



WIPO | Re:Search

Sharing Innovation
in the Fight Against
Neglected Tropical Diseases

BVGH Partnership Hub

Annual Report 2020

WIPO Re:Search Is:

- A global public-private consortium
- An R&D network spanning six continents
- Early-stage innovation for neglected tropical diseases (NTDs), malaria, and tuberculosis
- Sharing intellectual property (IP)
- Advancing UN Sustainable Development Goals
- Building R&D capacity in low- and middle-income countries (LMICs)

165

Collaborations established through 2020

- 50+ Ongoing
- 11 Advanced through key R&D milestones

151

Members

45

Countries

WIPO Re:Search Achieves:

- Key early-stage **product development milestones**
 - Antimalarial, antischistosomal, and antitubercular drugs with novel modes of action
 - Safer NTD treatments
- Millions of US dollars in **competitive external funding received** by collaborators
- **Patent filings** to protect inventions arising from collaborations
- Increased **international visibility of WIPO Re:Search Members** through publications and presentations

The Voices of our Members

“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 KGaA, Darmstadt, Germany

“WIPO Re:Search validates the essential role that 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)

“WIPO Re:Search provides valuable opportunities for 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

“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 and 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.

Dear WIPO Re:Search Members and Friends,

I am pleased to share the 2020 BVGH Partnership Hub Annual Report. In these pages we celebrate the accomplishments of the WIPO Re:Search Consortium during a year unlike any other—from new international collaborations (including the Consortium’s first leprosy and snakebite partnerships) and significant advances in ongoing collaborations (such as identification of novel antimalarial drug leads), to expansion of our global Member network and high-profile awards for our Fellowship Program alumni.

We were honored to be included in United Nations General Assembly (UNGA) Resolution 74/305, which recognizes the role of WIPO Re:Search, and innovation more broadly, in the continuing fight against malaria. UN Sustainable Development Goal 3 aims to end the epidemics of malaria, tuberculosis, and neglected tropical diseases by 2030. As COVID-19 threatens to derail hard-won progress against those diseases, the UNGA resolution is important validation of the work of the Consortium and our Members to make the world a healthier place.

Looking ahead, we are excited to be continuing our partnership with WIPO; our pharmaceutical company Members (Eisai Co., Ltd; GSK; Johnson & Johnson; Merck KGaA, Darmstadt, Germany*; MSD**; Novartis; Pfizer; and Takeda); and our outstanding academic, government, and non-profit partners worldwide. As WIPO’s new Director General Daren Tang advances WIPO’s development agenda, WIPO Re:Search will continue to play a key role in furthering the Sustainable Development Goals and the broader global health agenda.

WIPO Re:Search celebrates its 10th anniversary in 2021. Be sure to check BVGH’s monthly Snapshot newsletter and Twitter and LinkedIn channels for updates on our plans to commemorate this important milestone.



A handwritten signature in black ink that reads "Jennifer Dent".

Jennifer Dent
President & CEO
BIO Ventures for Global Health

* The business sectors of Merck KGaA, Darmstadt, Germany operate as EMD Serono in healthcare, MilliporeSigma in life science, and EMD Electronics in the US and Canada

** MSD is a trademark of Merck & Co., Inc., Kenilworth, NJ, USA

2020 Collaborations

Partners	Disease(s)	Asset(s) Shared	Phase	Product
Fiocruz, GIBH	Leprosy	Samples, Technology/Assay	Preclinical	Drug
IP Korea, U Zambia	Tuberculosis	Technology/Assay	Screening	Drug
J&J, LSTM	Snakebite	Compounds	Screening	Drug
J&J, SCRI, UW	Leishmaniasis	Compounds	Screening	Drug
UC San Diego, KNUST	HAT, Schistosomiasis	Technology/Assay	Screening	Drug
Merck KGaA, Darmstadt, Germany, UY1	HAT, Leishmaniasis	Compounds	Screening	Drug
SCRI, Fiocruz	Chagas Disease	Technology/Assay	Hit Identification	Drug
UBC, U Ibadan	Schistosomiasis	Technology/Assay	Discovery	Diagnostic

Fiocruz: Oswaldo Cruz Foundation
 GIBH: Guangzhou Institutes of Biomedicine and Health
 HAT: Human African trypanosomiasis
 IP Korea: Institut Pasteur Korea
 J&J: Johnson & Johnson
 KNUST: Kwame Nkrumah University of Science and Technology

LSTM: Liverpool School of Tropical Medicine
 SCRI: Seattle Children's Research Institute
 UBC: University of British Columbia
 UC: University of California
 UW: University of Washington
 UY1: University of Yaoundé I

These promising new WIPO Re:Search collaborations—including the Consortium's first leprosy and snake-bite partnerships—align with BVGH's targeted partnership development strategy. This targeted approach ensures BVGH focuses on catalyzing innovative partnerships that will address the greatest unmet medical needs through projects that maximize the likelihood of product success, impact, and uptake.

Collaboration Highlights

Changing the Snakebite Paradigm

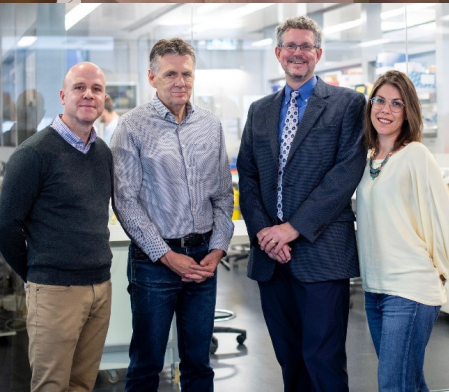
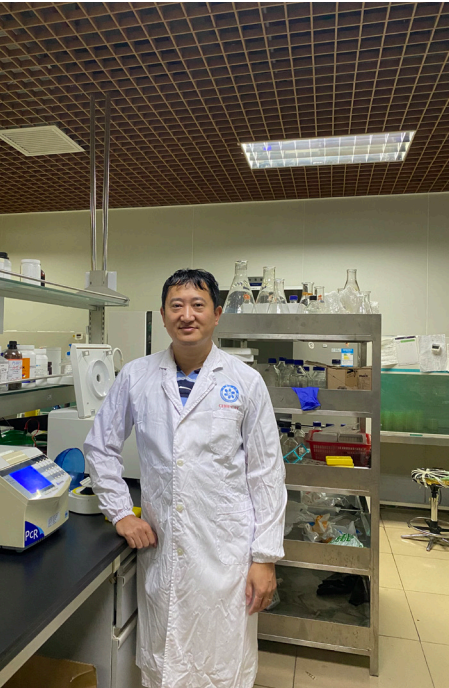
The only effective treatments for snakebite envenoming are antivenoms, medications made from antibodies against the components of venom. However, antivenoms are expensive to manufacture, and different antivenoms are required to treat the bites of different snake species. Prof. Nicholas Casewell at **Liverpool School of Tropical Medicine** seeks to revolutionize snakebite envenoming treatment by developing less costly, small-molecule therapies that inhibit toxins in venom. He identified toxic enzymes in snake venom from multiple species and needed access to a large, high-quality, diverse compound library in order to identify promising molecules that block the activity of the toxic enzymes. BVGH connected Prof. Casewell with scientists at **Johnson & Johnson** to discuss the project and a potential collaboration. With mutual interest in collaborating confirmed, an agreement was quickly executed, which led to the first WIPO Re:Search snakebite project. Johnson & Johnson shared its phenotypic compound library, along with compounds that inhibit human enzymes that are similar to the toxic enzymes in snake venom. The sharing of these proprietary assets enabled Prof. Casewell to search for compounds that would inhibit the snake's venomous toxins. Through this academic-industry collaboration, Prof. Casewell identified multiple compounds with highly promising inhibitory activity in his initial screens. Confirmatory studies are underway, and all parties are anxiously awaiting the next research results, which have the potential to change the snakebite paradigm.



Prof. Nicholas Casewell. Photo courtesy of Ben Gilbert.

Targeting Schistosomiasis Treatment and Tackling Praziquantel Resistance with Novel Diagnostics

Due to the lack of highly sensitive, point-of-care (POC) diagnostics for schistosomiasis, large numbers of people in endemic regions may be treated with praziquantel (PZQ) for both prevention and treatment of the disease, without first identifying infected individuals. Such mass administration of PZQ significantly increases the risk that resistance to the drug—the only approved treatment for schistosomiasis—will develop. Dr. Chiaka Anumudu at the **University of Ibadan** in Nigeria identified 54 human proteins as potential biomarkers of schistosomiasis infection. BVGH connected Dr. Anumudu to Dr. Horacio Bach at the **University of British Columbia**, to tap into his expertise validating and optimizing proteins for use in diagnostic tests. A WIPO Re:Search collaboration was quickly forged between the researchers. Dr. Bach will generate recombinant antibodies for the most promising candidate biomarkers, which Dr. Anumudu will then use to develop a POC diagnostic test. Dr. Anumudu recently received an award through the African Researchers' Small Grants Program (SGP IV) to support this critically important work. The development of an innovative new schistosomiasis diagnostic has the potential to be a game-changer in the field of NTDs.



Above: Dr. Tianyu Zhang
Middle: Dr. Flavio Lara
Below: From left: Dr. Manuel de Lera Ruiz (MSD), Prof. Alan Cowman (WEHI), Dr. David Olsen (MSD), and Dr. Paola Favuzza (WEHI). Photo taken prior to the COVID-19 pandemic.

China and Brazil Take on an Ancient Disease

Leprosy, or Hansen’s disease, is a chronic infectious disease—known to humans since ancient times—that is curable if treated early with a three-drug regimen known as multidrug therapy (MDT). However, shorter treatment regimens, particularly for a form of the disease known as multibacillary leprosy, are needed, and patients who cannot tolerate MDT require safe and effective alternatives. Dr. Tianyu Zhang at **Guangzhou Institutes of Biomedicine and Health** in China developed a new antibiotic (TB47) to treat leprosy. A WIPO Re:Search partnership was catalyzed by BVGH with Dr. Flavio Lara at **Oswaldo Cruz Foundation (Fiocruz)** in Brazil to generate the needed preclinical data to advance TB47 into clinical trials. Next steps involve Dr. Lara assessing the efficacy of TB47 against bacterial strains from leprosy patients in Brazil, using in vitro and in vivo models. Promising data from this collaboration may someday benefit leprosy patients worldwide. Brazil has one of the highest rates of leprosy in the world, and, in contrast to global trends, the number of cases continues to rise.

Delivering a One-Two Punch to Malaria Parasites: Novel Drug Leads with Dual 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)** to discover new antimalarial drug candidates with novel mechanisms of action to bypass resistance mechanisms.

The MSD and WEHI researchers recently published a peer-reviewed paper announcing a novel class of lead antimalarial agents that block multiple stages of the lifecycle of *Plasmodium falciparum* parasites. In line with the vision of WIPO Re:Search, MSD shared its aspartyl protease inhibitor libraries—assembled for other biochemical targets and medical indications—as a starting point for this drug discovery program. Through this WIPO Re:Search partnership, the researchers identified drug-like dual inhibitors of two essential *P. falciparum* proteases, plasmepsins IX and X (PMIX and PMX).

This collaboration has advanced through key R&D milestones. One compound, WM382, blocked growth of *P. falciparum* and *P. knowlesi* (which causes malaria in humans and other primates). WM382 also apparently cured mice of *P. berghei* (which causes malaria in certain rodents) and prevented parasites in the liver from infecting the blood. Additionally, WM382 prevented parasite transmission from the blood to mosquitoes—which could potentially reduce both the incidence and spread of malaria.

BVGH is proud of this collaboration and the critical accomplishments achieved, including securing millions of US dollars in grant funding from Wellcome Trust to support the program. Next steps involve further optimization of the potency, selectivity, and pharmacokinetic properties of this promising lead compound.

*MSD is a trademark of Merck & Co., Inc., Kenilworth, NJ, USA

Collaboration Highlights

Taking on Onchocerciasis and Building R&D Capacity

Current onchocerciasis treatments are not only ineffective against adult *Onchocerca volvulus* worms (macrofilariae), they can lead to the death of patients co-infected with *Loa loa*. Prof. Fidelis Cho-Ngwa at the **University of Buea** in Cameroon aims to develop a new medication with activity against both adult and juvenile *O. volvulus* but not *Loa loa*. **Eisai Co., Ltd.**—a company committed to sharing its IP to both combat neglected diseases and improve the capacity of LMIC researchers to contribute to the fight—is collaborating with Prof. Cho-Ngwa to advance his onchocerciasis drug discovery program.

With compounds shared by Eisai, Prof. Cho-Ngwa and his team were able to identify protease-activated receptor (PAR)-1 inhibitors with significant activity against adult worms. These promising results led to Eisai agreeing to share additional IP assets, including the structures of the hit compounds and synthesis protocols developed and optimized by company chemists. These assets will position Prof. Cho-Ngwa to rapidly and efficiently produce additional quantities of hit compounds for confirmatory and in vivo testing.

Access to Eisai's compounds and related assets have allowed Prof. Cho-Ngwa to bypass some of the most time consuming, expensive, and risky stages of early drug discovery. The collaboration has also helped Prof. Cho-Ngwa draw new attention to his important research. For example, he was invited to speak to international health and IP professionals in Geneva at "Public-Private Partnerships: How to Unleash Africa's Innovation Potential," a seminar hosted by the International Federation of Pharmaceutical Manufacturers & Associations (IFPMA).

Prof. Fidelis Cho-Ngwa

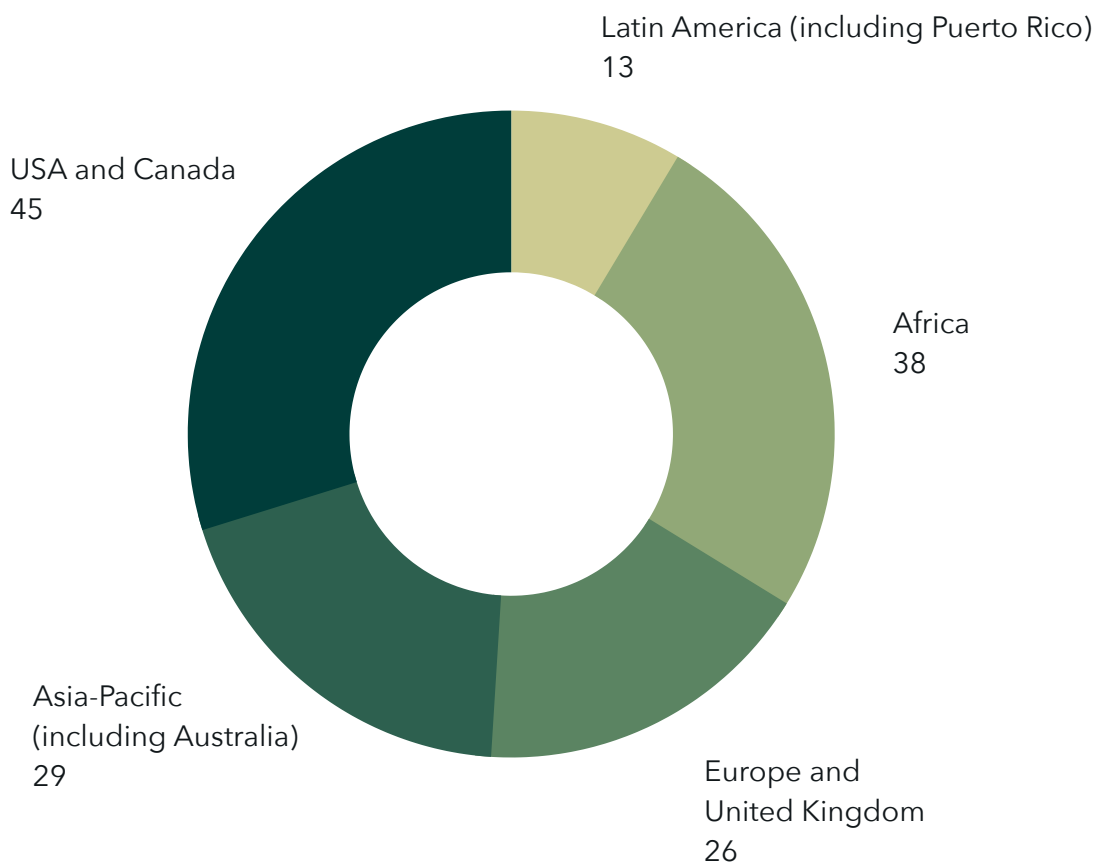


Welcome, New Members!

We grew our membership to 151 organizations across 45 countries, with targeted recruitment in Latin America and Africa.

- Federal University of Health Sciences of Porto Alegre (UFCSPA), Brazil
- Foundation for Neglected Disease Research (FNDR), India
- Jomo Kenyatta University of Agriculture and Technology (JKUAT), Kenya
- Public Health Institute, Sudan
- University of Antioquia, Colombia
- University of Tokyo, Japan

WIPO Re:Search Membership Spans the Globe



WIPO Re:Search Fellowship Program

Supported by the Government of Australia through WIPO Funds-in-Trust (FIT), BVGH and WIPO coordinate and manage WIPO Re:Search capacity building fellowships with a focus on our LMIC Members. These sabbaticals place LMIC scientists in advanced laboratories to hone their NTD, malaria, and tuberculosis research skillsets and spur new WIPO Re:Search collaborations. In addition to energizing and empowering LMIC scientists to advance their own R&D programs, WIPO Re:Search fellowships also nurture the research enterprises at the scientists' home institutions through knowledge exchange and collaborations.

Despite the COVID-19 pandemic, BVGH identified fellows and hosts for a third round of the fellowship program, confirmed matches, and adapted plans accordingly.

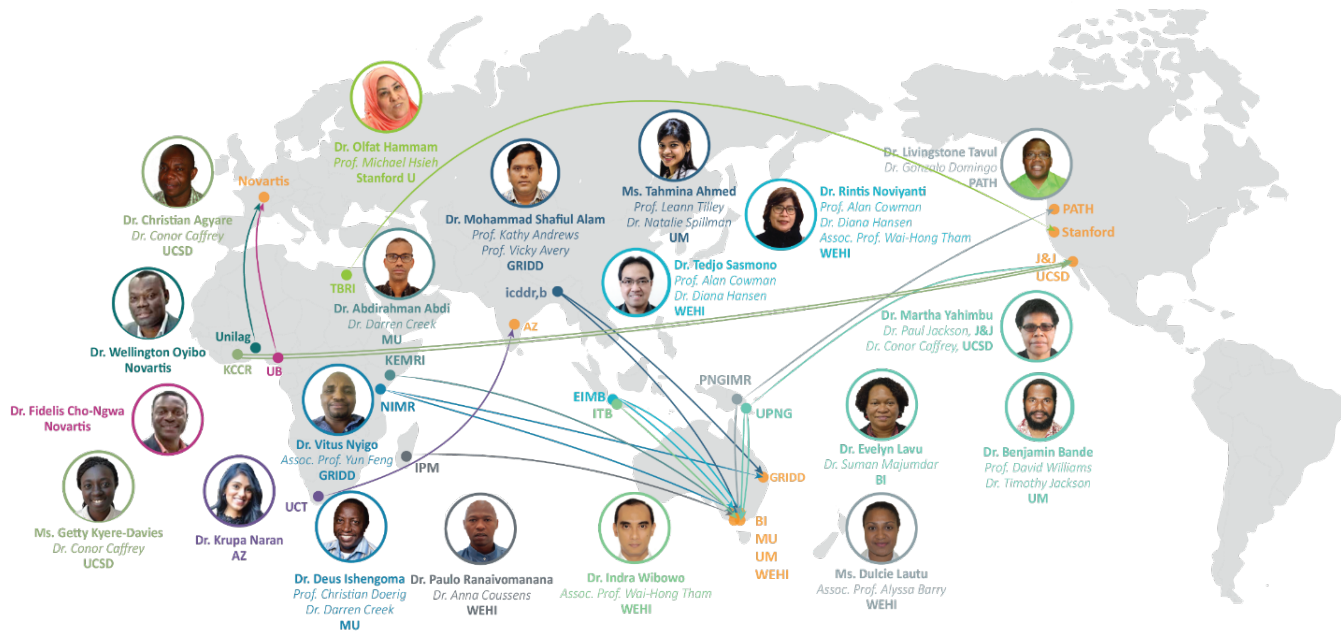
20 Fellowships completed

100+ Months of training
conducted

11 LMICs benefitted

40% of fellows are women

- US \$8.2 million+ grant funding
- Fellow promotions
- International publications and presentations
- New research collaborations



Fellow Institutes

- EIMB:** Eijkman Institute for Molecular Biology
- icddr,b:** International Centre for Diarrhoeal Disease Research, Bangladesh
- IPM:** Institut Pasteur de Madagascar
- ITB:** Institut Teknologi Bandung
- KCCR:** Kumasi Centre for Collaborative Research in Tropical Medicine
- KEMRI:** Kenya Medical Research Institute
- NIMR:** National Institute for Medical Research
- PNGIMR:** Papua New Guinea Institute of Medical Research
- TBRI:** Theodor Bilharz Research Institute
- UB:** University of Buena
- Unilag:** University of Lagos
- UCT:** University of Cape Town

Host Institutes

- AZ:** AstraZeneca
- BI:** Burnet Institute
- GRIDD:** Griffith Institute for Drug Discovery
- J&J:** Johnson & Johnson
- MU:** Monash University
- UM:** University of Melbourne
- WEHI:** Walter and Eliza Hall Institute of Medical Research
- UCSD:** University of California, San Diego

Fellowship Program Alumni News

Awards

- **Dr. Deus Ishengoma** (National Institute for Medical Research, Tanzania) received a US \$7.5 million capacity building grant from the Bill & Melinda Gates Foundation to establish a genomics laboratory in his home country Tanzania, conduct nationwide malaria studies, and train experts in genomics and bioinformatics.
- **Dr. Martha Yahimbu** (University of Papua New Guinea) received an American Society of Tropical Medicine and Hygiene (ASTMH)/Bill & Melinda Gates Foundation Annual Meeting Travel Award, which supported her participation in ASTMH's virtual 2020 Annual Meeting and will fund her attendance at the in-person 2021 Annual Meeting in Maryland, USA.

Presentations

- **Dr. Livingstone Tavul** (Papua New Guinea Institute of Medical Research) presented his fellowship work on the landscape of glucose-6-phosphate dehydrogenase (G6PD) diagnostics at the point of care at the Papua New Guinea National Malaria Control Program Annual Meeting.

Research Programs: Applying Fellowship Learnings to Combat COVID-19

- **Dr. Rintis Noviyanti** (Eijkman Institute for Molecular Biology [EIMB], Indonesia) is performing advanced research in Indonesia to predict relapse of *Plasmodium vivax* malaria. She is also supporting her country's COVID-19 response by studying the prevalence of antibodies against SARS-CoV-2 in collaboration with Indonesian and global partners. This work will inform Indonesia's vaccination program strategy.
- **Dr. Tedjo Sasmono** (EIMB, Indonesia) is leading a study in Indonesia on dengue and COVID-19 clinical similarity and diagnostics cross-reactivity. He continues to collaborate with fellowship host Dr. Diana Hansen (WEHI, Australia), who recently won e-ASIA funding for a new dengue study with Dr. Sasmono.

Communications

BVGH shares WIPO Re:Search successes with global audiences to increase program and Member visibility and engage strategic partners.

BVGH's communications are amplified by Members and external stakeholders.

BVGH Publications

- Partnership Hub 2020 Mid-Year Report
- Partnership Hub 2019 Annual Report
- Monthly Partnership Hub Snapshot newsletter
- Social media promotion (LinkedIn, Twitter)

BVGH Presentations and Events

- Presented WIPO Re:Search at Nigerian Diaspora Biomedical Research Think Tank
- Coordinating 2021 virtual IP capacity building workshop, for researchers and IP professionals in LMICs, in collaboration with WIPO

WIPO Re:Search 10th Anniversary Communications (in development)

- Publication showcasing the Consortium's major achievements and highlighting future directions
- Global virtual and/or in-person events (with WIPO)

Peer-Reviewed Publications by WIPO Re:Search Investigators

- Antimalarial Trioxolanes with Superior Drug-Like Properties and In Vivo Efficacy, *ACS Infectious Diseases*
- Dual Plasmeprin-Targeting Antimalarial Agents Disrupt Multiple Stages of the Malaria Parasite Life Cycle, *Cell Host & Microbe*
- Diterpenoids Isolated from the Samoan Marine Sponge *Chelonaplysilla* sp. Inhibit *Mycobacterium tuberculosis* Growth, *The Journal of Antibiotics*
- Testing the Effect of PAR1 Inhibitors on *Plasmodium falciparum*-Induced Loss of Endothelial Cell Barrier Function, *Wellcome Open Research*

People are Talking about WIPO Re:Search

UN General Assembly malaria resolution

Collaborating to End Neglected Tropical Diseases: Catalyzing Innovation and Partnerships—Joint publication of IFPMA, Japan Pharmaceutical Manufacturers Association (JPMA), and vfa Pharma

Creating Synergies to Beat Neglected Diseases—Guest column by Thomas Cueni (IFPMA), *Life Science Leader*

BVGH 2021 Goals

Collaborations

Establish 12 targeted collaborations, including 2 involving Latin American Members

Support over 50 ongoing collaborations

Recruitment

Recruit 3 new Latin American Members

Communications

Promote WIPO Re:Search through:

- Publications
- 10th anniversary events (with WIPO)
- International conference presentations
- Partnership Hub Snapshot newsletter
- Partnership Hub Mid-Year and Annual Reports
- Social media

Capacity Building

Transition the third round of the WIPO Re:Search Fellowship Program (FIT3) to virtual formats, and manage all sabbaticals to successful conclusions

Implement the virtual IP capacity building workshop, for researchers and IP professionals in LMICs, in collaboration with WIPO



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BIO Ventures for Global Health
2101 Fourth Avenue, Suite 1950, Seattle WA 98121

Email: info@bvgh.org
Website: www.bvgh.org