New Partnerships Explore Novel Science to Pursue Healthcare Solutions of the Future

**Partnership with ViraTherapeutics adds to ongoing growth of external innovation portfolio**

Innovation at Boehringer Ingelheim is founded in the Company’s desire to discover and develop new medications of high therapeutic value. Our active investment program in external innovation has resulted in new collaborations which leverage emerging science and technology to accelerate the discovery of next-generation medical breakthroughs.

A new long-term partnership with ViraTherapeutics aims to develop a novel oncolytic virus platform and investigate ViraTherapeutics’ lead candidate Vesicular Stomatitis Virus (VSV) glycoprotein (GP) alone and in combination with other therapies.

Oncolytic virus therapy is a cancer treatment approach that uses a virus that infects and breaks down cancer cells. Tumor antigens that are normally hidden from the immune system inside the cells are released, triggering an immune response to fight the tumor.

“This is an important milestone for ViraTherapeutics. In the collaboration with Boehringer Ingelheim we can now fully explore the platform and therapeutic potential of our VSV-GP oncolytic virus. We will also continue to investigate VSV-GP’s potential to be armed with therapeutic genes as well as antigens for its use as a prophylactic or therapeutic vaccine vector.” Prof. Dr. Dorothee von Laer, Scientific founder and CEO of ViraTherapeutics.

ViraTherapeutics has developed its novel technology with joint support from its lead investors EMBL Ventures and Boehringer Ingelheim Venture Fund (BIVF). Under the terms of the agreement, Boehringer Ingelheim receives the right to acquire ViraTherapeutics after the conclusion of Phase I clinical development.


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**Partnership with Saniona seeks to develop novel treatments for patients with schizophrenia**

There are more than 20 million people worldwide affected by schizophrenia.¹ Our new partnership with Saniona aims to discover and develop new treatment options for these patients. The joint research activities seek to identify compounds that restore normal brain network activity in patients with schizophrenia by reversing the imbalance between excitatory and inhibitory neurotransmission in certain brain regions.

“We are delighted to have Boehringer Ingelheim as a partner for our schizophrenia program. My team and I have worked in a long-lasting partnership with Boehringer Ingelheim before and I can truly say that they are one of our preferred partners. We have a high respect for their diligent and results-oriented R&D operations, their company values and their effective and respectful collaborations with partners.” Dr. Jørgen Drejer, CEO of Saniona.


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With respiratory diseases accounting for three of the top five leading causes of mortality, resulting in the deaths of one in seven people around the world, finding innovative new treatments to fight these life-threatening conditions has never been more important.

At the forefront of research in respiratory medicine for nearly 100 years, Boehringer Ingelheim has a long tradition of scientific excellence in this area. With a portfolio of marketed products that includes the world’s most-prescribed treatment for Chronic Obstructive Pulmonary Disease (COPD) SPIRIVA® (tiotropium bromide), and the Company’s newest addition to its respiratory portfolio: OFEV® (nintedanib), for the treatment of Idiopathic Pulmonary Fibrosis (IPF), Boehringer Ingelheim continues to innovate.

As the Company looks forward to how it can build on its success and continue to deliver novel and life-changing treatments in this area, it is focusing its research lens on areas of significant unmet need. With eight compounds in pre-clinical and Phase I/II development across a variety of areas including interstitial lung disease (ILD), severe asthma, cystic fibrosis and COPD, the research team is also exploring potential new patient populations for its existing treatments, such as nintedanib, for the treatment of systemic sclerosis associated interstitial lung disease (SSc–ILD) and progressive fibrosing interstitial lung disease (PF-ILD).

“The deep scientific expertise and understanding of patients with respiratory disease that we have built over the last century provides a strong foundation for our research of the future. We are pleased that the FDA recognized OFEV® for its innovation with a Breakthrough Therapy designation for the treatment of pulmonary fibrosis. But our vision is to go even further for the many patients with these debilitating and life-limiting conditions. We want to transform these deadly diseases into ones which patients can live with and manage over the long-term.” Dr. William Mezzanotte, Vice President and Head of Respiratory Medicine.

While the Company's own respiratory discovery research team has achieved significant results, Boehringer Ingelheim also recognizes the important role that its collaboration partners play in working to deliver its research goals. Building on its strong cohort of more than 45 existing partnerships, encompassing all regions of the world and projects across the value chain, the Company has recently announced two new collaborations to further advance its research in respiratory diseases:

- Collaborating with Inventiva with the aim of discovering new medicines for the treatment of IPF and other fibrotic diseases
- Establishing a research alliance with Harvard Stem Cell Institute's Harvard Fibrosis Network to find novel treatments for severe fibrotic diseases

“Our central aim is to foster innovation both within our own research organization and our expanding global network of academic and industry partners. Working together, we seek to combine our longstanding knowledge in respiratory disease research and medicine, with the expertise of our partners, to offer patients and doctors breakthrough treatment options with high efficacy, few side effects and convenient dosage forms and regimens. Our patient-centered approach focuses on developing novel treatments that slow the progression of chronic airway diseases, facilitate the repair of, or reverse, airway remodeling, control inflammation or halt accelerated aging of the lung.” Dr. Cara Williams, Vice President, Discovery Research Respiratory Diseases.

While science is the starting point, facilitating success for each project involves a multidisciplinary approach. Transitioning the science from the laboratory to the hands of clinicians involves teams of highly qualified professionals. Boehringer Ingelheim has the experience and willingness to design and implement the trials needed to demonstrate a therapy’s effectiveness combined with industry-leading social media expertise to facilitate patient recruitment. We have teams across a range of capabilities ready to complement our partners’ expertise so together we can deliver better therapies for patients.

If you would like to find out more about partnering with us in Respiratory Diseases, please contact Dr. Silke Hobbie (silke.hobbie@boehringer-ingelheim.com) or Dr. Peter Seither (peter.seither@boehringer-ingelheim.com).


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**Focus on... Respiratory Diseases**

2015, Collaboration to identify key epigenetic regulators of COPD.

2016, Research and drug discovery collaboration and licensing agreement to develop potential new treatments for IPF.

2016, Research collaboration to discover new ways of treating severe fibrotic diseases.
Harnessing Innovation to Address the Challenge of Severe Fibrotic Diseases

Fibrotic diseases including IPF, chronic kidney disease (CKD) and non-alcoholic steatohepatitis (NASH) are a major cause of mortality and morbidity worldwide. The diseases can affect many organs, including the liver, bone marrow, lung, kidney, gastrointestinal tract, skin, eye, and the heart. But the biology and mechanisms of progression of fibrotic diseases are poorly understood. Boehringer Ingelheim’s new partnerships seek to increase knowledge about the underlying causes of this group of serious diseases with the aim of developing potential new treatments.

A research collaboration with the Harvard Stem Cell Institute’s Harvard Fibrosis Network aims to discover new ways of treating fibrotic diseases. The Harvard Fibrosis Network unites Harvard investigators in several of the University’s schools and at Harvard-affiliated Massachusetts General Hospital and Brigham and Women’s Hospital. Boehringer Ingelheim is initially sponsoring three projects to explore novel pathways and molecular targets for the treatment of IPF, Chronic Kidney Disease (CKD) and Non-Alcoholic Steatohepatitis (NASH).

“We are very excited about joining forces with Boehringer Ingelheim to identify new therapeutic concepts for patients with pulmonary fibrosis, including IPF.” Prof. Dr. Andrew Tager, Principal Investigator at the Center for Immunology and Inflammatory Diseases at the Massachusetts General Hospital (MGH) and Associate Professor of Medicine in the MGH Division of Pulmonary and Critical Care Medicine.

Boehringer Ingelheim has itself already established a fibrosis cluster in its Discovery Research organization. This cross-functional model has already enabled the development of nintedanib for the treatment of IPF, which is now also being investigated for its efficacy in SSc-ILD in a Phase III clinical trial.

A drug discovery and licensing collaboration with Inventiva builds on both companies’ experience in the development of innovative therapies for fibrosis, oncology and orphan diseases.

A joint research team will validate a new therapeutic concept with the aim of discovering new medicines for the treatment of IPF and other fibrotic diseases. The partnership combines Inventiva’s deep know-how and proprietary technologies in the field of transcriptional regulation and fibrosis with Boehringer Ingelheim’s capabilities in drug discovery and clinical development of new therapeutic agents.

“We are very proud to enter into this collaboration with Boehringer Ingelheim, a company well-known for its excellent research and development skills in the field of fibrosis, and particularly in the area of Idiopathic Pulmonary Fibrosis. This new partnership further testifies to Inventiva’s expertise and contributes to strengthening our position as a leading and innovative actor in the field of fibrosis.” Dr. Pierre Broqua, CSO and Co-Founder, Inventiva.

Our Partnering Focus: Respiratory Diseases

In-licensing and external collaborations at research, pre-clinical and clinical stages to include:

**COPD:**
- Airway epithelial barrier dysfunction: repair and regeneration
- Small airway disease and remodeling
- Tissue destruction and emphysema development
- 3D translational pharmacology models

**Asthma:**
- Airway epithelial barrier dysfunction: role in allergy development
- Innate immune dysfunction
- Translational human pharmacology models
- Treatment of severe non-Th2 asthma

**IPF:**
- Anti-fibrotic mechanisms beyond OFEV
- Extracellular matrix sensing and stiffness in IPF
- 3D translational human pharmacology models
- New disease-relevant animal models
- Treatment of cough

**Acute Respiratory Distress Syndrome (ARDS):**
- Endothelial and epithelial barrier dysfunction
- Control and resolution of inflammation
- Translational models
Inspiring New Perspectives: The Boehringer Ingelheim Innovation Unit

As a research-driven organization Boehringer Ingelheim sees innovation as both a fundamental need and a driving force. Currently experiencing a period of unprecedented success, culminating in 11 new product launches in the two-and-a-half years to November 30th 2016, the Company also recognizes the need to look to the future to accelerate the next generation of medical breakthroughs.

With more than 50% of its early-mid-stage pipeline anchored in collaborations with external partners, and a pipeline of more than 100 research and development projects, Boehringer Ingelheim knows that to achieve its future goals it must explore the broad horizon of the innovation ecosystem through both an internal and external lens in order to inspire new ideas and new perspectives.

To harness the extensive creative pool of global biomedical research more effectively, and foster a continued culture of collaboration within the organization, Boehringer Ingelheim established its ‘Innovation Unit’ on July 1st. Led by Dr. Michel Pairet, the Unit is responsible for longer-term pipeline development for all stages of the value chain up to clinical proof-of-concept and has a designated investment commitment of 1.5 billion Euros for collaborations with external partners.*

A key structural change associated with the Innovation Unit brings together the Company’s translational and early clinical research teams to work alongside the discovery and pre-clinical groups. The closer contact between functions will be a further mechanism to increase the efficiency of information transfer and drive the acceleration of research and development.

*Investment designated to the end of 2020.

Boehringer Ingelheim to Announce 2nd Innovation Prize Winner on December 12th.

Demonstrating its continued commitment to supporting innovation through championing early-stage entrepreneurs, Boehringer Ingelheim, together with the Boehringer Ingelheim Venture Fund will announce the winner of its 2nd Innovation Prize at an event at LabCentral, Boston on December 12th. The award provides a platform for the next generation of biotech companies and entrepreneurs to showcase their ideas and projects. The winner will receive Boehringer Ingelheim’s ‘Golden Ticket’ – a voucher which represents prepaid rent for one reserved bench in LabCentral’s shared laboratory for one year, including benefit of LabCentral’s shared infrastructure and services. The inaugural Prize, which garnered close to 60 entries, was won by Kleo Pharmaceuticals in October 2015.

Meet Us at our Upcoming Events

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<td>JP Morgan Annual Healthcare Conference</td>
<td>Jan 9-13</td>
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<td>RESI Conference</td>
<td>Jan 10</td>
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<td>ASCO Annual Meeting 2017</td>
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For more information on how you can join us in working together for better health, please visit our website: http://partnering.boehringer-ingelheim.com