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Conquering Rinderpest in India: A Symphony of Science and Ethics Paving the Way for Future Veterinary Triumphs

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Throughout the course of human history, the enduring impact of the Rinderpest disease on social, economic, and ecological facets has persisted for millennia. Traditionally disseminated through trade and conflict, the disease has caused substantial cattle losses in India, with notable instances such as the one million animal deaths in Himachal Pradesh in 1860. By 1996, the number of outbreaks and death rates had plummeted to zero, a stark contrast to the 8,000 outbreaks and 200,000 deaths per year before 1950. This disease was known notorious for spreading through the trade in animals and as a consequence of war, left an indelible mark on the course of humanity. In India, Rinderpest was accountable for the decimation of thousands of cattle annually, with its prevalence extending to nearly every district in the country, as documented by Hallen *et al*. in (1871). The mortality rate attributed to this disease ranged from 80% to 100%, inflicting substantial economic losses.

The conquest of Rinderpest in India was achieved through a combination of scientific advancements and ethical considerations. Scientifically, extensive research efforts in India led to the development of antisera and the ground breaking discovery of a vaccine for the heterologous host. This laid the groundwork for the successful implementation of control measures, including the National Eradication Program initiated in 1954 and the subsequent National Program on Rinderpest Eradication in 1992. These programs utilized reliable diagnostic tools, focused quality vaccination, and comprehensive seromonitoring and clinical surveillance.

Europe successfully implemented zoo sanitary control measures, movement restrictions, and compulsory slaughter to eliminate Rinderpest from the continent. Despite India's extensive efforts to combat the disease, the nation showcased to the global community that a compulsory slaughter policy could be avoided, given cultural sensitivities that deem animal slaughtering as inhumane. This achievement was facilitated by focused quality vaccination, seromonitoring audits, and clinical surveillance covering a livestock population of 480 million, utilizing 1,642 million vaccine doses from 1956 to 1998—the largest sero-clinical surveillance initiative globally. India obtained Rinderpest freedom status from the OIE in Paris.

Pioneering research on rinderpest commenced at the Imperial Bacteriological Laboratory, now recognized as the Indian Veterinary Research Institute (IVRI), in 1890. The initial breakthroughs emerged from the Mukteshwar laboratory, where the first notable contribution was the development of anti-rinderpest serum in 1899, accompanied by the innovation of the serum simultaneous method of immunization. Post-1900, Mukteshwar laboratory scaled up its efforts to achieve large-scale production of rinderpest anti-sera.

A significant turning point occurred in 1920 when J.T. Edwards introduced the goat tissue virus vaccine, a milestone that ushered in effective control measures for rinderpest not only in India but globally. This breakthrough played a pivotal role in combating the disease across Asian, African, European, and other countries, as detailed by Edwards in 1949. The efficacy of the rinderpest control program saw a rapid increase in the late 1930s when lyophilized freeze-drying techniques for rinderpest vaccine became available at IVRI.

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Further advancements ensued, with IVRI developing the lapinized rinderpest Nakamura strain IV in 1943, and subsequently, lapinized-avianized virus vaccines were successfully formulated. These scientific breakthroughs marked crucial milestones in the quest for effective control and eradication of rinderpest, contributing not only to the well-being of livestock in India but also globally.

The National Rinderpest Eradication Programme was initiated on October 1, 1954, as documented by Dutta in 1954. Shortly thereafter, Uppal and Seetharaman (1957) meticulously addressed all technical aspects of freeze-drying, including seasonal variations, and increased the production capacity of the Goat Tissue Virus (GTV) vaccine at various veterinary biological units across the country. The technology for rinderpest vaccine production was subsequently transferred from the Indian Veterinary Research Institute (IVRI).While the usage of GTV proved advantageous for indigenous animals, Dhanda and colleagues (1967) reported adverse effects on cross-bred animals. In a significant development in 1966, IVRI achieved the distinction of producing tissue culture rinderpest vaccine, effectively replacing GTV.

To enhance disease recognition for rinderpest, several diagnostic methods were developed. These included the agar gel immune-diffusion test, battery-operated counter immune-electrophoresis, and Elisa techniques, along with rocket immune-electrophoresis (RIE), Fluorescent Antibody Test (FAT), Immunoperoxidase Test (IPT), Immunomicroscopic Agglutination (IMA), Indirect Hemagglutination Assay (IHA), Serum Neutralization Test (SRM), and Rapid Plate Hemagglutination Assay (RPHA). These diagnostic advancements played a crucial role in improving the accuracy and efficiency of disease detection during the rinderpest eradication efforts.

The culmination of these efforts was India being officially recognized as rinderpest-free by the OIE in 2006, as highlighted by Uppal in 2011. A noteworthy national ceremony was organized in August 2011 in Delhi to mark this achievement, with representation from global veterinary bodies such as FAO and OIE, along with Indian counterparts ICAR and DAHD & F, all coordinated by FAO National consultant Prof. P.K Uppal.

Considering the estimated overall investment of 33,357 million USD for the rinderpest vaccination campaign in India from 1955 to 1993, the resulting savings on recurring vaccination costs are significant and stand as an unparalleled achievement in the history of veterinary R&D in India. The Food and Agriculture Organization (FAO) underscored that the eradication of Rinderpest played a pivotal role in India's green revolution. FAO estimated that India gained an additional $289 billion in food production from 1965 to 1998 due to Rinderpest eradication, resulting in a 102.06 times increase in income from milk and a 193.96 times increase from beef meat between 1950-51 and 2005-06. The benefits of rinderpest eradication extend to enhanced food security and nutrition in India. Milk production witnessed a remarkable increase of 2.99 times from 1955 to 1995, while the export of meat and other livestock products soared by 17.99 times from 1959 to 1995 (Uppal, 2011).

The FAO estimated an additional food production gain of 289 billion dollars from 1965-1998, attributing the success to rinderpest eradication and its role in facilitating the green revolution.

This remarkable transformation was made possible through sound research at IVRI, technology transfer to various immune biological state units, and robust technical inputs on diagnostics, surveillance, and monitoring. The legacy of this achievement reverberates in the annals of Indian veterinary history.

Looking forward, the lessons learned from the triumph over Rinderpest in India provide a roadmap for addressing other health challenges. The successful eradication sets a precedent for the strategic application of scientific research, ethical considerations, and collaborative efforts in tackling veterinary diseases. One such avenue of focus is the ongoing commitment to eradicating diseases like Foot-and-Mouth Disease (FMD). By leveraging the knowledge and experience gained from the Rinderpest eradication, the aim is to further enhance human livelihoods, ensure

food security, and contribute to the broader field of veterinary public health. This involves sustained research, robust vaccination strategies, and continued vigilance through surveillance and monitoring programs. The scientific and ethical principles that guided the conquest of Rinderpest in India serve as a foundation for addressing and overcoming future challenges in the realm of animal health and well-being.

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