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Heterologous expression platforms for developing new generation vaccines for emerging viral infections

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The increased demand for recombinant vaccine antigens or immunotherapeutic molecules has resulted in exploration of highly efficient and cost-effective heterologous expression systems. It is practically impossible to have a universal expression platform for vaccines and therapeutic proteins and hence there is a constant evolution of traditional expression systems, including *E.coli*, yeast, plant, insect cells, mammalian cells and cell free systems. One can select an appropriate expression system based on the protein structure, ease of expression, post-translational modifications, desired immunological response, protein yield, cost of production, etc. With the advancement of molecular engineering techniques and bioinformatics tools, fine-tuning of existing systems for the production of next generation viral vaccines are reaching maturity. However, there is an increasing demand for any breakthrough innovations that provide rapid, efficient, robust, safe and cost-effective solutions.

Different antigenic proteins ranging from single protein based subunit vaccine for Pandemic flu, African horse sickness and Bluetongue to multi-protein based virus like particles of Bluetongue and Chikungunya viruses were made employing various expression systems like *E.coli*, yeast, plant and insect cells. The resultant vaccine candidates were tested for their biological activity and elicitation of immunological responses in animal models. Selection of an appropriate expression host for producing vaccine was made based on their effectiveness and manufacturing feasibility. Our data suggests that every protein is unique, and would require a dedicated strategy that ensures its optimal expression and biological activity. With the ongoing emerging and re-emerging viral outbreaks, it's extremely important to explore all possible expression systems for rapid selection of an ideal platform for quick development of vaccines to address any urgent medical needs.

Biography

Athmaram Thimmasandra Narayanappa has Ph.D in Biotechnology from Bangalore University, India and post-doctoral training at London School of Hygiene and Tropical Medicine, UK. He has expertise on molecular virology with specialization on development and evaluation of vaccines for veterinary and human use. He has extensively worked on several emerging viral infections viz, Pandemic flu, Chikungunya, Dengue, Kyasanur Forest disease, Bluetongue, Orthoreovirus, Swine parainfluenza and African horse sickness. His research was focused mainly on recombinant expression and purification of antigenic proteins and multi-protein complexes employing various expression platforms like *E.coli*, yeast, plant and baculovirus. He has developed upstream and downstream processes for large scale expression and purification of antigenic proteins for prophylactic and diagnostic applications. He has served at Defense research and development organization (Government of India) as senior scientist leading the Bioprocess scale-up facility for producing vaccines and diagnostics for several virus and bacterial agents of bio threat importance. He has also developed an inactivated vaccine and molecular diagnostic methods for Swine orthoreovirus infection at Virginia Tech, Blacksburg, VA. Some of his technologies were successfully transferred for commercial use. Currently, his research work is focused towards developing serum substitutes and cell culture media for viral vaccine production.

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