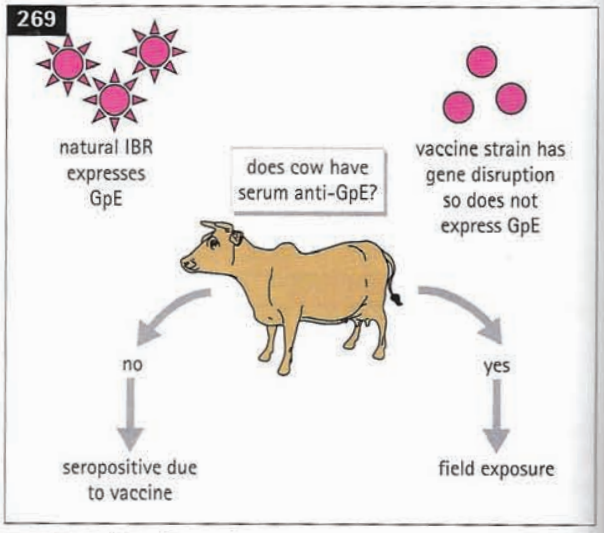
MARKER VACCINES

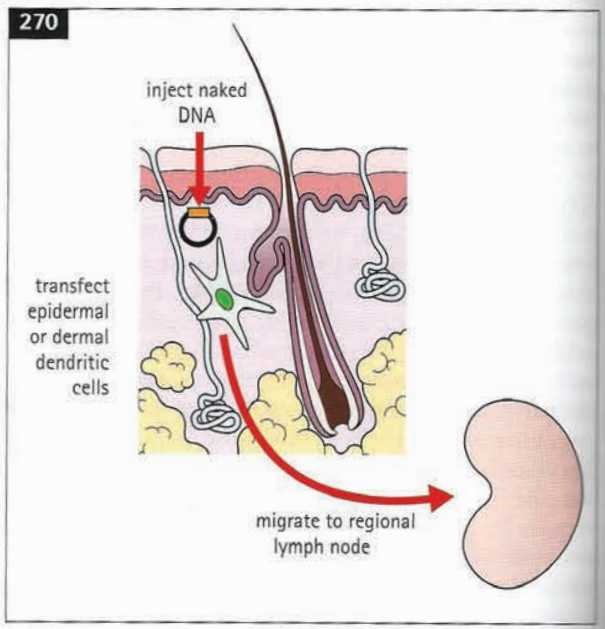
A further recent advance is the development of **'marker vaccines'**. Many infections are diagnosed by the detection of serum antibody as evidence of exposure (e.g. Lyme borreliosis, FIV), but as vaccination also induces serum antibody it has traditionally been difficult to **discriminate between vaccinal and exposure titres.** Marker vaccines have now been developed to make this distinction possible. An excellent example of such a product is the marker vaccine for infectious bovine rhinotracheitis (IBR). The virus contained in this product has deletion of the gene encoding surface glycoprotein E; therefore, if a cow has serum antibody to glycoprotein E, this must have been generated by exposure to field virus rather than by vaccination (269). Development of a marker vaccine requires parallel development of an **appropriate diagnostic test.**



269 Preparation of a marker vaccine. A marker vaccine permits discrimination between a vaccinal and exposure immune response. The IBR vaccine incorporates a genetically modified virus that does not express glycoprotein E (GpE). A serological test is developed in parallel with the vaccine. Any cow that has serum antibody to glycoprotein E must have been exposed to field virus. IBR,. infectious rhinotracheitis

NAKED DNA VACCINES

The current forefront of vaccine development is that of the **naked DNA vaccine.** In this instance a gene of interest from the pathogen is inserted into a **bacterial plasmid that is injected directly into the animal** without the need for a carrier organism. The plasmids may be injected by needle (as current veterinary products), administered mucosally (with appropriate protectants) or fired through the epidermis associated with tiny gold particles. The principle of this method involves the **plasmids transfecting host cells at the site of injection,** particularly APCs. The pathogen gene is expressed within the APC and the protein enters the processing pathway for MHC class II expression (270). Naked DNA vaccination triggers a **very potent mixed cell-mediated and humoral immune response** that provides exceptionally effective protection. Such vaccines may be used in young animals **in the face of maternally-derived antibody.** The best example of such a product is that used to protect horses from infection by the West Nile virus. Naked DNA technology has also been examined experimentally for CDV, FIV and rabies virus protection in small animals. A single injection of plasmid incorporating the gene for rabies glycoprotein G, given intradermally into the pinna of Beagle dogs, leads to the development of serum neutralizing antibody and affords protection from challenge with virulent virus one year post vaccination.



270 Preparation of a naked DNA vaccine. The gene of interest from a pathogen is incorporated into a bacterial plasmid that is directly injected into the animal. The plasmid transfects local host cells, including APCs, which migrate to the regional lymphoid tissue. Expression of the gene within the APC leads to ready access of the protein to the antigen processing pathway of the cell and effective presentation of peptides for induction of the T-cell response.

VACCINES OTHER THAN FOR INFECTIOUS DISEASE

Traditional vaccines have been designed to protect from the risks of infectious disease and been highly successful in so doing. The next generation of vaccines will have a range of other applications in the treatment (**therapeutic vaccines**) and prevention of