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DNA Vaccines And HIV/AIDS

Ricardo Belmontes
Worcester Polytechnic Institute

James Ham
Ricardo Paz
Emily Scott-Solomon

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**DNA Vaccines And HIV / AIDS**

Ricardo Belmontes, James Ham, Ricardo Paz, Emily Scott-Solomon

**Advisors:** Professors Jill Rulfs and Helen G. Vassallo

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**Problem Statement**

HIV / AIDS affects over 33 million people worldwide, with the greatest number of victims located in developing countries. Conventional drugs only ease symptoms and do not cure the disease. A DNA vaccination that knocks down the CCR-5 gene could offer a solution to the disease.

**Over 33 Million People Live with HIV/AIDS Worldwide**

HIV is a retrovirus that infects T-cells which are central in adaptive immunity. It enters a cell by attaching to the CD4 receptor and the CXCR4 or CCR5 co-receptor. The HIV infection causes the body to lose cell immunity. The current treatment for HIV/AIDS, a triple cocktail which combines protease and reverse transcriptase inhibitors, costs about $10,000-$15,000 a year. However, the protease inhibitors increase the risk of cardiovascular disease and sudden heart failure in middle-aged HIV/AIDS patients.

**Creating the Vaccine: Funding**

While the cost of delivering a DNA vaccine to a patient is cheap, the initial discovery cost of the vaccine is in the millions. In 2000, contemporary pharmaceutical companies estimated the cost of creating a new drug was $403 million. Two potential HIV / AIDS vaccine trials were scheduled, estimated to cost $140 million and $63 million dollars. In order to create a vaccine, additional funding would be needed from outside sources:

- The Bill and Melinda Gates Foundation
- Private foundations
- Universities and research centers
- National Institute for Health (NIH):
  - Estimated budget in 2008 is $2,905,219,000 with $596,195,000 allocated for AIDS/HIV research.

**DNA Vaccines**

A DNA vaccine works by directly injecting DNA into the body, either the muscle or skin. Carrying the genetic information required, it begins producing antigens inside a host cell which will lead to a cell-mediated immune response. The plasmid DNA vaccine carries the genetic code for a piece of pathogen antigen and transcribes it to peptides. The cytotoxic CD 8+ lymphocytes bind to the peptides and induce the cell-mediated immune response.

**Trial Areas: Lesotho and the United States**

- United States • Developed nation • Unstable economic and politics minimized • Focus can be made on effectiveness of vaccine
- Lesotho • 270,000 people infected with AIDS (23.2% of population)

**Problem Statement**

- Relatively small area (11.720 sq miles) • Presence of Riders for Health • Variety of variables stereotypical of developing nations

**Assessment:**

- Housing Location
  - Environmental factors that contribute to spread of disease
  - Area in need of alternative distribution method
- Blood Test Results
  - Check HIV virus level
- Dietary Habits
  - Nutrition Level
- Clinical Visitation Dates
  - Followed inoculation regiments (grace periods between treatments)
- Age
  - Determine most susceptible population to target
  - Most treatment responsive age
- Gender
  - Determine most susceptible population to target
  - Check for gender specific side effects
- Economic Status (Income)
  - Determine most susceptible population to target
  - Determine price range affordable
- Family History (if Available)
  - Determine potential genetic diseases
  - Other diseases that could be attributed to death if occurs
- Patient Health History
  - Determine progression of HIV/AIDS in system
- Allergies
  - Cease distribution to patient to avoid hyperimmune response
- Prescriptions
  - Determine if certain medications heighten vaccination response
  - Determine if certain medications increase health risks

**References:**