



## Reducing losses of fattening pigs due to Haemorrhagic Intestinal Syndrome (HIS) – subproject risk factors

*Fabienne Holenweger<sup>1</sup>, Negar Khayat-zadeh<sup>2</sup>, Andreas Hofer<sup>2</sup>, Hubert Pausch<sup>3</sup>, Gertraud Schüpbach-Regula<sup>4</sup>, Peter Spring<sup>5</sup>, Xaver Sidler<sup>6</sup>, Alexander Grahofer<sup>1</sup>*

<sup>1</sup>Clinic for Swine, Department for Clinical Veterinary Medicine, Vetsuisse Faculty, University of Bern, Bern, Switzerland; <sup>2</sup>SUISAG, Allmend 10, 6204, Sempach, Switzerland; <sup>3</sup>Animal Genomics, Department of Environmental Systems Science, ETH Zurich, Zurich, Switzerland; <sup>4</sup>Veterinary Public Health Institute, Department of Clinical Research and Veterinary Public Health, Vetsuisse Faculty, University of Bern, Bern, Switzerland; <sup>5</sup>Berne University of Applied Sciences, HAFL - Agricultural Sciences, Zollikofen, Switzerland; <sup>6</sup>Division of Swine Medicine, Department of Farm Animals, Vetsuisse Faculty, University of Zurich, Zurich, Switzerland.

### Key words

Haemorrhagic bowel syndrome; Abdominal distension; Sudden death; Breeding; Housing; Feeding Management; *B. pilosicoli*; Swine

### Aim of the study

The aim of this study was to identify potential risk factors for the occurrence of HBS in Swiss fattening farms, focusing on breeding, management, and environmental factors as well as gastrointestinal pathogens.

### Material and methods

This case-control study included 50 case farms (mortality rate due to HBS > 1.5%) and 50 control farms (mortality rate due to HBS < 0.25%) with 600 or more pigs slaughtered per year in Switzerland. This sample size ensures 80% power to detect odds ratios greater than 3.5 at the 5% significance level. A questionnaire was used to collect general information about the herd, housing parameters, management and hygiene measurements of the pen and feeding system. In addition, a herd examination of the pen was carried out to assess the following parameters: pen size, number of pigs per pen, water flow rate, number of drinkers, height of drinkers, water pH, trough length, feed pH, air temperature and draught. In addition, feed and water samples were collected to assess the microbial load and the particle size of the feed was assessed. In addition, faecal samples from 26 randomly selected herds (13 case vs. 13 control) of 10 pigs per herd were analysed for *L. intracellularis*, *B. hyodysenteriae* and *B. pilosicoli* by quantitative polymerase chain reaction. After the study, the pig density was calculated, as well as the number of pens, the width of the pens per pig and the number of pigs per drinker.

### Results and significance

The study is one of the first case-control studies to look categorically at risk factors for the occurrence of HBS in pig herds. Pigs sired by the PREMO® breed proved to be a significant risk factor for HBS (odds ratio (OR) = 147) compared to other breeds. Furthermore, pigs from two or more origins per batch were significantly more likely to develop HBS (OR = 52) compared to pigs from only one origin. Farms with 1 decimetre more feedlot space per finisher pig had a lower incidence of HBS (OR = 0.07). In addition, the frequency of cleaning of the distribution pipes (divided into categories) had a significant effect ( $p < 0.05$ ) on the HBS incidence of a farm. In addition, the presence of sugar beet as a feed component in liquid feeding systems was found to be significantly correlated ( $p = 0.03$ ) with being an HBS case farm. Another risk factor found for liquid feeding systems,

but only for meal users, was particle size. A higher percentage of small particles (<2 mm) in the meal was correlated with a higher risk of being an HBS case farm ( $p = 0.02$ ), while no significant correlation was found for the use of pellets. The microbial quality of the feed in dry feeding systems, at the level of the first and last outlet tube, the number of total aerobes is significantly correlated with HBS ( $p = 0.03$ ). Furthermore, the amount of *E. coli* in the whey samples was significantly correlated with HBS ( $p=0.04$ ), but as a protective factor rather than a risk factor. Analysis of faecal samples showed a significant difference ( $p < 0.05$ ) in the prevalence of *B. pilosicoli* in the herd category.

These results confirm that HBS has multiple risk factors that cannot be attributed to one management or housing category alone. Furthermore, the factors should not be considered individually as a single cause of HBS, but rather as factors that increase the risk of HBS and that together contribute to increasing this risk without directly influencing each other.

### **Publications, posters and presentations**

Holenweger F, Schüpbach G, Hofer A, Sidler X, Grahofer A. Housing and management factors and breed predisposition for haemorrhagic bowel syndrome in swine. *Porcine Health Manag.* 2023 Oct 11;9(1):44. doi: 10.1186/s40813-023-00340-y. PMID: 37821926; PMCID: PMC10566139.

Holenweger F, Spring P, Khayatzadeh N, Hofer A, Schüpbach G, Grahofer A. Feed-related risk factors and potential infectious agents for hemorrhagic bowel syndrome in swine. Under review.

Hofer A, Pausch H, Grahofer A. HIS-Projekt auf Kurs, erste Resultate in einem Jahr, *Suisseporcs Information* March 2022

Khayatzadeh N, Pausch H, Grahofer A HIS-Projekt im Zeitplan, erste Resultate vom Teilprojekt Genomik, *Suisseporcs Information* March 2023

Khayatzadeh N, Pausch H, Grahofer A Aktuelle Erkenntnisse zum Hämorrhagischen Intestinale Syndrom (HIS) bei Mastschweinen: Welche Aspekte sind zu beachten?, *Suisseporcs Information* February 2024

Holenweger F (2023). Housing and management factors and breed predisposition for haemorrhagic bowel syndrome in swine. Doctoral Dissertation, Vetsuisse Faculty, University of Bern.

Holenweger F. Gesund und tot! - Welche Risikofaktoren für das hämorrhagisch intestinale Syndrom (HIS) gibt es in Schweizer Schweinebeständen? (oral presentation), 22. Mar 2023, Nutztierkolloquium, Bern.

Holenweger F. Gesund und tot! - Welche Risikofaktoren für das hämorrhagisch intestinale Syndrom (HIS) gibt es in Schweizer Schweinebeständen? (oral presentation), 25. Mar 2023, HIS Steering Committee Meeting, Sempach.

Holenweger F. Gesund und tot! - Welche Risikofaktoren für das hämorrhagisch intestinale Syndrom (HIS) gibt es in Schweizer Schweinebeständen? (oral presentation), 4. May 2023, 10. Schweizerische Tierärztetage, Fribourg, awarded for best thesis presentation.

Holenweger F. (2023) HIS – Zufall oder Wahrscheinlichkeit? (oral presentation) 8. Sep. 2023, 26. Seminar Schweizer Vereinigung für Schweinemedizin, Emmetten.

Holenweger F, Schüpbach G, Hofer A, Sidler X, Grahofer A. Breed predisposition and environmental and management factors for haemorrhagic bowel syndrome in swine (poster presentation) 4-7 Jun. 2024, 27th International Pig Veterinary Society Congress & 15th European Symposium of Porcine Health Management, Leipzig

### **Project 1.21.04**

**Project duration** 1. April 2021 – 31. March 2024