Open innovation in GSK

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San Cibrao das Viñas, Ourense
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Open Innovation

A term coined 5 decades ago

Table 2. Contrasting 'closed innovation' principles and 'open innovation' principles.

	Closed innovation principles	Open innovation principles
i	The smart people in our field work for us.	Not all of the smart people work for us so we must find and tap into the knowledge and expertise of bright individuals outside our company.
ii	To profit from R&D, we must discover, develop, produce and ship it ourselves.	External R&D can create significant value; internal R&D is needed to claim some portion of that value.
iii	If we discover it ourselves, we will get it to market first.	We don't have to originate the research in order to profit from it.
iv	If we are the first to commercialize an innovation, we will win.	Building a better business model is better than getting to market first.
v	If we create the most and best ideas in the industry, we will win.	If we make the best use of internal and external ideas, we will win.
vi	We should control our intellectual property (IP) so that our competitors do not profit from our ideas.	We should profit from others' use of our IP, and we should buy others' IP whenever it advances our own business model.

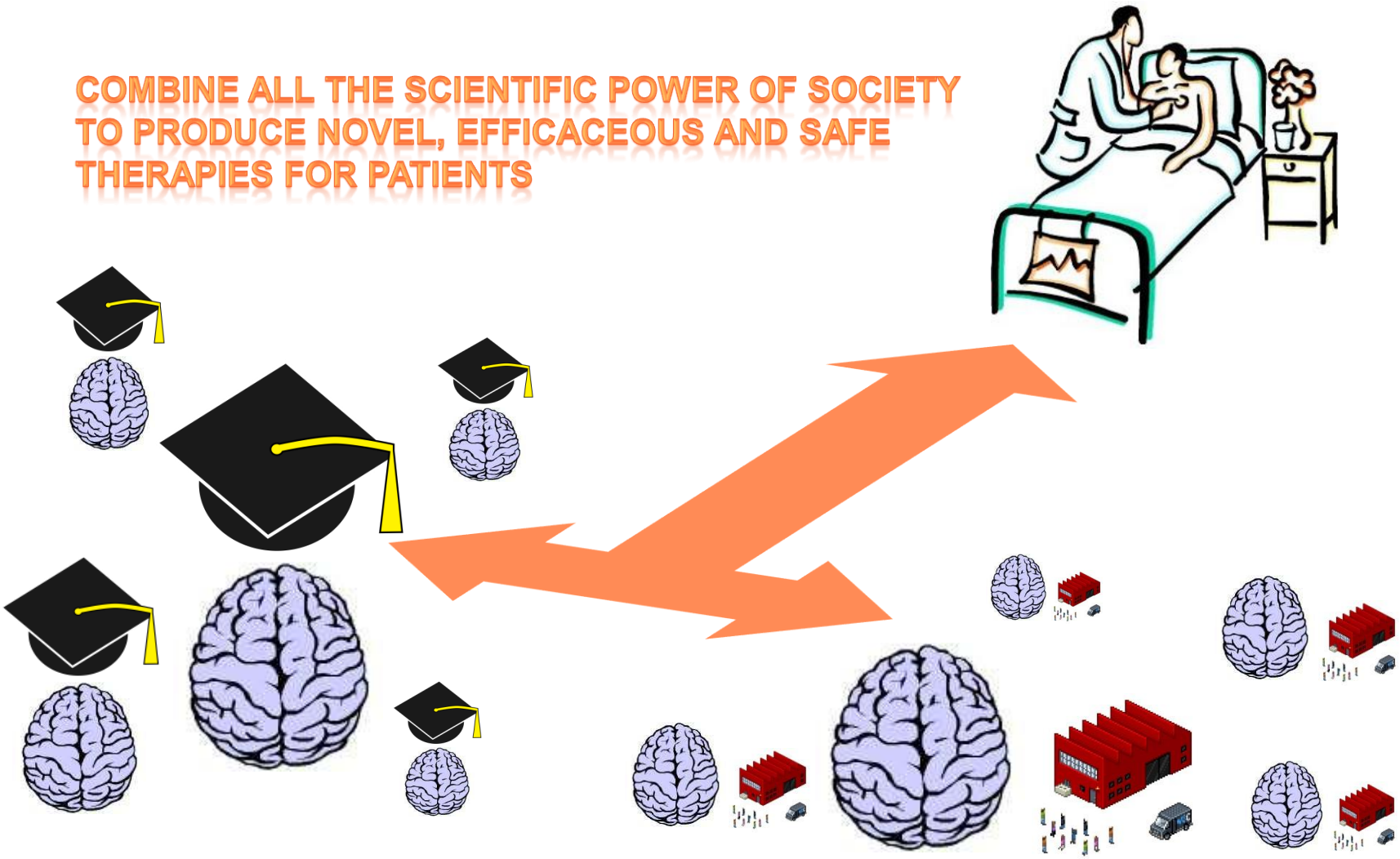
Source: Chesbrough (2003).

From **WHY 'OPEN INNOVATION' IS OLD WINE IN NEW BOTTLES,** PAUL TROTT and DAP HARTMANN, International Journal of Innovation Management, Vol. 13, No. 4 (Dec. 2009) pp. 715–736

Focus on the patient

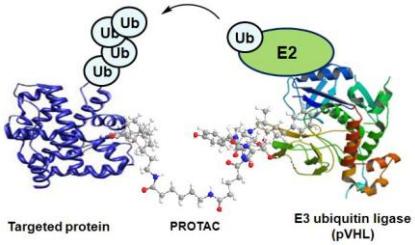
Accelerating the path from ideas to therapies

COMBINE ALL THE SCIENTIFIC POWER OF SOCIETY TO PRODUCE NOVEL, EFFICACEOUS AND SAFE THERAPIES FOR PATIENTS



Open innovation in GSK

A range of models



YALE

Protein Degradation

THE FRANCIS CRICK INSTITUTE

Crick GSK LinkLabs

DPAc

tres cantos
OPEN LAB FOUNDATION

Tres Cantos Open Lab

COI
PHARMACEUTICALS INC.

Avalon

Trust in Science
To discover, to develop, to deliver

Trust in Science

Africa Open Lab

UCL
Pentraxin
GlaxoSmithKline

Academic DPU

Diseases of the Developing World

A non-profit initiative

Open Innovation & GSK Corporate Responsibility

- GSK is committed to **Global Health**
- We aim at discovering **innovative medicines** to combat Diseases of the Developing World
- We do not seek commercial return, but **access to treatment**
- We want to **work together** with private and public partners

Open Innovation Strategy for Diseases of the Developing World (DDW) launched in 2010

Utilise our investment in DDW to act as a catalyst and stimulate research activity outside GSK

PRESS RELEASE

GlaxoSmithKline

Issued: Wednesday 20 January 2010, London, UK

GSK announces 'open innovation' strategy to help deliver new and better medicines for people living in the world's poorest countries

- **'Open Lab' established with $8m seed funding for new research**
- **13,500 malaria compounds to be made freely available**
- **New collaborations to share intellectual property for neglected tropical diseases**
- **Pledge to create sustainable pricing model for world's most advanced malaria candidate vaccine**
- **GSK African Malaria Partnership awards four new grants worth $2.5m**

Andrew Witty, Chief Executive of GlaxoSmithKline, today announced a series of new initiatives targeted at further transforming the company's approach to diseases that disproportionately affect the world's poorest countries. His announcements build on commitments made in 2009 to work in partnership, expand access to medicines and encourage new research into neglected tropical diseases.

Reinforcing and Moving Forward...

PRESS RELEASE

GlaxoSmithKline

Issued: Thursday 11 October 2012, London UK

GSK announces further initiatives to advance openness and collaboration to help tackle global health challenges

- Tuberculosis (TB) 'compound library' to be made available to help stimulate research into TB
- Investment in GSK's Tres Cantos Open Lab to be doubled with an additional £5m funding awarded
- Detailed data from GSK clinical trials to be made available to researchers to further scientific understanding and knowledge

GSK today announced new measures to further advance its commitment towards greater openness, transparency and collaboration. Speaking at a meeting hosted by the Wellcome Trust in London today, GSK CEO Sir Andrew Witty will outline new steps to build on the encouraging signs of progress resulting from GSK's 'open innovation' approach to R&D, designed to help develop new solutions for the world's most serious health challenges.

UNITING TO COMBAT NEGLECTED TROPICAL DISEASES

London Declaration on Neglected Tropical Diseases

Private and Public Partners Unite to Combat 10 Neglected Tropical Diseases by 2020

Partners pledge innovative, coordinated action aimed at new World Health Organisation goals

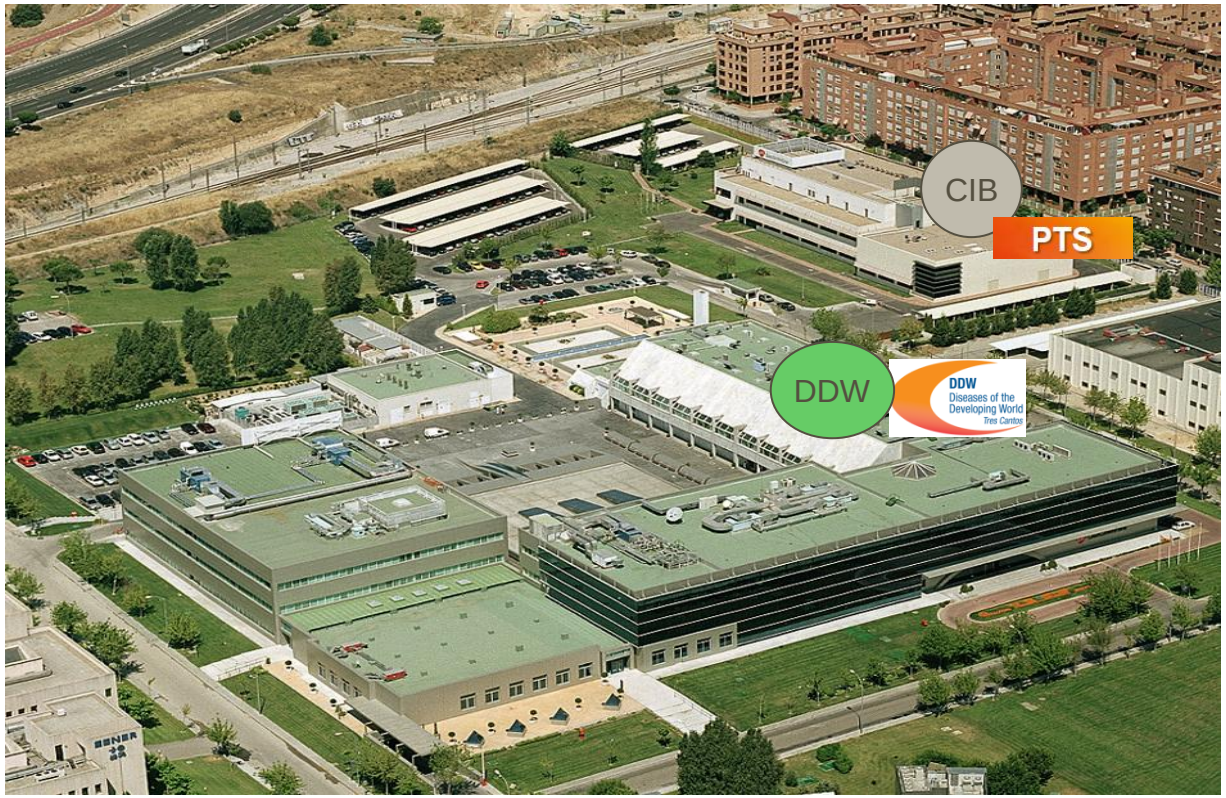
Ending the Neglect & Reaching 2020 Goals

- Monday, 30 January 2012 London

UKaid, Johnson & Johnson, DNDi, Bill & Melinda Gates foundation, MERCK, USAID, Pfizer, Bayer, NOVARTIS, GILEAD, Bristol-Myers Squibb, MSD, GlaxoSmithKline, Eisai, AstraZeneca, The World Bank, BD, SANOFI, Abbott, MundoSano, The Children's Investment Fund Foundation

Speaking on behalf of the CEOs of the 13 pharmaceutical companies involved, Sir Andrew Witty, CEO of GlaxoSmithKline, said, "Many companies and organisations have worked for decades to fight these horrific diseases. But no one company or organisation can do it alone. Today, we pledge to work hand-in-hand to revolutionize the way we fight these diseases now and in the future."

GSK Tres Cantos facilities for DDW drug discovery



Malaria DPU

Tuberculosis DPU

Kineto DPU

PTS

LAS
Laboratory animal science

DMPK

DDW - The Three Pillars of "Open Innovation"

1. Providing access to our know-how and resources

"Open Lab"

tres cantos OPEN LAB FOUNDATION

SEVENTH FRAMEWORK PROGRAMME

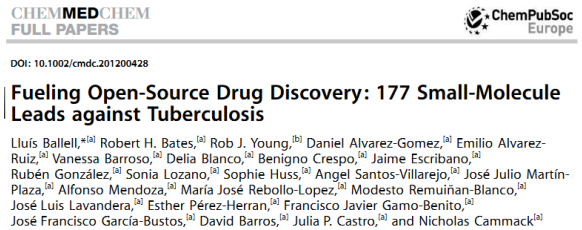
BILL & MELINDA GATES foundation

wellcome trust

Collaborative research through the Open Lab and other schemes

2. Sharing our data and assets with the worldwide research community

"Open Source"



Publishing screenings data and sharing the compound sets

3. Being more flexible with our Intellectual Property

"Patent Pool"

WIPO | Re:Search
Sharing Innovation in the Fight Against Neglected Tropical Diseases

bvgh
BIO Ventures for Global Health

Making IPR in the results available to third parties in accordance with the Guiding Principles of WIPO Re: Search, so that IP output is made available royalty free for neglected diseases treatment/research in the least developed countries

The “Open Lab” concept

An Open Innovation model for drug discovery

Collaborative research between any research institution in the field and GSK

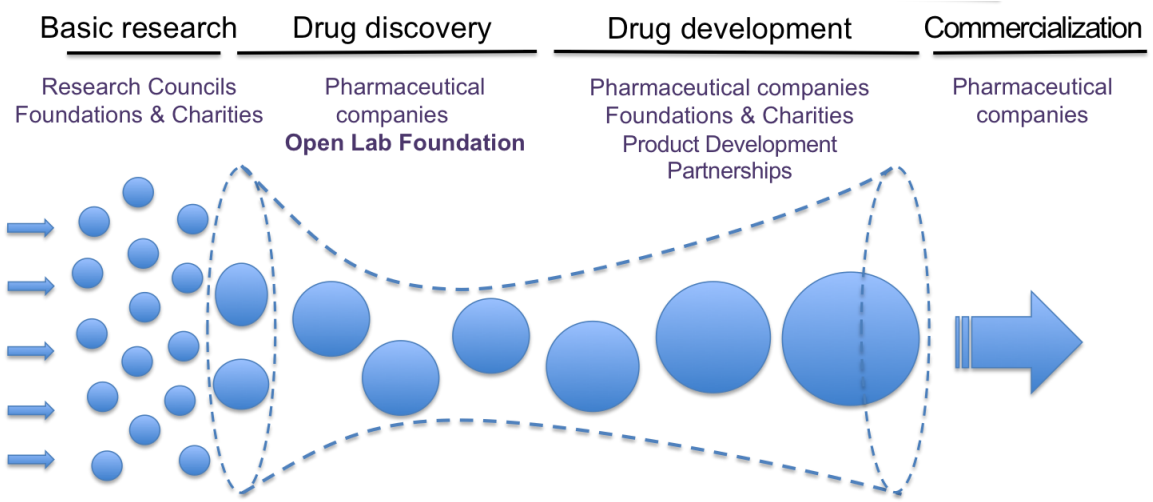
Grantees can access GSK’s industrial scale expertise, processes, facilities and infrastructure including the ultra-high-throughput screening facility and Biosafety Level 3 in *vitro* and in *vivo* laboratories

IP management

Grantees are committed to allocate IP arising from TCOLF supported projects to **WIPO Re:Search**, a “patent pool” for open innovation in neglected diseases so that IP output is made available royalty free for neglected diseases treatment/research in the least developed countries.

to bridge the drug translation gap

providing financial and infrastructural support to R&D projects transitioning from basic research to drug discovery



Positioning the Open Lab at Tres Cantos within the R&D value chain

Pharma R&D pipeline with sources of funding at various stages along the R&D value chain

Diameter of the pipeline is related to funding available to projects
Individual projects represented by circles with size relating to their funding requirement

The “Open Lab” legal framework

The Tres Cantos Open Lab Foundation (TCOLF) was established as a not-for-profit organization in 2010 – Charity registered in England and Wales

Mission

*Enable **translation of innovative research to benefit the health of the people in the developing world** affected by Neglected Tropical Diseases, specially **Tuberculosis, Malaria and Kinetoplastid infections.***

*This goal will be achieved through **collaborations** where the complementary expertise and capacity currently residing in the Pharmaceutical industry as a whole is made accessible to Academic, Biotech and other Pharmaceutical Industry scientists.*

Programms and funding

(traditional) Open Lab
since activity start in 2010

£5M seed funding
from GSK in 2010

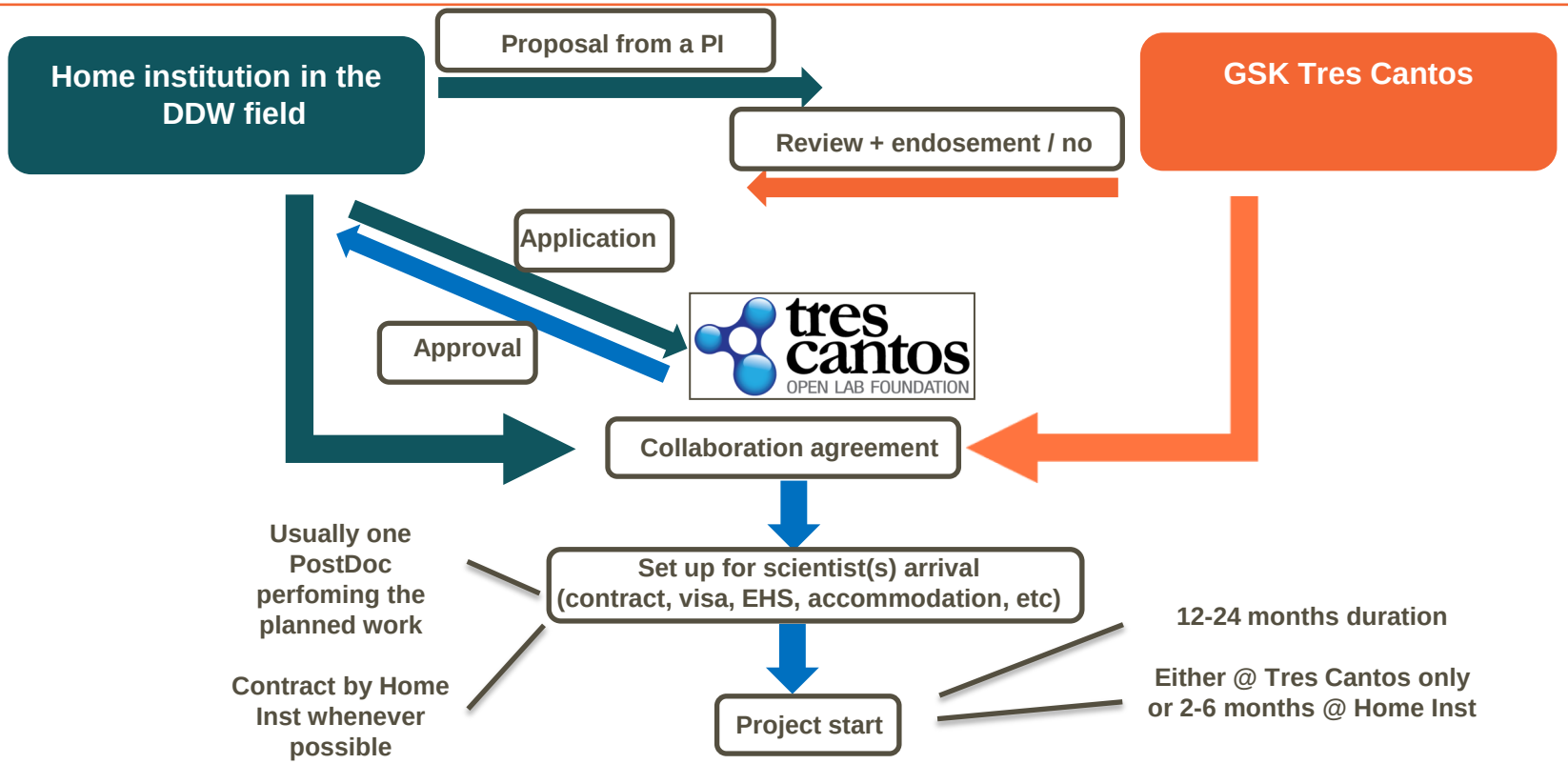
Additional £5M funding
committed in 2012

Cofund Programme
since March 2013

1,15M€ granted by the European Union through the FP7 Cofund scheme for 2013-2018

Open Lab Portfolio:

A "typical" Open Lab project set up



WORK PACKAGE No.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	Site
WP1																									Home Inst
WP2																									GSK TCMDC
WP3																									GSK TCMDC
WP4																									GSK TCMDC

Open Lab Portfolio: May 2011

From a few examples as proof of concept…

Open Lab Portfolio: October 2015

… to 51 Projects in 11 Waves (and moving forward)

Approved* (7)

- Hugo Duarte (COFUND)
- Stefan Jacken (COFUND)
- Cynthia Tallant (COFUND)
- Abraham Lopez-Moure (COFUND)

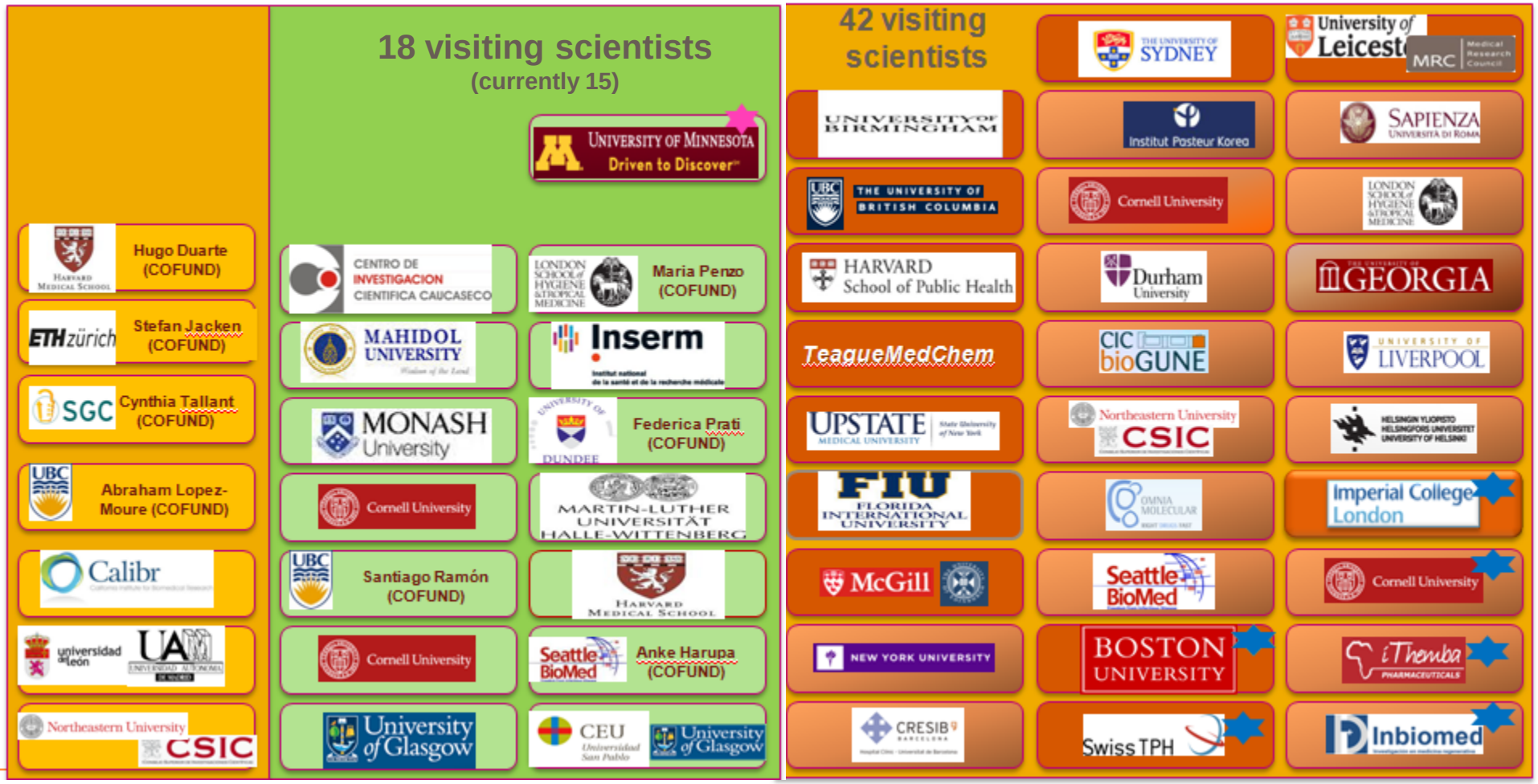
Active (15)

18 visiting scientists
(currently 15)

- Maria Penzo (COFUND)
- Federica Prati (COFUND)
- Santiago Ramón (COFUND)
- Anke Harupa (COFUND)

Completed (29)

42 visiting scientists



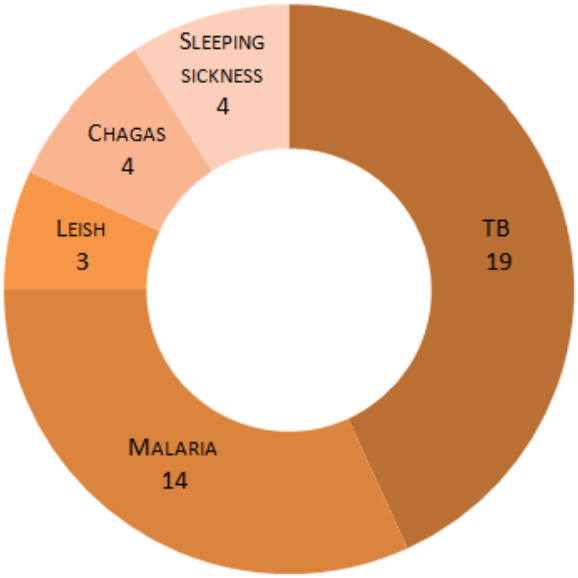
* Subject to finalisation of collaboration agreements

Not funded by TCOLF

Post OL / no cost extended

Open Lab Portfolio:

Breakdown by geographical distribution, disease and type

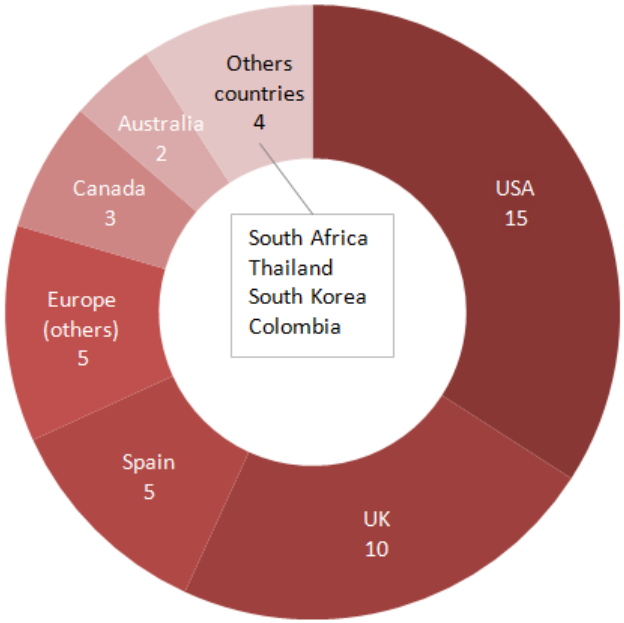


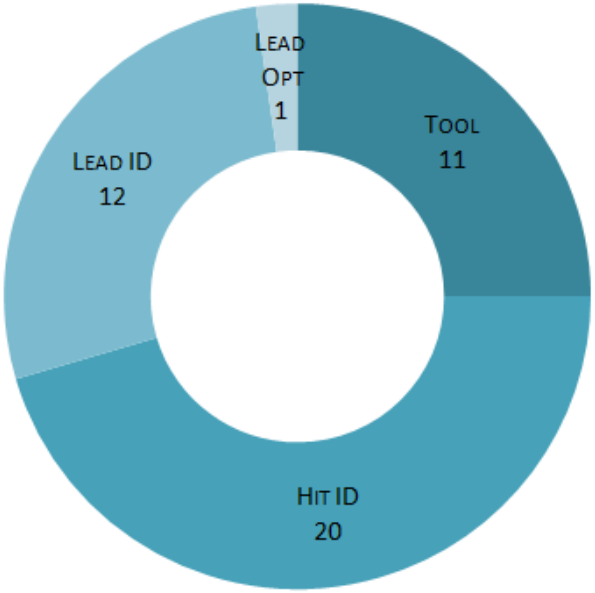
Higher share of Tuberculosis projects.

Trend towards TB/Mal/Kineto balance

Geographical distribution driven by location of leading institutions in the field

Developing countries presence still low





More presence of early stage and new tools projects.

Slow but steady trend moving early stage resource to clinical development.

GSK Assets to the Eyes of our Partners

- Integrated expertise in Drug Discovery for diseases of the developing world: Hits, Leads & Candidates
  - MedChem, Parasitology, Animal models, DMPK, Safety Pharmacology, etc.
  - Biological reagents (proteins, recombinant cells, SC-derived primary cells), Assay development, Screening, Cheminformatics, eXP, etc.
- Cutting-edge platforms and infrastructure
  - The uHTS facilities
  - BSL3 lab
- Testable chemical diversity
  - The 2.2M Compound Collection
- Our Brand
  - The industrial perspective
  - The company
  - The team

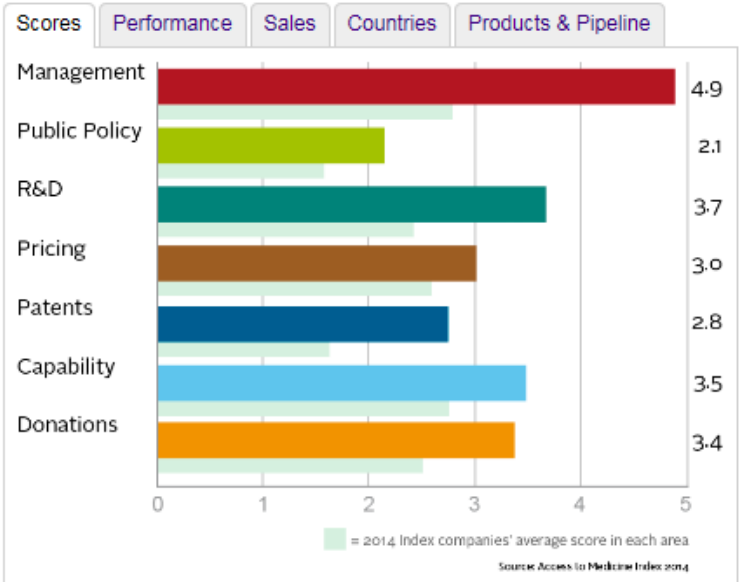
Open Lab impact highlights

- Key role in the validation of five therapeutic targets
- Valuable knowledge generated for 7 other targets
- Two promising lead optimisation programmes and a pre-candidate asset
- 14 papers accepted (JMC, JBC, AAC, PLoS, PNAS…)
- 31 oral presentations and posters
- ~£38M generated in follow up grants for GSK and/or our partners from different funding bodies (NIH, EU/FP7, WT, BMGF, MRC)

External recognition

GlaxoSmithKline plc

GlaxoSmithKline plc
Novo Nordisk A/S
Johnson & Johnson
Novartis AG
Gilead Sciences Inc.
Merck KGaA
Merck & Co. Inc.
Sanofi



access to medicine index

rank	score
1 =	3.3
1 (2012)	

2014 report: building on experience to start new initiatives

2011 report: GSK's open innovation strategy in DDW assessed as industry leading practice

"Research scientists from around the world meet at its Tres Cantos campus to work on projects for the developing world, and in 2011 six projects were launched from this open lab."

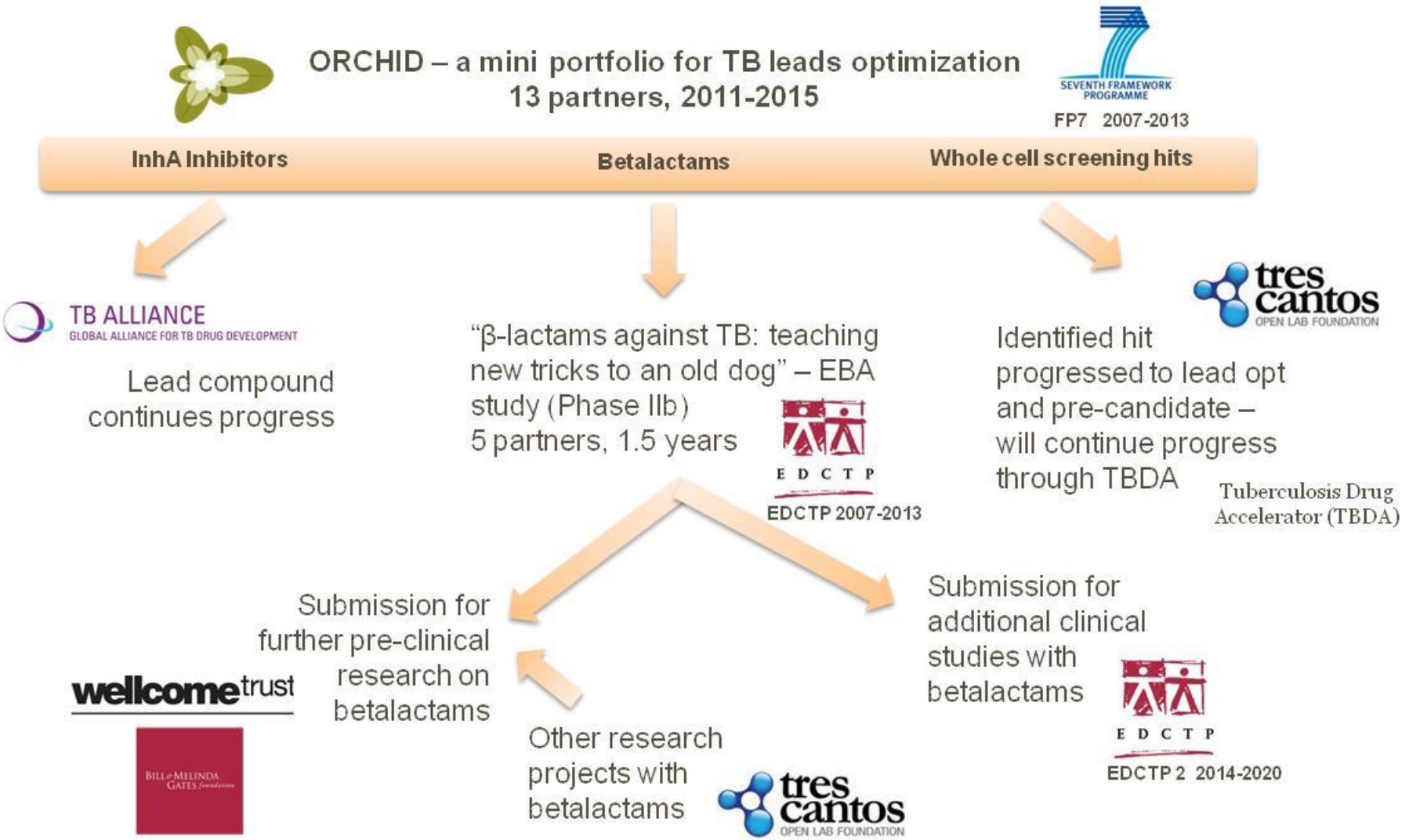
Source: http://www.accesstomedicineindex.org/

Establishing innovative Open Lab for Africa for NCDs. Building upon its first Open Lab in Spain, GSK is establishing a second Open Lab for Africa. This lab aims to improve understanding of NCD variations seen in the African setting to inform prevention and treatment strategies of NCDs in African patients. Understanding local disease variations is essential to address needs that are specific to Africa.

Beyond the Open Lab:

Other examples of collaborative research

ORCHID: Navigating public & private funding schemes to leverage funding and continue research



The WT/GSK DDW Drug Discovery Engine

£5m award over 5 years – dependent on success (milestone-based funding)

Portfolio entries are subject to agreement of the collaborator

Our intent is not to duplicate activities within the DDW space

PRESS RELEASE

GlaxoSmithKline

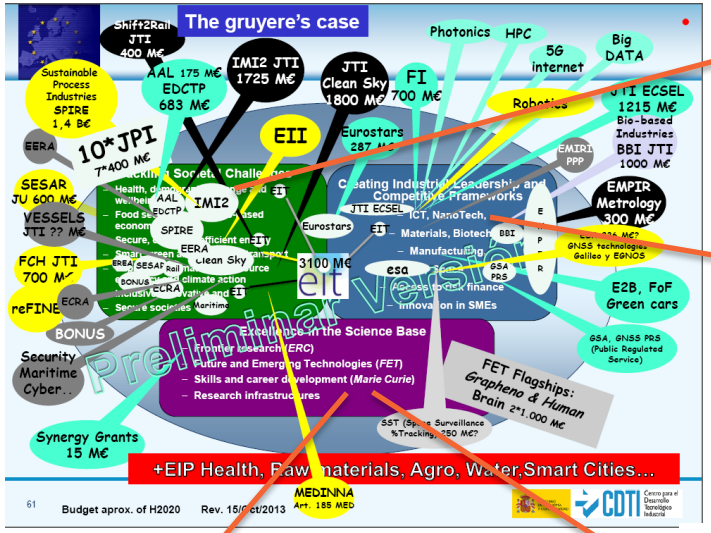
Issued: Friday 3rd May 2013, London UK

Funding boost for GSK's open innovation research into diseases affecting the developing world

GlaxoSmithKline plc (GSK) today announced a funding injection of up to £5m from the Wellcome Trust to support its open approach to discovering and developing urgently needed new treatments for diseases of the developing world.

Other ongoing collaborations

With EU public funding



JTI, in-kind private funding - 21 partners, 5 years

Large collaborative projects

With private donors funding

CooperaTB

Marie Curie – Industrial doctorates

Marie Curie - Initial Training Networks

In the framework of long-term partnerships

Tuberculosis Drug Accelerator (TBDA)

Source: "Horizonte2020: de la visión general a las oportunidades", CDTI , Spanish Ministry of Economy and Competitiveness, October 2013

Our commitment with the society & patients

Increase awareness – Communicate research - Attract young students to scientific careers

Researchers´ Night

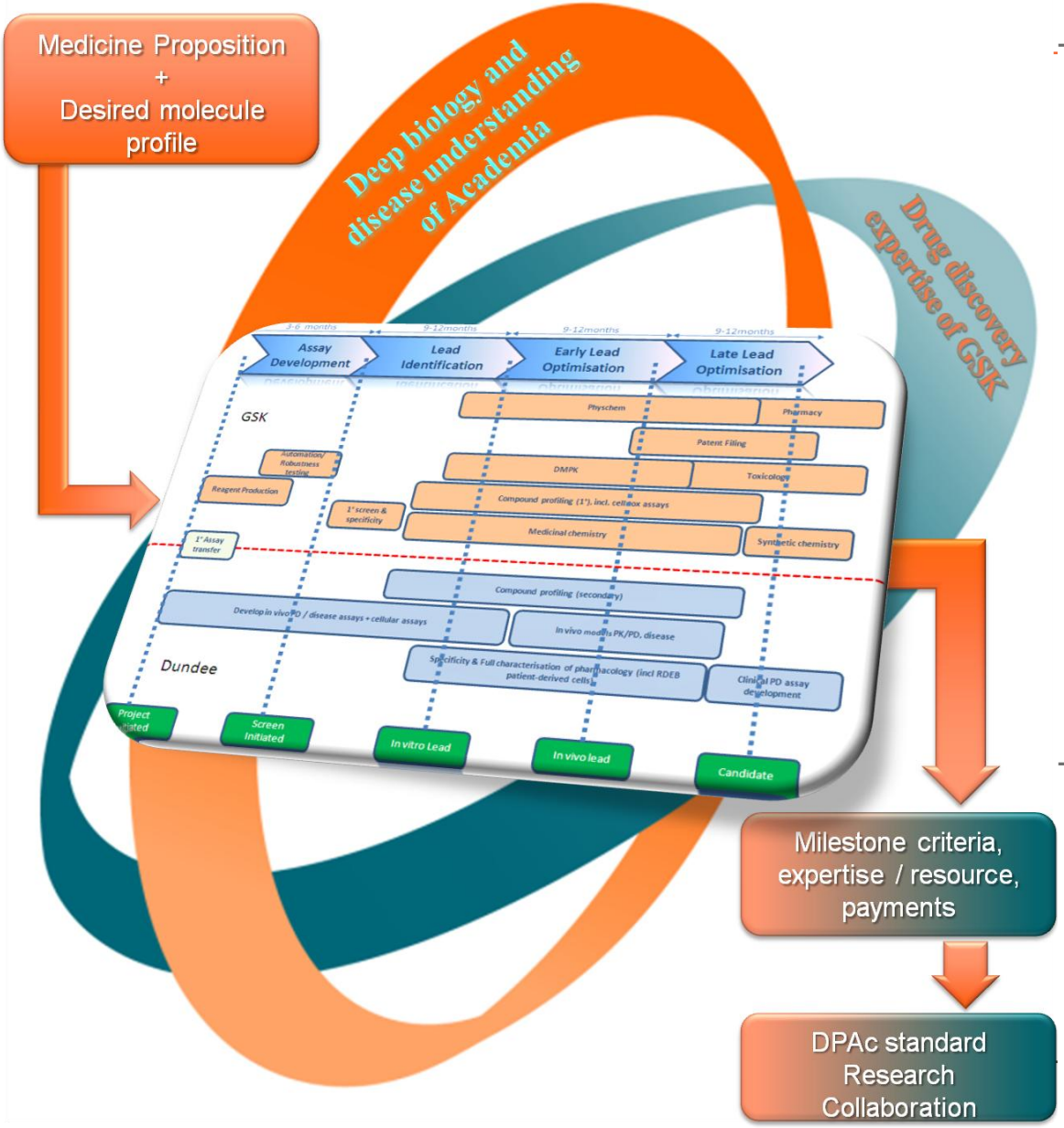
Science Week

Science at Tres Cantos

Discovery Partnerships with Academia

Accelerating the path from ideas to new therapies

DPAc: A collaborative approach from GSK



- The DPAc initiative was put in place five years ago to implement a more efficient way of combining all scientific and technological capabilities in academia and industry to improve the rate of discovery of new therapies for human diseases. GSK actively looks for recognised experts with a unique and clear therapeutic hypothesis involving a tractable target or pathway. Collaborations are established on the basis of an equitable access to Intellectual Property approach as both risks and benefits are shared.

- The academic partner benefits from having a single partner from idea to medicine with access to a broad array of people, tools and techniques within GSK, joint publications and generation of new research tools and a financial share in the success of a future medicine.

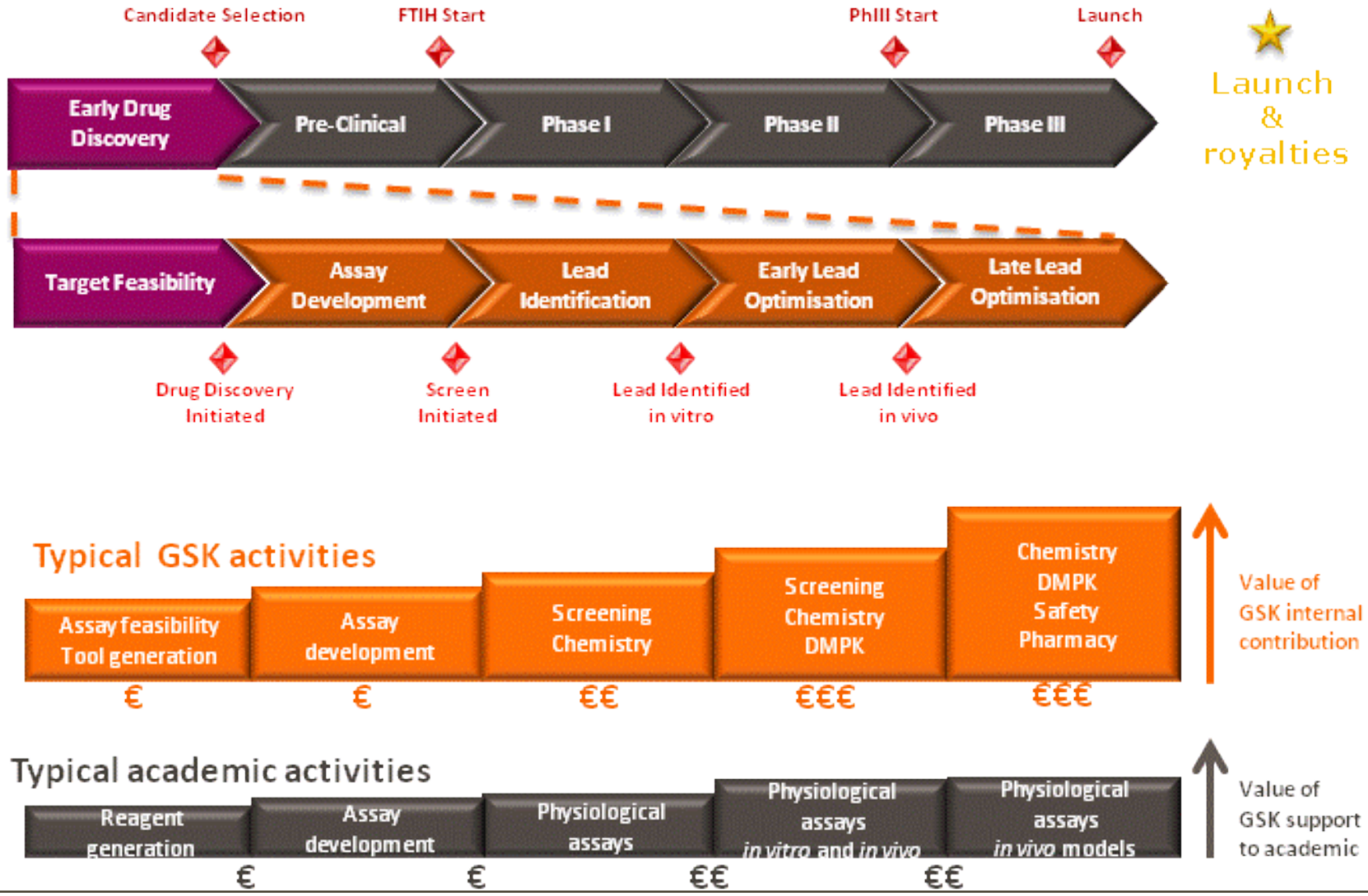
What we are looking for

Clear Therapeutic hypothesis	• A coherent and supportable hypothesis that modulation of target will produce a physiological effect which will be of therapeutic benefit to particular patients
Target defined	• Specific drug target identified, and some understanding of type of pharmacology desired
(Exclusive) enabling expertise	• Academic partner has know-how and/or expertise essential to progressing the target which is not (readily) found elsewhere
Tractability	• Target knowledge suggests that a drug-like molecule can be generated • Disease knowledge suggests that opportunity can be evaluated effectively in the clinic
Requirement for GSK contribution	• GSK has capabilities and expertise which will help progress the project to the next milestone

What the benefits are

- A single partner from idea to medicine
- A key role in the project
- Working alongside a drug discovery expert from GSK
- Access to a broad array of people, tools and techniques within GSK
- Joint publications and generation of new research tools
- A financial share in the success of a future medicine

Share in the investment, share in the reward



contact e-mail: **dpac@gsk.com** web site: **www.dpac.gsk.com**

What are GSK's capabilities?

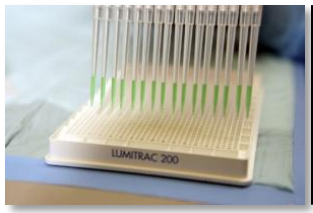
Large scale protein production

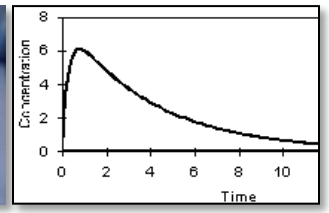
HTS capacity 2 million compound set

Medicinal chemistry and computational molecular design

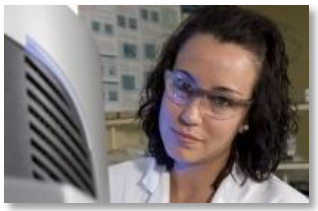
Selectivity screening

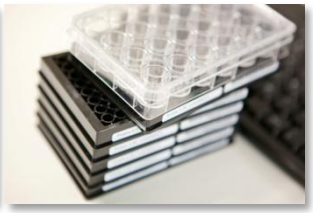
PK-PD modelling

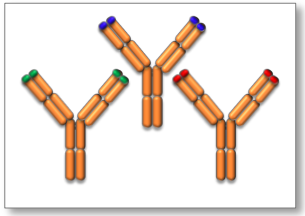


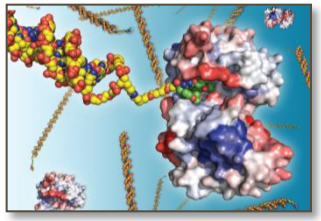


Target Feasibility → **Assay Development** → **Lead Identification** → **Early Lead Optimisation** → **Late Lead Optimisation**









scinovo
INNOVATION IN COLLABORATIVE PRECLINICAL DEVELOPMENT

Flexible, high tech assay platforms

Biopharm discovery platforms

Biopharm affinity maturation

Encoded Library technology >10 billion compounds

Synthetic & analytical chemistry

Preclinical Development (safety, chemistry, pharmacy)

contact e-mail: **dpac@gsk.com** web site: **www.dpac.gsk.com**

Managing the relationship

- Consistent agreement framework to promote rapid project initiation
- Working together – Joint Research Committee
- Joint investment of time/energy/resource to progress the project at both partner sites
- Strong interactive relationships between project team
- Equitable approach to IP
  - Academic will receive commercial rights if GSK terminates the collaboration

Active European projects

Preventing Multiple Organ Failure in Severe Acute Pancreatitis


Mr Damian Mole
John Liddle

Treating Systemic Amyloidosis


Prof Sir Mark Pepys
Mark Bamford

Therapy for Netherton Syndrome, Rosacea and Atopic Dermatitis


Prof Alain Hovnanian
John Liddle

© Laurent Attias/Fondation Imagine

Treatment of *P. aeruginosa* Infections


Dr Giovanni Bertoni
Stephane Huet

Disease-modifying approach to the treatment of Huntington's Disease


Prof Susann Schweiger
Iain Uings

Treating α1-Antitrypsin Deficiency


Prof David Lomas
Andy Pearce

Treating Graft *vs* Host Disease and other immunological diseases


Prof Nathan Karin
Jeremy Griggs

Treating Chronic Kidney Disease


Prof Karl Skorecki
Jeremy Griggs

Discovery Fast Track Challenge

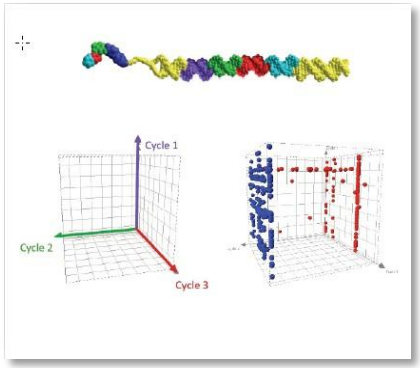
- One of the ways in which collaborations can be established is through the **Discovery Fast Track** (DFT) challenges, focused on initial testing of the therapeutic hypotheses and generation of validated hits. These molecules can then be used by the academic lab as tools to further strengthen their idea or they can be starting points for drug development under a “full DPAc agreement”.
- The DFT Challenge is an opportunity for academics to win a partnership with GSK helping to start the process of finding new medicines from their innovative ideas. The challenge was initially piloted in Canada and USA in 2013 and was open to principal investigators affiliated with an institute, college or university. The challenge was expanded to Europe in 2014 and 2015 and this year we have received over 200 proposals in Europe from multiple countries with Spain being an increasingly significant contributor.

How does Discovery Fast Track work?

- The researcher provides a novel drug discovery concept that may include assay protocols, tools, reagents and models
- GSK provides a team of scientists and its state-of-the-art capabilities to scale up and industrialise assays and data analysis
- The target is screened against GSK compound collections and enabled to find novel quality pharmacologically active compounds

Reagents and Assays

High Throughput Screening

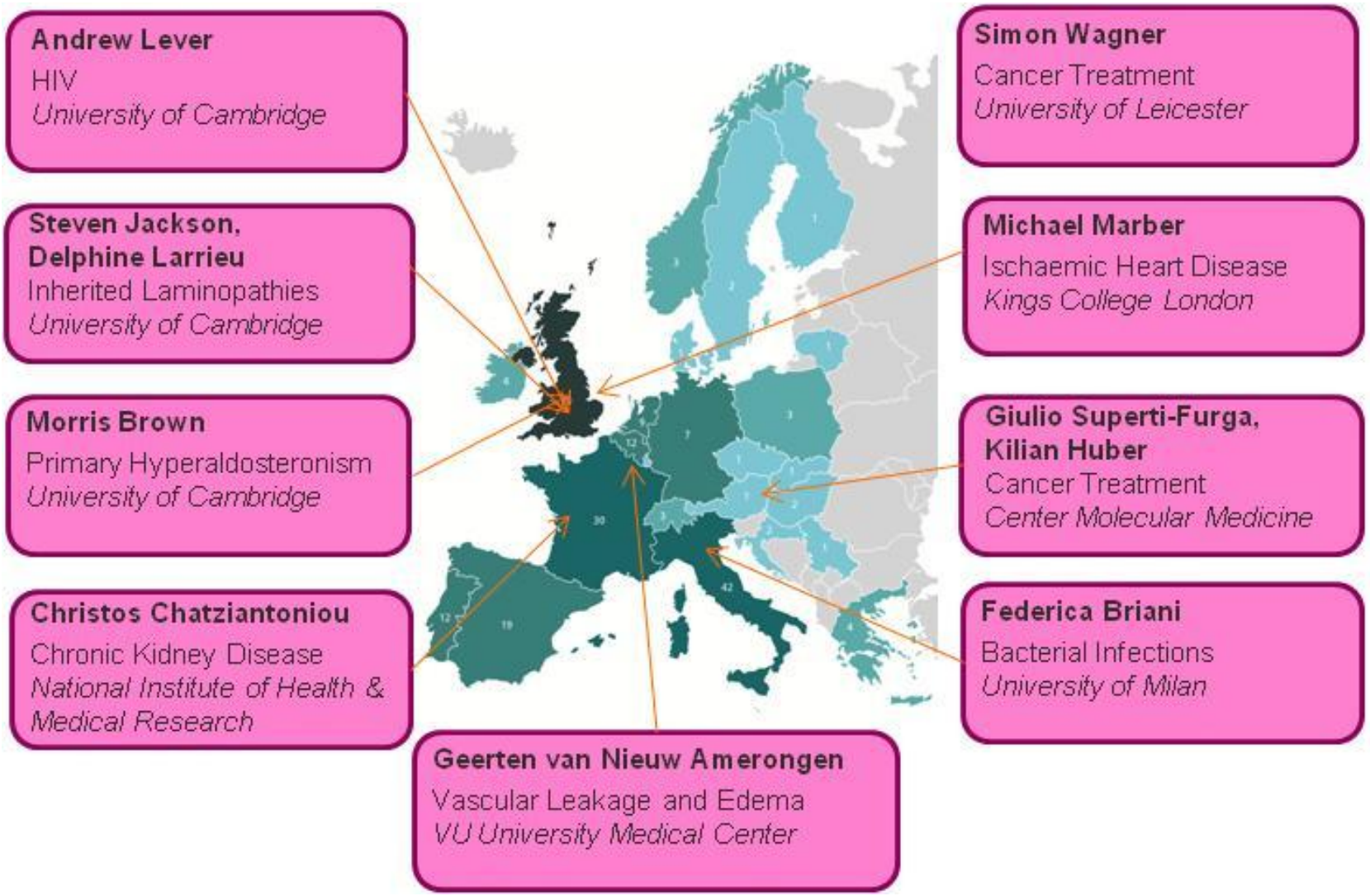


Encoded Library Technologies

Hit Qualification Support

http://openinnovation.gsk.com/

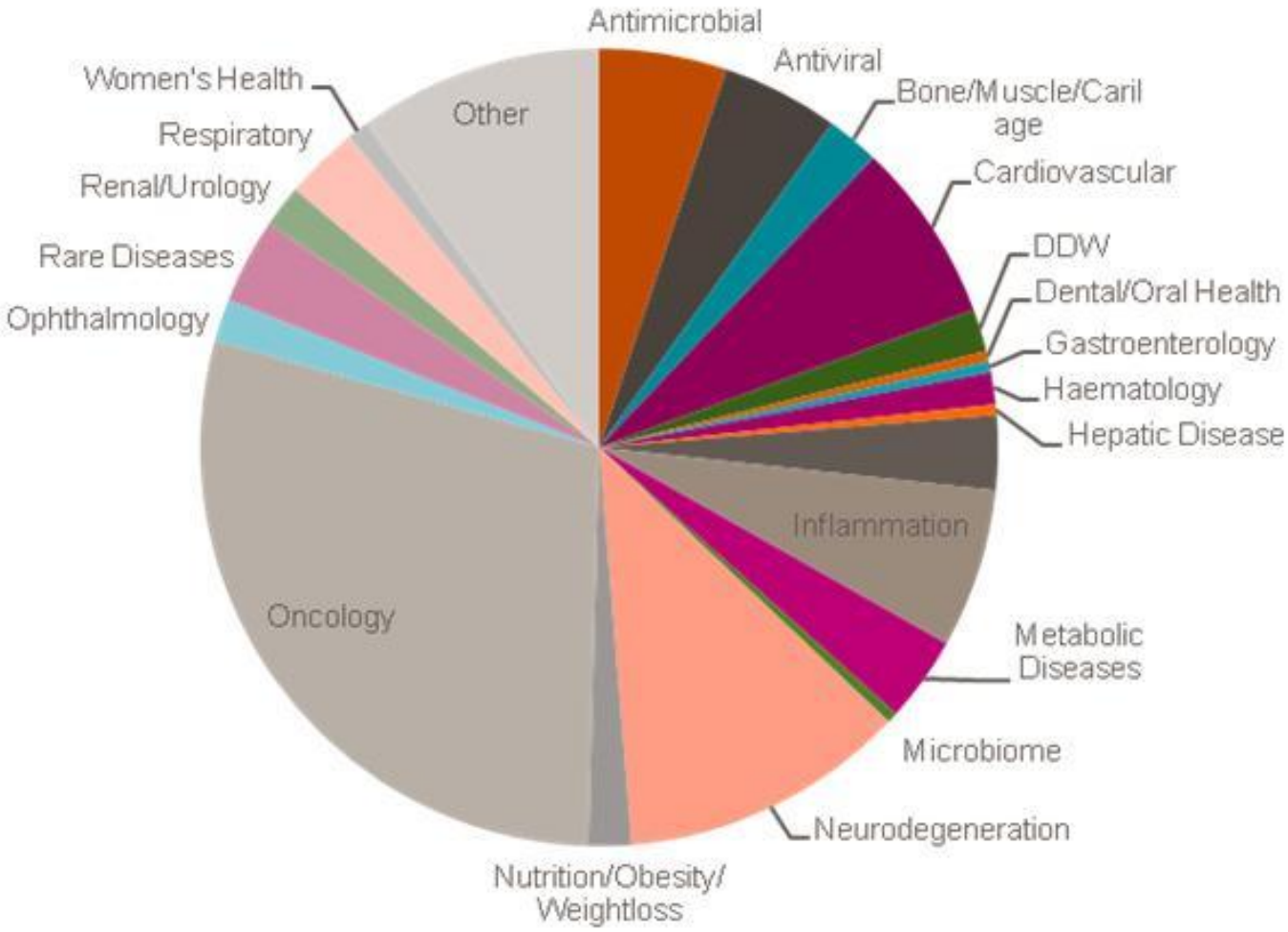
DFT Europe 2014 winners



http://openinnovation.gsk.com/

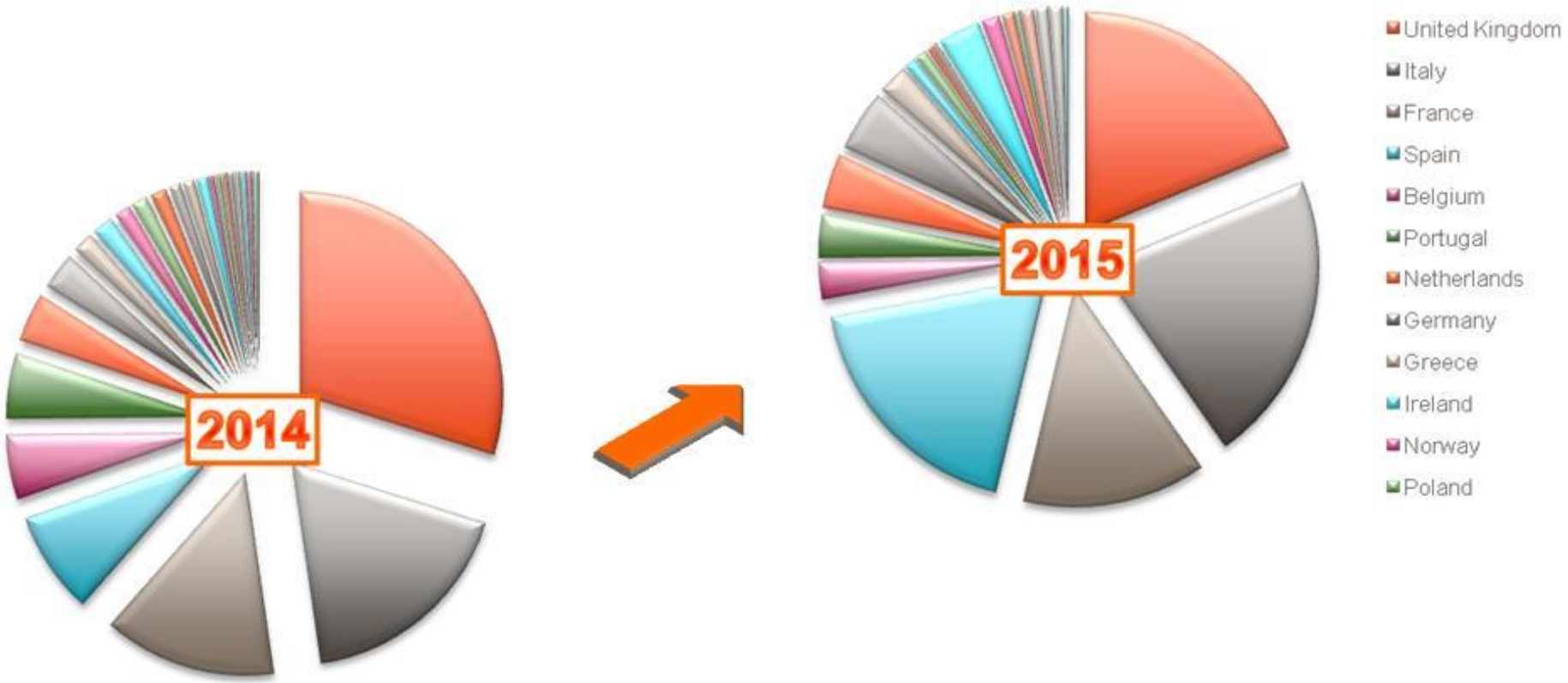
DFT Europe 2015 proposals

by therapeutic area



DFT Europe 2015 proposals

by country



DFT Europe 2015 proposals

by country

217 proposals from 140 institutes from 19 countries

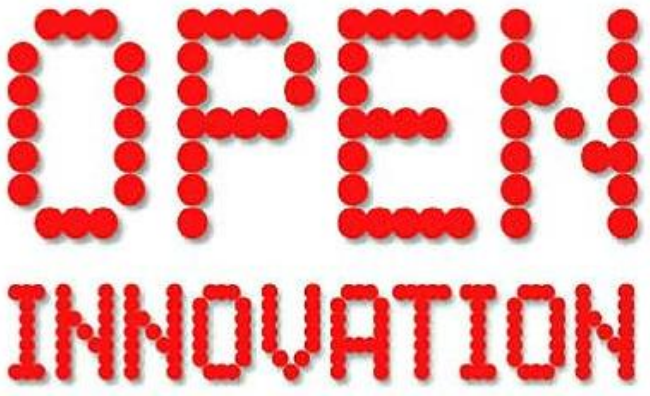
http://openinnovation.gsk.com/

Concluding remarks

Navigating the IP Road
in the Open Innovation World

GSK R&D approach to open innovation

- In some areas we believe that by being more open, i.e. **by giving up more and sharing more** we will
  - Create the right environment – externally as well as internally - to stimulate innovation and enhance the productivity of R&D and deliver products of value
  - Create a new way of doing R&D
  - Give even greater value to society and build trust



In Conclusion

- Whatever Open Innovation is, it isn't going away
- Global Patents is already supporting a broad spectrum of Open Innovation initiatives
- Some of these initiatives challenge us to think about IP in new ways
- We are learning and innovating
- We can learn from each other
- No-one said it was going to be easy

Thanks for your attention

- *Open Lab:*
  http://www.openlabfoundation.org/
- *Discovery Partnerships with Academia:*
  http://dpac.gsk.com/
- *Discovery Fast Track Challenge:*
  http://openinnovation.gsk.com/
- *GSK:*
  https://www.gsk.com/