iGEM 2012

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Our Pitch

- Yolo Plastics focuses on reducing the cost of recycling plastic pollutants by engineering microorganisms to convert plastic waste into biomass and high-value chemicals, promoting a more sustainable plastics industry.

The Problem: Environmental

- The Pacific Gyre patch has a mass of 100 million tons.
  - 90% of oceanic pollution is plastic
  - 80% of which comes from land
  - 20% from vessels.
- Contamination ranges:
  - leachate leaking in landfills
  - toxn in marine foodchain
  - harmful greenhouse gases.
  - Chemical leaking causes diseases in food/liquid containers
- 200,000 albatross killed per year along with other animals.

The Problem: Economical

- Collisions with floating or submerged waste objects
  - 269 boating accidents,
  - 15 deaths
  - 116 injuries
  - 3 million dollars in damage.
- California spends $72 million per year to collect and dispose of one-time use disposable cups and bags.
- California spends $52.2 million for beach cleanups.
- In total, the current annual costs to public agencies for litter prevention, cleanup, and disposal is $375.2 million.
- Currently, recycling is the epitome of inefficiency, utilizing an ironic 4,000,000 kilojoules of energy to degrade 1000 pounds of PET

Our Solution and its Value

- Bacteria will degrade PET, an abundant plastic, into Terephthalic Acid (PTA) and Ethylene Glycol
  - Recycling mixed materials
    - Value: We will degrade more efficiently than most recycling and landfill facilities, especially high cost high energy mixed material methods
  - Synthetically grown plastics
    - Value: No more use of chemical and petroleum processes
  - Ethylene glycol can be used as a carbon source for bacteria
    - Value: Bacteria can live off of PET
  - TPA or Purified TPA (PTA) can be reused for synthetic materials
    - Value: TPA will be reintegrated as a recycled bioplastic for other PET products.
    - Value: PHA can be turned into bioplastics that have a wide array of biomedical and pharmaceutical applications i.e. scaffolds, tissue grafts, sutures. PHA can be recycled into more biodegradable plastics for commercialization

Market

Incentives

- Company marketing/PR
- Tax incentives and Legislative benefits
  - CalRecycle
- Sustainability
- Green industry is growing
  - Bioplastics are in high demand along with synthetically made materials
- "Going green" allow companies to distinguish themselves as more progressive, allowing them to gain an edge on their competition
- Current chemical processes are wasteful and not cost effective

Customers

- Plant PET Technology Collaborative:
  - Coca Cola, Nike, Ford, Proctor & Gamble, Heinz
- Synthetic Material Producers
  - Shaw Carpets
  - Mohawk Industries
- Waste Management
  - Yolo Landfill
  - Waste Connections
  - Waste Management
- Environmental Agencies
  - WWF, Plastiki, CalRecycle
- Bioplastic and Chemical Producers
  - Genomatica, MicroMidas
  - Materials and Chemical Companies

Competitive Landscape

	Bioplastic/ Chemical Production	Waste Treatment	Inorganic Degradation	Methane cultivation	Non synthetic,Chemical Processes
Your Company	✓	✓	✓		
Waste Management		✓		✓	✓
Yolo County Landfill		✓		✓	✓
Earth 911		✓	✓		✓
Metabolix	✓				✓
Genomatica	✓				✓

Business Model

Revenue Scheme

- Utility: Customers that have mixed synthetic materials or in need of disposing waste
  - Synthetic, cheap, efficient recycling
  - Current methods are uneconomical and energy intensive
- Unit Sales: Sale of TPA to bioplastic and materials producers
  - Wide customer base due to variability of our product
- Analogs:
  - MicroMidas
  - Genomatica

Cost and Pricing

- Cost of Proof of Concept: $30,000
  - Includes Fixed Cost
- Cost of Licencing: ~$20,000
  - (can be cut if partnered with UC)
- Cost of Facility: 1 million dollars
  - (can be cut if brought if partnered with other plant)
- Cost of disposing 1 ton in landfill: $200
- TPA sells for $1400 per metric ton
- (Need current cost of combustion, filtration, chemical recycling)

Product, Price, Promotion, Place

Product	We provide a way to safely and easily degrade PET into monomers that can then be recycled into either PET or other biodegradable products
Price	Price per ton of plastic needed to decomposed Price per unit of TPA produced.
Promotion	Through environmental organizations and gather public support by showing conscientious energy and waste disposal
Place	Either in a facility in which we sell our process and provide and service to companies who wish to obtain TPA or degrade their waste.

Technology

- We are engineering bacteria to overproduce a enzyme that is known to degrade PET into ethylene glycol and terepthalic acid (PTA).
- We are working to optimize existing metabolic pathways that can use ethylene glycol as a carbon source, allowing bacteria to live off of plastic alone.
- Engineered strains will be able to convert PTA into PHA, a bioplastic of higher value than PET.
- We plan to optimize these pathways so that degradation and production is possible at the landfill level. This will be a new and effective way to take a cheap feedstock, PET, and break it into PHA in maketable quantities.
- We are developing this technology with researchers at the University of California, Davis and with advising from local recycling facilities. We will need to work with plastic suppliers and producers to test plastics and understand what needs there are.
- The costs of this technology will be largely in the research and proof of concept stage.

Milestones

- Milestone 1: See if cells thrive off of PET, with TPA remaining (small scale) 2 months
- Milestone 2: Gain initial funding off of results 4 months
- Milestone 3: Test on mixed plastic products or common materials 5 months
- Milestone 4: Test in bioreactor 6 months
- Milestone 5: Gain funding to test on industrial scale 7-9 months
- Milestone 6: Gain enough support to pursue full scale business 10 months
- Milestone 7: Create own facility 14 months
- Milestone 8: Expand customer base 15 months

The Team

- Board of Directors

name	relevant skills and experiences
Akshay Sethi	Chief Financial Officer, B.S. Biochemistry and Molecular Biology
Marc Facciotti	Chief Operating Officer, Ph.D. in Biophysics, Director of Facciotti Lab at UC Davis, Professor of Biomedical Engineering
Mattan Hamou	Chief Executive Officer, B.S. Cell Biology and Physiology
Nick Csicsery	Executive Director of Laboratory Procedure, B.S. Synthetic Biology and Bioengineering

- Researchers

Our amazing UC Davis iGEM Team

http://2012.igem.org/Team:UC_Davis/Team

The Team

- Advisory Board

name	relevant skills and experiences
Peter Matlock	Biotechnology Business Development and Entrepreneurship
Jon Bissell	CEO of MicroMidas
Tom Hinds	Director of Marketing UC Davis
Waste Management Advisor	Manager in Waste Management that has experience with bioreactors and landfill characteristics
Recycling Facility Advisor	Senior Partner of recycling facility that understands that costs and logistics of recycling
Environmental Agency Advisor	Public relations officer, experience with raising funds and awareness
Biotechnology Expert Advisor	Partner of biotechnology firm that understands the science, industry, and field of bioremediation

Summary and Next Steps

- FINANCIAL PROJECTIONS AND PRICING!!