Modulation of the host cells to create a potential antiviral state (PRRS)

PRRSV causes high fevers, dyspnea, anorexia, tachypnea, and faltering growth in neonates. Adult pigs show respiratory illness when infected with PRRSV ultimately leading to pneumoniae. These viruses replicate in macrophages and dendritic cells other than epithelial cells reducing the antigen-presenting capabilities. They also cause septicaemia and mortality as a result of secondary infections in pigs.

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These findings, however, are contradictory between laboratory and field because it is difficult to replicate the field conditions in the laboratory. Therefore, the severity caused by PRRSV is not only determined by the viral strain but also the secondary infections and the external and internal environment of the hosts (swine).

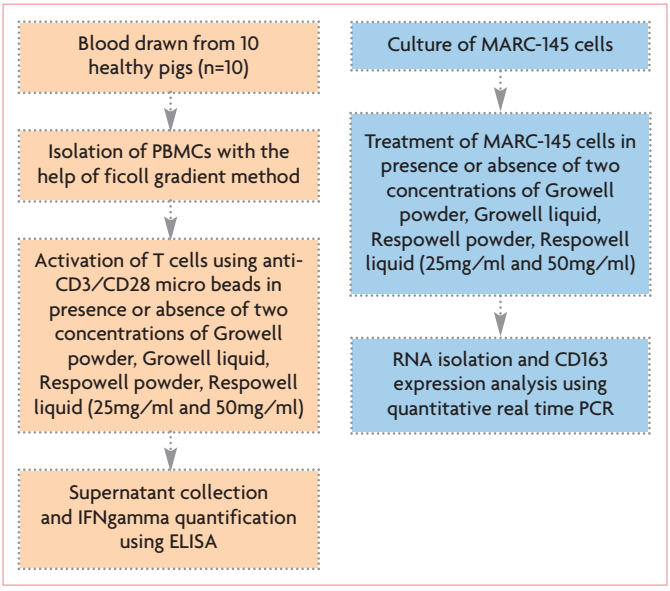
African swine fever (ASF), caused by the Asfarviridae family (DNA virus), can spread by direct or indirect contact or fomites, or biological vectors such as ticks. ASF virus has caused economically disrupting infections in the past.

Depending on the susceptibility of the host and strain of the virus the severity of the disease might vary with haemorrhagic fever. Fever, depression, and diarrhoea are common symptoms.

Another infection is that of foot and mouth disease caused by picornaviridae aphthovirus via aerosol. Epithelial tissues are the main site of the attack by the virus. A strong humoral immune response is provoked by the foot and mouth disease virus in pigs. Influenza viruses commonly infect pigs and have been extensively studied after the 'Spanish Flu' and the outbreak of 'swine flu'. H1N1, H1N2, and H3N2 (influenza type A) are the influenza viruses that infect pigs. These viruses spread rapidly within the herds with recurrent infections. Multiple strains of the influenza virus can infect the same population in a given time period.

A study on viruses and the diseases caused by them in pigs is important to eradicate the global trend of pandemic and endemic outbreaks and to maintain the quality of pig farming. The current time demands the design of supplement systems which can modulate the host system to fight against virus infections and in the current study we have analysed the effect of two natural products, Growell and Respowell, for their capacity to modulate the T cells to create an antiviral state as well as their ability to modulate the expression of gene responsible for viral entry in a well characterised in vitro host cell system.

Method in brief.



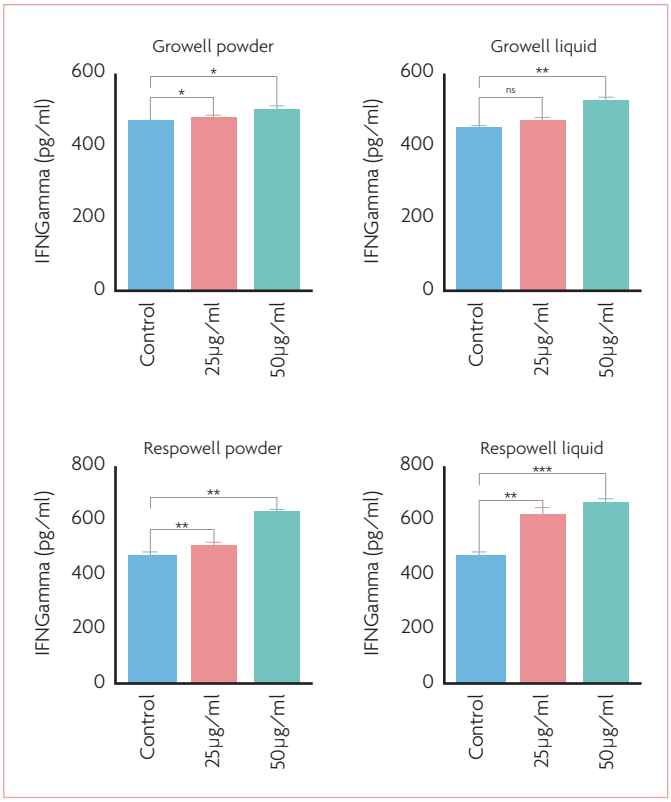


Fig. 1. Treatment of all four products increased the secretion of IFNgamma from activated T cells in a concentration dependent manner. The increase in IFNgamma caused by Growell powder, Growell liquid, Respowell powder and Respowell liquid were statistically significant.

Results

● **The effect of Growell/Respowell of IFNgamma production by T cells:** Treatment of all four products increased the secretion of IFNgamma from activated T cells in a concentration dependent manner.

The increase in IFNgamma secretion caused by Growell powder ($p=0.0323$ and $p=0.0436$; $p<0.05$ is significant), Growell liquid ($p=0.0808$ and $p=0.0023$; $p<0.05$ is significant), Respowell powder ($p=0.0096$ and $p=0.0010$; $p<0.05$ is significant), and Respowell liquid ($p=0.0056$ and $p=0.0003$; $p<0.05$ is significant) were statistically significant.

● **The effect of natural products on gene expression of CD163:** Treatment of all four products reduced the gene expression of CD163 in MARC-145 cells in a concentration dependent manner.

While the decrease in gene expression caused by Growell

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powder was not statistically significant (p=0.2911 and p=0.2401; p<0.05 is significant), the decrease caused by Growell liquid (p=0.0451 and p=0.0029; p<0.05 is significant), Respowell powder (p=0.0079 and p=0.0005; p<0.05 is significant), and Respowell liquid (p=0.0032 and p=0.0002; p<0.05 is significant) were statistically significant.

Discussion and conclusion

Pleiotropic in nature, IFNgamma is a cytokine which is one of the main weapons in the antiviral arsenal of host immune responses. It is secreted by activated T cells and creates an anti-viral state by doing multiple functions like helping other immune cells, macrophage activation, activation of tissue resident dendritic cells and natural killer cells.

Other than activation of immune cells, IFNgamma also inflicts an anti-viral response by directly affecting the vital processes of viral infection that is viral entry, replication, gene expression, genome stability, release and reactivation.

The liquid and powdered forms of Growell and Respowell were able to modulate the porcine T cells towards the elevated production and secretion of IFNgamma in a concentration dependent manner.

Data from the PBMCs from 10 porcine donor cells clearly indicate that all four product treatments increased the IFNgamma within 24 hours which is the clear indication that both Growell and Respowell are able to affect the porcine T cells.

Data shows that the effect of Respowell was higher in comparison to Growell. On the other hand liquid forms of both products were proven to be more effective than powdered form which is the possible indicator of better solubility of liquid form.

Secondarily the treatment of MARC-145 cells with the products has lowered down the gene expression of a CD marker CD163 which is an important protein on the cell surface which helps the viral entry by interacting with viral coat proteins.

IFNgamma increase makes both Growell and Respowell potent immunomodulators, specifically to fight against viruses in pigs and place them in the category of supplemental systems which can be utilised by the host immunity to create a well-guarded antiviral state. ■

References are available from the authors on request

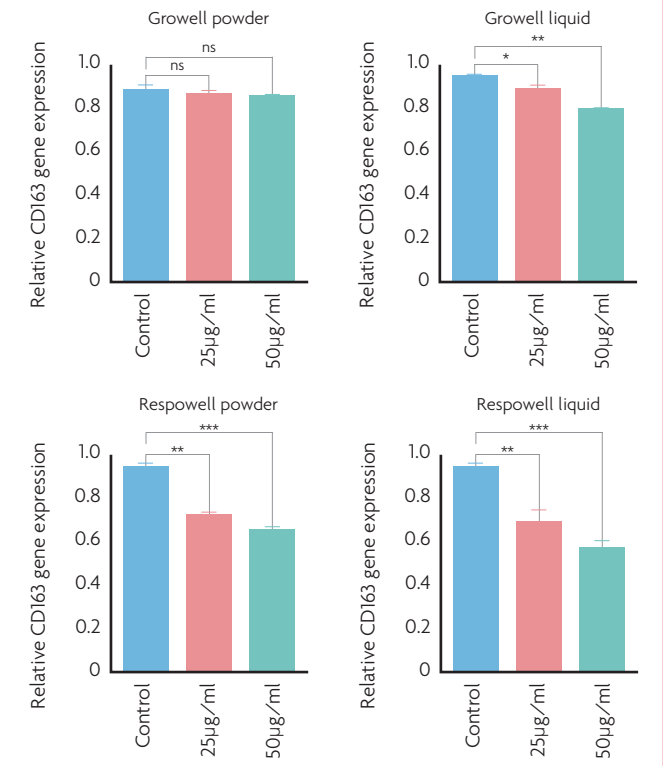

Fig. 2. Treatment of all four products reduced the gene expression of CD163 in MARC-145 cells in a concentration dependent manner. While the decrease in gene expression caused by Growell powder was not statistically significant, the decrease caused by Growell powder, Growell liquid, Respowell powder and Respowell liquid were statistically significant.