

endemicity or having very low infection load which may be left undetected under the swabbing method.

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## P-028

### Risk Factor Analyses for Porcine Reproductive and Respiratory Syndrome Using Survey Data

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**Introduction:** Porcine reproductive and respiratory syndrome (PRRS) is considered the most economically important swine disease worldwide. In the United States, the total annual loss due to PRRS virus (PRRSV) was estimated at \$664 million in 2011; \$302.06 million for breeding herds and \$361.85 million for fattening phase. The annual cost amounted to \$114.71 for every sow in the US breeding inventory and \$4.67 for every marketed pigs (1). Several studies have been conducted to determine various risk factors associated with the probability of a herd developing a new PRRSV infection. The Production Animal Disease Risk Assessment Program (PADRAP) developed by the American Association of Swine Veterinarians (AASV) is one of the commonly used tool in the swine industry that computes internal and external biosecurity scores (2). This study aimed to identify risk factors that could play a role in active PRRS infection as farm-level using survey data collected from the domestic pig farms.

**Materials and Methods:** We collected 147 swine farm samples through face-to-face interview by veterinarians using the structured questionnaire (99 questions) including various biosecurity risk factors related to PRRSV positivity. The probability of PRSS positive farm was estimated by using multivariable logistic regression model. In logistic regression, dependent variable is whether the farm is PRRS positive/unstable or not. Independent variables are aggregated scores for each of 4 risk strata: breeding system (11 items), internal risk (28 items), external risk (48 items), and farm characteristics (12 items). With a continuous risk factor, the odds ratio calculated from the coefficient for each risk stratum was interpreted for the change in outcome caused by unit change in the risk factor across the whole

sample. A total of 130 records except finishing farms were analyzed.

**Results:** Three risk strata contributing PRRS positive farm, in descending order of statistical significance, were internal risk ( $p=0.032$ ), breeding system ( $p=0.002$ ), and farm characteristics ( $p=0.020$ ). After adjustment for other variables, every one unit increase in internal risk score increase the odds of PRRS positive by 0.97%. The corresponding increase was 0.96% inbreeding system score and 0.58% in farm score. External risk factor was not statistically significant. The adjusted pseudo R-square goodness of fit test indicated no problems with the fitted model ( $p=0.243$ ).

**Conclusions:** The results of this study indicate that risk factors highlight the importance of biosecurity measures for the prevention of PRRSV infection. To this end, farm owner's awareness to improve above-mentioned biosecurity measures is critical to support effective control of PRRSV from the pig population. This research was supported by Agricultural Biotechnology Development Program, Ministry of Agriculture, Food and Rural Affairs (Grant number: 313005).

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## P-029

### Korean red ginseng oil enhances host immune response and stimulates protection against *Brucella abortus* infection using a mouse model

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**Introduction:** Ginseng (*Panax ginseng* Meyer) is one of the most extensively used botanical products for the treatment of various human diseases worldwide. Essential oils from herbs and plants have been used as alternative remedies for the treatment of many infectious diseases.

**Materials and Methods:** We investigated the protective effects of the essential oil from Korean red ginseng (RGO)

against intracellular *Brucella* (*B. abortus*), particularly effects on the bacterial viability, NO production, uptake and intracellular growth in macrophages; and subsequently, mice were treated with RGO and then were intraperitoneally infected with *B. abortus*. At 14 days post-infection, the weight and bacterial number from each spleen were monitored, and the serum samples were evaluated for cytokine production.

**Results:** RGO did not affect viability of *B. abortus* but significantly reduced NO production, bacterial internalization and intracellular replication, as well as bacterial adherence, F-actin polymerization and phosphorylation of MAPKs signaling proteins (ERK1/2, JNK and p38a) in macrophages. Furthermore, co-localization of *B. abortus*-containing phagosomes (BCPs) with LAMP-1 significantly increased in macrophages treated with RGO. On the other hand, the spleen weight and bacterial proliferation in these organs were significantly attenuated in treated mice. For the cytokine analysis, the non-infected RGO-treated mice displayed increased TNF and IFN- $\gamma$ , while the *B. abortus*-infected RGO-treated group showed reduced IL-10 as compared with the control groups.

**Conclusions:** RGO can be used as an immunomodulator and as an alternative option for the treatment and/or prevention of brucellosis.

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#### P-030

### The heat stress response activates immunity against intracellular *Brucella abortus* survival in vitro and in vivo

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**Introduction:** *Brucella* spp. are facultative intracellular Gram-negative bacteria that cause brucellosis in animals and humans however the relation of *Brucella* pathogenesis and host physiological changes is not clearly understood. In this study, we firstly report about the immunological role of heat shock responses and heat shock proteins in host immunity against *B. abortus* infection in vitro and in vivo.

**Materials and Methods:** To in vivo test, mice were randomly allocated into four different groups, and then infected with *B. abortus*. The mice were treated with heat stress (42°C) for 1.5 h per day. After 2 weeks post-infection, bacterial burden and different immunological aspects were evaluated and statistical analysis in compared to controls. Furthermore, the macrophages were infected with *B. abortus* and then treated with heat stress for 1.5 h. The intracellular survival of bacteria at different indicated times and several host immune factors such as NF- $\kappa$ B activation, cytokines, ROS and NO production were assessed.

**Results:** After two weeks of infection, the bacteria number in heat exposure group was significantly lower than control group which paralleled with the marked increases of important cytokines (IFN $\gamma$ , IL1 $\beta$ , TNF and IL6), expression of iNOS and NF- $\kappa$ B pathway. However, the prolong exposure of heat shock also caused high expression of anti-inflammatory cytokine, IL10. Interestingly, the similar results were also obtained when the bacterial killing capacity was enhanced by heat exposure in macrophages. These were accompanied with the increased expression of heat shock protein 70 and 90 (HSP70 and HSP90), the elevated translocation of NF- $\kappa$ B p65 but without influence on NO production. Moreover, the induction of pro-inflammatory cytokines (TNF, IL6 and IL1 $\beta$ ) but not IL-10 indicating the role of heat stress in pro-inflammatory response induction. The other immunological factors that may contribute to antibacterial activity such as apoptosis and ROS production were also found to be induced by heat shock, suggesting the implication of heat stress on brucellacidal activity.

**Conclusions:** Taken together, our results suggest the antibacterial effect of heat stress responses in *B. abortus* infection however the further studies to prove the real function of heat shock proteins in brucellacidal immunity should be conducted.

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#### P-031

### Intracellular Trafficking Modulation by Ginsenoside Rg3 Inhibits the *Brucella abortus* Uptake and Intracellular Survival within RAW 264.7 Cells

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**Introduction:** Brucellosis is probably the commonest zoonotic infection globally in humans and animals caused by bacteria of the genus *Brucella* spp. *Panax ginseng* is a famous medicinal herb and has been widely used in traditional medicine in Asia and around the world. We