is possible with reasonable accuracy, while the "Cleanliness" score varies quite a lot among farmers and has a high level of systematic bias (underreporting) that makes this indicator less usable with the current system.

Animal welfare and sustainability are important parameters demanded by customers all over the world and with the Arlagaarden® system, Arla Foods has established a valuable tool that can improve a farmer's business and create a strong signal to meet customers' needs for reliable records.

The collective collection of data on the 1.4 million cows that supply milk to Arla Foods is essential for the dairy company to be able to demonstrate responsible milk production. The main objective of Arlagaarden® is to make the milk more valuable by demonstrating that the animals thrive well and that the milk is produced in a sustainable way.

Farms that have some problems also receive help and guidance to improve and in this way the system helps to push all dairy farms further and towards greater animal welfare.

LOOKING AHEAD

The database already has millions of records on animal health parameters for 1.4 million cows on nearly 10,000 farms. Retailers and key customers are already asking for specific knowledge on the different farm categories. Intensive learning and training exercises on cow scoring are improving validity, as is follow-up verification within the Quality Scheme supporting gradual increases in accuracy. The tens of millions of records will enable a great deal of data immersion and therefore give scientists tools to systematically analyse and hopefully isolate different issues in the ongoing search for a simplified method to better assess animal health.

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Control of Infectious Bovine Rhinotracheitis through inactivated marker vaccine: a field study in India

Immunization with IBR inactivated marker vaccine can be adopted in both organized and unorganized sectors for control of IBR in cattle and buffaloes

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UN SDGs

Summary

Location: The pilot project on control of infectious bovine rhinotracheitis (IBR) in cattle and buffaloes was implemented in India covering 11 villages of two states (Gujarat and Andhra Pradesh) and in an organized herd (Telangana) with high IBR prevalence.

Resource based measure:

- Measure 1: No loss in animal productivity due to IBR vaccination with inactivated marker vaccine
- Measure 2: IBR inactivated marker vaccine is effective in cattle and buffaloes.

Animal based measures:

- Measure 1: Protection from infection thereby improving health and well-being
- Measure 2: Differentiation of infected from vaccinated animals.

Group demographics: This project includes dairy farmers (both men and women), veterinary technicians, field veterinarians and research group.

AN EVALUATION OF THE EFFECTIVENESS OF THE IBR VACCINATION IN CATTLE AND BUFFALO IN INDIA

Infectious bovine rhinotracheitis (IBR), an economically important disease of cattle and buffaloes, is caused by bovine alphaherpesvirus-1 (BoHV-1) belonging to genus *Varicellovirus*, family *Herpesviridae* [1]. The disease is characterized by rhinotracheitis, pustular vulvovaginitis, balanoposthitis, conjunctivitis, enteritis, decreased milk production, weight loss, and abortion [2, 3]. Latency is a unique feature of this virus infection and almost all infected animals harbour the virus for life after infection. The virus reactivation can occur due to stress or immunosuppression, resulting in intermittent shedding of virus in natural secretions, thereby transmitting the disease to other susceptible animals [4]. The disease is endemic in India and serological prevalence has been reported from almost all parts of the country [5]. Currently, no national control programme is in place for this important disease.

A project was undertaken to evaluate the effectiveness of vaccination in India with the inactivated IBR marker (gE deleted) vaccine as a disease control measure in both the organized and unorganized sector. In this study, the effectiveness of the IBR vaccination in buffaloes under Indian condition was also evaluated.

PLANNING AND PERFORMANCE OF THE IBR VACCINATION

IBR vaccination was carried out in an organized dairy cattle herd and in 11 villages (unorganized sector) of three states in India using a commercially available IBR inactivated marker (gE deleted) vaccine. The vaccination regime includes primary immunization of two doses (0 and 28 DPV) followed by booster at every 6 months intervals. All the animals above 3 months of age were vaccinated irrespective of their IBR infection status.

Organized herd: The organized dairy cattle herd (n~900) included in the study had high IBR seroprevalence and was experiencing high abortion rate. The IBR vaccination was initiated in October 2016 and by the end of study in the 2019, seven rounds of vaccination were completed. Representative animals were observed for 10 days to rule-out any adverse effects following vaccination. Further, total milk production in the herd was compared before and after vaccination (10 days each) were compared to evaluate any

negative effect of vaccination on milk production. The immune response elicited in the animals following vaccination was evaluated by screening serum samples collected at different time intervals, from representative animals, in IBR ELISA and by serum neutralization test (SNT). The differentiation of vaccinated from infected animals (DIVA) was performed using companion gE ELISA test. To study the persistence of maternal antibody, calves borne from vaccinated dams were screened in parallel by gB and gE ELISA tests. Apart from the above, a prospective cohort study was undertaken to study the protective effect of IBR vaccination on bovine abortion in the organized herd. Only heifers (first time pregnant) were included in the analysis and abortion status of the heifers were recorded.

Unorganized sector: After ensuring the positive effect of IBR vaccination in the organized herd, the project was extended to unorganized sector. The project was initiated in February 2018 and 11 villages of two states (Gujarat and Andhra Pradesh) were included in the study. Approximately 62,000 vaccine doses were used in nearly 12,500 cattle and buffaloes of these villages in five rounds of vaccination. Blood samples from the representative animals were collected pre and post vaccination to study the immune response and vaccine effectiveness. A total of 3,714 serum samples were collected and tested by gB and gE ELISA.

The protective effect of the vaccination was determined on the basis of the percentage of uninfected (sero-negative) animals included in the study that remained uninfected by the end of the study period.

Mass awareness drives emphasizing on disease potential, management of suspected animals including disposal, significance of vaccination and testing etc. found to be the epitome of success of this project. IBR awareness film in Hindi, English and nine other Indian regional languages has been developed for farmer's awareness which is available in social media (https://www.youtube.com/watch?v=len5xY2Cc1M) in addition to extension leaflets/posters in different Indian vernacular. Technical workshops on IBR in the project implementation areas were also organized to generate awareness and to improve participation in the project.

> "IBR vaccination was able to protect more than 90% of the susceptible population in the highly endemic herd and more than 98% in the unorganized sector in India."
>
> **Dr S K Rana**

THE VACCINE WAS FOUND TO BE SAFE AND RESULTED IN SEROCONVERSION

Organized herd: The vaccine was found to be safe, even in pregnant and lactating animals, as no reactions were recorded in any rounds of vaccination. No significant reduction in milk yield following vaccination was recorded. Seroconversion was recorded in all the animals (positive by ELISA) and the antibody titre further increased after the booster dose. The gE ELISA test was able to differentiate vaccinated animals from infected animals (DIVA). More than 90% of IBR seronegative animals remain uninfected for IBR even after 3 years (during the study period) in the endemic setting. In calves borne from vaccinated dam, 97.5% remained uninfected in this endemic farm till studied. The overall sero-prevalence of IBR in this farm reduced from 73% at the beginning of the study (2016) to 48% at the end of study period (2019). Similarly, the incidence (new infections) of IBR in the farm reduced from 13.7% to 4.4%. Studies on persistence of maternal antibody in the calves borne from vaccinated dams revealed the maternal antibody wanes latest by 9 months of age. Further, these calves with maternal antibody could be differentiated for infection status by DIVA-ELISA test. This suggests that IBR vaccination of dams will not interfere procurement of high genetic merit bull calves for breeding purposes. Abortion in bovine is multifactorial in nature, and IBR has been implicated as one of the cause of abortion. Reduction in the rate of abortion was also recorded among the first time pregnant heifers in this farm after introduction of IBR vaccination programme[6].

Unorganized sector: The vaccination was undertaken with the help of local field veterinarians as per the recommended schedule. Dairy farmers (both men and women) of the project villages participated in the vaccination campaign and attempt was made to vaccinate all the cattle and buffaloes above 3 months of age. The overall vaccination coverage in five rounds of vaccination was 91.7%. No adverse effects in the vaccinated animals were reported by the farmers following vaccination. The overall seroconversion recorded after five rounds of vaccination was 95% and rate of sero-conversion was comparable in both cattle and buffalo. Around 98% of the vaccinated animals remained uninfected during the study period (570 days post vaccination).

CONCLUSION

No untoward reactions were reported after vaccination even in pregnant and lactating cattle and buffaloes. Seroconversion was

recorded in almost all animals and the antibody titre was maintained till the next vaccination schedule. The vaccine was able to protect over 90% of the susceptible population in the highly endemic herd and more than 98% in the unorganized sector. Extension activities were also undertaken to educate the farmers of the country on the severity of IBR and to popularize vaccination as a control measure. The findings of this study demonstrate vaccination with IBR inactivated marker vaccine is effective in control of the disease in endemic settings.

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Differential Somatic Cell Count in milk: a new tool for better udder health management in Italy

The availability of high-throughput differential somatic cell counting is the most innovative instrument for mastitis diagnosis and milk quality assessment in recent years. The quality and quantity of information provided by these instruments will dramatically improve our knowledge of the management and health of dairy cows.

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UN SDGs

Summary

Location: Milan, Italy

Resource based measure:

- Measure 1: dairy herd sustainability
- Measure 2: milk yield and quality

Animal based measure:

- Measure 1: udder health
- Measure 2: cow welfare

CAN DIFFERENTIAL CELL COUNT BE AN EFFECTIVE TOOL FOR MASTITIS DETECTION?

The progressive decrease in the average of SCC in dairy herds worldwide is affecting the accuracy of SCC as a marker of subclinical mastitis. This evidence supports studies that aim to apply differential cell count (DSCC) as a tool to identify mastitis. Two of the main obstacles to applying the DSCC were the lack of availability of high-performance milk analysers and the cost of these tests. The recent availability of high-throughput milk analysers, capable of performing partial DSCC on milk, allowed to overcome these problems and to increase our knowledge on udder immunity and mastitis pathogenesis.

"The results the studies, as well as those of others, confirm the importance of the DSCC as a tool to define the health status of the udder, but also as a marker of the milk composition of the local immune response."

Prof. Alfonso Zecconi

Our goal was:

1. To define the DSCC thresholds useful to identify subclinical mastitis and the effects of possible confounding factors
2. Assess the relationship between DSCC and milk composition and yield
3. to describe the DSCC and the total amount of different cells in the milk of cows during the course of lactation with different SCC levels and parities

MATERIALS AND METHODS

In the first study, 4386 weekly milk tests from four dairy herds were considered. The second study considered 3,022 monthly milk test records from 24 randomly selected dairy herds and the third study considered 17,939 monthly milk test records from 12 dairy herds.

Real time PCR (qPCR) was performed on individual milk samples to define udder health status. All milk testing was performed using certified methods, currently applied by the Italian Breeders Association (www.aia.it) at the ARAL laboratories on a Fossomatic 7C (Foss, Hilleroed, DK).

The data on the cows were obtained from the breeding codes of the Italian Breeders Association (AIA).

RESULTS

The results showed that threshold values of 66.3%, 69.2% and 69.3% should be applied to have, respectively, ≤100 DIM (transformed using fractional polynomial regression), 101-200 DIM and >200 DIM to have the highest probability of correctly identifying the udder health status.