**Application of protein engineering in development of new generation of vaccines: some reports**

Ali Mohammad Ahadi1\*

1. Department of Genetics, Faculty of Science, Shahrekord University, Shahrekord, Iran

* Correspond to: Dr. Ali Mohammad Ahadi, Department of Genetics, Faculty of Science, Shahrekord University, Shahrekord, Iran.

E-Mail:Ahadi\_al@sku.ac.ir Mobile: +989122094047 Fax: +983832324419

**Abstract**

Undoubtedly, the most effective strategies to prevent the pathogenicity of harmful organisms development of effective vaccines against pathogens. Several generations of vaccines have been introduced by companies and scientific centers around the world; however, the problems and insufficiencies for them in promoting of the immune system, emphasizes the need for new studies. Here, some of our researches about the application of protein engineering in design and development of new trial vaccines are presented. Two pathogenic organisms in human societies that have been considered in our studies are Rotavirus and Salmonella typhi. Rotavirus and salmonella is two major agent of intestinal infection and annually cause very high rate of death among people all over the world that many of them are children. These two infection are prevalent in many developing countries. Several antibiotic treatments have been conducted to control the salmonella infection but clinical management is becoming more difficult due to the emergence of drug resistant strains. also improvement of sanitation has not been able to decrease the incidence of rotavirus infection, efficiently. Therefore, vaccination is the best and most effective way to control these two infections. We carried out in our department, three projects in order to development of desired vaccines. At the first, a multi-epitopic vaccine again Rotavirus was designed and constructed by using SOEing PCR method. This vaccine included nine motives containing several well characterized effective epitopes derived from VP4 and VP6 proteins of *Rotavirus*. In the next projects we designed and developed the second fusion protein as a multi-epitopic vaccine against Salmonella typhi included OmpA, OmpF and OmpC proteins. Finally, we designed and constructed the third multifunctional and multi epitopic vaccine. This protein contains a multiple vaccine derived from salmonella and rotavirus antigens, which simultaneously will be able to simulate immune responses against these two pathogens. Our method in construction of fusion genetic constructs was SOEing PCR method. Some very extent Immunoinformatic and bioinformatics analysis was carried out by using of several software and server in every step. Also, analysis of some biophysical and biochemical properties of desired fusion proteins was carried out. Genetic constructs were cloned and expressed in pET system and protein expression was analyzed by SDS-PAGE and western blot. Purification and animal challenges of produced vaccines are ongoing.

**Keywords**: Fusion proteins, Multi-epitopic vaccine, *Rotavirus*, *salmonella*, Immunoinformatic.