Research Project: Foot-and-Mouth Disease Virus (FMDV) Countermeasures Discovery

Title: Adenoviral-based Foot-and-Mouth Disease Virus Vaccine: Evaluation of New Vectors Expressing Serotype O in Bovines

Authors:

- Moraes, Mauro
- Diaz San-Segundo, Fayna - USDA PIADC ORISE FELLOW
- Pena, Lindomar - ORISE FELLOW
- Grubman, Marvin

Publication Date: July 10, 2009

Technical Abstract:
Foot-and-mouth disease virus (FMDV), an antigenically variable virus, is considered the most important infectious disease of cloven-hoofed animals. Recently serotypes A and O have been the cause of major outbreaks. We previously demonstrated that an adenovirus-based FMDV serotype A24 subunit vaccine, Ad5-A24, can protect swine and bovines against homologous challenge, but swine vaccinated with Ad5-O1Campos were only partially protected when challenged with O1C 21 days post-vaccination (dpv). Recently, we demonstrated that inclusion of the coding region of nonstructural protein 2B in the Ad5-A24 vector with a modified CMV promoter (Cl) resulted in early and improved immune responses in pigs. To address the limited immunogenicity of Ad5-O1C, we have produced a set of Ad5 vectors with the modified Cl promoter, Ad5CI-O1C, and with the complete 2B coding region, Ad5CI-O1C2B. To evaluate the potency and efficacy of the new vectors, 16 cows were separated into 4 groups and vaccinated with 5x10^9 pfu per animal of Ad5- O1C, Ad5CI-O1C, Ad5CI-O1C2B or Ad5-Blue (control vector). All groups were challenged, intradermally in the tongue, at 21 dpv with 104 bovine infectious dose50 FMDV O1C. After challenge all animals in the control group developed clinical disease, while 2 of 4 animals in each group receiving O1C vaccine were completely protected. Protection correlated with the presence of total antibodies against viral structural proteins on the day of challenge. Based on parameters including the level of total antibodies, onset of clinical score and temperature, we found that the group inoculated with the vector containing the CMV promoter, Ad5-O1C, had a better overall response compared to the groups inoculated with either Ad5CI vector. In a direct comparison between the new vectors regulated by the Cl promoter, we observed that the presence of 2B resulted in enhanced protection when considering temperature and levels of virus in nasal swabs. These results indicate that a vector combining the 2 features, CMV promoter and the 2B coding region, should improve Ad5 vaccines against FMDV serotype O.