

Production of the Antimalarial Drug Artemisinin from the Medicinal Plant *Artemisia annua* L.

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Malaria: Worldwide Epidemic

- Transmitted by **mosquitos**
- Prevalent in **underdeveloped regions**

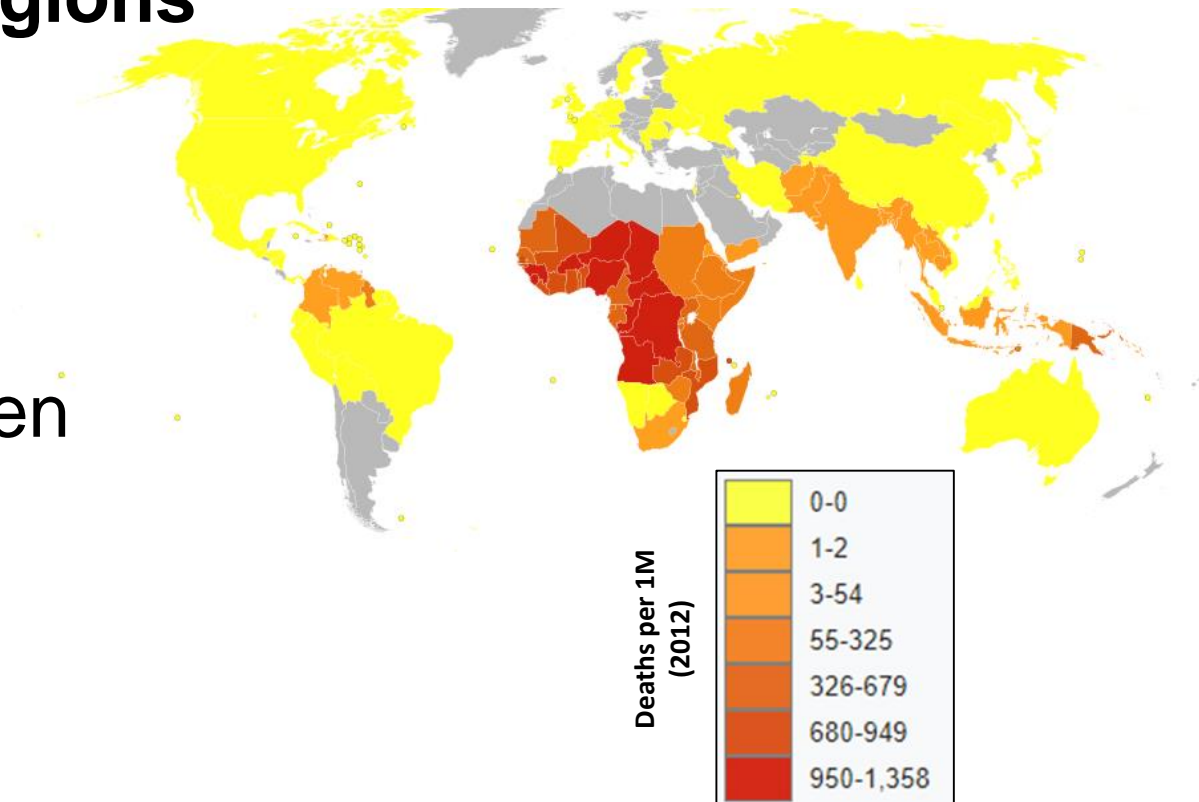
214 Million Cases in 2015

438,000 deaths reported

125 million at risk pregnant women

≈200,000 infant deaths annually

1,300-1,500 U.S. cases annually



Treatment: Recs, Scarcity, and Price

- Most effective treatment: **Artemisinin-combination therapy (ACT)**
 - Artemisinin + Amodiaquine/Lumefantrine/etc.
 - **Artemisinin naturally produced** in *Artemisia annua* plant
- Medicine supply is relatively **expensive and scarce**
- Counterfeiting of medicine/fake medicines exists
- Market demand high, supply low

Sweet Wormwood

- “Sweet Wormwood”
Artemisia annua L.
- **Summer annual**
- Belongs to **daisy/sunflower family** (Asteraceae)
- Commercially produced in **Southeast Asia and Arable Africa** “**LOW TECH**”
- 270-300+ growing season
- Artemisinin accumulates in glandular thrichomes on leaf lamina surface
“**EXTRACTION LOW TECH**”



➔ New cost-effective, efficient extraction technologies = emerging



Artemiflow: New Tech & the U.S.

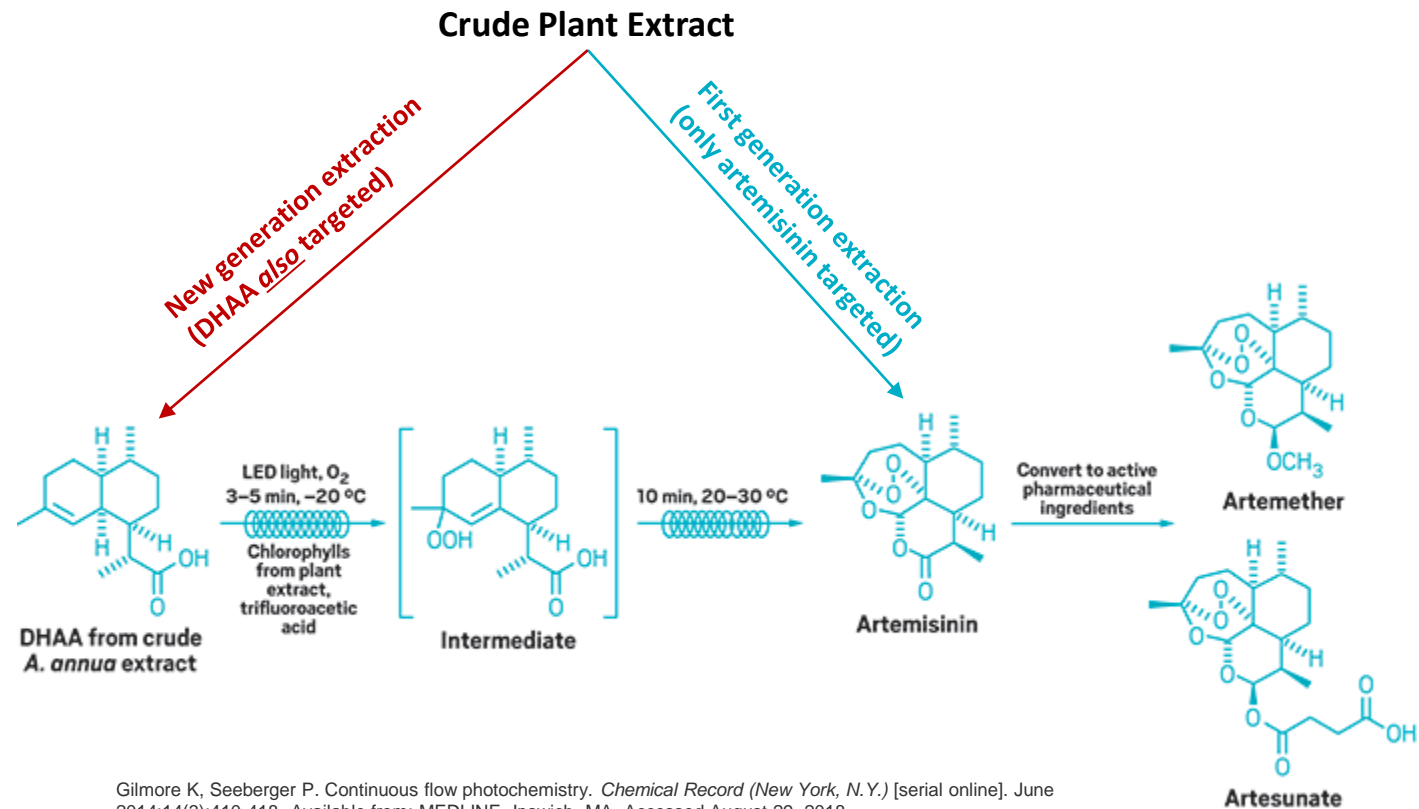
- German founded company
 - Scientists from the Max-Planck Institute
- Extraction efficiency increased
 - **Continuous flow system**
 - **Target artemisinin *and* chemical relatives**
 - **Higher yields, lower costs**



Dr. Peter Seeberger



Dr. Kerry Gilmore



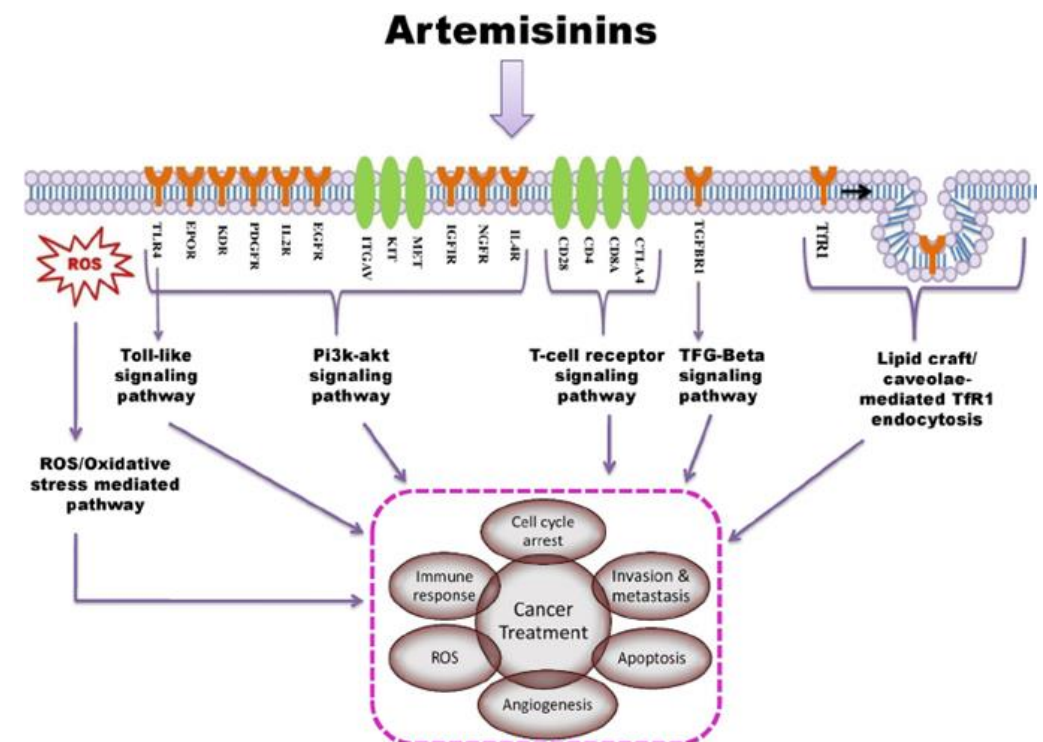
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Expansion: Cancer Treatment & Other Uses

- Artemisinins shown to be **effective for cancer treatment (Human trials now)**
 - **Already FDA approved drug**, only requires repurposing approval
- **Diabetes** potential
- **Veterinary applications** being explored



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Collaborative Research Opportunities

- **KTRDC & Markey Cancer Center** approached by **Artemiflow**
- KTRDC tasked with exploring propagating sweet wormwood in a **tobacco-type production system**
- **Limited information exists** on growing from seed
- **Step-wise approach developed** to gather info and data



Agronomic Pilot Research Funded By:

UK College of Agriculture,
Food and Environment

Kentucky Tobacco Research and Development Center

Summit Grant Program

Current Ongoing Agronomic Research

1. GREENHOUSE TESTING

2. FIELD TESTING

3. HARVEST TESTING

Fertility

Timing

Tolerances

Planting Date

Variety Testing

Chemical Application

Equipment

Post-Harv Processing

Storage



36 DAS



Herbicide Screening



RJ Carousel Setter



41 DAT
(132 DAS)



73 DAT
(164 DAS)



Inducing flowering

Potential Impacts for Regional Producers

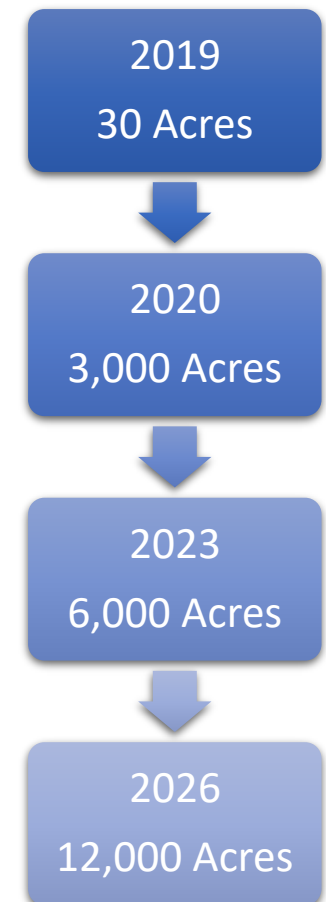
Existing Production & Demand

- Sweet wormwood an **established crop worldwide**
- Drug is FDA approved – **high demand exists & is expanding**
- Processing tech extremely efficient = **highly cost competitive**
- Field trials have **demonstrated cropping potential in CKY**

Fits Tobacco Bill

- **Similar to tobacco production**
 - Equipment, management
- Artemiflow stresses **value & importance of producers**
 - Per acre return **\$\$ estimated ≈tobacco**

Artemiflow's Sweet Wormwood acreage estimates:



Thank You!

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