Compositions and Methods for Detection, Prevention, and Treatment of Anthrax and Other Infectious Diseases

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Technology description

Background

One of the most pressing infectious diseases that researchers are searching to diagnose, prevent, and treat is that caused by the bacteriaBacillus anthracis(Anthrax). This disease is increasingly important to address as its bacterial spores have been used in bioterrorism, where there is the use of antibiotic resistant strains.
Early diagnosis and intervention before toxin production is vital for patient survival. However, the current methods of diagnosis with bacterial cultures take 12-14 hours for a preliminary diagnosis and further testing with sophisticated assays for more definitive diagnosis. This is a very time consuming process, and initial point of contact diagnosis would be a much more effective means with which to diagnose and then treat Anthrax infections before toxin production is too high.

Technology Description

A collaboration of researchers at the University of New Mexico, University of Nevada, Reno, and University of Minnesota have developed a system of both vaccine formulation and method of immunization to better diagnose, treat, and even prevent infection of B. anthracis through utilizing the glutamic acid capsule that surrounds the bacteria. The capsules that surround this specific bacteria, made of γ_D PGA or γ_L PGA, prevent phagocytosis of the pathogen and thus allow for its replication within the subject' s blood and tissues. The vaccine formulated by researchers involves combining these capsulated polypeptides of the Anthrax pathogen and a CD40 agonist, which when injected with either enough concentration or over a series of injections can elicit an immunoprotective response in the patient against this pathogen. This introduction of two substances can be done either simultaneously, in immediate sequence, or through the use of booster shots of the polypeptide that either do or do not include the CD40 again. The vaccines can be formulated to contain either/both of γ_D PGA or γ_L PGA.
The researchers have also proposed a method of deriving and extracting antibodies to fight the anthrax infection via attacking the polypeptide surrounding capsules, which can then aid in the process of preventing and treating infections of this pathogen. Antibodies can be extracted from humans or

animals previously exposed to the previously discussed immunization sequence(s) and then introduced into a new subject via passive immunization to elicit immunity and prevent infection. This passive immunity process can also occur through creation of monoclonal hybridomas of the antibodies. These same antibodies are also envisioned to serve a purpose in diagnosis via contacting a sample of interest with the antibody to see if the capsular polypeptide of the pathogen of interest is present and comparing the levels to that of a baseline value or a known-uninfected sample from the same species of patient. High levels of the capsules would indicate infection.

Application area

Allows for diagnostic tests that are faster than current culture diagnoses
Easier than nucleic acid hybridization techniques
Not dependent on the presence of viable pathogen which would not be present if patient already treated with antibiotic
Provides antibody for treatment, diagnosis, and prevention of disease
Can be utilized pre or post-exposure
Immunization and immunity target the capsule of the bacteria which is essential for production of disease and not subject to manipulation for bioterrorism
Same process can be expanded to apply to other infectious diseases that are encapsulated in glutamic acid polypeptides

Institution

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