



PhD. Defence

**Probiotic Potential and Impact of Novel *Bacillus subtilis* in Improving Growth Performance and Gut health of Weaning Piglets**

Sudhanshu Sudan

Date: May 23rd 2022 at 6:00am

The PhD Defence for Sudhanshu Sudan has been scheduled for May 23rd, 2022 at 6:00am. The defence will be held online via Teams: [https://teams.microsoft.com/l/meetup-join/19%3ameeting\\_NmY0MmRkMjAtMmE2Mi00YTM5LWJmZDUtODc4NDhkZDE0MmI4%40thread.v2/0?context=%7b%22Tid%22%3a%22be62a12b-2cad-49a1-a5fa-85f4f3156a7d%22%2c%22Oid%22%3a%22bd28915-dda5-478f-8ecb-a3682dcf0c3a%22%7d](https://teams.microsoft.com/l/meetup-join/19%3ameeting_NmY0MmRkMjAtMmE2Mi00YTM5LWJmZDUtODc4NDhkZDE0MmI4%40thread.v2/0?context=%7b%22Tid%22%3a%22be62a12b-2cad-49a1-a5fa-85f4f3156a7d%22%2c%22Oid%22%3a%22bd28915-dda5-478f-8ecb-a3682dcf0c3a%22%7d)

**The exam committee will consist of:**

Examining Chair: Dr. Alexandra Harlander

Advisor: Dr. Julang Li

Adv. Committee Member: Dr. Elijah Kiarie

Additional Graduate Member: Dr. David Huyben

External Examiner: Dr. Tomonori Nochi

**Abstract:**

Post-weaning diarrhea (PWD) and associated mortality in commercial swine production remain a significant challenge for antibiotic-free meat production. With the ban on antibiotic usage in livestock production, probiotics have gained a lot of attention as a potential alternative. However, strain and host specificity limit their efficacy. In this research, I tested probiotic potential of a novel *Bacillus subtilis*, BS9 and its impact on growth performance and gut health of weaning piglets. The *in vitro* studies established that BS9 displayed a strong survival ability in gastrointestinal environment and with no cytotoxicity to intestinal cells. Using a *Enterotoxigenic E. coli* challenge model in swine intestinal cells, a strong contact dependant antimicrobial and cytoprotective activity of BS9 was revealed. Supplementation of BS9 through water in weaning piglets significantly reduced PWD and feed conversion ratio (FCR) in the overall study comparable to pharmacological zinc oxide. Although no significant increase in body weights were reported, a significant increase in average daily gain (ADG) was observed in the second period (Week3-4) in BS9 supplemented group. Average daily feed intake (ADFI) was also not affected by BS9 supplementation. Like zinc oxide group, BS9 supplementation significantly reduced fecal *E. coli* and coliform and increased fecal lactic acid bacteria and bacillus spp. in weaning piglets. It also appeared to positively impact gut health by modulating intestinal immune markers, intestinal mucosal gene expression of gut health related genes and modulating fecal metabolic signature compared to the negative control group. In conclusion, this research shows the novel *Bacillus subtilis*- 9 may be an effective alternative additive to pharmacological zinc oxide, although it appears that BS9 and zinc oxide influence the gut in distinct mechanisms to enhance piglet performance, and therefore further studies, perhaps in a larger sample size are recommended to evaluate confirm these findings.