Outline

Genentech Backgrounder
Definition of Green BioPharma
Green Chemistry at Genentech
Organizational Change Model
Strategic Focus Areas and Success Factors
Highlights of Accomplishments to Date
Roadmap
Outline

• Genentech Backgrounder
  Definition of Green BioPharma
  Green Chemistry at Genentech
  Organizational Change Model
  Strategic Focus Areas and Success Factors
  Highlights of Accomplishments to Date
  Roadmap
Backgrounder

Genentech fully owned by Roche since 2009
Genentech South San Francisco (15,000 EEs)
  – US Roche HQ, R&D, biologics development, mfg, sales/mktg
  – Global clinical development
Biologics → Small molecule, ADCs
Strong mission-oriented corporate culture, driven by science and innovation and patients
Oncology, immunology, metabolism; new: neuroscience, infectious diseases
Roche Group commitment to stay on DJSI (top 3 among health care)
1500 Green Genes Team members in SSF
Pharmaceuticals, broadly categorized

Small molecules

- low molecular weight (<500 g/mol)
  - examples: aspirin, OTC drugs
- manufacturing process: chemical synthesis
- **environmental impact: solvents, energy**

Large molecules (aka biologics)

- high molecular weight (~10,000 daltons), aka “macromolecules”
  - examples: proteins, growth hormone, insulin
- manufacturing process: grow genetically modified cells (microbrewery meets high tech)
- **environmental impact: water use (cleaning), certain materials and chemicals; energy**
**Pharmaceutical industry**

Traditional Pharma: small molecules  
Biotech: large molecules  
Trend and future: each is moving into the other’s space → biopharma

<table>
<thead>
<tr>
<th>Pre-IND or IND-enabling studies (“pre-clinical”)</th>
<th>IND (FDA filing)</th>
<th>Phase I</th>
<th>Phase II</th>
<th>Phase III</th>
<th>NDA or BLA (FDA filing)</th>
<th>Commercialization</th>
</tr>
</thead>
<tbody>
<tr>
<td>OK to test in?</td>
<td>Does it cause harm?</td>
<td>Is it efficacious?</td>
<td>Does it really work in typical clinical settings, compared to X?</td>
<td>OK to sell?</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Small: n~10  
Bigger: n ~ 100  
Much bigger: n ~ 1000

©2012, Genentech
Outline

Genentech Backgrounder
• Definition of Green BioPharma

Green Chemistry at Genentech
Organizational Change Model
Strategic Focus Areas and Success Factors
Highlights of Accomplishments to Date
Roadmap
Definition

Green BioPharma is the design, development, and implementation of biological and chemical products and processes that reduce or eliminate the use and generation of substances hazardous to human health and the environment.

Vision

With the incorporation of Green BioPharma:

• Customers, business partners, and the community regard Genentech as a leader in efforts that reduce its ecological footprint resulting from its core competencies.

• Employees continuously innovate, evaluate, and implement ways to reduce the environmental impact of their decisions and operations.

• Wherever possible, the result of green innovations are quantified.

Green BioPharma forges the bridge between patients, people and the environment.
Outline

Genentech Backgrounder
Definition of Green BioPharma
- Green Chemistry at Genentech
Organizational Change Model
Strategic Focus Areas and Success Factors
Highlights of Accomplishments to Date
Roadmap
Green Chemistry @Genentech: a short timeline

~2009

• Roche Technical Working Group on Green Chemistry established
  • 1-2 Genentech process chemists involved
  • sponsors lectures and annual process chemistry contest
  • limited exposure to rest of company
  • no organizational structures

Fall 2011

• Green Genes lunch and learn talks by Green Chemistry scientists at UCB
  • Great response from employees
  • Green Genes subteam
• Launched the Green BioPharma Program
  • Hired a Green BioPharma Project Manager
  • Established Green BioPharma Steering Committee, as part of Sustainability Council

2012

• Steering Committee endorsed 2012 goals and projects
• Green Genes Subteam is 28 90 130 volunteers

2013

• Published a video on this effort
Outline

Genentech Backgrounder
Definition of Green BioPharma
Green Chemistry at Genentech
• Organizational Change Model
Strategic Focus Areas and Success Factors
Highlights of Accomplishments to Date
Roadmap
Organizational Change Model

All efforts are rational, scientific, scalable
Presented as opportunities for innovation
Behavioral changes lead to influencing decision-making

Changes must be at parity if not superior to existing processes/products.
Outline

Genentech Backgrounder
Definition of Green BioPharma
Green Chemistry at Genentech
Organizational Change Model
• Strategic Focus Areas and Success Factors
Highlights of Accomplishments to Date
Roadmap
Strategic Focus Areas

Engage Leadership and Employees
- Various programs and projects

Build Institutions

Develop and Deploy Metrics
- Educate stakeholders
- Drive performance

Manage Supply Chain and End-of-Life (EOL)
- Better procurement and waste decisions

Engage Vendors
- Promote innovation to drive
- Higher value services
- Greener products
Success Factors

Cross Functional Collaboration ➔ Scalability
• Helps create a unified perspective for Genentech

Leadership Endorsement ➔ Institution Building
• Legitimizes new efforts
• Leaders tend to be Connectors who can find Mavens

Employee Engagement ➔ Leadership Development
• Green Genes sub-team, to test products, share best practices, pilot programs (share learnings on Wiki)

Industry Benchmarking ➔ Industry Leadership
• Who’s doing what? Peer pressure motivates, validates

How we execute
Outline

Genentech Backgrounder
Definition of Green BioPharma
Green Chemistry at Genentech
Organizational Change Model
Strategic Focus Areas and Success Factors
  • Highlights of Accomplishments to Date
Roadmap
Accomplishments

Internal
- Steering Committee empaneled and meeting monthly
- 11 of 12 goals completed in 2012
- Positive results of proof-of-concept of GB PM role
- Program documentation

External
- Discovery Chemistry Green Team established
  - driving green solvent substitution
  - entirely staffed and led by Disc Chemistry employees
  - has VP approval
- Surplus Chemical Recycling Program piloted & improving
- Performed 10 Green Lab Assessments
  - building a network of peer resources to demonstrate and share best green practices in labs
- Container recycling/diversion, saving $10,000s in supplies and waste costs.
- Industry collaboration to develop Green BioPharma tools
  - BioPharma Focus Group of the Pharmaceutical Roundtable of the ACS Green Chemistry Institute
Outline

Genentech Backgrounder
Definition of Green BioPharma
Green Chemistry at Genentech
Organizational Change Model
Strategic Focus Areas and Success Factors
Highlights of Accomplishments to Date

• Roadmap
Greening Genentech’s core competences: a roadmap

Current
- Efficient Assay Use
- Filter Recycling
- Single Use Technologies
- Greener Solvents
- Lab Recycling
- Chemical Recycling
- Disc Chem Green Team
- Greener Products
- Green Lab Assessments
- Waste Container Mgt
- Container Recycling
- Waste Container Mgt
- Lab Recycling
- Chemical Recycling
- Greener Products
- Green Lab Assessments
- Single Use Technologies

Future
- Sustainability Marketing
- Efficient Assay Use
- Filter Recycling
- Efficient Assay Use
- Filter Recycling
- Green Clinical Ops
- Rational Cold Storage
- Biologics Eco Metric
- Best Green Practices Guide
- Buffer Environmental Impact Guide
- Efficient Assay Development
- Raw Material Container Recycling
- Chemical Recycling
- Waste Container Mgt
- Green Lab Assessments
- Raw Material Container Recycling
- Chemical Recycling
- Waste Container Mgt
- Green Lab Assessments

Discovery Research
- Process Development
- Clinical Manufacturing
- Clinical Development
- Green Lab Assessments
- Waste Container Mgt
- Raw Material Container Recycling
- Chemical Recycling
- Waste Container Mgt
- Green Lab Assessments
Acknowledgements

Genentech EHS
Bruce Maeda, Director
Marlene Kosinksi, Acting Director
Jon Kawamoto, Sr Mgr, Environmental Group

GB Steering Committee
Tina Larson, Sr. Dir, Process Dev (Executive Sponsor)
Ekta Mahajan, Sr. Engineer, Process Dev Engineering
Debbie O’Connor, Sr. Mgr, Pilot Plant
Asha Radhamohan, Engineer, Process Dev

Jacob Corn, Scientist, Early Development Biochemistry Research
Stefan Koenig*, Scientist, Small Molecule Process Chemistry Research

Joe Jerkins, Sr. Mgr, Quality Systems, Production
Srinavyana Vutukuru, Engineer, Manuf Sci & Tech

Tse-Sung Wu, EHS (Team Lead)
Kristi Budzinski, EHS (GB Project Mgr)

*Chair of the Roche-Genentech Green Chemistry Technical Working Group

Bruce Roth, VP Discovery Chemistry

Many Green Genes volunteers and emerging leaders
Better Chemistry Video Clip (3:35)

http://www.youtube.com/watch?v=R2_0i-6nyQ0