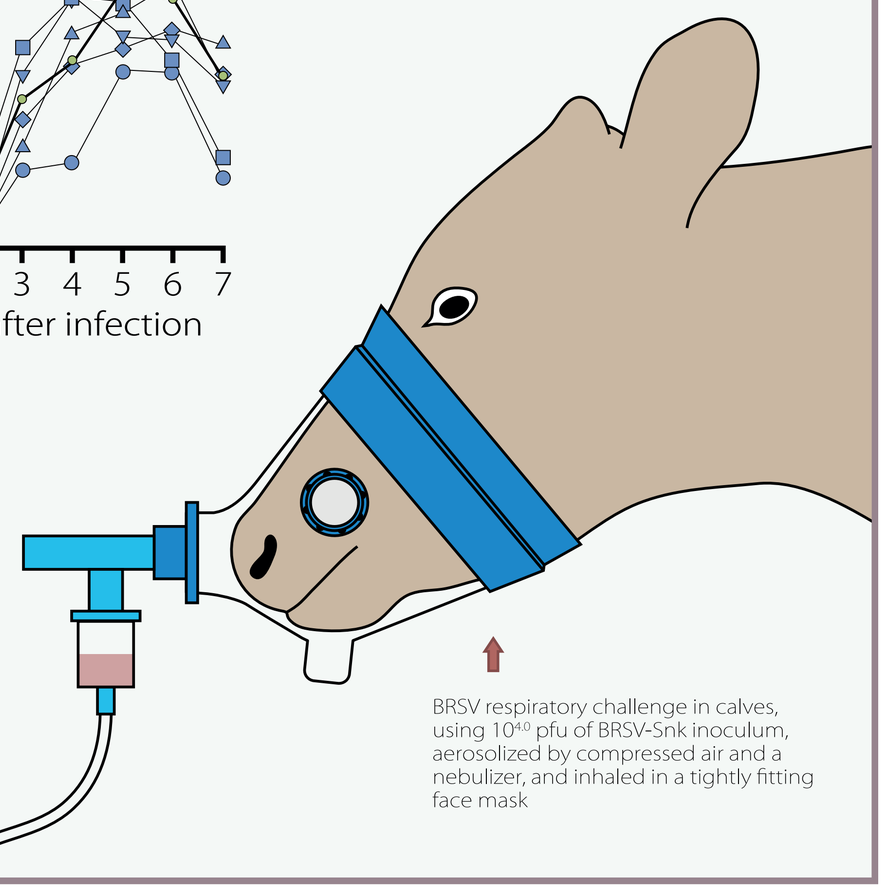
Nasal virus shed



Lung pathology



The severe clinical signs, extensive pathology and high amounts of virus shed detected was robust across the five infected calves in Study 2, and matched that observed in the BRSV-Snk infected calves in Study 1.



- In this BRSV infection model, using an aerosolized inoculum passaged in vivo, we demonstrated field-like clinical signs, pathology and levels of shed virus.
- This model is highly relevant for studying the pathogenic mechanisms of BRSV, and to evaluate vaccine candidates and possible therapies, due to its reproducibility and fidelity with field-like conditions.
- The methods used to monitor calves in this model may equally be used in field-evaluations of vaccine efficacy and duration in natural outbreaks of BRSV.
- This model may serve as an alternative to study the pathogenesis and develop control measures for the closely related pneumovirus human respiratory syncytial virus (HRSV), a common cause of pneumonia in children.

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