Working together for better health

Innovation @ Boehringer Ingelheim

Boehringer Ingelheim

Boehringer Ingelheim Launches opnMe.com: The New Open Innovation Portal

opnMe.com provides free and open access to selected molecules for the scientific community

Boehringer Ingelheim has long taken a progressive approach to harnessing scientific and innovation excellence wherever it is found. Our open innovation interests extend across a range of initiatives from traditional partnerships with academia and industry to public-private partnerships and scientific crowdsourcing. Building on this strong foundation, Boehringer Ingelheim is expanding its own innovation ecosystem with **opn**Me – a new Internet portal. This latest initiative is designed to create new channels of discovery by providing free and open access to selected pre-clinical compounds for non-clinical investigation purposes for scientists around the world. In addition, other pre-clinical assets are available for collaboration.

opnMe - designed by us, unlocked by you, developed together

A catalyst for cooperation and collaboration across the scientific community, opnMe.com aims to accelerate research initiatives and enable new disease biology in areas of high unmet medical need by sharing well-characterized, including many best-in-class, pre-clinical tool compounds. These molecules, **designed** by Boehringer Ingelheim scientists, can be **unlocked** by the innovation community and used as tools to validate scientific hypotheses and discover novel biology. The molecules have been designated either as '*Molecules to Order*', which are offered without entering into intellectual property discussions, via a simple shopping cart system. For other selected '*Molecules for Collaboration*' a crowdsourcing option offers the opportunity to initiate joint research projects. Scientists interested in these molecules are invited to submit a research proposal. If the proposal is chosen, the science will be **developed** together with Boehringer Ingelheim scientists.

The compounds available have been developed for some of the most relevant molecular targets in medical research and synthesized according to the highest quality standards. They are provided with a comprehensive data package which will allow the correct interpretation of independent research findings using the tools and which ensures reproducibility of external experiments. The list of compounds offered on opnMe.com will be expanded on a regular basis.

> *"Working together with scientists across the world, we can accelerate research in a wide range of biomedical research areas. This exciting new initiative further expands Boehringer Ingelheim's global external innovation footprint and will help unlock the full potential of some of our most interesting compounds. By sharing these compounds with scientists around the world, we will advance scientific research and expect to spark discoveries that will lead to safe and effective new medicines for patients."*
>
> Dr. Clive R. Wood, Senior Corporate Vice President Discovery Research, Boehringer Ingelheim.

It is estimated that most of the world's molecular diversity is held by commercial organizations and therefore not accessible to the countless scientists in research institutions working to discover new therapies for the many diseases for which there are still no effective treatments.[1] opnMe.com helps to redress this imbalance by providing the tools and scientific exchange of knowledge that the innovation ecosystem needs to realize synergies and maximize the potential for drug discovery.

Reference: 1. Reichman M and Simpson PB. (2016) Open Innovation in early drug discovery: roadmaps and roadblocks. *Drug Discov Today* 21, 779–788.

Leveraging the Permeable Boundaries of Innovation

The cost of early-stage drug screening and medicinal chemistry now approaches 40% of the overall costs for pharmaceutical R&D.[1] So it's not surprising that pharmaceutical companies are cooperating in the early stages of discovery research, in pre-competitive public-private partnerships (PPP), to combine the expertise of the global biomedical community with the capabilities of the pharmaceutical industry. Leveraging the mutually beneficial opportunities of these more 'permeable' boundaries has been at the core of our participation in a range of PPPs - including the Innovative Medicines Initiative (IMI).

Accelerating the development of innovative medicines

Established in 2008, IMI aims to improve health by speeding up the development of innovative medicines, particularly in areas where there is an unmet medical or social need. Now with over 800 participating organizations, IMI membership includes universities, pharmaceutical and other industries, small and medium-sized enterprises, patient organizations, and medicines regulators. Boehringer Ingelheim was involved from the very beginning because we valued the importance and unique opportunity of working together with public and private partners, in an open manner, to address these enormous challenges.

ADAPTSMART PRISM transQST

We were involved in 28 different projects in IMI1, covering a broad range of topics, including discovery of biomarkers, initiatives aimed at improving drug safety, and engagement of patients in the drug discovery process. As one of the top 10 contributors to IMI, our overall committed in-kind and cash contributions in the first phase exceeded 33 million euro.

Now in its second phase – IMI2 – we are excited to be working on a further 12 projects. One of these – PRISM – aims to help accelerate the development of medicines for difficult-to-treat neuropsychiatric disorders through developing a quantitative biological approach to the understanding and classification of neuropsychiatric diseases.

Bernd Sommer, Vice President, Neuroscience Research at Boehringer Ingelheim is a member of the PRISM coordination team. *"Neuroscience is an area where there is still insufficient knowledge about the underlying biological causes of disease. This limited understanding is one of the reasons behind the dramatic slowdown in the development of new drugs. The PRISM project is closely aligned to Boehringer Ingelheim's own approach to Central Nervous System research which focuses on gaining a better understanding of the brain circuitry underlying major untreated neuropsychiatric symptoms. We are optimistic that these biological approaches will lead to the development of effective treatments that patients with these distressing conditions so urgently need."*

For more information on these and other IMI2 projects visit
http://www.imi.europa.eu/projects-results/project-factsheets

Fostering Innovation Excellence with the Next Generation of Leading Scientists

As part of our expanding open innovation strategy, Boehringer Ingelheim's new postdoctoral program provides talented and ambitious scientists with the opportunity to pursue cutting-edge research with industry-leading colleagues. The program aims to attract highly motivated young fellows with a strong scientific background to fill open postdoctoral positions across Boehringer Ingelheim research sites and specialties. Candidates are also invited to proactively submit research proposals aligned with the stated scientific focus of each therapeutic area.

Participants will explore challenging areas of research and create the starting point for many new therapeutic concepts and technologies, paving the way to the discovery and development of breakthrough medicines that will make a difference to patients' lives.

Uniquely, at the end of their tenure, post-doc fellows moving to an academic institution will have the opportunity to apply for a transition grant so they can pursue their research in their own laboratory.

"Post-doc researchers at Boehringer Ingelheim, will have access to excellent resources and deep scientific knowledge to pursue original research and publish articles in prestigious journals. In addition to learning from our drug discovery and development experience, they will also be able to benefit from Boehringer Ingelheim's wide scientific relationships and partnerships, enhancing their research and building networks within and outside Boehringer Ingelheim." Dr. Clive R. Wood, Senior Corporate Vice President, Discovery Research at Boehringer Ingelheim.

For more information please visit
http://post-doc.boehringer-ingelheim.com/.

Reference: 1. Paul SM et al. (2010) How to improve R&D Productivity: the pharmaceutical industry's grand challenge. *Nat. Rev. Drug Discov.* 9, 203–214.

Powering Drug Discovery Through Cooperation and Collaboration

After a lean 2016 when the US Food and Drug Administration approved only 22 novel drugs, 2017 is looking brighter with 38 innovative new medicines approved to date (1st Jan – 8th Nov 2017).[1,2] And with only around one in ten phase I compounds achieving approval,[3] Boehringer Ingelheim believes that taking a diversified approach and building a broad architecture of external innovation is essential for knowledge-sharing and improving the efficiency of drug discovery.

We recognize the advantages of sharing proprietary information in the form of results, chemical tools, or unsolved problems in return for valuable insights and ideas. Dr. Adrian Carter, Corporate Vice President and Global Head Discovery Research Coordination highlights the importance of providing a reliable framework for sharing to learn.[4]

"The Internet and the principles of open innovation have unlocked a plethora of new possibilities for accessing exciting ideas in the broader scientific world. Indeed, open innovation is, in essence, about sharing and learning. And the more you share, the more you learn. You can share a question and ask the scientific crowd to help solve your problem, or you can provide solutions by openly sharing chemical tools to explore new biological mechanisms. We actively support both these approaches through our work with public-private organizations such as the Structural Genomics Consortium and IMI, as well as our crowdsourcing initiatives with organizations such as Innocentive or innovation hubs such as BioMed X. opnMe is a natural extension of our progressive open innovation strategy which we believe will further the development of trust and openness within the drug discovery community. It will help us to identify the "secret ingredients" that could be the catalyst for the next new medicine.

Meet Us at Our Upcoming Events

J.P.Morgan

JP Morgan Annual Healthcare Conference

January 8-11, 2018
San Francisco, CA

AUTM
Association of University Technology Managers®
Advancing Discoveries for a Better World®

AUTM Annual Meeting

February 18-21, 2018
JW Marriott Desert Ridge Resort & Spa
Phoenix, AZ 85054

AACR
American Association for Cancer Research

AACR Annual Meeting

April 14-18, 2018
McCormick Place
2301 S. King Drive,
Chicago, IL 60616

AMERICAN THORACIC SOCIETY 1905 ATS

ATS Annual Meeting

May 18-23, 2018
San Diego Convention Center, 111 Harbor Dr,
San Diego, CA 92101

ASCO

ASCO Annual Meeting

June 1-5, 2018
McCormick Place
2301 S. King Drive,
Chicago, IL 60616

BIO International Convention
The Global Event for Biotechnology

Meet us on stand # 955

BIO International Convention

June 4-7, 2018
Boston Convention & Exhibition Center
415 Summer St,
Boston, MA 02210.

Reference: 1.https://www.fda.gov/Drugs/DevelopmentApprovalProcess/DrugInnovation/ucm537040.htm 2. https://www.fda.gov/downloads/Drugs/DevelopmentApprovalProcess/DrugInnovation/UCM536693.pdf 3. Hay MT, Thomas DW, Craighead JL, Economides C, Rosenthal J. Clinical development success rates for investigational drugs.pdf. *Nature Biotechnology*. 2014; 32:40±51. PubMed Central PMCID: PMC 24406927 doi: 10.1038/nbt.2786 PMID: 24406927 4. Carter AJ, Donner A, Lee WH, Bountra C. (2017) Establishing a reliable framework for harnessing the creative power of the scientific crowd. *PLoS Biol* 15(2): e2001387. doi:10.1371/journal.pbio.2001387

New Partnerships and Key Research Milestones Advance Next Wave of Innovation in CardioMetabolic Disease Portfolio

Boehringer Ingelheim sets the bar high for innovation in cardiometabolic diseases. We have a strong legacy of 'firsts' extending over many decades, which has revolutionized the treatment landscape. But research into cardiometabolic diseases is at a turning point. Advances in treatment and an enhanced emphasis on primary prevention interventions have resulted in significant improvements in life expectancy over the last 30 years. Yet challenges remain. Rising rates of diabetes and obesity are projected to increase with one in ten adults estimated to have diabetes by 2040,[1] and the worldwide prevalence of obesity increasing three-fold between 1975 and 2016.[2] Against this challenging landscape, scientists at Boehringer Ingelheim, together with their academic and industry partners, are examining their research through a new lens. Our distinctive patient-centric approach takes a holistic view of the broader therapeutic needs of patients who often have multiple conditions connected by common underlying pathologies.

Investigational compound progresses to phase IIa development in NASH and diabetic retinopathy

An investigational compound from one partnership has reached a key milestone and demonstrates how a single mechanism has the potential for broad impact. BI 1467355, an oral inhibitor of amine oxidase, copper containing 3, acquired from **Pharmaxis**, has been recognized with the initiation of two phase IIa studies. The 12-week proof of clinical principle study in NASH will investigate suitable dosing and evaluate safety. A second proof of clinical principle study in diabetic retinopathy is also being initiated. Both studies will be followed by a subsequent phase IIb study to confirm the findings.

Working together to tackle the global challenges of obesity and chronic liver diseases

Collaborations with three new partners are applying cutting-edge science to address the significant unmet medical needs in obesity and chronic liver disease.

Our **joint research and development program with Gubra** aims to identify novel peptidic compounds which are able to regulate food intake. The collaboration brings together Gubra's expertise in the design, synthesis, characterization and in vivo testing of therapeutic peptides with Boehringer Ingelheim's expertise in the development of innovative medicines for patients with cardiometabolic disease. This new partnership complements other ongoing collaborations in cardiometabolic diseases, including the dual-acting glucagon/GLP-1 agonist and the long-acting amylin analog development programs, conducted in collaboration with **Zealand Pharma**, which have recently entered phase I trials.[3]

"2017 has been an exciting time for us in the CardioMetabolic Disease Research team. We began the year with the EU approval of empagliflozin as the first oral type 2 diabetes treatment to reduce cardiovascular death, only shortly after the FDA approved the new indication in December 2016. Now we hope to continue our track record of innovation as – among other milestone achievements – we advance one of our investigational compounds into clinical trials in two important areas of unmet need." Dr. Michael Mark, Global Head of CardioMetabolic Diseases Research, Boehringer Ingelheim.

Addressing the need for new therapeutics in chronic liver disease.

The World Gastroenterology Organization estimates that more than 50 million people worldwide are affected by chronic liver diseases.[3] Non-alcoholic steatohepatitis (NASH) is a type of liver disease that is strongly associated with obesity and type 2 diabetes. With no currently approved treatment options, there is an urgent need to accelerate research in this area.

Our recent collaborations with **MiNA Therapeutics and Dicerna Pharmaceuticals** are investigating new therapeutic approaches that address previously inaccessible drug targets to protect and restore liver functionality in NASH and fibrotic liver disease.

Dicerna's GalXC™ technology platform uses RNA interference (RNAi) therapeutics to inhibit the expression of disease-causing genes by silencing the messenger RNAs of those genes.

Our partnership with MiNA Therapeutics leverages MiNA's expertise in small activating RNA (saRNA) therapeutics. saRNAs have been demonstrated to activate transcription of specific genes resulting in upregulation of proteins with therapeutic potential.

Both collaborations will enable Boehringer Ingelheim to rapidly design, profile and develop novel compounds, also creating potential opportunities for combination with our other NASH pipeline assets.

We are excited to expand our comprehensive cardiometabolic research portfolio with these three new partnerships. The novel science demonstrated by these collaborations provides a strong foundation for the next generation of breakthrough medicines for patients in the challenging disease areas of obesity and chronic liver diseases." Dr. Johannes Zanzinger, Global Head of BD&L, Cardiometabolism, Boehringer Ingelheim.

Reference: 1. IDF Diabetes Atlas • Seventh Edition. 2. http://www.who.int/mediacentre/factsheets/fs311/en/ 3. http://www.worldgastroenterology.org/publications/e-wgn/e-wgn-expert-point-of-view-articles-collection/global-burden-of-liver-disease-a-true-burden-on-health-sciences-and-economies