

Abstract

Enzootic pneumonia (EP) caused by *Mycoplasma hyopneumoniae* is an important respiratory disease of pigs worldwide. Transmission is predominantly by direct contact; but the role of indirect transmission remains poorly understood. Prevention and control strategies have relied on antibiotics, management and vaccination. However, even with control strategies in place, infection is still considered a huge problem for the pig industry, worldwide. The aim of this study was to assess the effects of three novel environmental methods of pathogen reduction, namely; silver ion solutions, titanium dioxide (TiO₂) photocatalytic paints, and UVC air filtration on the survival and growth of *M. hyopneumoniae*. The first part of the thesis informed the study design for the remaining work, by recording the survival of *M. hyopneumoniae* outside the host. This study examined survival of *M. hyopneumoniae* dried on five different surfaces encountered in pig units, exposed to 4 °C, 25 °C and 37 °C and cultured for up to 12 days. Maximum survival at 4 °C was 8 days for all strains on at least one surface (except stainless steel) and was limited to 2 days at 25 °C and 37 °C. Overall, dust and polypropylene copolymer supported *M. hyopneumoniae* survival the longest when compared with other surface materials. As *M. hyopneumoniae* was shown to survive in the environment, the second part of the study tested the three novel methods, *in vitro*. The minimum inhibitory concentration of silver ion solutions on *M. hyopneumoniae* was 2.3 PPM. Only one of the four TiO₂ photocatalytic paints tested was successful in preventing *M. hyopneumoniae* growth at a light intensity of 0.12 mW/cm², with a 1.77 and 1.68 log reduction after 4 h and 8 h, respectively. UVC

irradiation was able to kill 90% of *M. hyopneumoniae* after 9.32 sec. All three methods showed an antimicrobial effect. The final part of this study, investigated the application of silver ion solutions, TiO₂ photocatalytic paints and UVC air filtration, *in vivo*. Four groups of pigs were experimentally infected with *M. hyopneumoniae*, and environmental samples were collected. Only one viable *M. hyopneumoniae* sample was found throughout in the environment (vaccination group), from 144 samples. General bacteriology was also collected in the four groups, however, no significant differences in the quantification of viable bacteria were found between the groups, indicating, the three novel methods did not reduce pathogen load in the environment. This is the first investigation into the application of; silver ions, photocatalytic paints and UVC air filtration to inhibit *M. hyopneumoniae* both *in vitro* and *in vivo*. Further, work is needed to further establish if these novel methods can be of use in the control of infectious pig diseases.