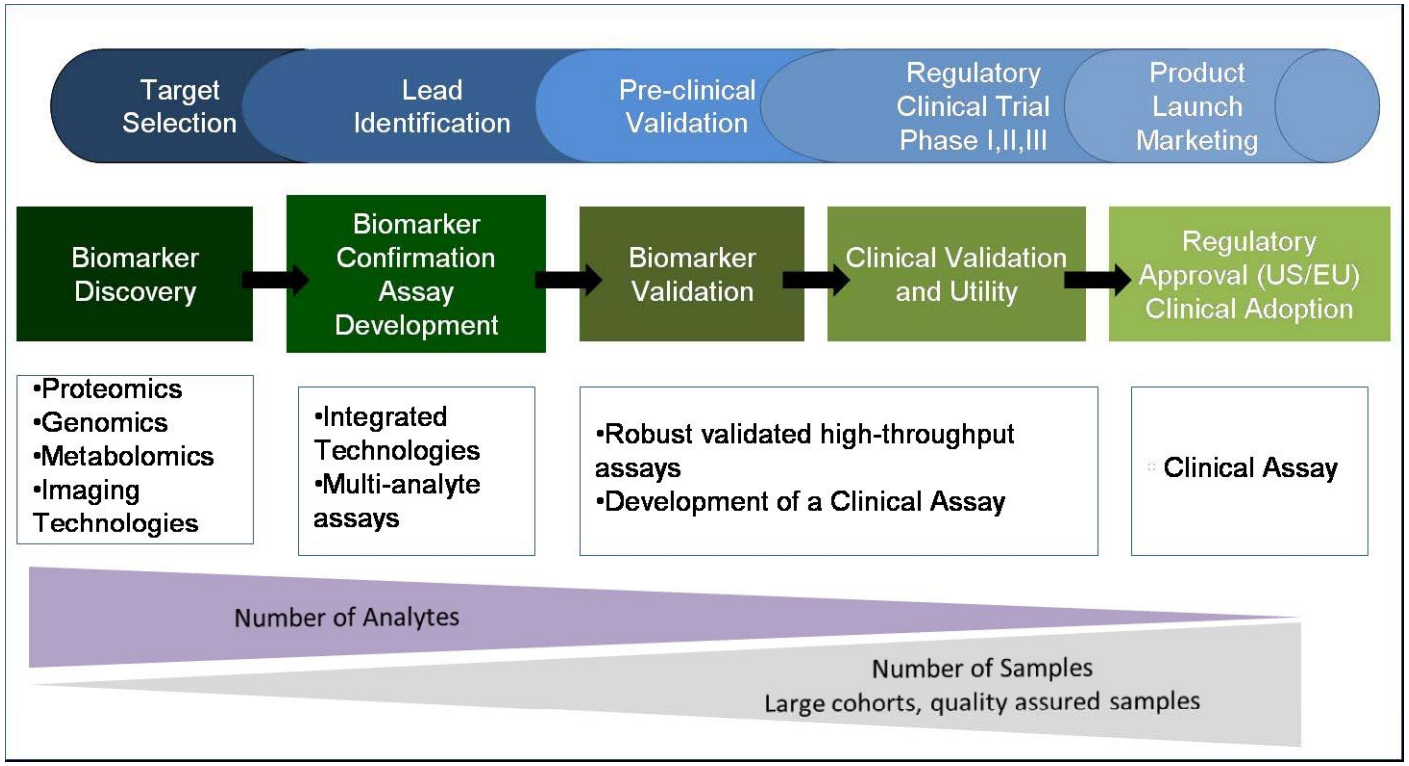
# The Irish Biomarker Network - Inaugural Workshop

## *'Improved Translation of Biomarkers to the Clinic'*



# The Irish Biomarker Network - Inaugural Workshop

## *Improved Translation of Biomarkers to the Clinic*

Overview of the background to the establishment of a National Biomarker Network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# Irish Biomarker Network

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# Aim

To establish a National Biomarker Network to connect scientists and clinicians interested in biomarker research to share expertise in discovery, translation and commercialisation of biomarkers across disease areas.

The Network will focus on the following short, medium and long-term objectives

# Short term Objectives (next 12 months)

To develop a database of investigators engaged in biomarker research in various disease areas

To provide a centralised location for sharing/exchange of skills/ expertise/ information in relation to the different phases of biomarker research

To assist the biomarker research community by developing a translational framework for biomarker research

To develop/share guidance on FDA/EU/IMB regulations for biomarker validation / clinical studies

To make the case to funding agencies of the actual costs of biomarker development

To make the case to funding and government agencies on the importance of bio-repositories/biobanks as a critical source of material for biomarker studies and also the importance of linking discovery, validation and commercialisation to standardised biological collections

To conduct a gap analysis to detail gaps in the system, including funding gaps for biomarker discovery, validation and commercialisation

To develop a strategy for commercialisation of biomarkers

To develop a Biomarker Road Map for the Biomarker Network

To link with International Biomarker Networks

# Proposed Medium and long Term Objectives

**Medium term Objectives – potentially requiring some or significant additional resources (1-3 years)**

To align with clinical trials to determine the possibility of accessing pre-treatment samples for biomarker validation work, for example explore linkage with ICORG

To explore the potential for developing a couple of demonstration projects in Biomarker Development

To provide information on bio-resources, disease areas, sample types etc. across the system

To provide information on assays feasibility and what assays are in development

**Longer term Objectives -requiring significant resources medium term (1-3 years)**

To build a repository of control samples that could be shared across the network under defined rules of access and scientific peer review

To share disease samples across the network where there is insufficient sample number under defined rules and scientific peer review. This will be subject to the appropriate ethics approval and will be on a voluntary basis of the members that wish to join a particular study or collaboration

# Why Are Biomarkers Important?

Diagnosis is the foundation of therapy

Biomarkers can be quantitative measures that allow us to

- diagnose and
- assess the disease process and
- monitor response to treatment

Biomarkers are also crucial to efficient medical product development

As a consequence of scientific, economic and regulatory factors, biomarker development has lagged significantly behind therapeutic development

# Potential of Biomarkers to Improve Patient Care

**POTENTIAL of biomarkers and diagnostic tools/Medical Devices**

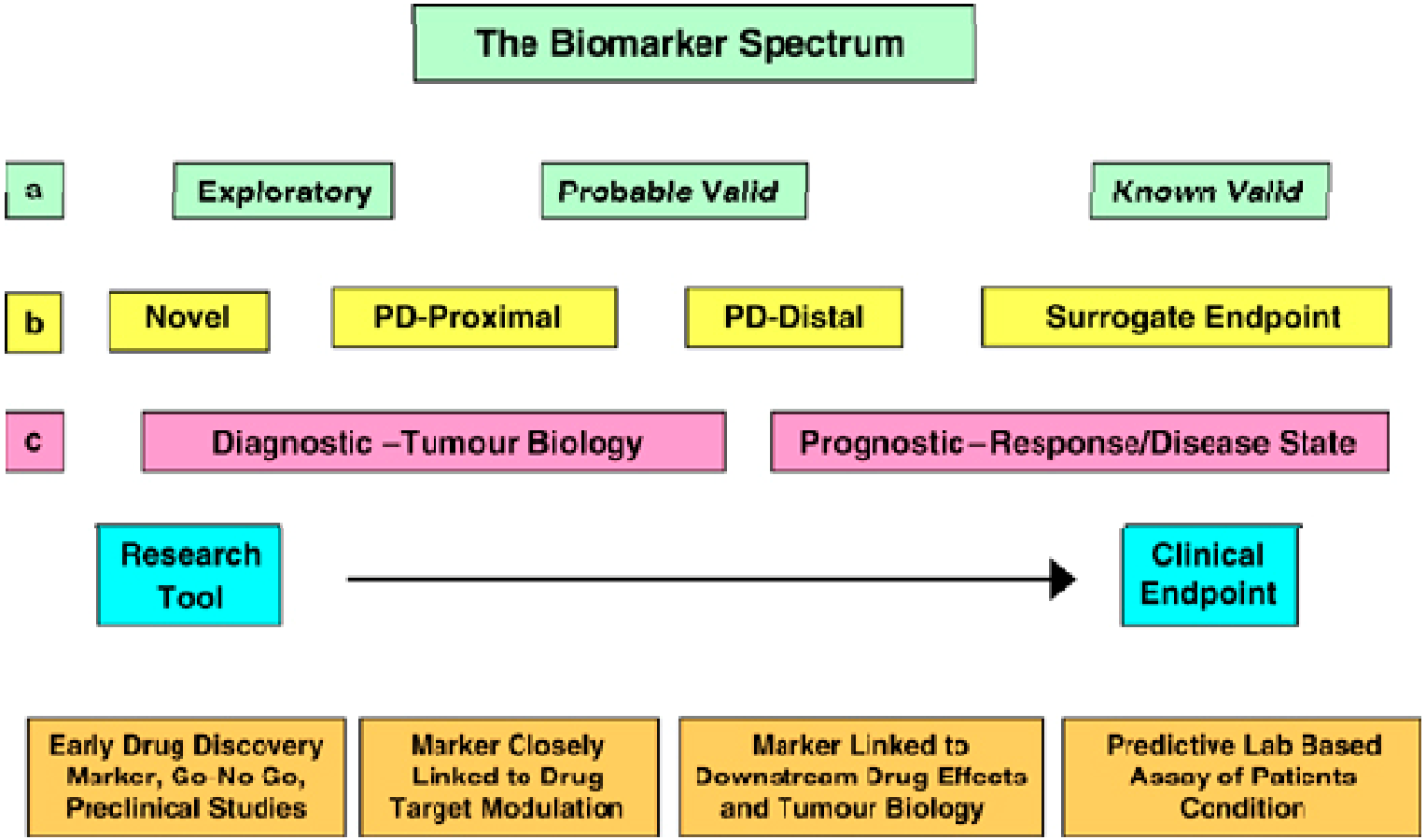
- Easier, more accurate and earlier detection/diagnosis of disease
- Monitor disease progression
- Predisposition to disease
- Disease and disease subtype diagnosis
- Prognostic determination
- Stratification of patient populations – Clinical Trials
- Selection of appropriate therapy
  - Maximize efficacy
  - Minimize toxicity
- Selection of correct dose
- Panels of Biomarkers – Increased Specificity & Specificity
- Monitoring Outcomes (good and bad)

**Patient-focus**

- More targeted therapies ensuring that the patient will be responsive to treatment and avoiding unnecessary side effects

**Prevention by influencing lifestyles**

- personalised medicine & personalised nutrition




The Biomarkers spectrum from the perspective of different stakeholders.

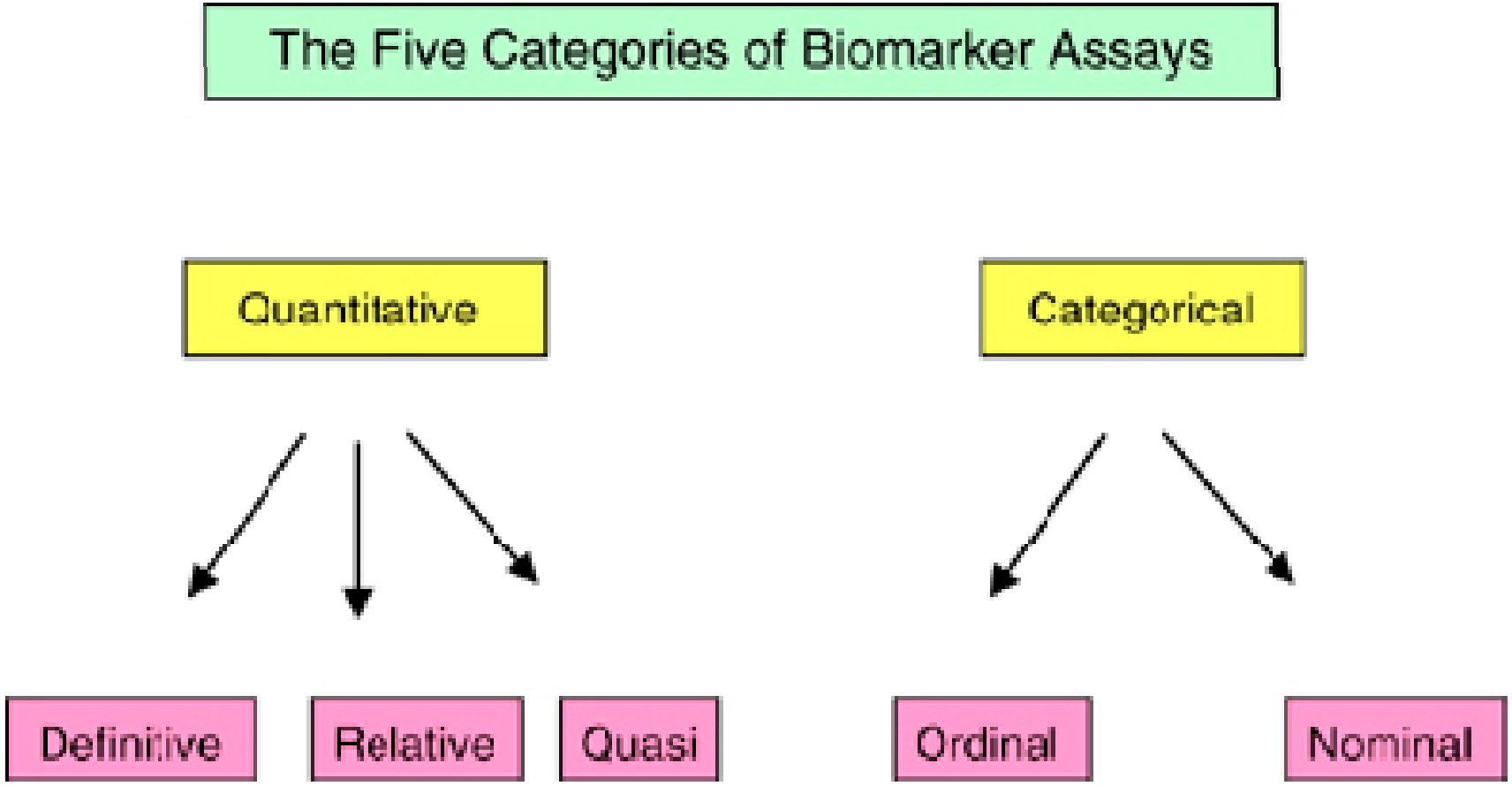
(a) The US Food and Drug Administration envisages three evidentiary stages towards biomarker approval (Goodsaid &Frueh, 2007

(b) Within the pharmaceutical industry biomarkers are utilized throughout the whole drug discovery process from compound selection to clinical trials (Lee *et al.*, 2005).

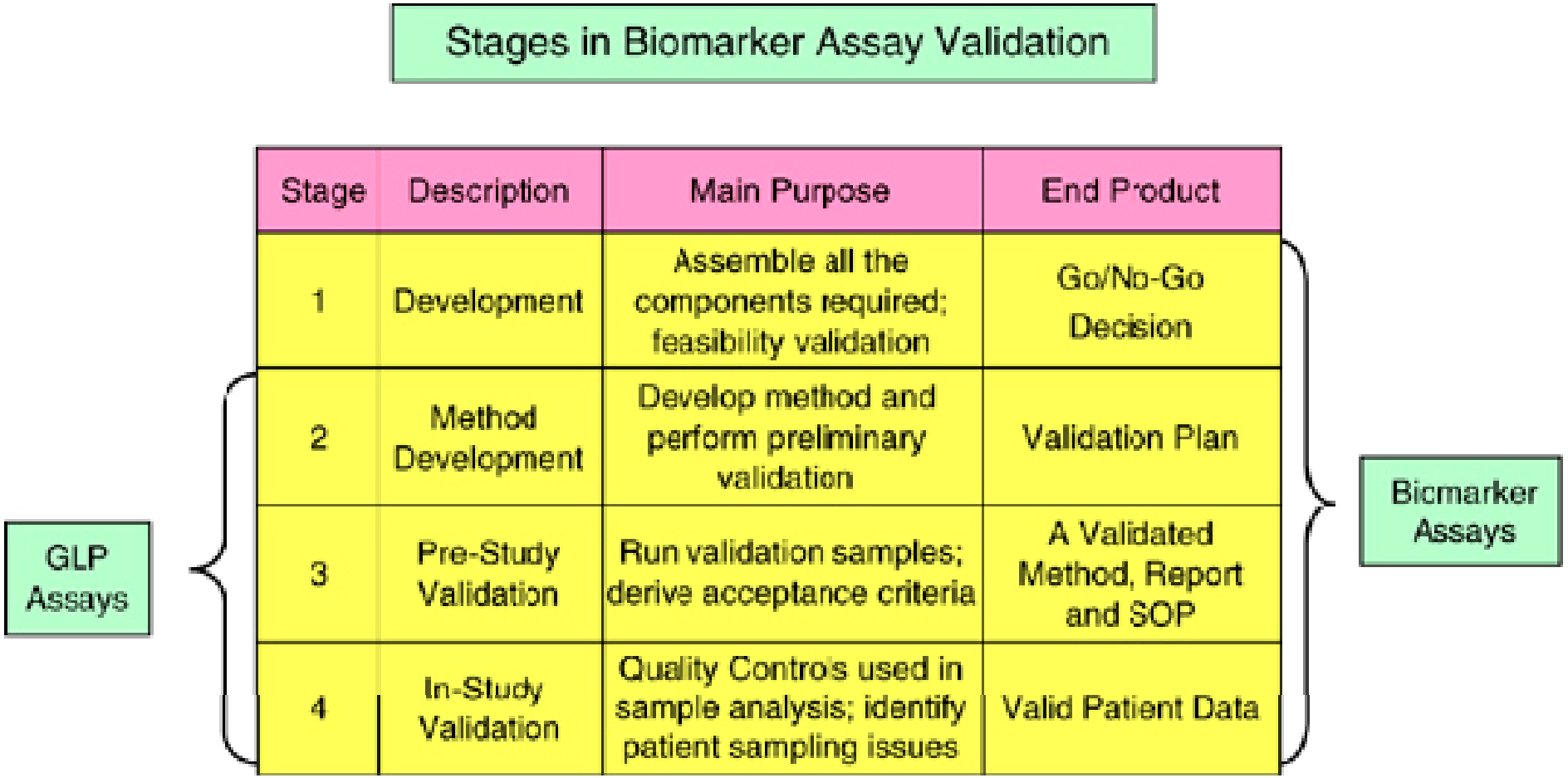
(c) In cancer medicine, biomarkers may be seen as being either diagnostic of tumour biology, or prognostic of disease or therapeutic outcome (Ludwig and Weinstein, 2005).

From: **Biomarker method validation in anticancer drug development** J Cummings, et al

# The five categories of Biomarker assays.



# Stages in Biomarker Assay Validation



# Use of Biomarkers in Early Drug Development and Decision Making

Evaluate activity in animal models

Bridge animal and human pharmacology via proof-of-mechanism or other observations

Evaluate safety in animal models, e.g., toxicology

Evaluate human safety early in development

# Use of Biomarkers in Later Drug Development and Decision Making

Evaluate dose-response and optimal regimen for desired pharmacologic effect

Use safety markers to determine dose-response for toxicity

Determine role (if any) of differences in metabolism on above

Rolan. Br J Phamacol 44: 219, 1997

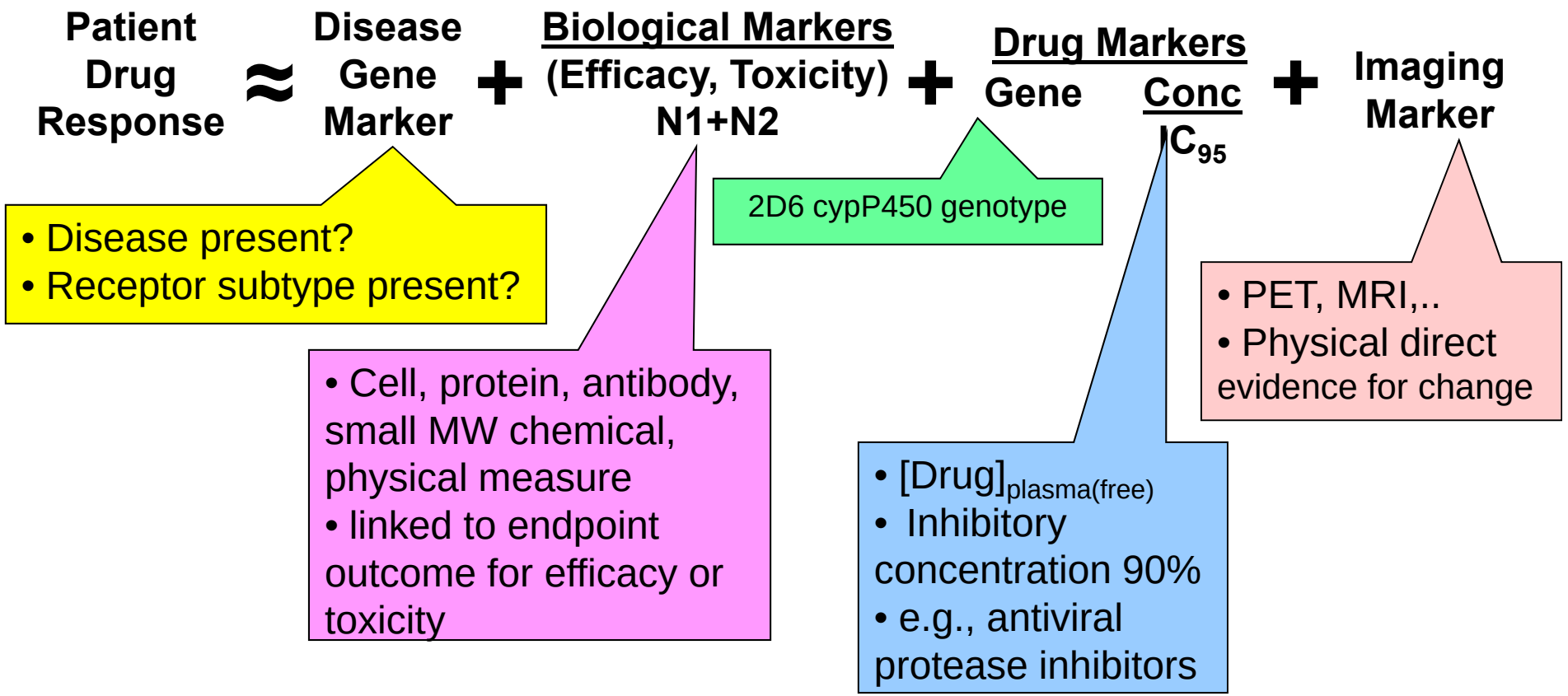
## Biomarker Development: More is at Stake than Efficient Drug Development

Biomarkers are the foundation of evidence- based medicine: who should be treated, how and with what

Requirement for new markers (and panels), advances towards more targeted therapy will be limited and treatment will remain largely empirical (i.e, trial and error)

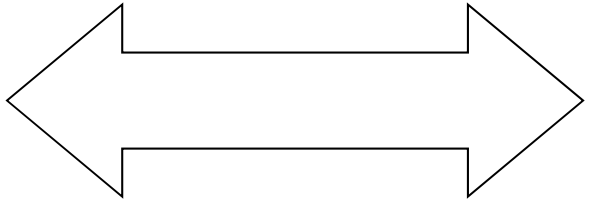
Requirement for biomarker development be accelerated along with therapeutics

# Potential use of Biomarkers in Future Clinical Practice: The Ultimate in Personalized Medicine



# Translational Research

bench



bedside

Research/molecular:

- clinical trials
- expression
- mutations
- gene function
- pathways
- proteomics
- drug targets and therapies
- model organisms
- genomics
- molecular markers

Users:

- clinicians
- researchers
- statisticians
- Bioinformaticians
- Systems Biology

Clinical:

- clinical trials
- tissues
- pathology
- treatment
- outcomes
- demographics

# Challenges

## International Competition

## Critical Mass

## Focus

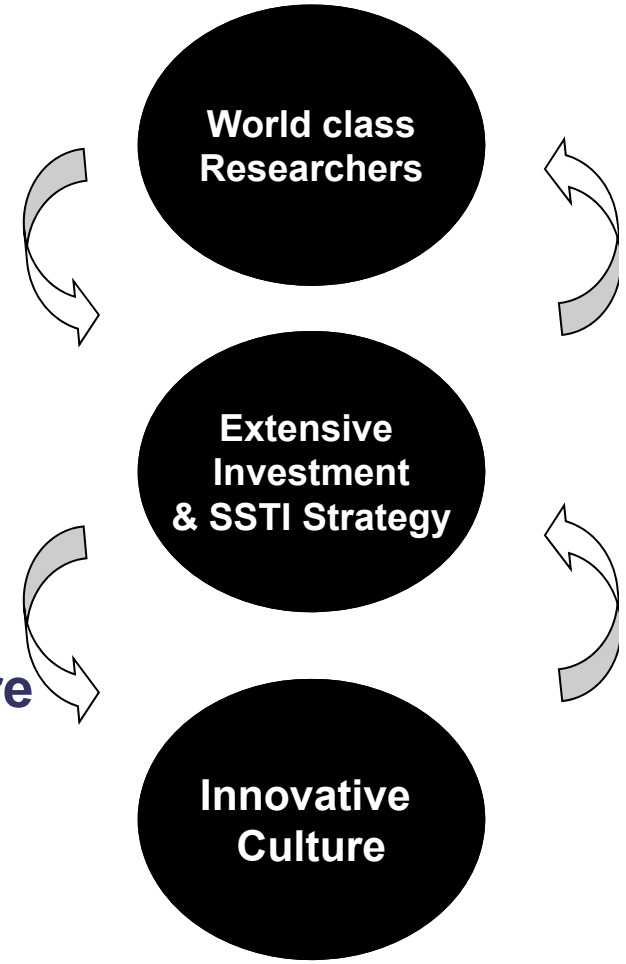
- Technologies
- Disease Area

## Geography (virtual organisation)

## Sustainability

# Why Ireland can be a Global Player in Biomarker Development and Translational Research

- **Excellently Trained Researchers**
- **Integrated Science Strategy**
- **Extensive Investment in R&D**
- **Building Research Infrastructure**
- **World Class Research Universities**
- **Pharmaceutical Companies based here**
- **Innovation Culture**



# Ireland: Integrated Science Strategy

- NDP 2000-2006 €2.5bn Science R&D budget

  Science Foundation Ireland  2000 – 2006 €646 million

- SSTI 2006 – 2013 - Integrated Strategy
  €2.7 billion up to 2008 to deliver the strategy
  €5.0 billion up to 2013 in total

- Research Infrastructure funded to high international standards

- Corporate Research Support
  Industry accounts for 66% of the expenditure on R&D
  Foreign-owned companies contribute two-thirds of the industry share

- EU 6th Framework Programme 2002 – 2006  € 17 billion
- EU 7th Framework Programme 2007-2013  € 48 billion

# Ireland: A Centre for World Class Research

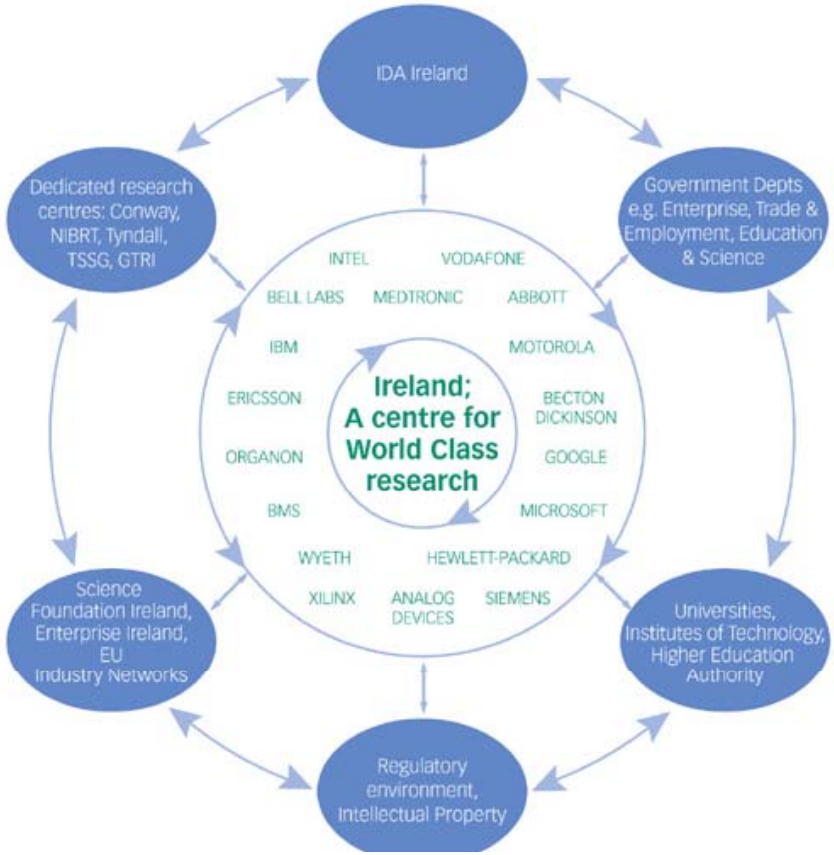
Ireland is a key global location for the pharmaceutical industry.

13 of the 15 companies in the world have substantial operations here

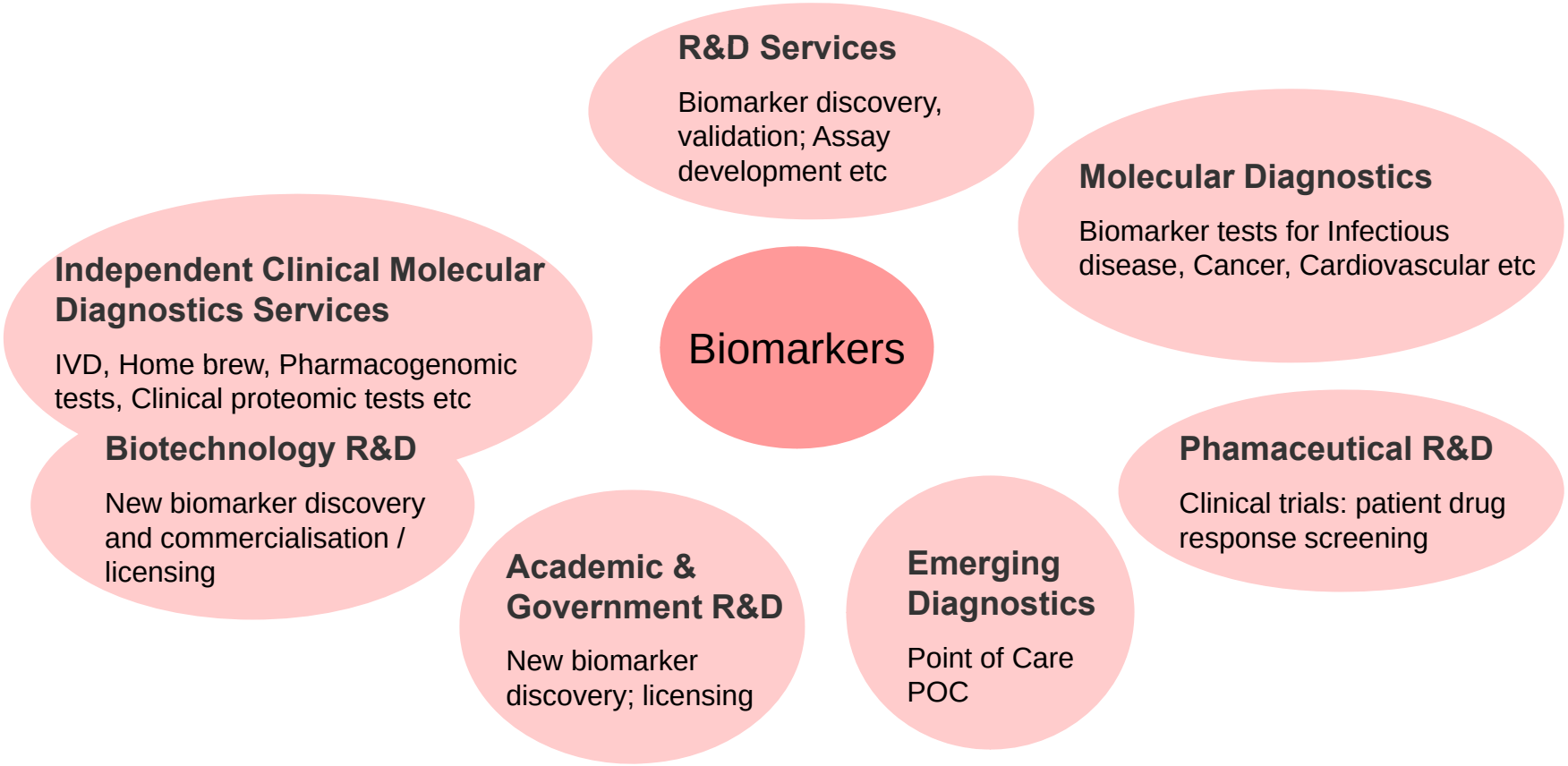
In total, there are 83 facilities employing more than 17,000 people

12 out of 25 of the world's top selling drugs produced here

Products are manufactured for global markets



# Biomarkers: A market with major growth potential




Adapted from: Molecular Biomarkers for Clinical Diagnostics and Drug Discovery and Development

# Technologies and Infrastructure underpinning Translational Research

Proteomics

Bioinformatics

Chemistry

Nanobiology

Stem Cells (NUIG)

Systems Biology

Bioprocessing: NIBRT

National Institute of Bioprocessing Research and Training (NIBRT)

- Optimising protein generation
- Generating novel functional mutants
- Novel protein-nanomaterial conjugates

# Building on Ireland's Success

- Clinical Trials
- Clinical Researchers
- Biobanking

# Clinical Trials

Advance patient diagnosis and treatment

Embed Pharmaceutical R&D

Ensure Training of Clinical Researchers

Generate Intellectual Property

Generate high quality employment

# Clinical Research

Faster and Better Diagnosis and Therapy –reduce

High quality Clinical Researchers -Ensure Training and Expertise Nurses, Doctors, Medical Researchers

Protected Time

Research funding

# Biobanking

Would position Ireland as Global Leader both in Academic and Industrial R&D

Facilitate Longitudinal studies

Global Centre for Clinical Trials

Embed Pharmaceutical R&D

Develop highly trained experts

Leverages existing Investment + ensure increased share of FP7

**A biobank is a container (low temperature freezer unit) or a place, maintained by designated personnel, specifically for the collection, freezing and storage of small human tissue or blood samples and associated data.**

# Ethical Issues

**Ethics Committees & Clinical trials**

**Ethical Issues – Biobanking**

Irish Council for Bioethics

Human Biological Material: Recommendations for Collection, Use and Storage in Research 2005

# Translational Research -Development Pipeline

**1.**

**Excellent Science**

University R&D and licensed technology

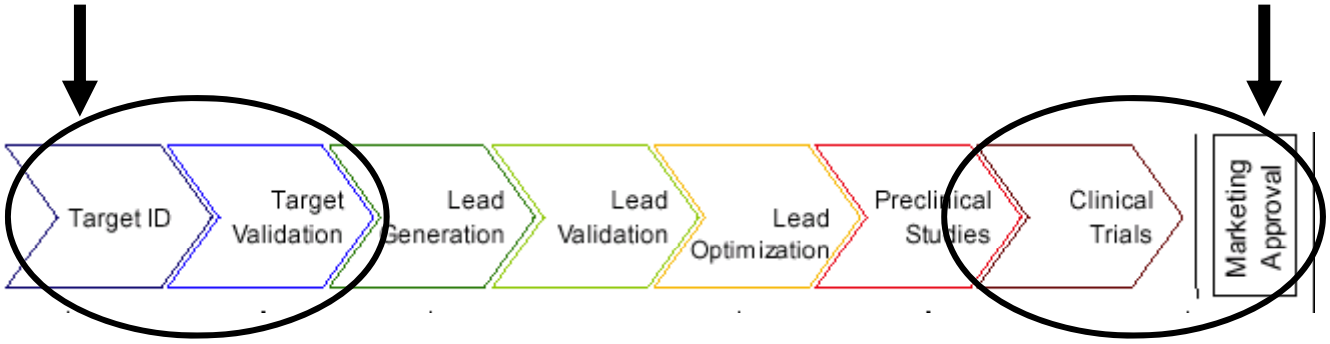
**3.**

**Pharmaceutical**

Multinationals, Manufacturing

&

Service sectors in Ireland




| **Research** | **Development** | **Pre-Clinical** | **Clinical** | **Post- approval** |
|---|---|---|---|---|
| ~ 2-5 years | ~ 3-7 years | ~ 3 years | ~6- 8 years | **Testing** ~ 2 years |

**From Laboratory to Patient**

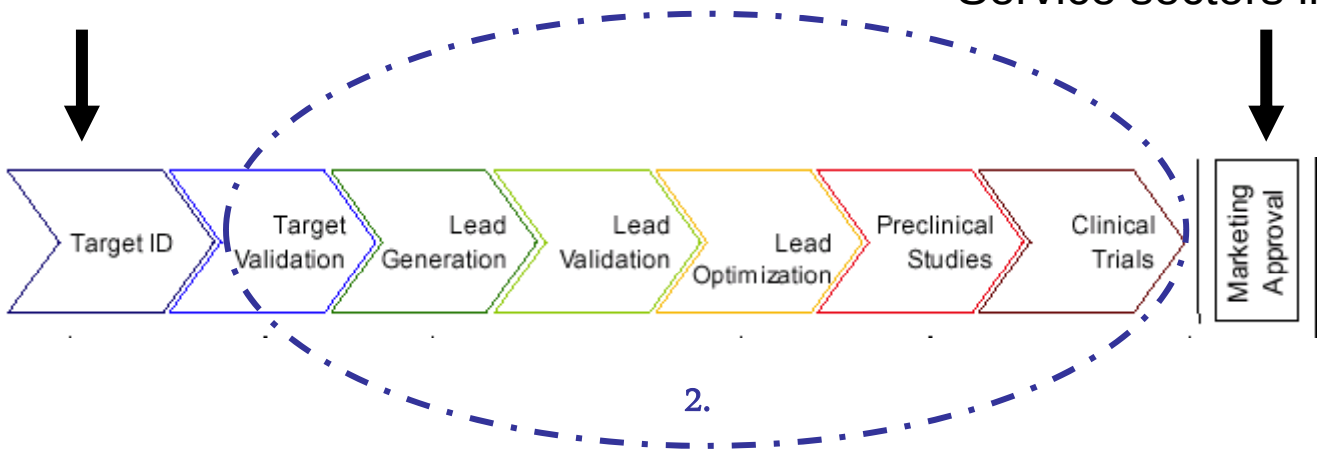
Only 1 of every 10,000 potential medicines makes it through the research and development pipeline and FDA approved

Approval takes 15 years of research and development, on average and costs over $800 million dollars

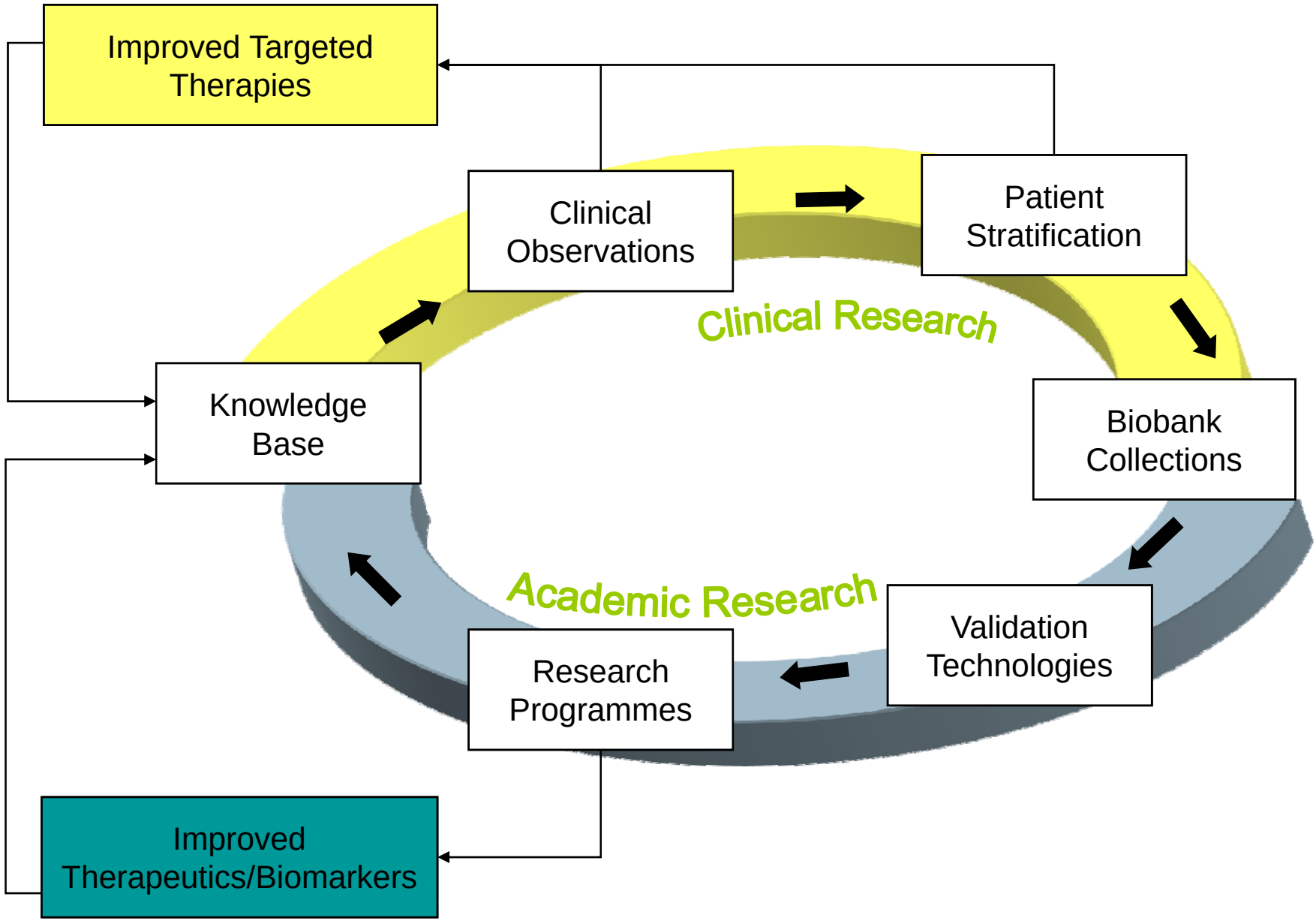
# Translational Research

**1.**
**Create Excellent Science**
HEI R&D and
licensed technology

**3.**
**Leverage**
Multinationals, Manufacturing
&
Service sectors in Ireland




**Academia + Industry aim to add value to existing investments**




*Modified from DMMC 2005*

# Facilitated Discussion on the Focus, Value and Key Objectives of an Irish Biomarker Network

| |
|---|
| Name: |
| Affiliation: |
| Question / Comment: |

Submit your questions/suggestions to the Comment Box using the form at the back of the Workshop Programme

***Thank you!***

***dolores.cahill@ucd.ie***