Open Innovation at GSK
Collaboration academy & pharma industry

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Bangkok Dec 2017

Outline

- Introduction to the Diseases of Developing World Center (DDW)
- Three different units with three different business models
- Main pillars of DDW collaborative ways of working
  - Open Innovation and WIPO
  - Open Source
  - Open Lab
- Summary and conclusions

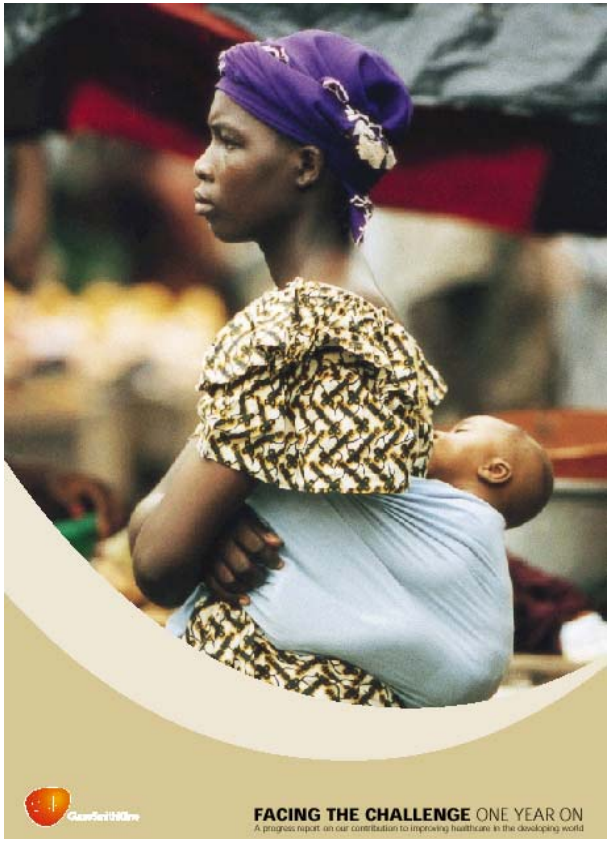
All animal studies were ethically reviewed and carried out in accordance with European Directive 2010/63/EU and the GSK Policy on the Care, Welfare and Treatment of Animals. The human biological samples were sourced ethically and their research use was in accord with the terms of the informed consents

Tres Cantos Medicines Development Campus

GSK diseases of the developing world

Tres Cantos Medicines Development Campus

- Focused on R&D in malaria, TB and kinetoplastid diseases
- **Collaborative with key funding partnerships**
- Projects prioritised by unmet medical need - not commercial benefit
- Approx. 120 scientists in Tres Cantos



Medicines for Malaria Venture

TB ALLIANCE
GLOBAL ALLIANCE FOR TB DRUG DEVELOPMENT

DNDi
Drugs for Neglected Diseases *initiative*

wellcome trust

BILL & MELINDA GATES *foundation*

DDW – Diseases of the Developing World

One site and three DPUs with different business models

Kineto DPU

- **Virtual unit acting as catalyst**
- **Untapped area where DDW can add value**
- **Key partnerships formed**

TB DPU

- **Partnerships formed place GSK at the cutting edge of TB research**
- **Pooling of TB expertise through collaborative consortia**

Malaria DPU

- **GSK has world class malaria research capability**
- **Scientific advances have provided new opportunities**
- **Key strategic partnership with MMV, WT & B&MGF**

Three pillars of Open Innovation at DDW

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

Being more flexible with our Intellectual Property

“Patent Pool”

Sharing our data and assets with the worldwide research community

“Open Source”

Providing access to our know-how and resources

“Open Lab”

bvgh
BIO Ventures for Global Health

WIPO
WORLD INTELLECTUAL PROPERTY ORGANIZATION

tres cantos
OPEN LAB FOUNDATION

MARIE CURIE ACTIONS

Contributing to the Patent Pool

Establishment of an independent knowledge pool

2009: creation of POINT (Pool for Open Innovation against Neglected Tropical Diseases)

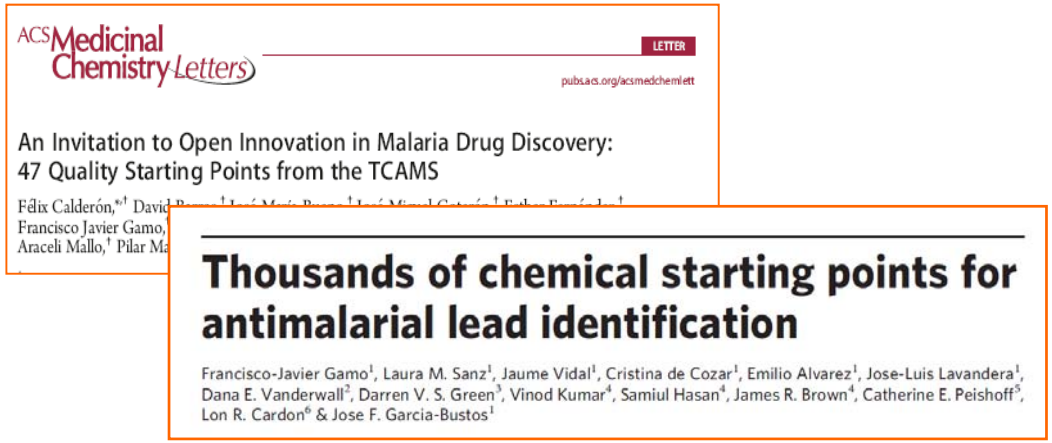
2010: bvgh BIO Ventures for Global Health as POINT administrator

WIPO
WORLD
INTELLECTUAL PROPERTY
ORGANIZATION

GSK contribution:

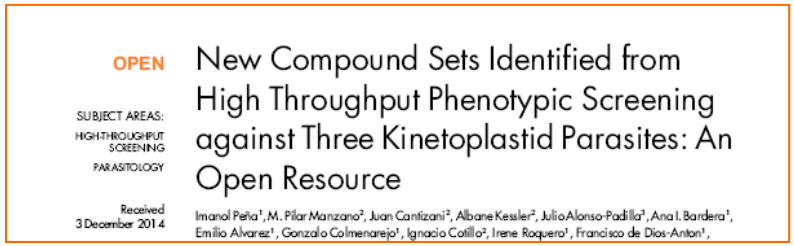
- **patents**
- **patent applications**
- **further knowledge and expertise**

Open source: sharing antimicrobial sets



Malaria (2010)
Nature **2010** *465* (7296) 305

Tuberculosis (2013)
ChemMedChem **2013** *8* (2)

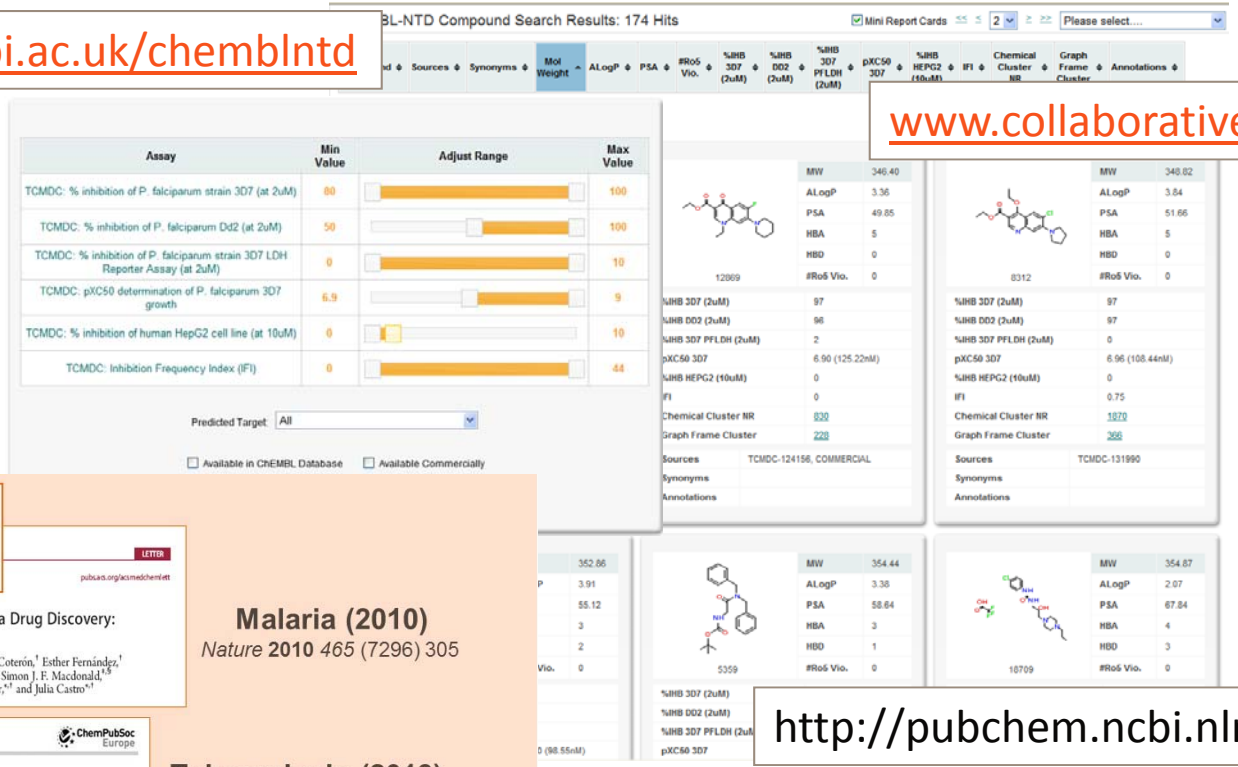


Leishmania, Chagas & Sleeping sickness (2015)
Sci.Rep **2015** *5* 8771

Antimicrobial set information is publicly available

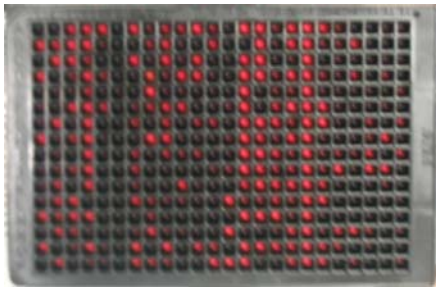
www.ebi.ac.uk/chemblntd

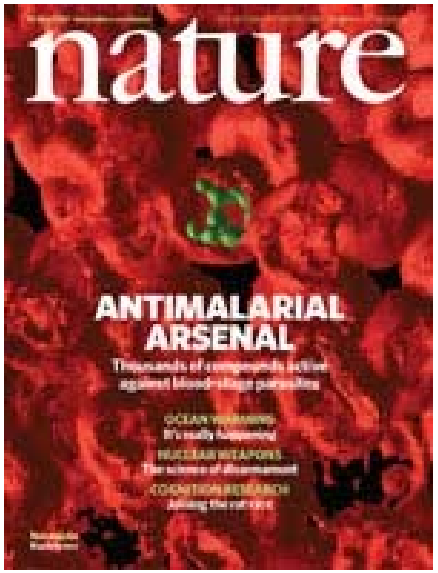
www.collaborativedrug.com



http://pubchem.ncbi.nlm.nih.gov/

Sharing not only information but samples with the scientific community





Imperial College London

Institut Pasteur Korea

HARVARD MEDICAL SCHOOL

FIAT LUX
Walter+Eliza Hall
Institute of Medical Research

University of Dundee

FIOCRUZ

ferrer

STUDIUM GENERALE CIVITATIS PERUSII · A.D. MCCCVIII ·

JOHNS HOPKINS
MEDICINE

MONASH
University

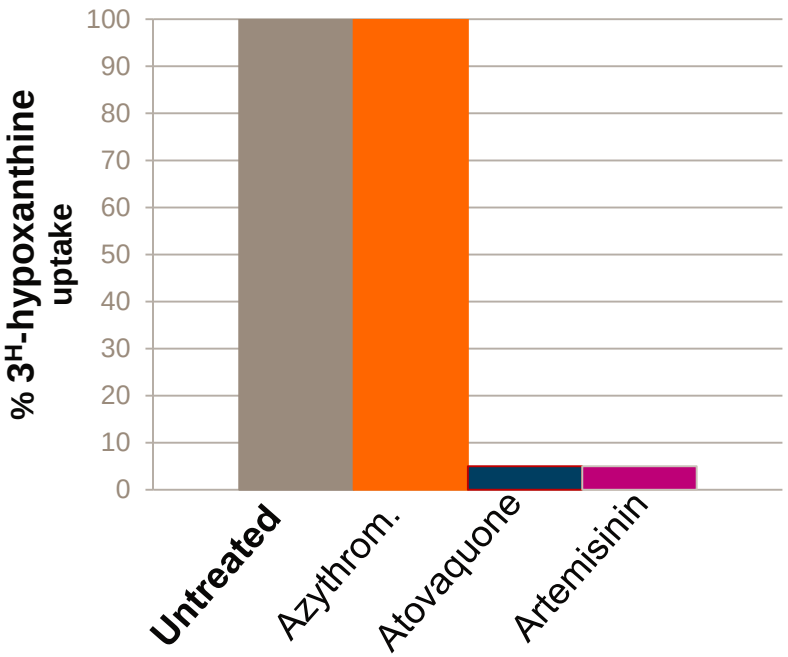
UNIVERSITY OF WASHINGTON · 1861 ·

Griffith
UNIVERSITY

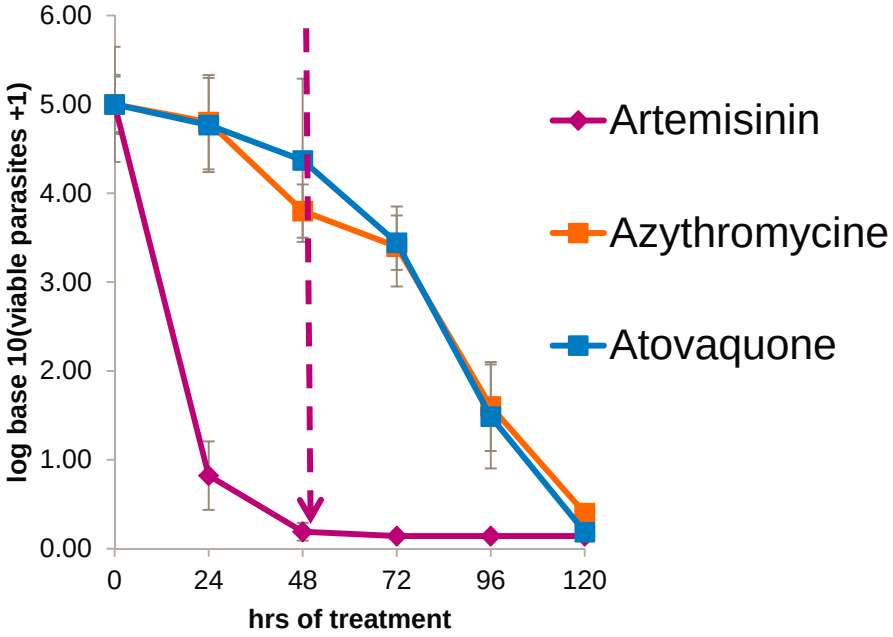
Collaborating with scientific community through internal platforms

- Compounds from external partners are profiled using proprietary state-of-the-art assays

48h growth inhibition at 10xIC$_{50}$



Parasites viability at 10xIC$_{50}$

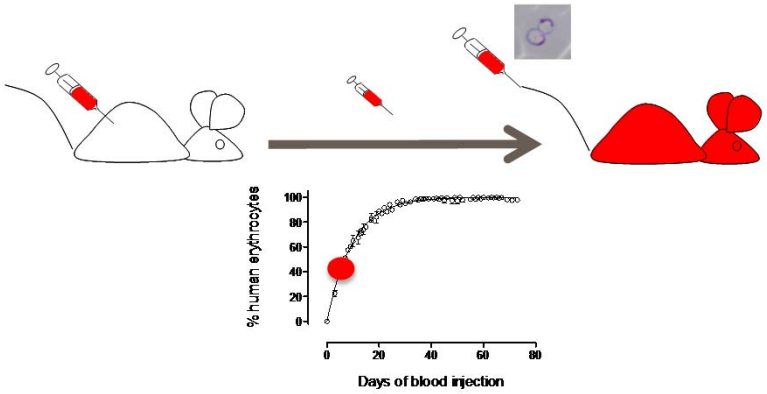


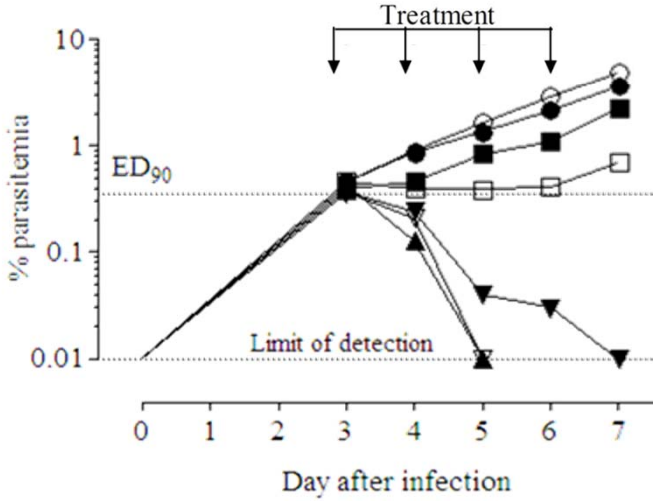
- PRR (**P**arasite **R**ate **R**eduction) to determine **killing profile** of antimalarials

Collaborating with scientific community through internal platforms

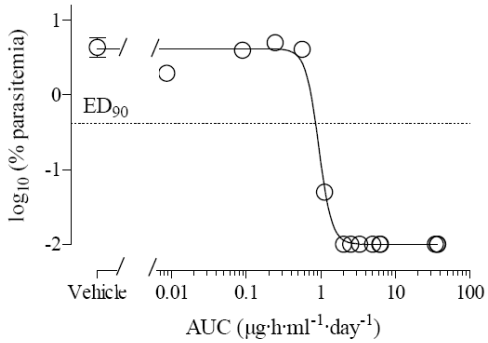
- Compounds from external partners are profiled using proprietary state-of-the-art assays

Mice engrafted with human RBC





4-day test
ED_{90}



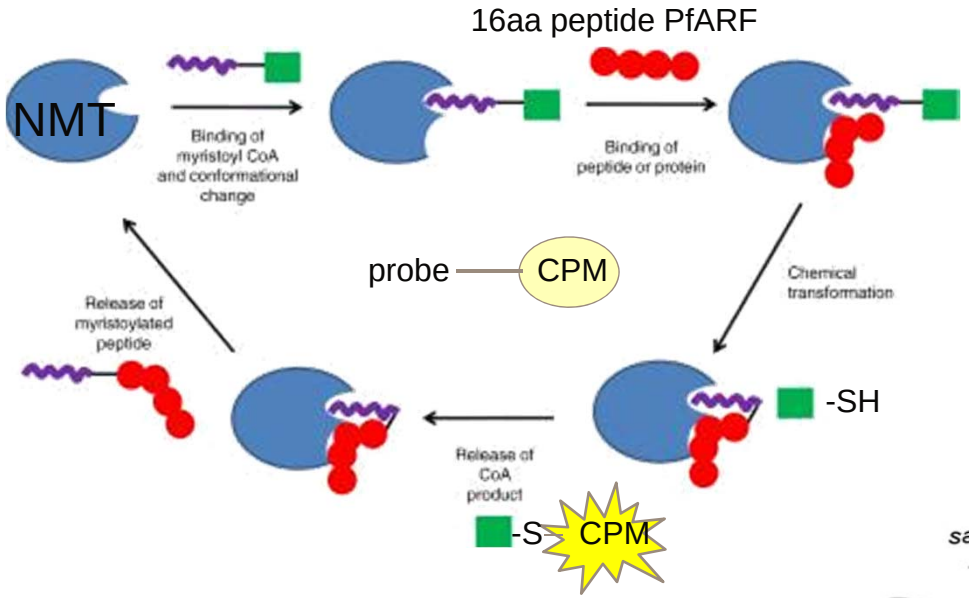
- ***P. falciparum* humanized mouse** model to assess efficacy against real pathogen

Joining forces: the Open Lab

www.openlabfoundation.org

ABOUT THE OPEN LAB | OUR APPROACH | RESEARCH PROJECTS | COLLABORATE WITH US

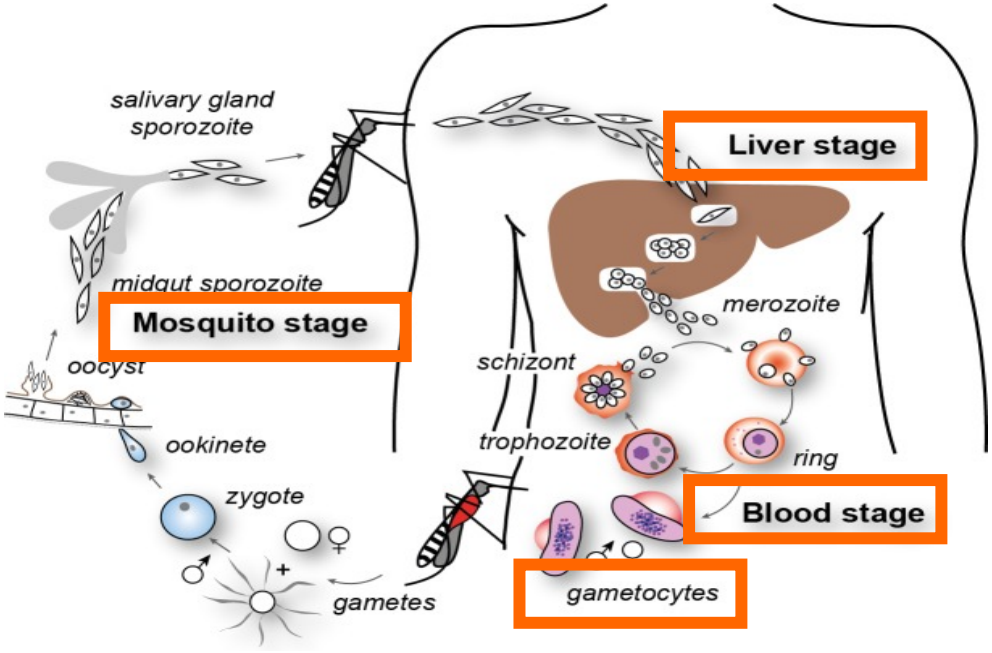
Open Lab project: antimalarial NMT inhibitors



Center for Infectious Disease Research

tres cantos OPEN LAB FOUNDATION

Prof. Alexis Kaushansky
Dr. Anke Jarupa



Adapted from Cowman et al. 2012

High Throughput Screening for NMT inhibitors

GSK screening colection + TCAMS (1.7 M compounds)

Primary HTS (PvNMT@ 10 uM)

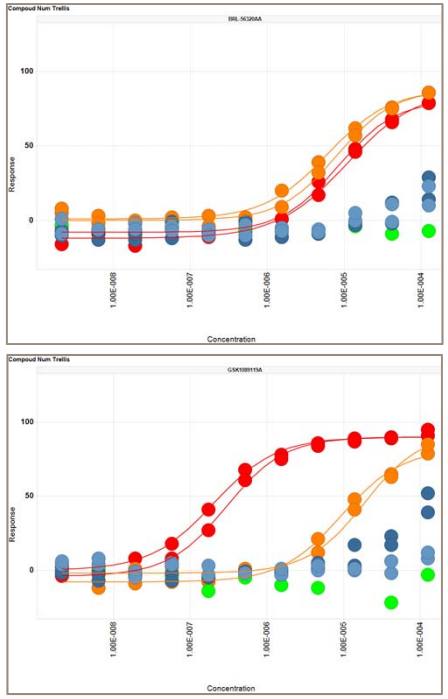
Confirmation
(PvNMT@10uM, n=2)

Dose Responses
(PvNMT, PfNMT, hNMT1, hNMT2, Cs)

Compound selection

Commit to Start of chemistry

1536 well plate format
3 weeks for the primary screening



PfNMT
PvNMT
hNMT1
hNMT2
Cs

Open Lab collaboration to build kineto boxes

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10-2011
GSK scientist to Dundee

11-2011
NEU/CSIC Open Lab

04-2012
NYU Open Lab starts

10-2012
Start Leish HTS

04-2014
End of Tb HTS

T. cruzi HTS
T. brucei HTS

Set-up of P3 BioKineto labs

04-2015
First request dispatched

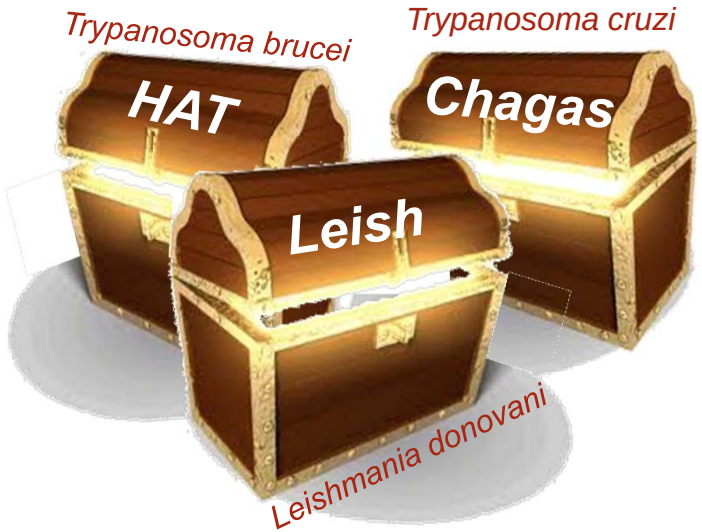
03-2015
Publication of the kineto boxes

Sci. Rep. **2015** *5*, 8771 DOI:10.1038/srep08771

Kineto Boxes

Each box contains ~200 high-value compounds:

- *in vitro* efficacy
  - pIC50>5 *versus* relevant phenotypic assays
  - 13 readouts per compound
- Safety
  - Selective over cytotoxicity assays
  - No overt *in silico* alerts
- Physicochemical properties
  - Chemically tractable hits
  - MW <500, cLogP <5, PFI <6-7, *in silico* CNS permeability (*T. brucei*)
- Exemplars of novel chemical space



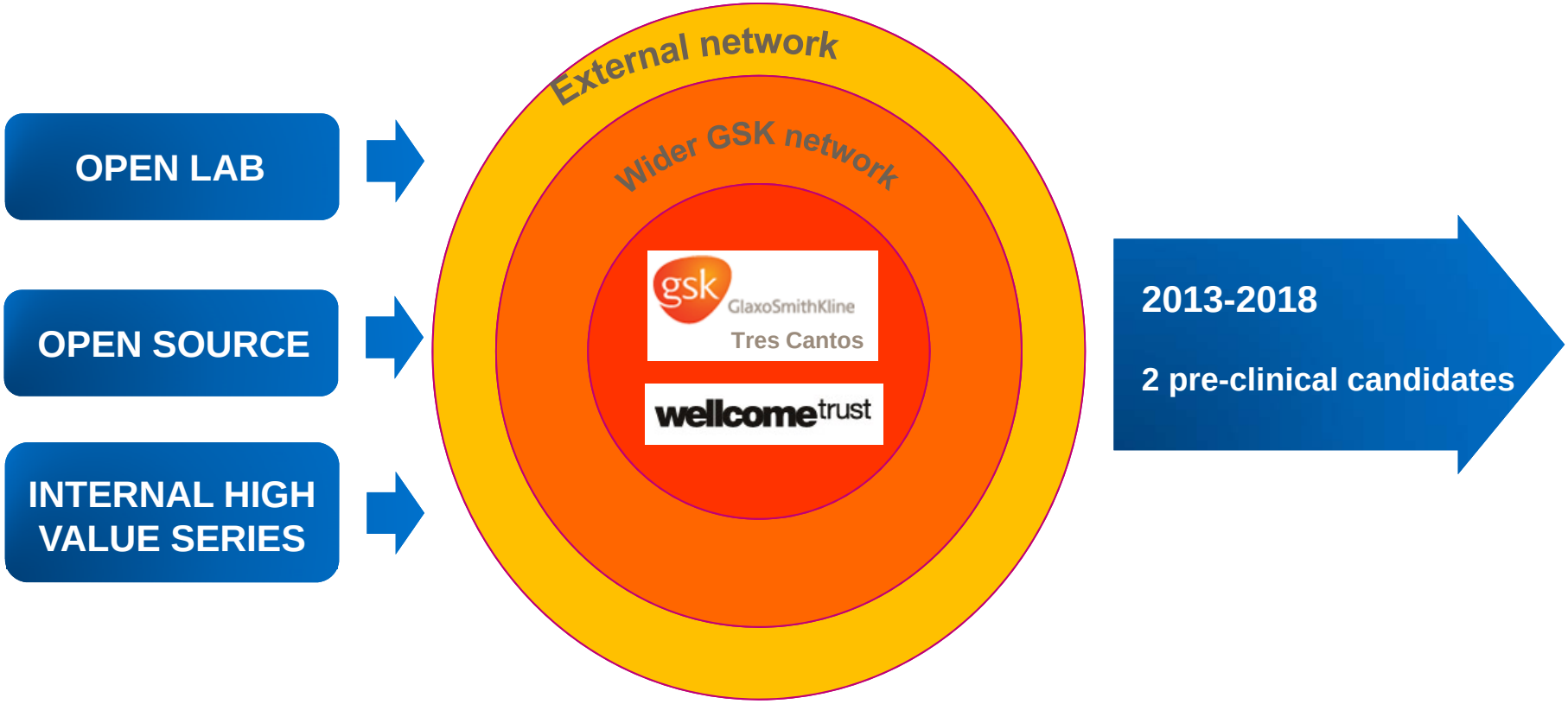
Open Lab Portfolio: December 2016

3 APPROVED* **25 ACTIVE** **32 COMPLETED**

2 Open Lab projects have currently entered pre-candidate selection phase

US$60M funding obtained from follow-up grants

The WT/GSK DDW Drug Discovery Engine



12 hit to lead projects worked out to date

4 projects in lead optimization (3 preCandidates)

First Candidate expected by 4Q2017

PRESS RELEASE

GlaxoSmithKline

Issued: Friday 3rd May 2013, London UK

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

In summary

- Partnerships between academy and industry is a real possibility
- Through three main pillars GSK is pioneering productive collaborations
  - Open Patent and WIPO
  - Open source
  - Open Lab

Collaboration is key to accelerate drug discovery in diseases of the developing world

Acknowledgements

Thank you to all our partners and those at GSK

We are always open to ideas for projects, collaborations, visits…