



# PharmAthene

## **RECOMBINANT PROTECTIVE ANTIGEN (rPA) ANTHRAX VACCINE – NOVEL SECOND GENERATION VACCINE TECHNOLOGY**

### ***Bacillus Anthracis* (Anthrax) Infection**

*Bacillus anthracis* is a spore forming, gram positive bacterium that has potential to be used as a weapon of bioterror when delivered in an aerosolized form. Following germination of the spores, the bacteria replicates and produces three toxins. Anthrax Protective Antigen (PA) initiates the onset of the illness by attaching to cells in the infected person where it then facilitates entry of the two additional destructive toxins - Lethal Factor (LF) and Edema Factor (EF) into the cell.

### **Current Standard of Care**

Antibiotics are the first line of defense against anthrax infection. However, early identification and treatment are critical for successful outcome. Even with aggressive antibiotic therapy, five of the eleven victims of the 2001 anthrax postal attacks died, underscoring the need for improved vaccines and anti-toxins for civilian protection. The current FDA licensed anthrax vaccine (BioThrax® Anthrax Vaccine Adsorbed) is approved for the prevention of anthrax infection, but requires six doses over a period of eighteen months to achieve protective immunity. AVA is a first generation anthrax vaccine made from cell free filtrates of whole bacterial cultures of *bacillus anthracis*. This vaccine was FDA licensed in 1970.

### **Key Characteristics of PharmAthene's rPA Anthrax Vaccine**

PharmAthene's second generation rPA anthrax vaccine consists of recombinant Protective Antigen (rPA) adsorbed onto Alhydrogel and packaged as a liquid filled syringe for intramuscular injection. It is a highly purified protein that offers the potential for improved safety and convenience. It is intended to be used to protect individuals before or after exposure to the anthrax bacterium. Preclinical studies suggest that two or three doses administered several weeks apart should be sufficient to induce protective immunity followed by an annual booster shot.

### **Development Timeline**

Phase I and Phase II clinical trials (approximately 700 healthy human subjects) have been completed and showed that the vaccine is safe, well tolerated and induces an immune response in humans. In preclinical studies this vaccine has demonstrated the capability to protect non-human primates against a lethal aerosol challenge of the anthrax Ames strain.

The manufacturing process for the rPA anthrax vaccine is currently at full commercial scale.

In 2002, PharmAthene UK was awarded a multi-year contract, from the National Institute of Allergy and Infectious Disease (NIAID). Total government funding to date for the rPA anthrax program is approximately \$134 million. Prior to this the rPA anthrax vaccine had been developed by the Defence Science and Technology Laboratories (Dstl). PharmAthene has obtained an exclusive licence to the product from Dstl.

On February 29, 2008, the Department of Health and Human Services (DHHS) issued a formal solicitation by Request for Proposals (RFP) for an "Anthrax Recombinant Protective Antigen (rPA) Vaccine for the Strategic National Stockpile (SNS)." The solicitation outlines a requirement to procure 25 million doses of an rPA anthrax vaccine. PharmAthene believes that the second generation rPA vaccine meets the mandatory qualification criteria for responding to this RFP. Based upon historical awards for similar RFP's, PharmAthene believes that this award could have a potential value of between \$350 and \$600 million and has submitted a response for consideration by DHHS.

**Third Generation rPA Anthrax Vaccine**

The objective of the third generation program is to develop an rPA anthrax vaccine which can maintain stability for three years at 35° C and induce protective immunity in two or fewer doses. The development of PharmAthene's enhanced vaccine candidate has been supported by an NIH grant since 2005. A government published Request for Proposal was issued on September 21, 2007 seeking proposals for a third generation rPA vaccine, reaffirming the US government's commitment to rPA based vaccine development. The primary objective of the program is to develop an rPA-based anthrax vaccine that can be stored, transported and used without the need for a conventional cold chain – an important advantage for civilian biodefense deployment within the Strategic National Stockpile. The U.S. government has indicated that they will award contracts to fund the development of third generation rPA vaccine candidates in September of 2008.