2014

Analyzing Treatment Plans for Malaria Using Artemisia annua

Dan Amirault
Worcester Polytechnic Institute

Kayleah Griffen
Worcester Polytechnic Institute

Follow this and additional works at: http://digitalcommons.wpi.edu/gps-posters

Recommended Citation
http://digitalcommons.wpi.edu/gps-posters/340

This Text is brought to you for free and open access by the Great Problems Seminar at DigitalCommons@WPI. It has been accepted for inclusion in Great Problems Seminar Posters by an authorized administrator of DigitalCommons@WPI.
Analyzing the Optimal Treatment for Malaria Using the *Artemisia annua*

Dan Amirault- Biomedical Engineering
Kayleah Griffen- Mechanical Engineering

**Abstract**
Malaria is a parasitic disease impacting 3 billion people worldwide. The *Plasmodium falciparum* is drug resistant to 90% of antimalarial compounds. Artemisinin is being used in a variety of forms to treat Malaria, and the best way is in edible tablets created from organic *Artemisia annua*.

**Description of Treatments**

- **ACT**: Artemisinin Combination Therapy, produced in bacterial plasmids or extracted from *A. annua*, combined with other antimalarials
- **pACT**: Organic *A. annua*, edible tablet created from plant leaves
- **Transgenic**: Metabolically engineered *A. annua*, also edible tablet created from plant leaves

**Analysis of Treatments**

**Sustainability**

- **Effectiveness**
  - Transgenic produces 7.65 times the amount of AN produced in pACT (3)
  - ACT resistance rapidly compared to pACT (4)

- **Resistance**
  - WHO approves ACTs (5)
  - pACTs already widely accepted in developing countries (4)

- **Artemisinin Content**
  - pACT $0.10$-$0.30$ / treatment (4)
  - ACT costs $6 / treatment (6)
  - pACT production could occur in developing country (4)
  - ACT production is costly and non-domestic (6)

**Results and Discussion**

- pACT= best treatment option
- Clonally propagated yields 1.4% Artemisinin content consistently (4)
- Least likely for drug resistance
- Already accepted in developing countries
- $0.10$-$0.30$ / treatment (4)
- Production occurs in developing country
- Method shown below

**Measures for Attribution**

Analyze mortality rates and incidence rates of malaria recorded by the WHO. Analyze the economic impact on a country based on GDP. Analyze if socially acceptable by people by studying compliance.

**Project Goals/Objectives**

Determine the ideal treatment for malaria derived from the *A. annua* by analyzing the benefits and costs of ACTs, pACT and transgenic *A. annua*.

**Economic Feasibility**

- pACT cost $0.10$-$0.30$ / treatment (4)
- ACT costs $6 / treatment (6)
- pACT production could occur in developing country (4)
- ACT production is costly and non-domestic (6)

**Why Malaria?**

- Endangers 3 billion people worldwide
- 90% cases in Africa (2)
- 10% reduction of GDP (1)
- Injects the *Plasmodium falciparum* parasite (1)

**Analysis**

- **Public Acceptance**
- **WHO Approval**
- **Delivery to Body**

**Social Acceptability**

- WHO approves ACTs (5)
- pACTs already widely accepted in developing countries (4)

**Acknowledgments**

We would like to thank our professors Jill and Helen. We would also like to give a special thanks to Rebecca Zinno for her help with writing and research, Pamela Weathers for her insight on the *A. annua*, and Jim and Jess for their design skills.

**References**