Drug Development at Genentech

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October 10, 2007
Agenda

1. Biotech and Pharma distinction
2. Genentech - Birth of Biotech
3. Drug Development Approach
4. Challenges Ahead
5. Q & A
Biotech is based on Genentech Engineering, Pharma is based on Chemical Engineering

**Biotech**
- DNA
- Copy of desired protein
- Employees:
  - Biologists
  - Physicians

**Pharma**
- Chemical compound
- High Throughput Screen
- Employees:
  - Chemists
  - Chemical Engineers
Both Pharma and Biotech Have Created Beneficial Drugs

Biotech
- Human Insulin
- Growth Hormone
- Factor VII
- Factor VIII
- Monoclonal Antibodies
  • Rituxan
  • Avastin
  • Synagis

Pharmaceutical
- Antibiotics
- Analgesics
- β Blockers
- Statins
- Anti-HIV
- Aspirin

Both have been successful!
- Infectious disease
- Diabetes
- Heart Disease
- Cancers
Industry results have been dramatic
Genentech = GENetic ENgineering TECHnology

Genentech
First Biotech company
Founded in 1976
Herb Boyer and Bob Swanson
1st product: Human Insulin, 1978

Opened the field of genetic engineering as a means to create life saving drugs.
Genentech has since launched many successful drugs:

- **Activase** (alteplase)
- **Rituxan** (rituximab)
- **Avastin** (bevacizumab)
- **Pulmozyme** (dornase alfa)
- **Nutropin Depot** (somatropin [rDNA origin] for injectable suspension)
- **Xolair** (omalizumab)
- **Lucentis** (ranibizumab injection)
- **Tarceva** (erlotinib)

- **Protropin** (somatrem for injection)
- **Herceptin** (trastuzumab)
- **Nutropin AQ Pen** (somatropin [rDNA origin] injection)
- **Raptiva** (efalizumab)

Funded years:
- '76
- '85
- '87
- '93
- '96
- '97
- '98
- '99
- '00
- '01
- '02
- '03
- '04
- '06
Genentech Now Is a Leading Biotech Company

• Approximately 12,000 employees

• Over 1000 MDs/PhDs

• Named in Fortune’s “Top 100 Best Companies to Work For” 9 consecutive years; ranked No. 1 in 2006

• Consistently ranked as Science Magazine’s Top Employer

• Approximately 2 million patients treated with Genentech drugs

• Over $9B in sales in 2006
Genentech’s growth introduced new issues

• Increasing complexity of drug development
  – Larger number of compounds
  – Resource prioritization
  – Longer and more expensive process
  – Competition

• Globalization of medicine
  – Worldwide development
  – Genetic diversity
  – Multiple regulatory environments
  – Consideration of how drugs are used ex-US
Follow the Science

• Understand physiology for particular key area pathway

• Identify disease and unmet need

• Design molecule to intervene
Following the science has led to some unique characteristics at Genentech

• All current drugs are first in class

• No direct-to-consumer advertising

• Entered disease areas with modest financial expectations
  – Rituxan financial estimates at time of launch were about 5% of current results
    – Standard of care in NHL
    – Approximately 1,000,000 patients treated

  – Avastin: initial clinical data was negative
    – Questions arose: why spend good money after bad
    – Subsequent clinical trials were positive
Genentech must be efficient to compete with big pharma

- **2006 R&D spend ($B)**
  - Genentech: 1.8
  - Wyeth: 3.1
  - Novartis: 5.3
  - Pfizer: 7.6

- **2006 Employees (000)**
  - Genentech: 11
  - Wyeth: 50
  - Novartis: 101
  - Pfizer: 98
Following the Science Can Lead to Efficient Drug Development

- Herceptin, launched 1998:
  - Total number of patients with breast cancer - 1.2M/year
  - Those that are HER2 positive: 20 - 25%
  - HER2+ patient median survival ~ 3 year (compare to 6-7 yrs for other breast cancer patients)

- Designed drug just for HER2+ patients
  - Typical Breast cancer study size: 2500 patients
  - Herceptin Phase 3 trial size: 690 patients
  - Treated patients show significant response
  - Smaller trial permitted faster and less expensive development

Drug is used by those who would most benefit “changed the course of breast cancer”
Genentech is US focused, but drugs are sold in over 120 countries.
Genentech faces some key issues as a large company

Worldwide development
• Increased organizational complexity
• Multiple languages
• Standards of care

Genetic diversity
• Assessing and controlling drug interactions with various genetic profiles

Multiple regulatory environments
• Various rules/regulations which may drive differing trial designs

Societal consideration of how drugs are used ex-US
• Social standards for medical treatment and end of life considerations
Improving Rituxan for Lymphoma

Rituxan is antibody that binds to cancer cell causing body’s immune system to attack cancer

- With approximately 1 million patients treated, it was noticed, a small sub-population did not respond as well
- Scientific question with a clear benefit to patients
- Analyzed genetic make up of “non-responders” which showed specific immune response traits
- Created newer version of Rituxan, which should also treat this sub-population

DLBCL studies 6, 7, 8 Rituxan label supplement: 5231
Summary

Biotech

• Relatively young industry focused on biologic engineering

• History making in South San Francisco

Genentech

• Many successful drugs on market, created by focusing on Patients and Science

• Continuing to focus on Patients and Science will aid in addressing Genentech’s issues as it grows