

The First 10 Years of WIPO Re:Search

Catalyzing Global Collaboration and
Innovation to Fight Neglected Tropical
Diseases, Malaria, and Tuberculosis



BIO Ventures for Global Health



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

WIPO Re:Search Mission and Vision

Mission

Accelerate the discovery and development of technologies for neglected tropical diseases, malaria, and tuberculosis by sharing intellectual property (IP) with the global health research community, catalyzing and fostering global health collaborations, and contributing to capacity building in developing countries.

Vision

Improved global health through innovation that mobilizes IP and the power of private and public sector collaborations.

WIPO Re:Search Diseases

Parasitic: Chagas disease, Cysticercosis, Dracunculiasis, Echinococcosis, Foodborne trematodiasis*, Human African trypanosomiasis, Leishmaniasis, Lymphatic filariasis, Malaria, Onchocerciasis, Schistosomiasis, Soil-transmitted helminthiasis

Bacterial: Buruli ulcer, Leprosy, Trachoma, Tuberculosis, Yaws

Viral: Dengue, Rabies

Other: Podoconiosis, Snakebite

* Clonorchiasis, fascioliasis, opisthorchiasis, and paragonimiasis

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Letter from WIPO Re:Search leadership

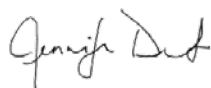
Dear WIPO Re:Search Members and Friends,

We are pleased to share this publication with you to commemorate the 10th anniversary of the WIPO Re:Search Consortium. In 2011, BIO Ventures for Global Health (BVGH), an industry-engaging non-profit organization, and the World Intellectual Property Organization (WIPO), a specialized agency of the United Nations, joined forces with several leading pharmaceutical companies to catalyze innovative early-stage research and development (R&D) for neglected tropical diseases, malaria, and tuberculosis. WIPO Re:Search mobilizes the intellectual property, know-how, creativity, and passion of industry, academic, non-profit, and government researchers worldwide to tackle some of the world's most devastating diseases. Through the Consortium, scientists from low- and middle-income countries (LMICs) are proactively engaged in R&D collaborations and capacity-building initiatives, with a focus on the early stages of the discovery process.

In its first ten years, WIPO Re:Search has grown from a handful of companies and research institutes to a robust international scientific network spanning over 40 countries on six continents. It has executed more than 165 early-stage R&D collaborations, generated millions of dollars in competitive external funding by Consortium researchers, and expanded research capabilities and programs in 11 LMICs. Many WIPO Re:Search collaborations have achieved critical early-stage product development milestones, and we look forward to spurring their continued advancement. The Consortium's collaborations have led to numerous peer-reviewed publications in scientific journals. WIPO Re:Search has produced several technical papers, on topics ranging from antimicrobial and multidrug resistance, to urgent innovation in response to public health crises.

In these pages, you will find the stories of the dedicated researchers around the globe, from both the public and private sectors, who have been instrumental to the success of WIPO Re:Search. We also look ahead to the next 10 years, as we envision how the Consortium will evolve to meet the needs of the ever-changing global health landscape.

As the world currently grapples with the devastating COVID-19 pandemic, we must build on the unprecedented collaboration to maintain and strengthen the fight against neglected tropical diseases, malaria, and tuberculosis. We thank you for your ongoing support of WIPO Re:Search, and we are eager to continue working with you to make this world a healthier place.



Jennifer Dent
President & CEO
BIO Ventures for Global Health



Daren Tang
Director General
World Intellectual Property Organization

Introduction

The WIPO Re:Search Consortium was founded in 2011 by BIO Ventures for Global Health (BVGH) and the World Intellectual Property Organization (WIPO) in partnership with multinational pharmaceutical companies. Today, the following companies constitute the Consortium's industry membership: Eisai Co., Ltd; GlaxoSmithKline (GSK); Johnson & Johnson; Merck; MSD¹; Novartis; Pfizer; and Takeda Pharmaceutical Company Limited.

WIPO and BVGH established WIPO Re:Search with two related goals: 1. demonstrate the importance of intellectual property (IP) in driving global health innovation; and 2. catalyze early-stage research and development (R&D) for neglected tropical diseases (NTDs), malaria, and tuberculosis (TB). The Consortium's founding Members established a governance structure with a specialized agency of the United Nations (UN) – WIPO – acting as the Secretariat, and a proven independent non-profit organization – BVGH – managing the Partnership Hub. As partners and co-leaders of WIPO Re:Search, BVGH and WIPO further defined their roles and responsibilities in alignment with their organizational missions and core competencies:

- **BVGH** (<https://bvgh.org>) has engaged the international pharmaceutical and biotechnology industry in impactful global health initiatives since its establishment by the Biotechnology Innovation Organization (BIO) in 2004. BVGH leverages its expertise in coordinating public-private partnerships to lead WIPO Re:Search Member recruitment, onboarding, partnering, and alliance management.
- **WIPO** (www.wipo.int), as part of the UN family of organizations and the global forum for IP services, policy, information, and cooperation, leads engagement with WIPO Member States (www.wipo.int/members), international organizations, UN agencies, and other entities around the globe. WIPO also manages the WIPO Re:Search Resource Platform, an interactive tool that enables users to visualize and retrieve information about Consortium Members, collaborations, and IP assets.

“WIPO Re:Search validates the essential role that industry intellectual property (IP), including know-how, plays in transforming creative ideas from the academic and non-profit sectors into lifesaving products for the world's neediest populations.”

Roy Waldron
Chief IP Counsel, Pfizer (Retired)

¹ MSD is a trademark of Merck & Co., Inc., Kenilworth, NJ, United States of America.

BVGH and WIPO share responsibility for communicating WIPO Re:Search's successes and impacts to global audiences.

In advance of the Consortium's fifth anniversary in 2016, BVGH and WIPO reviewed and reaffirmed the goals of WIPO Re:Search while also placing increased emphasis on advancement of promising R&D collaborations, capacity building, and communications. The WIPO Re:Search Advisory Committee² endorsed these actions. The expanded focus of WIPO Re:Search is captured in the four Strategic Goals published in 2017 (WIPO, 2017):

- Coordinate R&D collaborations that involve the royalty-free sharing of IP (including compounds, data, clinical samples, technology, and expertise) to address priority medical needs for NTDs, malaria, and TB.
- Accelerate the advancement of promising compounds or leads.
- Enhance global capacity for biomedical R&D and IP management.
- Communicate WIPO Re:Search accomplishments, and the beneficial role of IP in global health innovation, to increase the Consortium's international visibility and cultivate champions across sectors and geographical locations.

To commemorate WIPO Re:Search's 10th anniversary in 2021, this publication describes the Consortium's major achievements, features case studies of successful R&D collaborations and capacity-building fellowships, examines how the global health landscape has changed since the 2011 establishment of WIPO Re:Search, and discusses focus areas for the Consortium in its second decade.

² The WIPO Re:Search Advisory Committee was established in 2016 to provide input and strategic advice regarding Consortium activities and operations. Committee membership represents the geographical and organizational diversity of WIPO Re:Search Members from the private sector, public sector, product development partnerships, and academia.

“As a company that is committed to advancing human progress through science and technology, we have a responsibility to contribute to solving significant public health issues such as neglected infectious diseases. Through the Consortium with WIPO Re:Search, we are collectively accelerating our ability to achieve this goal with open access to our corporate compound library for pharmaceutical research. Only through strong public-private collaboration can we best reach sustainable solutions for malaria and neglected tropical diseases such as schistosomiasis.”

Peter Guenter
CEO Healthcare and Member of the Executive Committee, Merck

Key WIPO Re:Search accomplishments, 2011–2020

In its first 10 years, WIPO Re:Search has developed a robust international R&D network; coordinated impactful R&D collaborations and capacity-building fellowships across sectors, geographical locations, and diseases; and enhanced international awareness and visibility of the Consortium. In achieving its Strategic Goals, WIPO Re:Search has also advanced larger global health priorities – including the UN Sustainable Development Goals (SDGs) – and augmented the important work of other global health stakeholders.

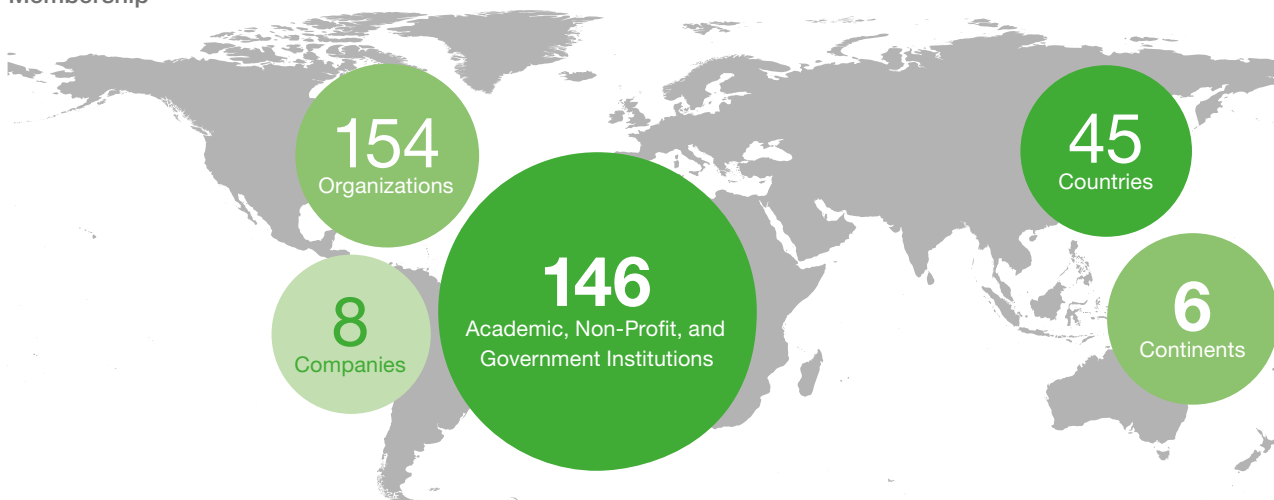
Driving progress toward the UN SDGs

The establishment of WIPO Re:Search in 2011 represented a direct response to the mandate given to WIPO by its Member States in the 2007 WIPO Development Agenda, which called

upon the Organization to contribute to the UN's Millennium Development Goals. Today, as the international community pursues the UN SDGs – 17 interrelated objectives for 2030 that focus on creating a better future for all (<https://sdgs.un.org/goals>) – WIPO Re:Search continues to advance the global development agenda. Major provisions of SDG 17 (partnerships) and SDG 3 (good health and well-being) are built into the WIPO Re:Search framework and underlie all Consortium activities. Additionally, the Consortium has prioritized engagement of scientists and institutions in low- and middle-income countries (LMICs) in WIPO Re:Search collaborations and fellowship programs. By providing LMIC partners with access to R&D resources and know-how not readily available in their countries, WIPO Re:Search enhances their capacity to conduct innovative research, in furtherance of SDG 9 (innovation and infrastructure).

WIPO Re:Search at a glance

Membership

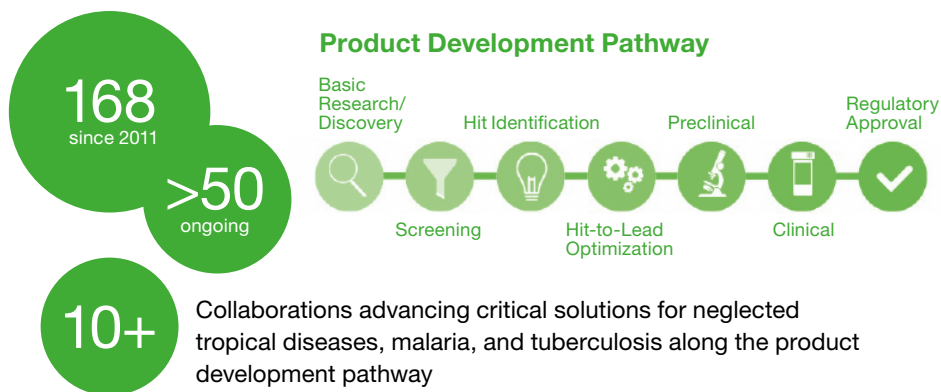


Eisai Co., Ltd. • GlaxoSmithKline (GSK) • Johnson & Johnson • Merck • MSD* • Novartis • Pfizer • Takeda Pharmaceutical Company Limited

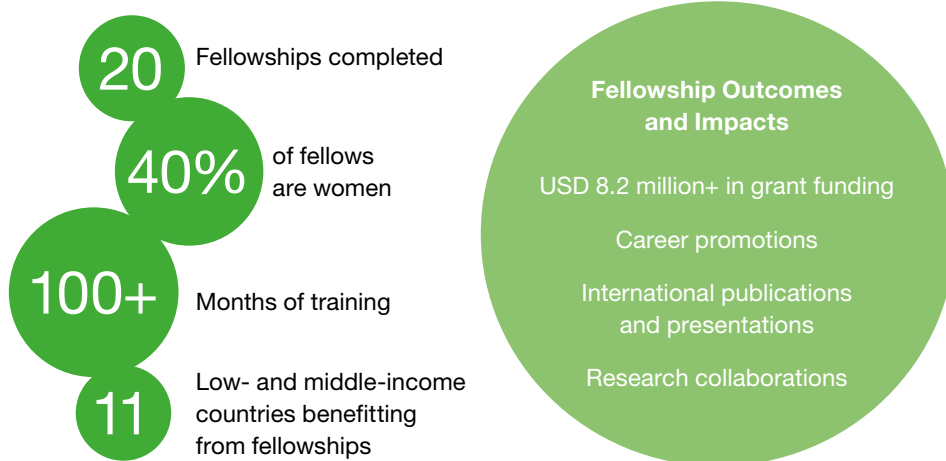
* MSD is a trademark of Merck & Co., Inc., Kenilworth, NJ, United States of America

Source: BIO Ventures for Global Health™

R&D Collaborations



Fellowships



Source: BIO Ventures for Global Health

Expanding Global Visibility of the Role of Intellectual Property in Innovation

A WIPO Re:Search colloquium and panel session at the **1st Malaria World Congress** in Melbourne, Australia were organized to showcase the important role of the Consortium in catalyzing research and development for malaria – which was responsible for over 400,000 deaths in 2019 alone. Both events focused on the WIPO Re:Search Fellowship Program (described on page 11). The program is developing a cadre of talented researchers in low-resource settings who are armed with the skills and international collaborative relationships needed to combat malaria as well as tuberculosis and neglected tropical diseases. Additionally, fellows are leveraging their training to battle COVID-19 and other urgent public health crises in their home countries.

Colloquium speakers and panelists included fellows, hosts, and high-level representatives from the Government of Australia, which supports the WIPO Re:Search Fellowship Program through WIPO Funds-in-Trust.

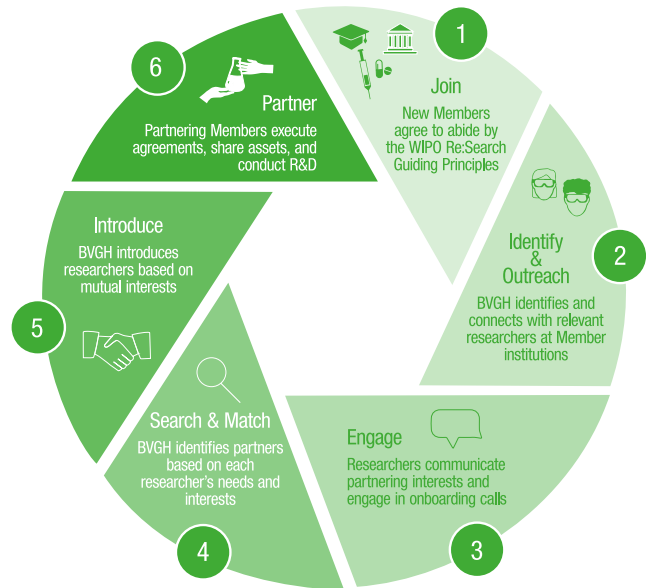
SDG 17: partnerships

The global WIPO Re:Search Member network currently spans over 150 industry, academic, non-profit, and government organizations across more than 40 countries on six continents. The network includes leading product development partnerships (PDPs) and over 60 LMIC-based organizations. In alignment with Target 17.6 (international scientific cooperation, including global North-South collaborations), BVGH has deployed its targeted partnering and alliance management approach to coordinate over 165 WIPO Re:Search R&D collaborations. These multinational global health collaborations not only advance critical early-stage R&D to address unmet needs, they also strengthen international understanding and establish new cross-border partnerships. Over 90 WIPO Re:Search collaborations involve public-private partnerships (Target 17.17), specifically, the sharing of valuable corporate assets for global good. WIPO Re:Search also helps collaborators identify high-value award opportunities to fund continued development of promising product candidates. Examples include Wellcome Trust awards secured for an antimalarial drug R&D partnership between MSD and the Walter and Eliza Hall Institute of Medical Research (see page 7 for more information about this collaboration) and an onchocerciasis drug R&D collaboration between Merck and the University of Buea in Cameroon (read about this collaboration on page 11).

Partnering and Alliance Management

WIPO Re:Search’s targeted partnering strategy focuses on addressing the greatest unmet medical needs for neglected tropical diseases, malaria, and tuberculosis through innovative approaches that maximize the likelihood of product success and uptake.

In its role as Partnership Hub Administrator, BVGH identifies WIPO Re:Search Members with complementary interests, capabilities, and needs; introduces the parties to determine if there is mutual interest in collaborating; coordinates communications between partners to align on collaboration milestones, roles, and responsibilities; and, once legal agreements are in place between the participating entities, provides alliance management support to help ensure successful outcomes.



Source: BIO Ventures for Global Health



SDG 17 Case Study

MSD and WEHI Scientists Discover Novel Malaria Drug Leads with Dual Antiparasitic Activity

Parasite resistance to antimalarial medicines is a significant and growing threat to malaria control. MSD* is partnering with Prof. Alan Cowman, Dr. Brad Sleebs, and Dr. Justin Boddey at the Walter and Eliza Hall Institute of Medical Research (WEHI) through WIPO Re:Search to discover new antimalarial drug candidates with novel mechanisms of action.

The collaborators recently announced the discovery of a novel class of lead antimalarial agents that block multiple stages of the lifecycle of *Plasmodium falciparum*, the parasite responsible for most cases of severe malaria. Using MSD’s aspartyl protease inhibitor libraries – assembled for other biochemical targets and medical indications – as a starting point for their drug discovery program, the researchers identified drug-like dual inhibitors of two essential *P. falciparum* proteases, plasmepsins

“It is an exciting opportunity to combine the incredible subject matter expertise of Alan Cowman and his team with the ‘drug-hunting’ experience of MSD scientists. The team is focused on discovering a novel therapeutic for the patients that need new drugs in the face of increased resistance to standard of care antimalarial drugs.”

Dr. David Olsen

Distinguished Scientist and Neglected Tropical Diseases Discovery Lead, MSD

IX and X (PMIX and PMX). The research was published in the April 8, 2020 issue of the peer-reviewed journal *Cell Host & Microbe* (Favuzza *et al.*, 2020).

One dual inhibitor, WM382, blocked growth of both *P. falciparum* and *P. knowlesi* (which causes malaria in humans and other primates). When administered orally, WM382 cured mice of *P. berghei* (which causes malaria in certain rodents) and prevented parasites in the liver from infecting the blood. WM382 also prevented transmission of *Plasmodium* parasite from infected blood to mosquitoes – which could potentially reduce both the incidence and spread of malaria.

The collaborators will continue to optimize the potency, selectivity and pharmacokinetic properties of their compounds with the aim of advancing lead candidates through preclinical development and into human trials.

This research was funded by Wellcome Trust (United Kingdom), MSD, National Health and Medical Research Council (Australia), and the Victorian Government (Australia).

* MSD is a trademark of Merck & Co., Inc., Kenilworth, NJ, United States of America

SDG 3: good health and well-being

WIPO Re:Search is helping to end the epidemics of NTDs, malaria, and TB (Target 3.3) by driving early-stage drug, diagnostic, and vaccine R&D collaborations. Importantly, the WIPO Re:Search Guiding Principles – to which all Members adhere – underscore the Consortium’s particular focus on the needs of patients in LMICs, thereby promoting solutions especially critical for resource-challenged regions (Target 3.B).



SDG 3 Case Study

Protecting Human Immune Cells from the Ravages of Tuberculosis

Current tuberculosis (TB) treatment regimens are lengthy and complicated, often involving multiple drugs taken on varying schedules for up to two years. Many patients discontinue therapy before being cured, threatening their health and their lives. Patient noncompliance has contributed to the rise of multidrug-resistant and extensively drug-resistant TB. As resistance to current antitubercular drugs grows, there is a critical need for medications with different mechanisms of action and shorter periods of administration.

Mycobacterium tuberculosis can survive and reproduce inside the macrophages of infected individuals, eventually killing the cells and suppressing the body’s immune response to the disease. Dr. Yossef Av-Gay at University of British Columbia (UBC) previously identified a human protein that promotes the survival of *M. tuberculosis* within macrophages. Through a WIPO Re:Search collaboration, Dr. Av-Gay is using compounds from Takeda Pharmaceutical Company Limited to develop inhibitors of the protein to treat TB. Using Takeda’s inhibitors – developed to treat other diseases – as a starting point, Dr. Av-Gay’s laboratory is repurposing these compounds and has identified highly active hits in screening assays that inhibited *M. tuberculosis* growth with relatively low macrophage toxicity. Such low toxicity is critical – a drug must not only be effective against pathogens, but also safe for human use. UBC has filed a provisional patent application covering the use of the compound class as antitubercular drugs, and Dr. Av-Gay will advance several of the hits to animal studies in the near future. BVGH is now looking to connect Dr. Av-Gay with additional partners to continue moving the project toward human impact.



SDG 3 Case Study

Leveraging Nigerian Innovation to Enable Targeted Schistosomiasis Treatment

Several research institutions in Nigeria are active in WIPO Re:Search. Nigerian researchers and institutions have participated in over 15 research and development collaborations, connecting the country’s talented scientists and valuable intellectual property with cutting-edge resources to drive the translation of Nigerian innovation into new medical products for neglected tropical diseases, malaria, and tuberculosis.

Dr. Chiaka Anumudu at University of Ibadan in Nigeria aims to improve the diagnosis of schistosomiasis, which is currently limited to two methods. Microscopy cannot be used in field settings due to the need for electricity, while point-of-care circulating cathodic antigen testing has only 60% sensitivity in detecting one species of the worm that causes schistosomiasis. Due to the shortcomings of current diagnostics, large numbers of people in high-risk areas may be treated with the drug praziquantel for both prevention and treatment of schistosomiasis, without first identifying which individuals are infected. Such mass administration of praziquantel – the only approved treatment for schistosomiasis – significantly increases the risk that resistance to the drug will develop.

Dr. Anumudu has identified 54 human proteins as potential biomarkers of schistosomiasis infection. She is partnering with University of British Columbia’s Dr. Horacio Bach, a proteomics and antibody engineering expert, to validate the biomarkers. Dr. Bach will generate recombinant antibodies for the most promising protein candidates, which Dr. Anumudu will then use to develop a blood test for fast, point-of-care diagnosis of schistosomiasis. Dr. Anumudu recently received an award through the African Researchers’ Small Grants Program to support this work. The development of highly sensitive and affordable diagnostics will enable more targeted use of praziquantel and reduce the risk of drug resistance.

WIPO Re:Search Guiding Principles and Product Access

The Guiding Principles state that for products resulting from WIPO Re:Search intellectual property (IP)-sharing collaborations, the IP owners agree to

- Provide royalty-free licenses for product use and sale in all least-developed countries
 - Consider in good faith the issue of product access for all developing countries
-

“WIPO Re:Search provides valuable opportunities for GlaxoSmithKline (GSK) scientists to connect with talented and innovative scientists across the globe to advance our research and partnership goals as we pursue the most promising leads in global health research.”

Mike Strange
Head, Global Catalyst, GSK

SDG 9: industry, innovation, and infrastructure

WIPO's mission is to lead the development of a balanced and effective global intellectual property ecosystem to promote innovation and creativity for a better and more sustainable future. In alignment with its Development Agenda, WIPO provides IP technical assistance and capacity-building (training) programs for Member States, particularly developing countries, least-developed countries, and countries in transition. Such efforts have contributed to what WIPO's Global Innovation Index 2019 termed the "blossoming" of innovation in both developed and developing economies worldwide. However, a "global innovation divide," in which innovation inputs and outputs are concentrated in very few economies and regions, persists (Cornell University *et al.*, 2019; Cornell University *et al.*, 2020).

WIPO Re:Search is tackling the global innovation divide by proactively engaging LMIC-based researchers and organizations in mutually beneficial R&D collaborations and capacity-building fellowship programs. More than 60 WIPO Re:Search R&D collaborations involve LMIC scientists. Such collaborations have benefitted LMIC researchers and their institutions, while addressing high-priority regional health and development issues.

“My time at Novartis, coordinated through WIPO Re:Search, was an amazing experience and the two most productive weeks of the year. Without BVGH, it would have been very difficult to make this important connection to industry.”

Dr. Artur Cordeiro
LNBio



SDG 9 Case Study (Latin America)

Combatting Chagas Disease

Chagas disease is a life-threatening parasitic disease that affects up to eight million people worldwide – most of whom do not know that they are infected. If untreated, infection can result in lifelong disease and lead to fatal cardiac arrhythmias, heart failure, and severe digestive problems. Once confined to the Americas, in recent years Chagas disease has spread to other continents due to global migration and travel. However, Latin America still has the highest burden of Chagas disease, which is considered one of the biggest public health problems in the region.

Dr. Artur Cordeiro, a drug discovery researcher at Laboratório Nacional de Biociências (LNBio) in Brazil – the country where Chagas disease was discovered and named – is committed to changing the narrative of the disease in Latin America. He has identified hit compounds with excellent activity against the parasite that causes Chagas disease. Through WIPO Re:Search, Dr. Cordeiro is collaborating with Novartis – a company that combines a passion for neglected tropical disease innovation with a dedication to building research capacity in low- and middle-income countries – to identify and advance additional compounds with the potential to revolutionize the treatment of Chagas disease.

After securing a grant from São Paulo Research Foundation (FAPESP) to cover his expenses, Dr. Cordeiro traveled to Cambridge in the United States of America, where he screened thousands of proprietary Novartis compounds through the company's Facilitated Access to Screening Technologies (FAST) Lab program. In addition to having access to Novartis' facilities, he also benefited from technical support and mentorship from scientists at the Novartis Institutes for BioMedical Research. Dr. Cordeiro identified hundreds of hit compounds while in Cambridge. Researchers at Novartis' Emeryville, United States site subsequently conducted additional analyses of the hits to help Dr. Cordeiro select the six most promising compounds for further development. Novartis and Dr. Cordeiro are exploring additional investigations involving those compounds, along with new hits that Dr. Cordeiro identified after returning to LNBio.

WIPO Re:Search Fellowship Program. Thanks to a Funds-in-Trust grant from the Government of Australia, WIPO Re:Search established a fellowship program that to date has coordinated 20 capacity-building sabbaticals in advanced industry and academic laboratories for scientists from 11 LMICs. Fellowships energize and empower LMIC scientists to advance their own R&D programs, while also nurturing research programs at their home institutions through knowledge exchange and collaborations. Beyond the fellowship experiences, WIPO Re:Search assists fellows with propelling their work forward in their home countries by connecting them with promising funding possibilities and facilitating additional partnership opportunities.



SDG 9 and WIPO Re:Search Fellowship Case Study (Africa)

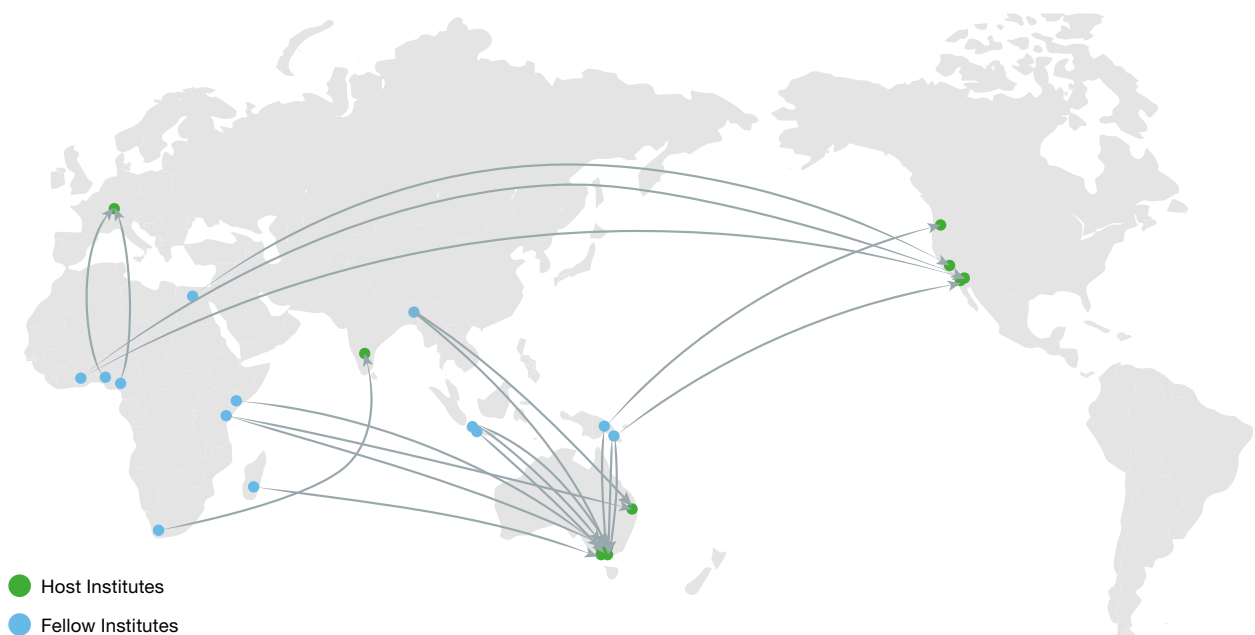
Driving Multinational R&D and Capacity-Building in Cameroon

WIPO Re:Search provides valuable capacity-building and global R&D opportunities for researchers working on neglected tropical diseases (NTDs), malaria, and tuberculosis. Its work with Cameroonian researchers Prof. Fidelis Cho-Ngwa (University of Buea) and Prof. Fabrice Boyom (University of Yaoundé I) illustrates this.

Prof. Cho-Ngwa completed drug discovery training at Novartis headquarters in Switzerland through a WIPO Re:Search fellowship. He is now leveraging that training to advance his NTD R&D programs, including a WIPO Re:Search collaboration with Merck for drug discovery activities. Current treatments for onchocerciasis are ineffective against adult *Onchocerca volvulus* worms and can lead to the death of patients co-infected with *Loa loa*, a parasite commonly found in West and Central Africa. Prof. Cho-Ngwa has been partnering with Merck to discover a molecule with activity against both adult and juvenile *O. volvulus* but not *Loa loa*. With support from WIPO Re:Search, the team received a Wellcome

“My engagement in WIPO Re:Search has led to new scientific publications, additional grant funding to pursue NTD and malaria R&D, and increased visibility of my research.”

Prof. Fabrice Boyom
University of Yaoundé I



Source: BIO Ventures for Global Health

Trust Pathfinder Award for USD 184,000 to enable the initial screening. Prof. Cho-Ngwa identified several promising hits from a 5,500-compound screening activity, with the compounds provided by Merck. The hits are now moving into the hit-to-lead optimization phase of drug discovery. Merck will also contribute medicinal chemistry expertise to support the advancement of this new drug discovery program.

Prof. Boyom aims to develop novel drugs for human African trypanosomiasis, leishmaniasis, and malaria by targeting critical parasite metabolic pathways. WIPO Re:Search has connected him with leading pharmaceutical companies (Eisai Co., Ltd.; Johnson & Johnson; Merck; and Pfizer) to assess the efficacy of their compounds – developed for other diseases – for treating neglected tropical diseases and malaria. Prof. Boyom has identified compounds with outstanding antiparasitic activity and is beginning hit-to-lead optimization. This work is supported by funding from Grand Challenges Africa programme (GCA/DD/rnd3/006). Grand Challenges Africa is a programme of the African Academy of Sciences (AAS) implemented through the Alliance for Accelerating Excellence in Science in Africa platform, an initiative of the AAS and the African Union Development Agency. Grand Challenges Africa is supported by AAS, the Bill & Melinda Gates Foundation, Medicines for Malaria Venture, and Drug Discovery and Development Centre of University of Cape Town.

Additionally, WIPO Re:Search introduced Prof. Boyom to Dr. Bill Baker, a chemist at University of South Florida, who is collaborating with him to develop new antimalarial drugs from Cameroonian medicinal plants. The researchers have published their findings in a peer-reviewed journal – a significant accomplishment which aids the scientific validation needed to attract funders and partners. Importantly, the National Institutes of Health (NIH) recently provided a grant to Prof. Boyom and Dr. Baker to continue their partnership.

WIPO Re:Search engagement is also helping Prof. Cho-Ngwa and Prof. Boyom enhance the international visibility of their work. For example, the International Federation of Pharmaceutical Manufacturers & Associations (IFPMA) invited them to present their work to global health and intellectual property professionals at an IFPMA-hosted seminar in Geneva, Switzerland.

Merck Open Global Health Library

To support researchers worldwide in identifying new approaches to treat life-threatening infectious diseases, Merck has recently launched its Open Global Health Library, a set of interesting compounds free of charge for testing against pathogens. With a capacity-building angle, WIPO Re:Search supports this initiative with its extensive network by connecting with young talents from low- and middle-income countries to enable them to generate future homegrown innovations.

“WIPO Re:Search is a game changer for NTD drug development. Thanks to the Consortium and the partnerships that BVGH has facilitated over the last few years, my team at University of Buea has been able to achieve what some of our predecessors could not accomplish in a decade.”

Prof. Fidelis Cho-Ngwa
University of Buea

SDG 9 and WIPO Re:Search
Fellowship Case Study
(Asia-Pacific)



Molecular Biology to Combat Malaria

Dr. Rintis Noviyanti – Principal Investigator, Senior Research Fellow, and Malaria Pathogenesis Unit Head at the Eijkman Institute for Molecular Biology in Indonesia – studies the molecular interactions between malaria parasites and their human hosts. During Dr. Noviyanti’s WIPO Re:Search fellowship placement in the laboratories of Dr. Diana Hansen, Dr. Wai-Hong Tham, and Prof. Alan Cowman at Walter and Eliza Hall Institute of Medical Research (WEHI) in Australia, she investigated the mechanisms by which individuals living in malaria-endemic areas develop immunity against the disease. Dr. Noviyanti is now leveraging the world-class training she received at WEHI to advance her research programs in Indonesia, with an eye toward applying her findings to the development of novel malaria diagnostics and vaccines.

Augmenting other global health stakeholder activities

PDPs

WIPO Re:Search catalyzes cross-sector R&D across a broad array of products and diseases, including programs outside the current scope of PDPs. WIPO Re:Search also stimulates R&D of compounds and technologies that may fall outside of current PDP portfolios but that, given sufficient validation and interest, could potentially be incorporated into their pipelines.

UN Global Compact

The UN Global Compact (www.unglobalcompact.org) supports companies in taking strategic actions to advance the SDGs and other broader societal goals. Signatories include over 12,000 entities in over 160 countries, including all current WIPO Re:Search company Members. By proactively establishing and managing cross-sector collaborations for WIPO Re:Search Members in support of SDGs 3, 9, and 17, the Consortium complements the UN Global Compact’s own partnering and matchmaking initiatives.

Access to Medicine Foundation

The mission of the Access to Medicine Foundation (<https://accesstomedicinefoundation.org>) is to stimulate and guide pharmaceutical companies to do more for people who live in LMICs. The Foundation’s mission aligns strongly with that of WIPO Re:Search, which catalyzes public-private partnerships to improve the management of diseases that disproportionately affect individuals in LMICs. The Foundation’s Access to Medicine Index analyzes and ranks the efforts of the world’s largest pharmaceutical companies – including all current WIPO Re:Search company Members – to improve access to treatments for multiple diseases and conditions in LMICs. WIPO Re:Search participation is considered in the evaluation of companies’ IP sharing performance. In the 2021 Index, the top four companies were all WIPO Re:Search Members, including one company that rose seven places from the 2018 Index (Access to Medicine Foundation, 2021).

“Research capacity building in low- and middle-income countries (LMICs) is a priority for Eisai. Through WIPO Re:Search, we are able to support LMIC scientists with opportunities – empowering them to drive their research programs forward, improve their visibility and reputation among key global stakeholders.”

Dr. Katsura Hata

Senior Director, Global Health Research Section, hhc Data Creation Center, Eisai Co., Ltd.

The shifting global health landscape

As WIPO Re:Search enters its second decade, it must ensure its continued impact and relevance in an evolving and dynamic global health landscape. Key global health advances and trends that will shape the next 10 years of WIPO Re:Search include:

Increased awareness of, and investments in, NTDs

The 2010s saw the launch of the SDGs and the London Declaration on NTDs (www.who.int/neglected_diseases/London_Declaration_NTDs.pdf), along with the emergence of

many high-profile global health initiatives focused on product R&D or disease control, elimination, and eradication (Table).

Increased investments by the entities listed in the table below and others – particularly multinational pharmaceutical companies (Policy Cures Research, 2020) – in NTD, malaria, and TB initiatives illustrate the widespread recognition of the immense human and economic toll of these diseases. Such expanded investments, if sustained, offer great promise for eliminating and eradicating these diseases globally as well as strengthening LMIC economies.

Table: Selected Global Health Initiatives Launched After WIPO Re:Search

Name	Brief Description
Bill & Melinda Gates Medical Research Institute (www.gatesmri.org)	Non-profit biotech organization that is developing products to fight malaria, tuberculosis (TB), and diarrheal diseases and improve maternal and newborn health outcomes. Focused on translation: advancing novel drug and vaccine candidates from the laboratory to human studies.
END Fund (https://end.org)	Private philanthropic initiative focused on delivering neglected tropical disease (NTD) treatments in collaboration with activist-philanthropist, government, non-governmental organization, pharmaceutical, and academic partners. Between 2012 and 2019, 922 million treatments delivered; 2.7 million health workers trained and over 30,000 surgeries performed.
Global Health Innovative Technology (GHIT) Fund (www.ghitfund.org)	Public-private partnership fund for global health research and development (R&D) that mobilizes Japanese industry, academia, and research institutes to create new drugs, diagnostics, and vaccines for NTDs, malaria, and TB, in collaboration with global partners. Over USD 250 million invested in over 100 partnerships.
Research Investment for Global Health Technology (RIGHT) Fund (http://www.rightfund.org/en)	Funding agency dedicated to supporting discovery and development of new health technologies for low- and middle-income countries through a partnership between the Government of Korea, Korean life science companies, and international funders. Over USD 44 million (more than 50 billion Korean won) in total funding from 2018 through 2022.
Uniting to Combat NTDs (https://unitingtocombatntds.org)	Partnership of global health and development organizations and companies established after the 2012 signing of the London Declaration on NTDs. (Some partners joined after the London Declaration was signed.) Partners work with the World Health Organization, country programs, and other stakeholders to support control, elimination, and eradication by 2030 of the 10 NTDs covered by the London Declaration. ³

³ Chagas disease, dracunculiasis, human African trypanosomiasis, leprosy, lymphatic filariasis, onchocerciasis, schistosomiasis, soil-transmitted helminthiasis, trachoma, and visceral leishmaniasis.

Infectious disease epidemics and pandemics

Devastating worldwide outbreaks of Ebola virus disease, Zika, and Coronavirus Disease (COVID-19) have increased awareness of the importance of robust investments in epidemic and pandemic preparedness and response. The outbreaks have also required international stakeholders to make difficult choices regarding allocation of finite resources among pandemic diseases, NTDs, malaria, and TB. The response to COVID-19 in particular has raised concerns that global progress against other infectious diseases such as malaria and TB could be reversed (The Global Fund to Fight AIDS, Tuberculosis and Malaria, 2020). In such contexts, WIPO Re:Search – being both cost-effective and highly productive – is more important than ever.

Additionally, concerns about access to COVID-19 therapies, vaccines, and diagnostics for the world's poorest populations have revived longstanding debates around topics such as patent pools (Worley, 2020) and compulsory licensing (Green, 2020) for global health products. The success of the WIPO Re:Search model – in which the voluntary sharing of IP rights drives innovation and promotes access to lifesaving healthcare products in LMICs – offers important perspectives in such debates.

Climate change, urbanization, and forced migration

Climate change is expected to affect geographic patterns of NTD exposure and transmission in the short, medium, and long terms in ways that are not yet fully understood (Booth, 2018). Similarly, more research is needed to elucidate the impacts of increasing urbanization on NTD transmission (Hotez, 2017). Additionally, as climate change and environmental degradation continue, millions of people in NTD-endemic countries will have no other choice but to migrate (Rigaud et al., 2018; Podesta, 2019), requiring health systems in countries unfamiliar with NTDs to cope with those diseases. Diagnosis and treatment of NTDs in migratory populations may present unique challenges that augment the importance of innovations in rapid diagnostics and single-dose drug regimens.



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Shaping tomorrow's WIPO Re:Search



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The next 10 years of WIPO Re:Search will be shaped by the changing global health landscape and R&D needs for NTDs, malaria, and TB. Some of the most significant R&D gaps are discussed below.

R&D needs

NTDs

In contrast to malaria and TB, R&D funding for NTDs has been essentially flat for the past decade (Policy Cures Research, 2020).

Drugs. NTD drug needs include but are not limited to more effective and safer treatments for Chagas disease (Villalta and Rachakonda, 2019); leishmaniasis therapies that are active against resistant strains (Altamura *et al.*, 2020); and specific antiviral drugs to treat dengue (Wilder-Smith *et al.*, 2019). Schistosomiasis medicines with mechanisms of action distinct from that of praziquantel, and activity against both adult and immature schistosomes, are also needed (Weber *et al.*, 2019).

Diagnostics. The World Health Organization (WHO) Road Map for NTDs 2021-2030 (World Health Organization, 2020a) establishes ambitious targets for NTD control, elimination, and eradication. Effective, affordable diagnostics are critical for achieving the targets. Current diagnostics gaps include but are not limited to detection tools for leprosy; rapid diagnostic tests (RDTs) to detect early Chagas disease infection in infants and assess schistosomiasis drug efficacy; less invasive tests of cure for visceral leishmaniasis; highly sensitive serological tests to inform mass drug administration for lymphatic filariasis and onchocerciasis; and assays to improve mapping, surveillance, and program monitoring and evaluation for multiple NTDs. The WHO Diagnostic Technical Advisory Group for NTDs is developing target product profiles (TPPs) to guide R&D efforts (World Health Organization, 2020b).

Vaccines. Human vaccines to prevent NTD infection or morbidity are currently available only for dengue and rabies. Additionally, the bacille Calmette-Guérin (BCG) vaccine for TB offers some protection against leprosy (Merle *et al.*, 2010).

Malaria

While funding for malaria R&D has increased in recent years (Policy Cures Research, 2020), significant unmet needs remain. The COVID-19 pandemic threatens to divert critical resources from malaria control efforts (The Global Fund to Fight AIDS, Tuberculosis and Malaria, 2020).

Drugs. The World Malaria Report 2020 identified *Plasmodium* resistance to antimalarial medicines as a key challenge in the fight against malaria (World Health Organization, 2020c). New drugs are needed that attack malaria parasites in different ways than existing therapies, in order to bypass resistance mechanisms. Target candidate profiles (TCPs) published by Medicines for Malaria Venture (MMV) focus on molecules that clear asexual blood-stage parasitemia, have activity against hypnozoites (mainly *P. vivax*) and hepatic schizonts, and block transmission by targeting parasite gametocytes or the insect vector (Burrows *et al.*, 2017). Additionally, as children under five years of age accounted for 67% of all malaria deaths worldwide in 2019 (World Health Organization, 2020c), child-friendly antimalarials are needed (Access to Medicine Foundation, 2020).

Diagnostics. Rapid, accurate diagnosis of malaria is critical for ensuring prompt care of infected individuals and avoiding inappropriate treatment of uninfected individuals. In 2019, national malaria programs distributed over 260 million RDTs (World Health Organization, 2020c). More sensitive diagnostics are needed to identify infections with *Plasmodium* species other than *falciparum*, as well as detect asymptomatic cases. Additionally, as malaria signs and symptoms are similar to those of many other febrile illnesses, tests to differentiate among multiple febrile infections are crucial (Policy Cures Research, 2020).

Vaccines. The world's first approved malaria vaccine, RTS,S – targeting *P. falciparum* – was introduced in Africa in 2019. More efficacious vaccines that can protect against *P. falciparum* and *P. vivax* and block transmission are needed (Policy Cures Research, 2020).

TB

As with malaria, significant unmet needs remain for TB despite increased R&D investments (Policy Cures Research, 2020), and the COVID-19 outbreak could threaten future progress against the disease (The Global Fund to Fight AIDS, Tuberculosis and Malaria, 2020).

Drugs. TB is the world's deadliest infectious disease. Although lifesaving, the complex drug regimens currently in use have contributed to patient noncompliance, treatment failure, and increases in multidrug-resistant and extensively drug-resistant TB. Affordable new medicines with novel modes of action and shorter treatment periods are needed (Policy Cures Research, 2020), as are pediatric drug formulations (Access to Medicine Foundation, 2020).

Diagnostics. TB diagnosis is especially difficult in children, who often cannot spontaneously produce sputum for gold-standard bacteriological tests. Existing pediatric diagnostic tests have limitations and are often not available in high-burden regions. Affordable, reliable point-of-care diagnostic tests for children in LMICs are crucial (Access to Medicine Foundation, 2020). Other TB diagnostic needs include easy-to-use, non-sputum-based rapid tests, as well as tests to identify drug resistance (Policy Cures Research, 2020).

Vaccines. The BCG vaccine, widely used outside of the United States of America, protects against meningitis and disseminated TB in children. However, it does not prevent primary infection or reactivation of latent pulmonary infection (the primary means of community transmission). Vaccines that protect against all forms of TB in individuals of all ages are needed (Policy Cures Research, 2020).

WIPO Re:Search will continue to define and clearly articulate its unique value proposition in the complex and rapidly evolving global health landscape. A major advantage and differentiator of WIPO Re:Search is that its collaborations leverage a wide array of IP assets and engage investigators across six continents to drive early-stage R&D for drugs, diagnostics, and vaccines.

As the global health landscape evolves, and new research (e.g., specific impacts of climate change, urbanization, and migration on NTDs) emerges, the Consortium will regularly assess whether modifications to WIPO Re:Search's strategy and operations are warranted.

Imagining the next 10 years

During the first half of 2021, WIPO Re:Search underwent an independent, strategic review of the Consortium's work since 2017. This exercise will inform the development of WIPO Re:Search's next five-year strategy. Just as the global health landscape has changed since 2011, WIPO Re:Search must also evolve to ensure that it continues to meet the most urgent needs of the NTD, malaria, and TB communities.

While the Strategic Review and stakeholder input will inform WIPO Re:Search's specific path in the new decade, the Consortium will continue to add value in the following areas:

Faster movement of lifesaving products through the development pathway

WIPO Re:Search maintains intensive and customized support for its most promising collaborations in its portfolio – those that offer the highest potential to lead to drugs, diagnostics, and vaccines that address critical gaps in the current arsenal. Such support can include assistance in identifying external funding to generate data needed to attract additional financing and high-powered development partners. WIPO Re:Search will continue leveraging its global networks to connect collaborators to companies and PDPs with the resources and firepower to take product development programs through clinical validation and regulatory approval. The Consortium leadership will keep potential development partners apprised of progress on relevant programs, and – in line with its current mandate – when appropriate, facilitate their evaluation by companies or PDPs for inclusion in late-stage development pipelines.

To augment the number of promising programs in its portfolio, WIPO Re:Search prioritizes the establishment of product R&D collaborations for which robust preliminary data or prototypes have already been generated. Such collaborations, in comparison to earlier-stage projects, have a greater likelihood of completing the necessary validation studies and assembling the data package required for uptake into company or PDP pipelines.

Equitable distribution of innovations

WIPO's mission is to lead the development of a balanced and effective global intellectual property ecosystem to promote innovation and creativity for a better and more sustainable future. Consequently, WIPO Re:Search strives to make new NTD, malaria, and TB products accessible to those who need them the most. The Consortium assists collaborators in establishing and managing partnerships with PDPs and other organizations with expertise in equitable distribution of products at affordable prices.

Expanded health R&D capacity in LMICs to enhance pandemic preparedness and response

The WIPO Re:Search Fellowship Program equips NTD, malaria, and TB researchers from LMICs to battle significant health threats in their home countries. A 2020 publication from WHO's Special Programme for Research and Training in Tropical Diseases (TDR) underscores the broader impacts of such research capacity-building programs beyond the specific diseases that are the focus of the training. Substantial numbers of participants in TDR's infectious disease training programs have been able to apply directly the skills learned to fight the COVID-19 pandemic (Zachariah, 2020).

Strategic growth of international network

WIPO Re:Search continues to nurture its current industry, government, academic, and non-profit alliances, while also creating new strategic partnerships that support the Consortium's efforts to channel resources and establish connections to address the needs of the NTD, malaria, and TB communities.



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Conclusion

As the second decade of WIPO Re:Search commences, the Consortium is ideally positioned to replicate, and expand upon, its accomplishments of the first 10 years. In response to the dynamic global health landscape, BVGH and WIPO will review and refresh the WIPO Re:Search strategy and approach. Where there are opportunities to strengthen and expand the Consortium's work and impact, we will make adjustments, and yet the core objective of WIPO Re:Search will remain unchanged – building a healthier future for the world's poorest populations.



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“Partnerships are critical in advancing and impacting research and development for neglected tropical diseases, malaria, and tuberculosis. One researcher or one organization cannot take on malaria or any other infectious disease alone. Effective research requires deep engagement of scientists in endemic regions, the private sector’s century of expertise in drug and product development and commercialization, and the unending curiosity and depth of research capacity of academic researchers around the globe. WIPO Re:Search brings these critical groups together in a manner I have not seen before. The connections and facilitation of meaningful partnerships is second to none.”

Prof. Alan Cowman

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