



Evaluation of disinfection efficacy of ionic silver water on PRRSV and Salmonella Typhimurium

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Introduction:

Porcine reproductive and respiratory syndrome (PRRS) is considered as one of the most economically important infectious diseases in swine industry worldwide. *Salmonella* Typhimurium, has a wide host-range and is of public health significance too. Considering the serious threats posed by these pathogens, firm biosecurity measures are a need of the hour to prevent the transmission of these diseases. Furthermore, disinfectants used in on-farm biosecurity procedures as well as in biosecurity procedures followed by reference laboratories handling dreadful pathogens form one of the most important tools of disease containment facilities. In the present study, we evaluated the disinfectant efficacy of ionic silver water against two important pathogens viz. PRRS virus and *Salmonella* Typhimurium.

Materials and Methods :

PRRSV (VR2332) and *Salmonella* Typhimurium (ATCC 14028) were used in the present study. Three different groups were made based on the diluents used for ionic silver water (ISW) viz. 1) ISW in distilled water (DW), 2) ISW in hard water (HW, 0.0305% CaCl₂ + 0.0139% MgCl₂), 3) ISW in hard water containing 5% FBS. Further, each group was used in four different concentrations (40, 20, 10 and 5 ppm) to evaluate the minimum effective concentration against these pathogens. *Salmonella* Typhimurium and PRRSV were pre-treated with ISW in appropriate diluents for either 30 min or 24 h at 4°C. To differentiate the different treatment groups with same treatment time or vice versa, 'concentration/time' has been used. The pretreated *Salmonella* Typhimurium mixtures were cultured on tryptic soy agar plates and incubated for 24 hours at 37°C. Simultaneously, the pre-treated mixtures containing PRRSV were inoculated on MARC-145 cells and cultured at 5% CO₂ at 37°C in a humidified chamber until the cytopathic effects (CPE) appeared in the cells.

Results :

No cytotoxicity was observed in MARC-145 cells when mock-inoculated with 40 ppm concentration of ISW until 5 days of culture post-inoculation. Groups 1 (DW) and 2 (HW) showed 90-100% inhibition in PRRSV replication after treated with 40 ppm ISW for 30 min or 24 hr. All the groups showed 90-95% inhibition in PRRSV replication after treated with 20 ppm for 24hr. Groups treated with ≤10 ppm ISW didn't show any significant effect on PRRSV replication (Fig. 1). On the other hand, groups 1 and 2 completely inhibited the growth of *Salmonella* Typhimurium after treated with 20-40 ppm ISW for 30 min or 24hr, while as only group 1(DW) showed complete inhibition of *Salmonella* Typhimurium growth after treated with 5-10 ppm ISW for 24hr. However, 90-100% inhibition on salmonella growth was shown in other groups at the same concentration of ISW (Fig. 2).

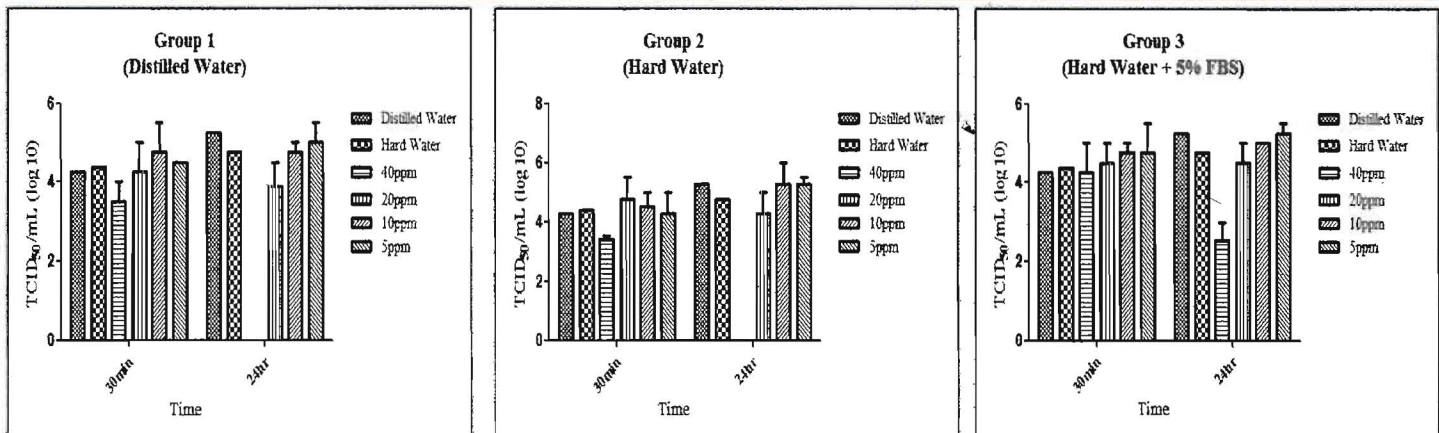


Fig. 1. Evaluation of ionic silver water against PRRS virus

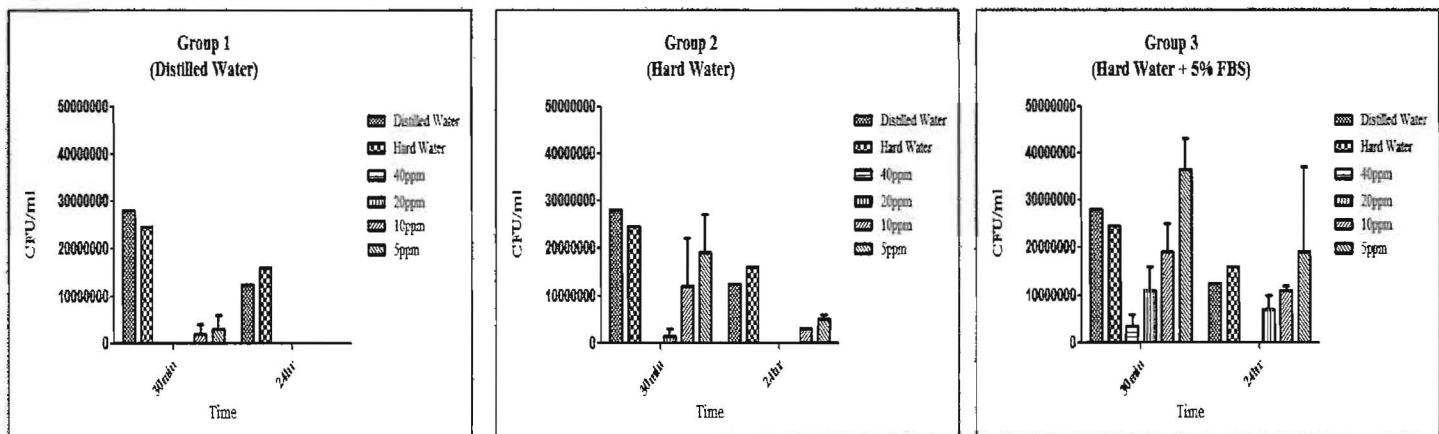


Fig. 2. Evaluation of ionic silver water against *Salmonella* Typhimurium

Conclusion :

Overall, ISW showed a remarkable disinfection efficacy of 90 to 100% against PRRSV and *Salmonella* Typhimurium with no observable cytotoxic effects at 20-40 ppm. Treatment with as low as 10 ppm ISW for 24 h still demonstrated a high disinfection efficacy of 90-100% against *Salmonella* Typhimurium while as no disinfection efficacy was observed against PRRSV at the same concentration. The results in the present study indicate that ISW could be used as a good disinfectant in on-farm and biosecurity procedures to handle PRRSV and *Salmonella* Typhimurium control. Moreover, ISW didn't cause cytotoxicity on MARC-145 cells, it will be also evaluated for the antimicrobial effects against PRRSV and *Salmonella* Typhimurium in vivo near future.

References :

Hwang, In-sok, Jaeyong Cho, Ji Hong Hwang, Bomi Hwang, Hyemin Choi, Junyoung Lee, and Dong Gun Lee Antimicrobial Effects and Mechanism(s) of Silver Nanoparticle. Korean J. Microbiol. Biotechnol Vol. 39, No. 1, 1-8 (2011)