## عنوان مقاله:

Design and Development of a New Method for the Production of Nanotoxoids from Clostridium Perfringens Beta Toxin

## محل انتشار:

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## خلاصه مقاله:

In recent years, a nanoparticle-based strategy has shown that non-denatured protein toxins can be used to enhance the appropriate immune response. Once the toxin reacts between the nanoparticles and the protein (toxin), it loses its toxicity because it does not attach to its ligand at the cell surface. The results of the nanoparticle and toxin complex show that the nanoparticles facilitate the internal release of the toxin. Clostridium perfringens beta toxin is produced by Clostridium perfringens type B and C, and diarrhea is the most important disease caused in newborn lambs. When beta toxin forms a complex with nanoparticles, the reaction between the toxin and the nanoparticle leads to the formation of a new form of nanoparticle in which the toxin loses its lethality due to its involvement; therefore, it becomes a toxoid. The nanoparticles used in this research are of poly lactic-co-glycolic acid (PLGA) type, one of the most developed biodegradable polymers. This study aimed to isolate and purify Clostridium perfringens beta toxin and produce its complex with PLGA nanoparticles to form a non-toxic structure. In this study, Clostridium perfringens beta toxin type B was isolated using ammonium sulfate precipitation and gel filtration chromatography. Toxin assay was performed in vivo (lethal dose [LD۵۰]) and in vitro by sodium dodecyl sulphate-polyacrylamide gel electrophoresis at each stage, and the quantity of purified toxin was calculated to be ۱۰ mg/ml. Afterward, the beta toxin antigen was used as the basis for the preparation of nanotoxoid candidates with nanoparticle formulation. Moreover, the PLGA polymer and water-oil-water methods were used to fabricate nanoparticles. Under optimal conditions, nanoparticles without antigen with an average size of ۱۰۰ nm and zeta potential of -۲۳.۲۸ mV, as well as nanoparticles containing antigen with an average size of ۱۲۰ nm and zeta potential of -۱۸.۲ mV, were prepared. When nanoparticles are injected into mice with the beta toxin, the toxin becomes a toxoid with no toxicity effects, and it cannot bind to its receptors and reveal its effects. In this study, the mice showed mild symptoms in one case, and none of them died. The beta and PLGA toxin model could also be applied as a candidate to study the release and immunization of the target animal. In

order to achieve antigen regulation using natural polymers, it is recommended to conduct a comparative study between nanoparticles based on natural polymers.


## کلمات کلیدی:

beta toxin, Clostridium perfringens, Nanoparticles, Poly lactic-co-glycolic acid