In 1994/1995, in spite of vaccination with MLV IBR/PI3/H. somnus vaccine, IBR outbreaks started to appear in feedlots in Alberta between day 65 and 90 after arrival of the calves. Sick rates ranged between 10% and 30%, with some feedlots reporting mortality rates as high as 30%. Some of these calves had severe pneumonia. Rapid vaccination at the time of the outbreak did prevent spread to noninfected animals in neighbouring pens, but not between animals in one pen. Normally, the animals are re-vaccinated at 90-100 days post-arrival. However, these outbreaks have continued to occur, sometimes even earlier than the first time, so feedlot veterinarians and operators are now revaccinating between 28 and 65 days post-arrival, depending on their situation. At present, the reason for these early, severe outbreaks are not clear yet; it is possible that a different strain of IBR has evolved, or BVD may be involved, possibly by suppressing the calves’ immune responses. We have started to investigate the existence of a new strain and preliminary evidence indicates that indeed, there may be a new IBR variant; however, further research is needed to determine the role of such a variant in the observed outbreaks of IBR.

The repertoire of gene-deleted mutants with potential as modified live vaccine has expanded significantly during the past few years (13). All, except one, of the recently developed mutants have significantly reduced virulence. When tested in an experimental BHV-1 challenge experiment, all mutants were capable of inducing protection. As each of the mutants have a deletion in one of the viral surface proteins, they can all be used with a companion diagnostic test as a “marked” vaccine. Two mutants in particular, which had sufficient residual virulence and immunogenicity, are very promising as potential marker vaccines.
In recent years considerable progress has been made with respect to the use of DNA vaccines in large animals. A DNA vaccine essentially consists of a DNA fragment that, once delivered to the host, directs the production of protective proteins, called antigens, in the host’s cells. A number of years ago, we demonstrated partial protection against BHV-1 challenge with a DNA vaccine that produces the major protective component of BHV-1 (12). During the past few years we have focused on the development of better DNA constructs and more effective delivery methods. Presently, two intradermal immunizations with an improved BHV-1 DNA vaccine are sufficient to induce protection against experimental viral challenge (14). These immunizations may be either given with a syringe and needle or with a needle-free injection device. Further improvements have been achieved by coating the DNA on microscopic beads, which are then propelled into the skin with a gene gun, an instrument that is driven by pulses of high-velocity gas. Because the beads with the DNA are driven directly into the cells of the skin, very low amounts of DNA are now needed to induce immunity (15).

One of the anticipated advantages of DNA vaccines is the potential for use in young animals, specifically as effective vaccination of neonates has been difficult to achieve with currently available vaccines. Yet, it is essential to induce protective immunity in neonates against those pathogens that are responsible for diseases occurring early in life. We recently demonstrated that a BHV-1 DNA vaccine can induce antibody, as well as cellular immune responses in three day-old lambs. Furthermore, animals that contained passively acquired serum antibodies responded to the DNA vaccine in a similar manner, which shows that DNA immunization might indeed be a useful approach to vaccinate neonates, even in the presence of maternal antibodies (16).

Another important issue concerns the compatibility of DNA vaccines in a multi-component formulation, but to date very little research has been carried out on this aspect. However, preliminary data indicate that, although under certain conditions interference may occur, plasmids generally may be mixed in one vaccine formulation without affecting the efficacy of the individual components (17). These recent advances are very promising for the practical applicability of DNA vaccines against IBR in cattle.


