

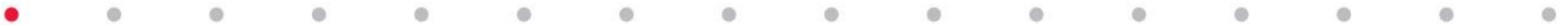


Pharmacogenetics Expertise

London Genetics is using its access to genetic expertise to work with the biopharmaceutical industry on smarter, faster and safer drug development

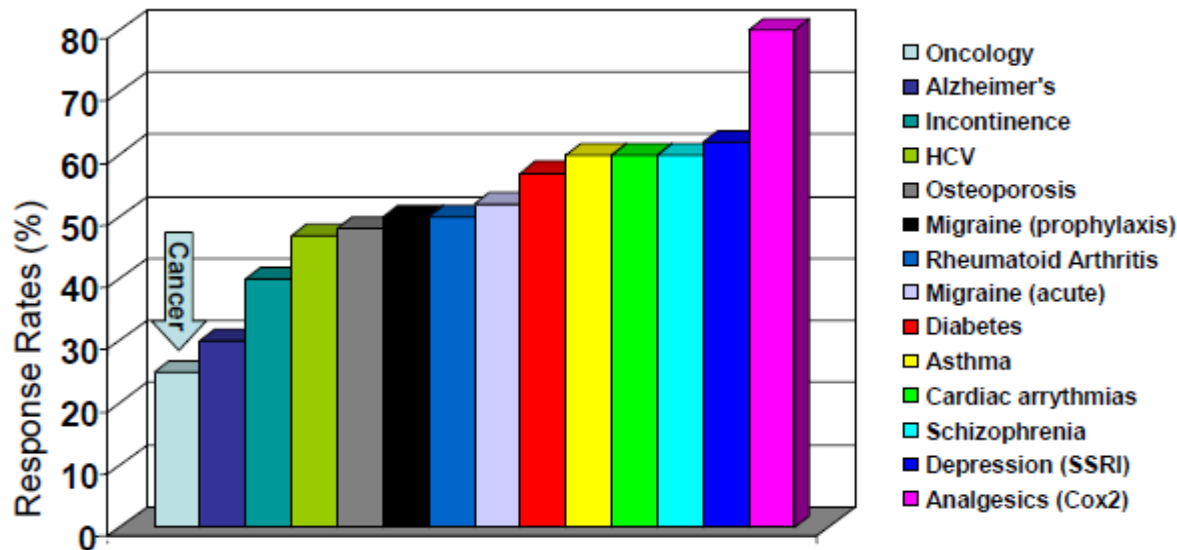


The drug development challenge



What is pharmacogenetics?

- Evaluation of the clinical consequences of genetic differences in drug substance exposure (EMEA)
- Treatment recommendations based on genetically determined differences in exposure (EMEA)
- Genetic variability means drug response rates are poor and variable



Source: FDA; Genentech

The challenge... and the pharmacogenetics solution

‘It is an unfortunate fact that medicines are currently not as effective as they could be in an average of around 50% of patients, and in certain indications the success rate is even lower. This is why Roche is systematically pursuing personalised medicine’¹

‘Biotech/pharma and personalized medicine manufacturers who are early adopters of personalized medicine stand to receive significant ROI as highly effective targeted therapies displace traditional therapies’²

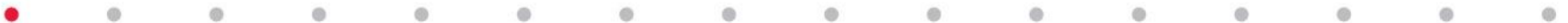
‘To support the patient recruitment and multi-center trial requirements for more targeted study populations, companies may begin to develop research and information collaboratives with affiliates, academic medical centers and research organisations’³

Source¹ Severin Sachwan, CEO, Roche (quoted in Burrill& Co Biotech 2009 – Life Science: navigating the Sea Change)

Source² Deloitte Centr for Health Solutions



**London Genetics provides the
pharmacogenetic solution**

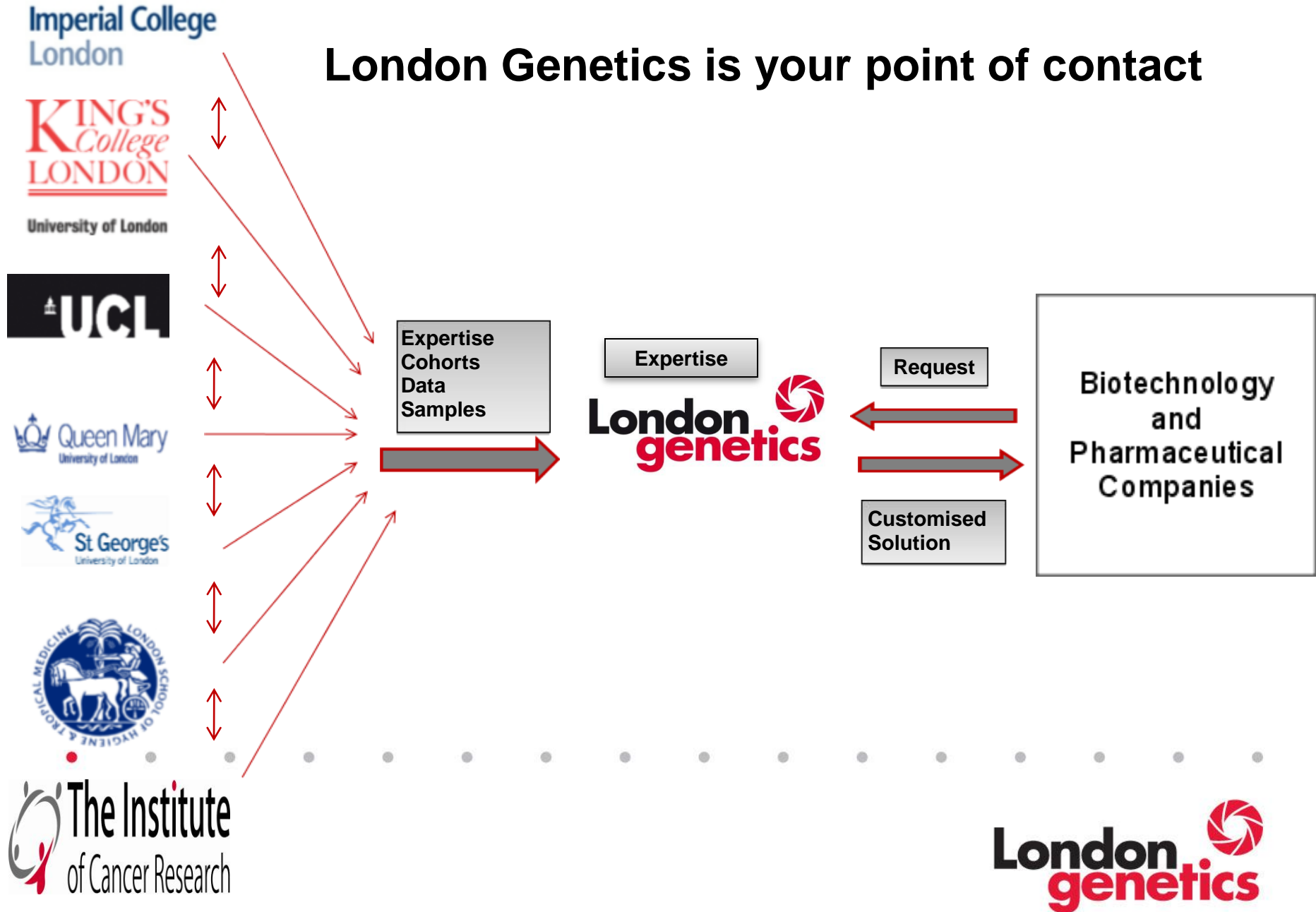


London Genetics provides the pharmacogenetic solution

- London Genetics provides industry with genetic expertise
 - Expedites partnerships with seven London centres of excellence
 - Consortium approach means customised solutions
 - Funded by the London Development Agency
- Broad therapeutic expertise
 - Focus on cardiovascular drugs and cardiovascular safety
- Experienced management team and Board
 - Industry, clinical and academic expertise
 - Pharmacogenetics expertise
- Several recent deals developed by London Genetics
 - Serious Adverse Events Consortium, Genizon Biosciences Inc



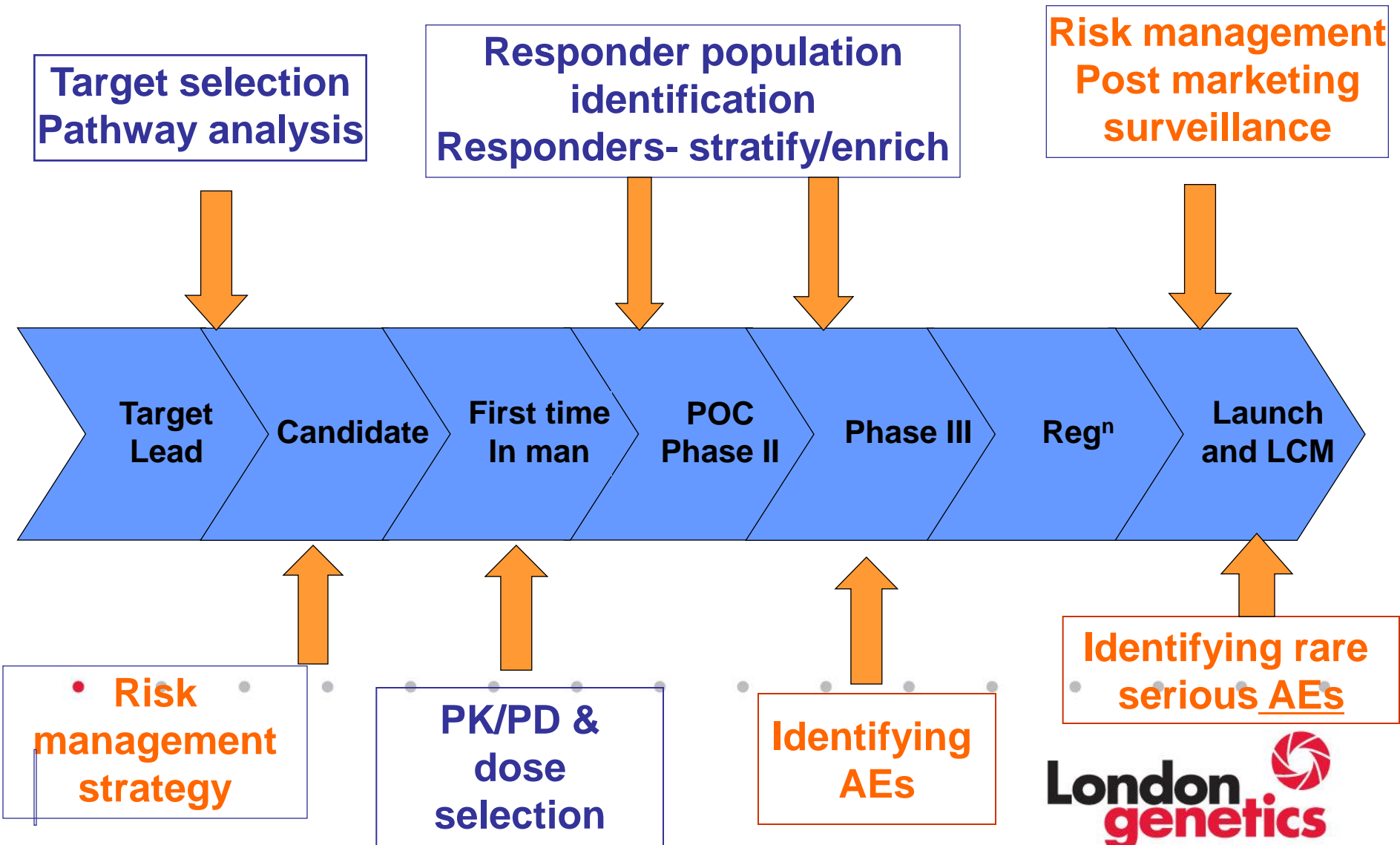
London Genetics is your point of contact



Why is pharmacogenetics of increasing importance?

- Industry is under pressure to produce smarter, safer drugs
 - Drug development costs are rising (>\$1bn) and productivity is falling
 - High-profile side-effect scares (Vioxx, Avandia) mean safety is a priority
 - Increased regulatory focus on pre-and post-marketing safety
- Pharmacogenetics will play key role in increased productivity and safety
 - Increased understanding of factors affecting drug efficacy and safety
 - Assessment of why a trial failed can restart development
 - Drugs-diagnostics combinations can increase sales and reduce risk
 - Drug relabelling can boost turnover
 - FDA Critical Path Initiative, EMEA Road Map
- Success stories in pharmacogenetics
 - Herception and HER-2 testing
 - Warfarin dosing
 - Abacavir in HIV
 - Erbitux and k-ras testing

Genetics across the pharma pipeline



London Genetics provides unique access



London Genetics is your point of access

- SAMPLES for genetic investigation, DATA to interrogate
 - Clinical data, samples, genetic information
- PATIENTS for clinical trials
 - Ethnically diverse populations, patient cohorts
- NETWORKS of clinical experts
 - Key opinion leaders
- EXPERTISE
 - Investigator-led research and development programmes
 - Strategy and risk management planning
- SERVICES
 - DNA/RNA analysis and bioinformatic services



Annual State-of-the Art Conference

London Genetics Cardiovascular Pharmacogenetics Conference

*Harnessing Genetic Knowledge To Improve Clinical Development
and Patient Care*

23–24 September 2009

Tylney Hall, Hampshire, UK

- Forum for discussion of the latest advances in cardiovascular genetics and pharmacogenetics
- Focus on the application and utility of the emerging science to add value, reduce costs and increase success



Recent London Genetics deals

- 2009 - collaboration with International Serious Adverse Events Consortium
 - Partnered with St George's University of London and others
 - Genetic research into drug-induced cardiac arrhythmias
 - London Genetics facilitated the collaboration
- 2008 – collaboration with Genizon Biosciences Inc
 - Partnered with University College London
 - Replication of Genizon's genome-wide schizophrenia study
 - London Genetics facilitated the collaboration



Pharmacogenetic case studies



Warfarin - pharmacogenetics informs cardiovascular therapy

- Warfarin is a widely used anticoagulant
 - Metabolism is affected by genetic variation
 - Getting dosing right is difficult and risks are high
 - Warfarin overdose leading cause of emergency hospital visits, underdose can lead to strokes
 - NIH trial to determine utility of PGx-based warfarin dosing
 - Significant potential cost savings (data from Deloitte)

Estimated treatment cost - severe bleeding event, \$'000 13,500

estimated treatment cost - stroke, \$'000 39,500

Serious bleeding events prevented with warfarin testing, pa 85,000

Strokes prevented with warfarin testing, pa 17,000

Potential cost saving related to severe bleeding events, \$bn pa 1.1

Potential cost saving related to strokes, \$bn pa 0.7

Avandia – pharmacogenetics can inform cardiovascular safety

- May 21 2007 NEJM study raised Avandia cardiovascular safety concerns
- Significant effect on GSK share price and Avandia sales
 - 2007 sales of Avandia product group £1.2bn, down 22%
 - 2008 sales of Avandia product group £0.8bn, down 40%
 - \$17.3bn loss in shareholder value from May 7 to June 5 2007 (Deloitte)
- FDA Guidance for Industry in December 2008
 - Diabetes Mellitus – Evaluating Cardiovascular Risk in New Antidiabetic Therapies to Treat Type 2 Diabetes (Dec 2008)
 - ‘how to demonstrate that a new therapy.....is not associated with unacceptable increase in cardiovascular risk’
- Concerns to be addressed during development
- Pharmacogenetics can address these issues

GSK share price sank on Avandia news

Source: Deloitte

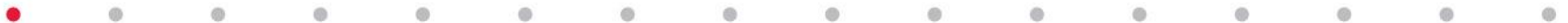


The future



What will the future developments in pharmacogenetics be?

- Market expected to expand with the development of tests for broader use
 - Most PGx tests developed for small defined groups (eg HER-2)
- Roche's AmpliChip CYP450 tests for two variations in CYP2D6
 - CYP2D6 thought to metabolise c25% of commonly used drugs
 - Relevance to areas such as mental illness, heart disease
 - 17% of US people are hypertensive, healthcare cost of \$41bn pa
 - 7% of US people are depressed, healthcare cost of \$12bn pa
- 'Of substantial importance in preventing impairment of human health' - FDA
 - Opportunity to make drug use more cost-effective

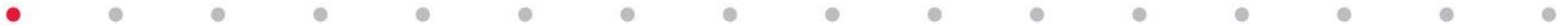


Increasing industry focus on genetic data

- Genzyme sets aside \$600M for personalised medicine
- Novartis launches molecular Dx unit
- Serious Adverse Events Consortium releases first data set on genes linked to Stevens-Johnson syndrome
- Genomas study links genes to increased BMI, oedema in diabetics treated with Avandia, Actos
- Illumina unveils strategy to enter molecular Dx market



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