Current developments of advanced veterinary biologics in Japan.

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Expansion in size and intensification of livestock farming contributes a spread of opportunistic infection, more complex infectious diseases, chronic infections and/or production diseases in Japan. These types of disease cause serious economic losses on the livestock industry, as these diseases are more difficult to prevent and treat. In addition, reduction of antibiotics usage and introduction of laborsaving livestock management practice are also urgent and crucial concern. To cope with these situations, variety of new approaches has being employed.

Cytokines are promising materials to develop novel agents and technologies for disease control. For example, recombinant feline IFN-ω, recombinant canine IFN-γ, and human IFN-α are already available as therapeutic agents in the market for feline calicivirus infection, canine parvovirus infection, atopic dermatitis of dog, and bovine rotavirus infection respectively. Some other cytokines are also actively studied for therapeutic applications. Among them, bovine GM-CSF has potential as a therapeutic agent for latent mastitis of lactating cows. Another potential technique for mastitis treatment is phage therapy. Although mastitis vaccine is so far not successful, vaccination techniques enable to activate mucosal immunity indicates great potential as an effective mastitis vaccine. As live vector vaccines have a large application potential to develop sophisticated preventive methods, Japan has a long tradition actively studying vaccine vectors. However, the presence of strong anxiety and skepticism for genetically modified organisms in Japan prevented to apply in a practical use. One such example is the fowlpox virus live vaccine vector which is developed in Japan and was used in U.S. but not in Japan. Recently this situation seems improving as Marek's disease virus vector live vaccine, is at last now come close to approval. Another promising example is a bacterial live vaccine vector, *Erysipelothrix rhusiopathiae*, which is an oral live vaccine vector, therefore potential as a laborsaving and animal-friendly vaccine vector. For a strategy for therapeutic agent and vaccine production, transgenic plant factory is also stepping into practical stage in Japan.