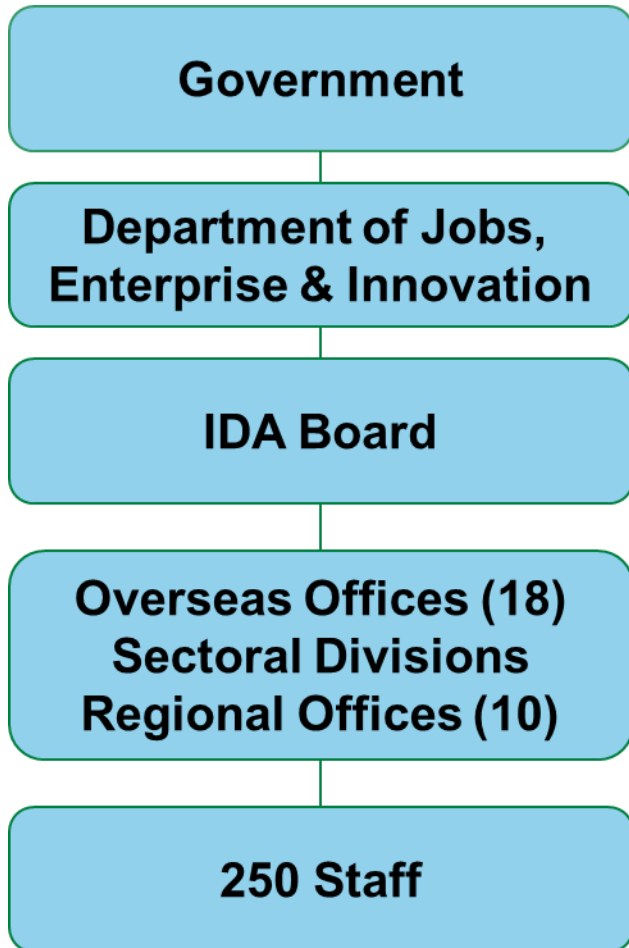


# **Modern Biotechnology :**

## **Essential for the transformation of Ireland's Pharmaceutical Sector**

## Agenda

- Introduction to IDA Ireland
- Multinational Life Science Sector in Ireland
- GMOs in agriculture
- Growth in Biotech manufacturing
- GMOs in research



## Objectives

- To attract best in class foreign direct investment, suitable for Ireland's national and regional needs
- To assist in the development of existing overseas companies
- To create valuable and sustainable employment

1,030

IDA Portfolio  
Companies: 515 from  
the US



152,000 / 260,000  
Impact

Total Employment



€122 billion

Total Exports



A wide range of **Industry sectors** is located in Ireland.

8 out of 10

Global ICT corporations



10

Top "Born on the Internet" companies



9 out of 10

Global Pharmaceutical corporations



More than  
50%

Of the world's  
leading Financial  
Services Firms



Foreign Direct Investment in Ireland

3 out of 5

Top Games companies



17 out of 25

Global Medical Device companies



# Pharmaceutical Industry in **Ireland**





## 9 of the world's top 10

pharmaceutical companies have  
substantial operations in Ireland

**24,500** people are  
directly employed



**+24,000** people are indirectly employed  
providing support services

---

# 120

Life Science Companies in Ireland

**2 clusters** - Dublin & Cork

**Hot spots** - Sligo, Waterford & Mayo



 **NOVARTIS**

 **Abbott**

 **Roche**

**SANOFI** 

 **Pfizer**

 **Johnson & Johnson**

 **AMGEN**<sup>®</sup>

 **Lilly**

 **GILEAD**

 **astellas**

 **gsk**  
GlaxoSmithKline

 **MERCK**

 **TEVA**

 **Takeda**

 **Stiefel**  
a GSK company

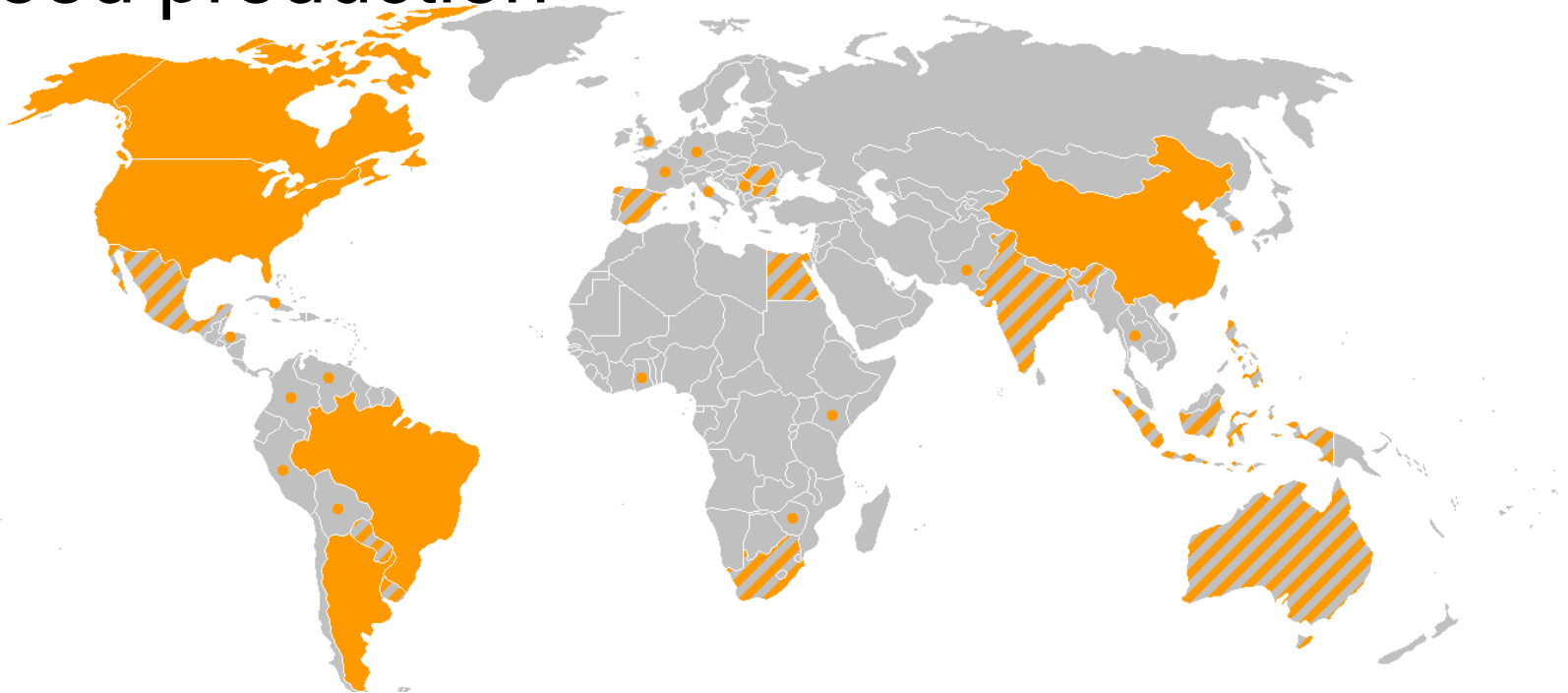
 **ALLERGAN**

 **abbvie**

 **Mylan**<sup>®</sup>

 **genzyme**  
A SANOFI COMPANY

## Food production



- Accelerate normal agri-breeding programs
- Yields, Disease resistance, shelf life?
- Improve “Quality”, Novel attributes, Consistency?
- Replace use of hormones, pesticides
- Environmental issues, health implications?



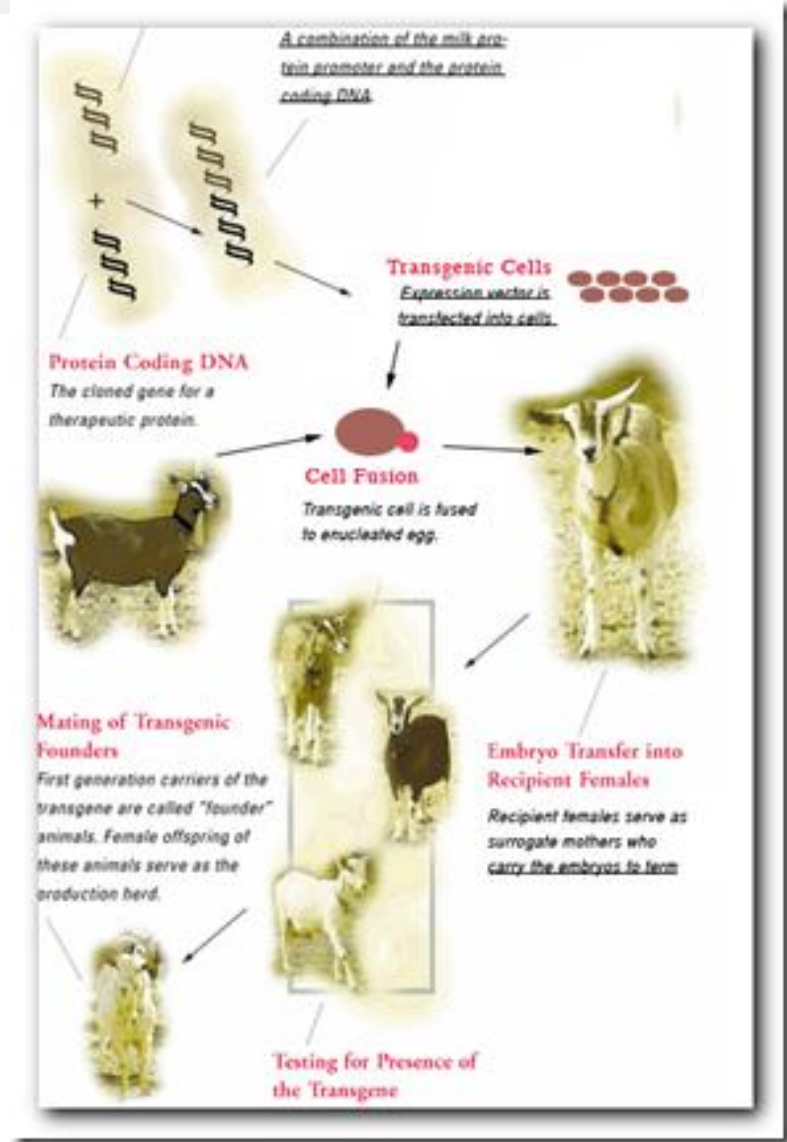
# Belgian Blue Steak Anyone?



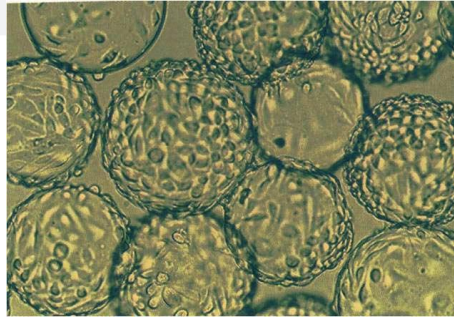
## “Pharming”



- Low cost drug production?
- Consistent production?
- Environmental issues



## Genetically modified cells as Drug production vehicle



- Cells taken from the organ and organism
  - require very specific conditions to survive
  - can't survive "in the wild"
- Deep scientific understanding of process, Highly contained manufacturing environment, Highly skilled staff
- Highly regulated: IMB, FDA, EPA

# Biologic Drugs from Genetically Modified Cells

## Biologics will dominate the pharmaceutical market by 2016

1	Humira	8'650
2	Enbrel	5'849
3	Avastin	5'579
4	Rituxan	5'523
5	Remicade	5'447
6	Advair	5'235
7	Herceptin	4'854
8	Prevnar	4'767
9	Revlimid	4'576
10	Crestor	4'534

Biologics

Chemicals

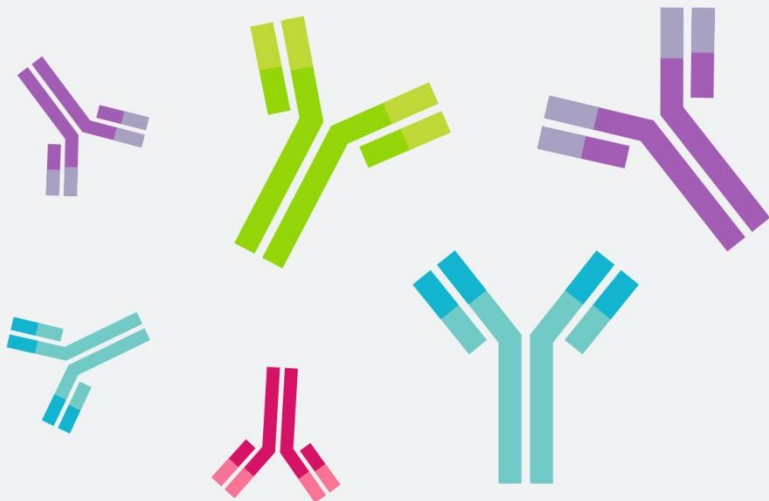
*Top 10 drugs in 2016 (mn EUR) - Evaluate Pharma*



# Growth in Biotech Manufacturing in Ireland

## Technological Diversity

- Manufacturing excellence in drug substance and drug product
- Small molecule and biologics



## Technological Transformation

Biotech manufacturing sites in Ireland:

2003



2013



## Agenda

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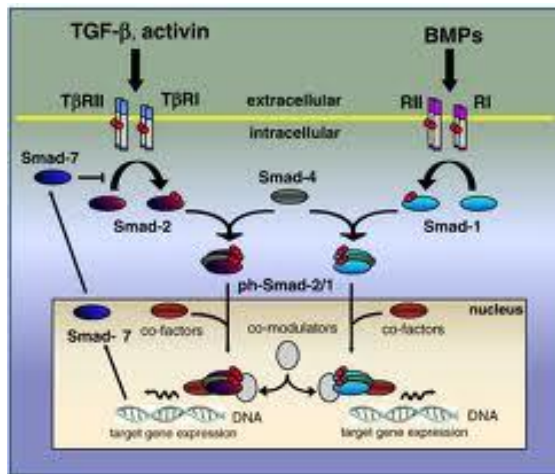
# IDA Ireland Belgian Blue to treating Cancer



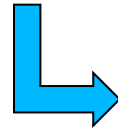
“Natural” GMO



Understand biology



Develop drugs

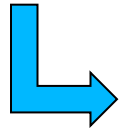
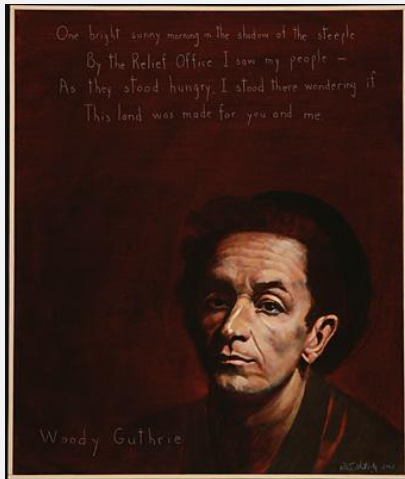


		Phase 1	Phase 2	Development / Commercial Rights
Botanoccept	$\beta$ -Thalassemia			<ul style="list-style-type: none"> <li>Cellgene funds 100% of current and future development and commercial expenses</li> <li>Acceleron received topline worldwide in the low-to-mid 20% range</li> <li>Companies will co-promote products in North America</li> <li>Cellgene promotes products in rest of world</li> </ul>
	Myelodysplastic Syndromes			
	Chronic Kidney Disease			
	Multiple Myeloma <sup>1</sup>			
	Sickle-cell/Blackten Anemia <sup>1</sup>			
ACE-538	$\beta$ -Thalassemia			<ul style="list-style-type: none"> <li>Acceleron eligible to receive up to \$567 million of milestones still outstanding</li> </ul>
	Myelodysplastic Syndromes			
Dalantercept	Head and Neck Cancer			<p>Acceleron retains worldwide rights</p>
	Renal Cell Carcinoma			
	Endometrial Cancer <sup>1</sup>			
	Ovarian Cancer <sup>2</sup>			

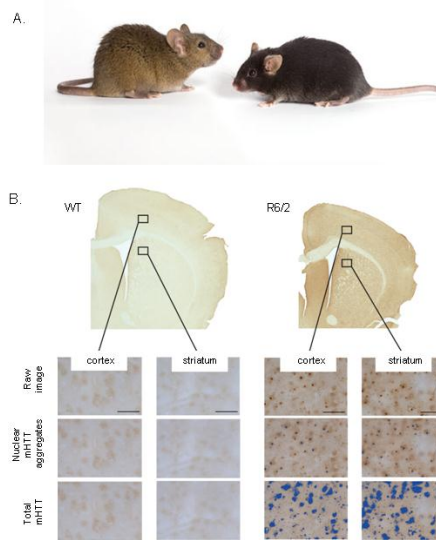
<sup>1</sup> StemCellRx sponsored trial

<sup>2</sup> Genzyme Oncology Group sponsored trial

# Huntington's Disease



Understand  
disease



GMO to mimic disease

Develop & test  
drugs

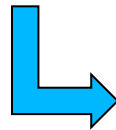


IMAGE: DNA DOUBLE HELIX  
CHDI INVITES INVESTIGATORS TO SUBMIT IMAGES RELEVANT FOR HD RESEARCH  
FOR THIS SPACE. PLEASE CONTACT US.

OUR ASPIRATION:

RAPIDLY DISCOVER AND DEVELOP DRUGS THAT  
DELAY OR SLOW HUNTINGTON'S DISEASE



Thank You