9th International Veterinary Immunology Symposium (http://9th-ivis.jtbcom.co.jp)
Plenary Session I-3: New strategies for disease prevention
Chairs: Richard Whittington and Shigeki Inumaru
Speakers: Mark Estes, Tracey J Coffey, Ramon A. Juste

Slow infection control by vaccination: paratuberculosis

Ramon A. Juste, DVM, PhD

Slow infections are those pathological entities that generally show: a) involvement of a low virulence external agent; b) frequent location at the inter-phase between the organic systems and the external environment; c) presence of a strong lymphocytic and macrophagic inflammatory component related to a local innate type immune response; d) unprotective or absent specific immune response; e) existence of many healthy carriers, but just a few individuals progressing to disease; f) slow time course of clinical disease, g) concentration of clinical onset in early adulthood, and h) association with a genetic component. The concept of slow infection was proposed by Bjorn Sigurdsson in the mid fifties of the last century as a model for the epidemics of Maedi/Visna in Iceland. In that episode, the import of apparently healthy rams that had even undergone a long quarantine period introduced three infections among the Icelandic sheep: Maedi/Visna, Ovine Pulmonary Adenocarcinoma, and paratuberculosis. The two first entities are of viral etiology and could be eradicated through massive depopulations. However, paratuberculosis was submitted to a successful control by means of vaccination of ewe lamb replacers. In a few years the frequency of of paratuberculosis lesions in the slaughterhouses had decreased by over 90% and more than 50 years later vaccination is still in use. Even though paratuberculosis vaccination in sheep has being practiced for decades and has been definitely accepted as an useful tool after extended usage in Australia, its use in cattle still seems to have a low profile. Indeed, there is very little in the literature reporting its continuous and successful field use in the UK and the USA for decades in hundreds thousands of cattle and frequently it is not even mentioned as a possible strategy for bovine paratuberculosis control.

Paratuberculosis presents a imunopathological spectrum that has been classified into several forms according to pathological and bacteriological criteria. Recent studies have confirmed this perspective and described its forms in detail in the three main domestic ruminant species. Since infection is widespread and most of the infected individuals do not show any signs of it, it can be assumed that the replacer vaccination is generally applied after exposure and therefore in the early phases of infection. This is consistent with repeated observations of beneficial effects of vaccination of adult cows. Therefore, in practice, paratuberculosis vaccination is applied more as a therapeutic treatment than as a preventive one. This lends support to the hypothesis of a mechanism of action based in modulation of host post-infection immune responses rather than in prevention of infection establishment. Meta-analysis shows that the protection provided by paratuberculosis vaccination ranges between 57% and 96% depending on the species and the specific variable considered.

Given the paratuberculosis infection characteristics, eradication of the agent is not always possible, and therefore control goals need to be focused on prevention of pathological-productive effects and the corresponding benefit/cost balance. Even in the perspective of a potential zoonotic character of paratuberculosis, control by vaccination might be the only strategy that can be widely implemented for reducing animal and human exposure to the agent. Other important factors in the equation are the humanitarian and the sustainability issues. Indeed, strategies based in the massive killing of animals in their top production age for economic reasons is no more advisable, neither in terms of social perception of animal wellbeing, or in terms of prolonged life of production resources.