

# TIMELY INFORMATION

## Agriculture & Natural Resources

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### **Efficacy of vaccinating cow-calf herds against BVDV**

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Bovine viral diarrhoea virus (BVDV) is a potentially serious problem for cow-calf herds and has been implicated as a cause of infertility, abortions, diarrhoea, respiratory disease (shipping fever), immunosuppression (weakening of the immune system which increases susceptibility to other diseases), and much more. Animals that are persistently infected (PI) with BVDV commonly shed large quantities of the virus throughout life, thus exposing herd mates and jeopardizing efforts to control BVDV. Persistent infection with BVDV occurs when a bovine fetus is infected during the first half of pregnancy, because the immature fetal immune system develops a tolerance to BVDV instead of fighting off the infection. Typically, controlling BVDV involves a combination of biosecurity, diagnostic testing and culling of PI animals, and vaccination to prevent infections and the birth of PI calves. However, if BVDV is introduced into a herd, only a pregnant cow or heifer's immune system (stimulated by natural exposure or vaccination) can protect a developing fetus during the first half of pregnancy. So how effective are BVDV vaccines in providing fetal protection?

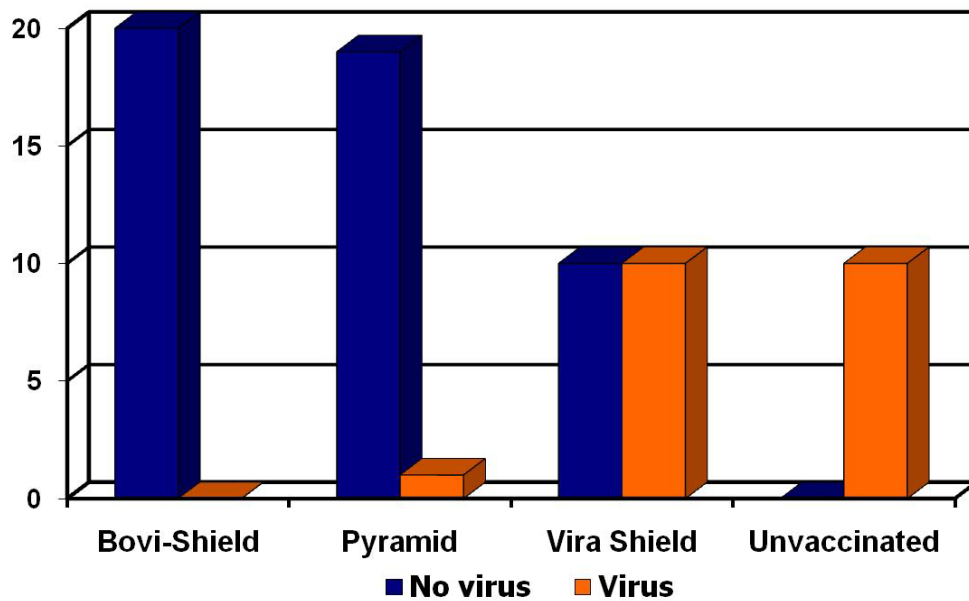
In a field trial conducted at the Michigan State University College of Veterinary Medicine Research Farm, two doses of a killed BVDV vaccine (CattleMaster® GOLD FP5-L5, Pfizer Animal Health) were administered 21 days apart, with the second dose given approximately two weeks prior to artificial insemination. In this trial, vaccination with CattleMaster® GOLD FP5-L5 prevented the birth of PI calves in 73% of heifers following natural viral challenge by exposure to PI cattle during 98 days of pregnancy.

To further investigate the efficacy of vaccination in preventing the birth of PI calves, a group of investigators from the Auburn University College of Veterinary Medicine and College of Agriculture recently conducted a field trial at the Upper Coastal Plain Agricultural Research Center in Winfield, Alabama. The research was supported by a grant from the Alabama Agricultural Experiment Station.

Eighty heifer calves born from September to November 2006 at the Upper Coastal Plain Agricultural Research Center were assigned to 1 of 4 treatment groups. One group of 11 heifers remained unvaccinated, but the remaining 3 groups of 23 heifers were vaccinated against BVDV at weaning (May 2007), 4 weeks post-weaning, one-year of age (October 2007), and 4 weeks later. The vaccines were selected after consulting a large distributor of animal health products in the Southeastern United States. Based on volume of sales in July 2006, Bovi-Shield Gold® FP5 (Pfizer Animal Health), Pyramid® 5 (Fort Dodge Animal Health), and Vira Shield® 6 (Novartis Animal Health) were administered to the treatment groups. These top selling vaccines represented two modified-live vaccines with label claims for fetal protection (Bovi-Shield Gold® FP5 and Pyramid® 5) and a killed vaccine (Vira Shield® 6).

Estrus was synchronized and all heifers were artificially inseminated over a 3-day period in late December 2007, after which 2 bulls were introduced to the heifers to ensure maximum potential for pregnancy. A total of 70 heifers became pregnant, 10 in the unvaccinated group and 20 in each of the vaccinated groups. Three BVDV-PI animals were housed with the 70 pregnant heifers in an isolated pasture from approximately 2 to 4 months of pregnancy. The pregnant heifers were monitored closely for clinical disease and viremia (presence of BVDV in the bloodstream) after BVDV exposure. No heifers showed signs of severe illness, but viremias were detected in heifers from the unvaccinated group (100%), the Vira Shield® 6 group (50%), and the Pyramid® 5 group (5%), as shown in Figure 1. No heifers were viremic in the Bovi-Shield Gold® FP5 group. Detecting a viremia in a heifer was important because it indicated that after exposure to BVDV the immunity induced by vaccination was not able to prevent the circulation of live virus in the heifer’s bloodstream. Since viremia likely precedes fetal infection, prevention of viremia via vaccination is desired.

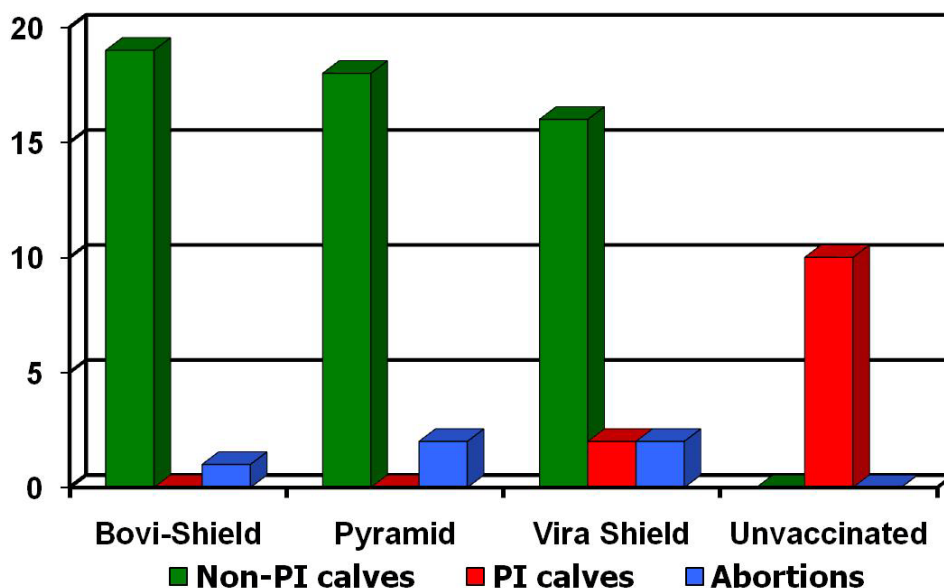
**Number of heifers with or without live virus circulating in the bloodstream after exposure to BVDV-PI animals**



**Figure 1.** The number of heifers in which live virus was or was not found circulating in the bloodstream after exposure to BVDV-PI animals.

Five heifers aborted during the trial (1 in the Bovi-Shield Gold® FP5 group, 2 in the Pyramid® 5 group, 2 in the Vira Shield® 6, and none in the unvaccinated group). Unfortunately, no aborted fetuses were found for further diagnostic investigation, so it is unclear if BVDV played a role in the abortions. Fortunately, the remaining calves were born uneventfully in September, October and November 2008 and were assessed using a variety of laboratory tests to determine if persistent infection resulted from fetal exposure to BVDV. Persistently infected calves were only produced in the unvaccinated (100%) and Vira Shield® 6 (11%) groups (Figure 2).

**Number of non-PI calves, PI calves, and abortions for all 4 treatment groups.**



**Figure 2.** The number of non-PI calves, PI calves, and abortions for all 4 treatment groups. Unfortunately, no aborted fetuses were found for diagnostic investigation, so it is unclear if BVDV played a role in the abortions.

### Conclusions

Vaccination with 4 doses of a modified-live BVDV vaccine (Bovi-Shield Gold® FP5 or Pyramid® 5) from weaning to breeding provided greater protection against viremia and the production of PI calves than vaccination with 4 doses of a killed BVDV vaccine (Vira Shield® 6). In this research, 4 vaccinations with a modified-live vaccine between weaning and breeding provided 100% protection against the development of PI calves after a worst-case scenario introduction of PI animals into a group of pregnant heifers. However, 50% of heifers that received 4 vaccinations with a killed vaccine between weaning and breeding became viremic, and 2 heifers vaccinated with the killed vaccine gave birth to PI calves. Therefore, if possible it is recommended to vaccinate breeding animals with modified-live vaccines labeled for fetal protection against BVDV. **However, these modified live vaccines need to be used safely according to label directions or reproductive problems can result.** Most importantly, heifers and cows should receive these vaccines for the first time when they are not pregnant, ideally approximately 2 months prior to the breeding season. Since 4 doses of modified-live vaccine between weaning and breeding may not always be feasible, it is also recommended to continue proper biosecurity and diagnostic testing for BVDV as needed depending on herd management and BVDV exposure risk factors. Work is currently underway at the Auburn University College of Veterinary Medicine to determine if fewer vaccinations with a modified live BVDV vaccine can achieve similar levels of effective BVDV fetal protection.

Many thanks to the Alabama Agricultural Experiment Station and the farm crew at the Upper Coastal Plain Agricultural Research Center who made this research possible.