2. Raksha-IBR Vaccine – Science & Technology

Indian Immunologicals Ltd. (IIL), a subsidiary of the National Dairy Development Board (NDDB), has launched Raksha-IBR, India's first indigenously developed glycoprotein E (gE) deleted DIVA marker vaccine against Infectious Bovine Rhinotracheitis (IBR).

About Raksha-IBR Vaccine

Vaccine Type - Raksha-IBR is a gE-deleted DIVA (Differentiation of Infected from Vaccinated Animals) marker vaccine developed to control and eventually eradicate Infectious Bovine Rhinotracheitis (IBR) in cattle.

Developer - The vaccine has been developed indigenously in India by ICAR-National Research Centre on Equines (Hisar) in collaboration with Indian Immunologicals Limited (IIL) under the Department of Animal Husbandry & Dairying (DAHD), Government of India.

Objective - To provide a safe, effective, and scientifically advanced tool that allows vaccination-based disease control while enabling serological differentiation between vaccinated and naturally infected animals.

Understanding the DIVA Concept

DIVA = Differentiation of Infected from Vaccinated Animals - Traditional vaccines cannot distinguish between antibodies produced due to natural infection and those from vaccination, complicating disease eradication efforts.

Mechanism - DIVA vaccines lack a specific antigenic marker (such as the gE protein). Vaccinated animals do not develop antibodies against this deleted marker. Infected animals with the wild-type virus do produce antibodies against it. Diagnostic tests (e.g., ELISA) detect antibodies against the missing marker, identifying infected animals within vaccinated populations.

Importance - Enables targeted culling, movement control, and surveillance, crucial for eradication programs like those led by the World Organisation for Animal Health (WOAH).

About Glycoprotein E (gE) — The Marker Gene

Structural Role - gE (glycoprotein E) is an envelope glycoprotein found on the surface of the Bovine Herpesvirus-1 (BHV-1). It assists in viral virulence, cell-to-cell spread, and immune evasion.

Deletion Rationale - By deleting the gE gene, scientists create a marker virus that is non-virulent and safe but still immunogenic. The deletion ensures vaccinated animals do not produce anti-gE antibodies, forming the foundation of the DIVA strategy.

Diagnostic Application - ELISA tests detect anti-gE antibodies. Presence of these antibodies → natural infection. Absence of these antibodies (in vaccinated animals) → successful immunization without infection.

Working Mechanism of Raksha-IBR

Step 1 - Vaccination

Cattle are administered the Raksha-IBR gE-deleted vaccine, which induces immunity against BHV-1 without producing antibodies against gE.

Step 2 - Exposure or Surveillance

If an animal is later exposed to the wild-type virus, it will develop anti-gE antibodies, detectable through diagnostic testing.

Step 3 - Differentiation and Control

Through DIVA-compatible ELISA testing, veterinary authorities can -

1. Identify infected animals within vaccinated herds.
2. Isolate or cull infected animals.
3. Continue vaccination campaigns safely.

Outcome - Achieves progressive eradication of IBR from cattle populations.

Comparative Analysis - DIVA vs Traditional Vaccines

Aspect	DIVA Marker Vaccine (Raksha-IBR)	Traditional Vaccine
Composition	Lacks a specific marker (e.g., gE)	Contains whole pathogen or major antigens
Serological Differentiation	Enables differentiation between infected and vaccinated animals	Cannot distinguish infection from vaccination
Disease Surveillance	Facilitates precise disease tracking and eradication	Complicates monitoring and data accuracy
Diagnostic Requirement	Needs companion diagnostic tests (ELISA for gE antibodies)	No specific companion tests required
Vaccine Type	Deletion mutant, subunit, or vectored	Live attenuated or inactivated
Safety	Safer due to deletion of virulence gene	Live vaccines may pose minor risks
Eradication Suitability	Highly suitable for eradication programs	Less suitable due to detection limitations

About Infectious Bovine Rhinotracheitis (IBR)

Causative Agent - Caused by Bovine Herpesvirus-1 (BHV-1), a member of the Alphaherpesvirinae subfamily.

Nature of the Disease - A highly contagious viral disease of cattle with both respiratory and reproductive manifestations.

Transmission -

1. Direct contact via nasal or ocular secretions.
2. Aerosolized droplets from infected animals.
3. Venereal transmission through infected semen or mating.
4. Latent infection in recovered animals can reactivate during stress.

Major Clinical Forms -

1. **Respiratory Form (IBR) -** Fever, conjunctivitis, nasal discharge, rhinitis, coughing, pneumonia, and reduced milk yield.
2. **Genital Form (Infectious Pustular Vulvovaginitis/IPV) -** Pustules and ulcers on the vulva, vagina, penis, or prepuce.
3. **Reproductive Impact -** Infertility, early embryonic death, and abortions in pregnant cows.

Economic Impact - Losses due to reduced fertility, decreased milk production, trade restrictions, and control costs.

Diagnosis -

1. **Serological tests -** ELISA for antibodies.
2. **Virus isolation -** From nasal or genital swabs.
3. **Molecular tests -** Real-time PCR for BHV-1 DNA detection.

Treatment - No curative therapy exists; management relies on vaccination, biosecurity, and controlled breeding practices.

About Bovine Herpesvirus-1 (BHV-1)

Virus Profile - Belongs to Herpesviridae family and Alphaherpesvirus genus. Establishes lifelong latent infections in sensory ganglia.

Diseases Caused - Infectious Bovine Rhinotracheitis (IBR) – Respiratory disease. Infectious Pustular Vulvovaginitis (IPV) – Reproductive disease.

Prevalence in India - BHV-1 infections are endemic in Indian cattle herds, especially in crossbred dairy populations, making control measures crucial for productivity.

Significance of Raksha-IBR Vaccine for India's Dairy Sector

Global Leadership in Milk Production - India accounts for over 25% of global milk output, making cattle

health a pillar of food security and rural income.

Productivity Enhancement - By preventing IBR-related reproductive disorders and abortions, farmers can expect -

1. Improved fertility rates,
2. Increased milk yield,
3. Better calf survival rates.

Support for Biosecurity and Herd Health - Raksha-IBR enables structured vaccination drives under national animal disease control programs, improving overall herd immunity.

Self-Reliance in Veterinary Biotechnology - The vaccine is a major step toward Atmanirbhar Bharat in the animal health sector, reducing reliance on imported biologicals and technologies.

Export and Trade Benefits - Certification of IBR-free herds facilitates international trade in semen, embryos, and livestock products, aligning with global sanitary standards (WOAH).

Broader Public Health and Policy Implications

National Animal Disease Control Programme (NADCP) - Raksha-IBR supports the NADCP's goal of controlling and eradicating major livestock diseases like FMD and Brucellosis, thereby improving animal productivity and farmer income.

Integration with Digital Livestock Health Platforms - Future integration with digital monitoring tools can strengthen disease tracking and vaccine coverage reporting.

One Health Synergy - While IBR itself is not zoonotic, controlling such diseases aligns with the One Health approach, reducing overall viral circulation and improving animal welfare.

Source - https - //www.thehindu.com/sci-tech/science/indian-immunologicals-rolls-out-indias-first-ge-deleted-diva-marker-vaccine-against-ibr/article70108345.ece