

Global Challenges Brief



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

THOMAS BOMBELLES, JENNIFER DENT*, MEGHANA SHARAFUDEEN, PHILIP STEVENS, KATY M GRAEF* & ANATOLE KRATTIGER

Global Challenges Division, World Intellectual Property Organization, Geneva, Switzerland

** BIO Ventures for Global Health, Seattle, USA*

1 minute read: key messages

- Additional resources for neglected tropical diseases (NTDs) research and development (R&D) have been mobilized in recent years, including collaborative R&D models and dedicated donor funding. More progress can be achieved through connecting researchers with intellectual property (IP) owners through coordinated global networks.
- WIPO Re:Search creates a global network that facilitates the sharing of IP in a broad sense, including know-how, technologies and research around NTDs, malaria and tuberculosis.
- With funding from WIPO Member States, WIPO Re:Search also works towards bridging gaps in NTD research by facilitating research sabbaticals for developing country scientists in laboratories, contributing to broader development goals.
- WIPO Re:Search is uniquely placed in the context of the United Nations system to broker collaborations between academia and the private sector.

Catalyzing New R&D Partnerships for Neglected Tropical Diseases

Neglected tropical diseases (NTDs)¹ are viral, parasitic, and bacterial infectious diseases that affect over 1 billion people around the world, the majority of which survive on less than US\$2 per day and live in impoverished areas of low-income countries.² NTDs directly cause around 10 million deaths each year and have a wide socio-economic impact, affecting people's ability to work, impairing the cognitive and physical development of children, among other negative consequences.

Many NTDs are easily preventable through, for example, improved sanitation and water management. However, the reality is that decades of under-investment by both government and the private sector have left few treatment options or diagnostic tools available to clinicians. There is therefore an urgent need for new and better drugs, diagnostics and vaccines.

Recent years have seen the arrival of collaborative research and development (R&D) models, product development partnerships (PDPs) and the commitment of extra public and private financial resources. Yet much remains to be done to bridge research gaps and bring together knowledge, tangible assets, skills and infrastructure from the private, non-profit, and academic sectors in the quest for new treatments for NTDs. These gaps are increasingly being filled by initiatives such as WIPO Re:Search.

Sharing IP and Know-how with Researchers Worldwide

WIPO Re:Search consists of a global network of companies, academia, research centers, and government

agencies that facilitates the exchange of technologies, research and know-how. The consortium was established in 2011 by the World Intellectual Property Organization (WIPO), in collaboration with BIO Ventures for Global Health (BVGH), pharmaceutical companies, and private and public sector research organizations. The founders believe that the search for new treatments for NTDs, malaria, and tuberculosis will be accelerated if IP, chemical compounds, and know-how are shared with researchers. WIPO Re:Search does this in a systematic and targeted way through its Partnership Hub, database and supporting services, such as IP training and sponsored research sabbaticals.

Strengthening Research Networks

WIPO Re:Search has developed a tripartite structure: a public database, the Partnership Hub (administered by BVGH), and a range of supporting services linking WIPO Re:Search to other WIPO programs and activities.

The **database** is populated with IP assets that Providers have made available for licensing through WIPO Re:Search. Providers submit summary information on: screening results (hits, leads, lead series), preclinical candidates, clinical candidates, enabling technologies, patents, formulations, diagnostic tools, vaccines, pathogen and patient samples, new biological entities, know-how, or other services for the purpose of facilitating NTD R&D. The information can be accessed without registration.

The **Partnership Hub**, managed by BVGH, facilitates collaboration agreements among Members. It identifies researchers' needs for IP and related resources to advance product development, finds other Members that may be able to meet these needs, and then helps to forge mutually beneficial collaborations with clearly defined roles, responsibilities, and objectives. To ensure these collaborations are sustainable, BVGH performs an alliance management role, providing assistance when necessary and recommending additional WIPO Re:Search Members with the expertise and assets needed to move a candidate product to the next stage of development.

WIPO Re:Search, with funding from WIPO Member States, provides access to **supporting services**,

mainly in the area of IP resources and training. Supported by Funds-in-Trust from the Government of Australia, scientists from developing countries have been hosted in laboratories of developed country Members. In partnership with the "SMEs and Entrepreneurship Support Division" and the "WIPO Academy", and funded by the Governments of Australia and Japan, WIPO Re:Search facilitates IP training for developing country Member institutions in knowledge and technology transfer. These sessions took place in Geneva in 2012 and New York City in 2014, and were supported by grants from the Governments of Australia and Japan.

A Diverse Membership

WIPO Re:Search's membership collectively possesses a tremendous wealth of IP and other assets which could be used to help develop desperately needed treatments and cures for NTDs. Over 90 for-profit, academic, nonprofit, governmental, and non-governmental research organizations have joined WIPO Re:Search since it was established in October 2011. These include multinational pharmaceutical companies, specialist biotech companies, academic centers and NTD PDPs. Institutions can join the consortium under one or more of the following three categories:

- **Providers** contribute IP know-how, expertise, materials, and services.
- **Users** can use IP assets in the database and work with BVGH to alert Providers to their resource needs.
- **Supporters** are interested parties that express support for the initiative.

Products will be Sold Royalty-Free in Least Developed Countries

The WIPO Re:Search Guiding Principles are incorporated into all collaboration agreements. These principles stipulate that all technology transfer licenses between Members are made on royalty-free terms for all Members anywhere in the world, and any products developed through a WIPO Re:Search collaboration will be sold royalty-free in all 49 Least Developed Countries (LDCs).³

Members are required to consider in good faith access for all developing countries, taking into account the

Box 1: A Summary of WIPO Re:Search Guiding Principles

- Members will provide royalty-free licenses for R&D related to NTDs, malaria, and tuberculosis.
- Members will provide a royalty-free license for any product developed through WIPO Re:Search that is used and sold in LDCs.
- Members will consider the issue of access and affordability to these products for all developing countries, including those that do not qualify as LDCs.
- Users will retain ownership of any new IP developed, but are encouraged to make new inventions available to other Members of WIPO Re:Search.

The WIPO Re:Search Guiding Principles are available in full at ow.ly/QauSa

Box 2: Data Sharing for Tuberculosis

Tuberculosis remains a serious threat to health, with more than 8.6 million new cases and 1.3 million deaths in 2012. Drug-resistance is a major contributor to this problem. With one third of the world estimated to be (latently) infected, treatments for new bacterial targets are desperately needed.

Methionine aminopeptidases (MetAPs) are viewed as a potential drug target for tuberculosis. When researchers stop expression of the gene encoding MetAP type 1 (MetAP-1) enzymes in bacteria, including *Mycobacterium tuberculosis*, the microbes die. Researchers from the Center for World Health & Medicine (CWHM) in Saint Louis, USA,

requested access to compounds inhibiting MetAP-1, which they wanted to test against drug-resistant *M. tuberculosis*. Consequently, BVGH arranged conversations between the CWHM researchers and GlaxoSmithKline (GSK) running a research program identifying unique inhibitors of MetAP enzymes. During those discussions, it turned out that GSK tests had produced disappointing results. Based on GSK's results, rather than continuing with its plans, CWHM placed the MetAP-1 inhibitor program on hold and avoided repeating dead-end experiments thereby saving money and months of valuable research time.

Box 3: From Cardiovascular Disease to Schistosomiasis

Researchers at the University of California, San Francisco (UCSF), USA, had demonstrated that an enzyme called HMG-CoA reductase, which has long been linked to the production of cholesterol in the human body, is also essential for the survival of the parasitic worm responsible for schistosomiasis. Because of this link, researchers were keen to investigate the potential for HMG-CoA reductase inhibitors (statins) in treating schistosomiasis. Early stage research had analyzed statins' effect on the schistosome parasite's viability, showing potent activity. To further assess statins' potential to treat schistosomiasis, BVGH connected the UCSF researchers with MSD (Merck & Co., Inc. in the USA

and Canada). MSD provided the researchers with statins to screen against the parasite. Because these statins have a known target, prior pharmacokinetics and safety studies, and drug-like properties, the UCSF researchers will be able to more rapidly direct promising molecules discovered in the laboratory into advanced studies in humans. The transition from the laboratory (pre-clinical) into clinical stage research is critical because many projects have failed to obtain the investments necessary to move forward. By making available the large volume of safety and other information about statins, time can be saved, costs reduced and the likelihood of success increased.

economic development of countries and the need to facilitate access for disadvantaged populations. The WIPO Re:Search Guiding Principles are broadly summarized in Box 1.

As of July 2015, 90 collaboration agreements have been achieved under the terms of WIPO Re:Search. Through these partnerships, private-sector Members and other Providers have shared chemicals, datasets, advice, and expertise. While the process of drug development is long and difficult, some of these collaborations have already begun to bear fruit (Boxes 2 & 3).

Building Scientific Research Capacity in Developing Countries

By sharing knowledge and resources, WIPO Re:Search has successfully bridged knowledge and skill gaps by facilitating sabbaticals for developing country scientists at Members' research facilities. These sabbaticals were made possible as a result of Funds-in-Trust from the Australian Government. So far, hosting arrangements for six African researchers have been organized at the labs of WIPO Re:Search Member organizations, including pharmaceutical companies and academic institutions.

This allows the scientists to upgrade their clinical lab skills, further their own research and take those skills back to their own country's institutions where they can be shared with students and colleagues. So far, scientists from Cameroon, Egypt, Ghana, Nigeria, and South Africa have taken part in these placements.

For example, Novartis hosted two researchers in 2013, a malaria diagnostics developer from the University of Lagos, Nigeria, and an onchocerciasis (river blindness) expert from the University of Buea, Cameroon. Novartis had created training programs designed to meet the individual needs and interests of the visiting scientists. One of the scientists who was interested in identifying plant products active against the microscopic worms that cause onchocerciasis, was trained on the use of cutting edge techniques needed to extract, purify, and identify active compounds from plants. The other scientist gained broad exposure to processes in innovation, governance of R&D innovation, clinical development activities, and knowledge management, and worked on assessing the feasibility of using dried blood spots to determine presence of anti-malarial compounds in patients. Both scientists returned to their home institutions, where they have applied their new knowledge to their research activities.

Key Implications & Considerations for Policy & Policymakers

The following implications and considerations for policy and policymakers are intended as starting points for reflection, to be adapted to specific needs and circumstances:

- Historic underinvestment into NTDs by the private sector suggests that more needs to be done to stimulate industry investment into R&D for NTDs.
- Alternative incentives and innovative program models will stimulate the private sector to contribute its considerable knowledge and skills to this field.
- WIPO Re:Search enables organizations to share relevant IP and other knowledge within an agreed and clear framework.
- Collaborations are negotiated directly between Members, creating a context of certainty for IP right holders.
- The Partnership Hub of WIPO Re:Search coordinates and brokers research partnerships within the IP system (through voluntary licensing), and leverages new resources and taps into IP and knowledge that might otherwise remain unexplored for NTD purposes.
- Policymakers should focus on expanding research networks and knowledge-sharing partnerships, especially between North and South.

Increasing International Cooperation

In its first three years of operation, WIPO Re:Search has demonstrated that companies are willing to participate in networks, share knowledge, skills and resources and want to collaborate with partners in developing and developed countries.

The majority of collaborations during the first two years mainly involved pharmaceutical Members providing assets to academic or nonprofit User Members. Since then, not only pharmaceutical Members but also many more academic/nonprofit Members contributed assets to other academic/nonprofit Members as shown in the below three examples:

A schistosomiasis researcher from the University of Ibadan in Nigeria assessed the ability of a lateral flow schistosomiasis dipstick diagnostic. This diagnostic had been developed by researchers at the National Institute of Parasitic Diseases (Chinese Centers for Disease Control), against the schistosomal worm species commonly found in Nigeria.

A natural products chemist at the University of British Columbia in Canada elucidated the structures of natural products previously demonstrated by a University of Ibadan researcher to have anti-malarial or anti-tuberculosis properties.

The University of Lagos, Nigeria, hosted a bioengineer from Stanford University in the USA, who tested his novel paper microscope for screening malaria parasites in samples collected from patients in the Lagos area. In exchange, Stanford University subsequently hosted a post-graduate student from the University of Lagos in order to develop a multiplex polymerase chain reaction (PCR) diagnostic customized to detect the most common pathogens in Lagos.

Cooperation and exchange between the private, public and academic sectors, and between North and South are central to WIPO Re:Search, and will help to accelerate the development of the next generation of treatments, vaccines and diagnostics for NTDs, malaria, and tuberculosis.

Further Reading

Ramamoorthi R, KM Graef & J Dent. 2014. WIPO Re:Search: Accelerating anthelmintic development through cross-sector partnerships. *Int. J. Parasitol. Drugs Drug Resist.* Available at: ow.ly/Qar1C

Wai T & P Stevens. 2014. *The changing landscape of medical innovation: How have business models responded?* Global Challenges Brief, WIPO: Geneva. Available at: ow.ly/R1Tx7

Bombelles T, J Dent, 2015. Neglected tropical disease research: re-thinking the drug discovery model. *Future Medicinal Chemistry.* 7(6):693-698. Available at: ow.ly/R50uL

- 1 WIPO Re:Search covers NTDs, malaria and tuberculosis. For more information on these diseases, please visit the UN World Health Organization (WHO) website at ow.ly/Qarh3 and the WIPO Re:Search website at ow.ly/Qaraq
- 2 Molyneux, DH. 2014. Neglected tropical diseases: Now more than just 'other diseases' – the post 2015 agenda. *Int. Health* 1–9. Available at: ow.ly/Qark2
- 3 www.wipoReSearch.org

Citation: Bombelles T, J Dent, M Sharafudeen, P Stevens, KM Graef & A Krattiger. 2015. WIPO Re:Search: Sharing Innovation in the Fight Against Neglected Tropical Diseases. Global Challenges Brief, WIPO: Geneva. Available at: ow.ly/QYILJ

WIPO Global Challenges Briefs provide overviews of issues relevant to debates about solutions to global challenges, such as public health, climate change and food security.

The views expressed in this work are those of the authors and do not necessarily represent the position or opinion of the Secretariat of WIPO or its Member States.