DNDi

Best Science
for the Most Neglected

Equity at the heart of medical innovation

2023 ANNUAL REPORT

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We use the power of innovation, open science, partnerships, and advocacy to forge solutions to a great injustice: the lack of medicines for life-threatening diseases that disproportionately impact poor and marginalized people.

The Drugs for Neglected Diseases initiative, DNDi, is an international not-for-profit organization that discovers, develops, and delivers safe, effective, and affordable treatments for the most neglected patients.

Cover page photo: Dr Mariame Camara, principal investigator of DNDi's sleeping sickness studies in Guinea, examines a patient suspected to have the disease in the village of Douprou in western Guinea. Once the country most affected by sleeping sickness in West Africa, Guinea is now hoping to soon receive WHO certification for eliminating the nightmare disease thanks to government control programmes that include vector control and new treatments introduced by DNDi and partners.

WE INNOVATE TO SAVE LIVES

We develop urgently needed treatments for neglected patients and work to ensure they're affordable, available, and adapted to the communities who need them.

WE FOSTER INCLUSIVE AND SUSTAINABLE SOLUTIONS

We work hand in hand with partners in low- and middle-income countries to power our progress and strengthen innovation ecosystems that put people's needs first.

WE ADVOCATE FOR CHANGE

We speak out for policy change to enable more effective and equitable R&D and access to the fruits of science for all people in need, no matter their income or where they live.

FOREWORD

Dr Marie-Paule Kieny
Chair of the Board
of Directors

Dr Luis Pizarro
Executive Director

2023 marked 20 years since our founding partners established DNDi, initiating an experiment in innovation and collaborative, not-for-profit pharmaceutical R&D centred on the needs of neglected patients. Throughout the year, we were grateful for the many opportunities to join with partners – in Latin America, East and West Africa, South and South-East Asia, Japan, North America, and Europe – to celebrate our collective successes in putting equity at the heart of medical innovation.

We were truly honoured that the impact of our collaborative model took centre stage when DNDi was awarded the 2023 Princess of Asturias Award for International Cooperation. We extend our appreciation to the Princess of Asturias Foundation for recognizing the achievements of our partnerships and shining a light on the needs of neglected patients around the world.

Progress during our anniversary year was a testament to the tremendous value of investing in medical innovation for neglected diseases, bringing new hope for patients with new tools that also accelerate the prospects for sustainable elimination of two diseases at the centre of our programmes from our earliest days.

Twenty years ago, the drugs used to treat sleeping sickness were so toxic they killed 1 in 20 patients. But through the dedication of our R&D teams and partners, we have steadily improved upon the treatment options available to patients and their doctors. Initially approved in 2018 for use against the *T.b. gambiense* form of sleeping sickness, fexinidazole became a game-changer as the first all-oral treatment for the disease. **In December 2023, the European Medicines Agency extended fexinidazole's indication for use against the less common but more acute form of sleeping sickness caused by *T.b. rhodesiense,*** paving the way for discontinuation of the toxic first-line treatment that has been in use for over seven decades and marking the 13th new treatment we have delivered with our partners.

In 2023, **Bangladesh became the first country to officially eliminate visceral leishmaniasis** (VL) as a public health problem, thanks in part to the improved treatment options DNDi and our partners have also delivered. After years of sustained commitment to improving VL screening, testing, and treatment, other South Asian countries are also set to follow suit. In Eastern Africa, health authorities and policymakers have also recently launched a new comprehensive framework to guide action on elimination.

While these are significant achievements in the fight against sleeping sickness and VL, we cannot afford to become complacent. Continued investment in new tools specifically designed to sustain disease elimination is critical. **Now progressing in Phase II clinical trials in India and Ethiopia, DNDi's new all-oral treatment for VL – LXE408 – puts hope on the horizon for treatments that are simpler, safer, and easier to administer** to patients at the point of care, even in the most remote and rural settings. It is one of seven new molecular entities for leishmaniasis in our portfolio with the potential to become powerful tools in reaching global elimination targets.

We also seized upon our anniversary milestone to look ahead.

While the future may increasingly be defined by the climate crisis and the rise of climate-sensitive diseases, geopolitical uncertainty, and the inevitability of new pandemics, it will also be shaped by the tremendous potential for scientific progress and medical innovation that transforms lives and livelihoods.

Adding dengue to our R&D portfolio in 2022 proved to be prescient. In 2023 and early 2024, countries in South America, South Asia, and Africa experienced unprecedented outbreaks of the disease. The scenes the world witnessed – tented hospitals overflowing with patients for whom there was no cure – were painfully reminiscent of the COVID-19 pandemic, reminding us once more of the importance of our work today and for the 20 years to come.

Our partnerships in countries most impacted by neglected diseases are the bedrock of the progress we are making to meet the treatment needs of people affected by dengue and other climate-sensitive diseases. Together with our Dengue Alliance partners from Brazil, India, Malaysia, and Thailand, our teams continued advancing research in 2023 to find dengue's missing cure. As our experience with sleeping sickness and leishmaniasis has shown, treatment solutions will be indispensable for successfully confronting the disease, together with vaccines, vector control technologies, and other essential tools.

Our commitment to equity in medical innovation is a pledge to address the unmet treatment needs of people facing the most neglected diseases – including mycetoma, a chronic disabling disease about which too little is known. **DNDi and partners conducted the world's first double-blind, randomized clinical trial to find a treatment for the fungal form of mycetoma and shared results in 2023** showing the drugs fosravuconazole and itraconazole to be effective when combined with surgery, with fosravuconazole having practical advantages including weekly versus twice-daily administration. Our teams were thrilled to share these encouraging results while advancing partnerships and new initiatives to conduct much-needed epidemiological research, expand access to treatment, and prepare the way for future clinical trials.

If there is a single highlight to look back on from 2023, it is the phenomenal power of partnership, which has been the highlight of every one of our 20 years: collaborations addressing today's most pressing global health challenges within and between neglected disease-endemic countries and with research and industry allies around the world. No new research effort and no new medical tool can truly meet the needs of neglected patients without the support and collaboration of affected patients and communities, industry stakeholders, academic experts, healthcare workers, and national decision-makers and health authorities.

As we look back on a momentous year, we would like to extend our sincere thanks to our partners, supporters, and staff who have walked with us through 20 years of innovating together and who will continue to play a critical role in putting equity at the heart of medical innovation in the years to come.

Learn more about our 20 years of progress

Celebrating 20 years of the best science for the most neglected

Throughout 2023, we gathered with partners, healthcare providers, and communities around the world to celebrate our achievements over the past 20 years and find ways to overcome the challenges that still prevent medical innovation from reaching the most vulnerable.

Highlights from around the world

Mobilizing support for neglected patients

In November 2023, over 1,000 enthusiastic participants joined DNDi and partners in a charity run to mobilize support for neglected patients. It was an inspiring and action-packed day in Kacheliba, West Pokot County, Kenya, a small town close to the Ugandan border where visceral leishmaniasis is highly endemic. We are grateful to our race ambassador, Kenya marathon champion Tegla Loroupe, and the many guests who joined to show their solidarity with patients and celebrate the successes of DNDi and partners' long history of clinical research in the area.

In the lead-up to the charity run, a free medical camp in Kacheliba saw over 900 patients – including more than 250 children under five – in a single day. Provided by DNDi together with our founding partner Kenya Medical and Research Institute, Kenya's Ministry of Health and Defence Forces, Rotary International, FIND, Amudat Hospital, and Kacheliba Hospital, the camp offered medical consultations, treatment, and preventive care services, including screening for mycetoma and visceral leishmaniasis.

Our story in film

Out of the Shadows tells the story of DNDi's 20-year journey in non-profit R&D that has helped save millions of lives – and our work with partners around the world to address some of today's most urgent challenges in global health.

Watch now

Closing the gaps with sustainable solutions

Co-organized by two of our founding partners – Fiocruz and Médecins Sans Frontières – in Rio de Janeiro, Brazil, this symposium brought together international scientists, product developers, policymakers, and civil society organizations to highlight the urgent action that is needed to close gaps in innovation and access to treatment for neglected diseases.

Advancing gender equity in health sciences

Our Forum on Gender, Health, and Science united women leaders and experts from Malaysia and Thailand to explore the unique challenges and opportunities facing women in science today. We were proud to co-host the event with DNDi founding partner the Ministry of Health of Malaysia, together with National Institutes of Health, Malaysia; Monash University, Malaysia; Faculty of Medicine Siriraj Hospital, Mahidol University, Thailand; and Institute of HIV Research and Innovation, Thailand.

Innovation in R&D: Lessons, successes, and challenges

On World NTD Day in January 2024, a scientific event in Paris hosted with DNDi founding partner Institut Pasteur focused on the successes and challenges of alternative models of medical innovation for neglected patients – and how these can be used to address new global health challenges fuelled by climate change and pandemic threats.

2023 in numbers

Nurses review records at the Dengue Management Centre of the Infectious Diseases Hospital in Colombo, Sri Lanka.

R&D PORTFOLIO

31
projects in our R&D portfolio, and an additional 14 projects in the treatment access phase

20
projects focused on identifying or developing new chemical entities

CLINICAL TRIALS

26
clinical trials in 8 disease areas, including 16 trials testing new chemical entities

68
clinical trial sites in 25 countries

4,472
patients enrolled in active DNDi clinical studies

FOSTERING SUSTAINABLE SOLUTIONS

683
researchers, clinicians, and health advocates trained across Africa, Asia, and Latin America

87%
of all R&D partner staff* are based in low- and middle-income countries (LMICs)

5
research networks to strengthen research capacity in Africa, Asia, and Latin America

MAXIMIZING THE PARTNERSHIP MODEL

225
R&D and access partner institutions in 47 countries

5:1
ratio of partner staff to DNDi staff* worldwide

GENDER AND DIVERSITY

35
nationalities represented among DNDi employees on 5 continents

52%
of DNDi leadership positions held by women

78%
of peer-reviewed scientific articles had a female first or last author

72%
of peer-reviewed scientific articles on DNDi research had at least one author from a partner institution in an endemic country

SHARING KNOWLEDGE

32
peer-reviewed scientific articles on DNDi research

91%
of peer-reviewed scientific articles published in open-access journals

FINANCES

€ 66.9 m
in annual expenditure

€ 11.8 m
in in-kind contributions and collaborative funding from partners

88%
of expenditure on social mission to maximize impact for neglected patients

*Staff in full-time equivalents (FTEs)

The quest to eliminate neglected diseases

From the first reported case to the very last

In 1827, a surgeon in what is today Bangladesh published a detailed account of a disease that was causing patients to come to hospital with grossly enlarged spleens, anaemia, and fever. This would become one of the first recorded outbreaks of visceral leishmaniasis, which came to be known as kala-azar, the Hindi for 'black fever'.

Two hundred years later, in October 2023, medical history was made again in Bangladesh. The country became the **first ever to receive official validation from the World Health Organization (WHO) for eliminating kala-azar as a public health problem.**

This remarkable global health milestone was achieved thanks to a host of factors: successful control of sandflies that transmit the disease, vigilant disease surveillance, a network of assiduous community health workers, and as many experts were quick to point out: the decisive impact of introducing new, efficacious, and safe treatments for the deadly disease.

DNDi was proud to be part of this huge step forward for neglected diseases and to be recognized by national authorities for helping to catalyze progress for patients. Along with our partners in South Asia, we conducted a four-year clinical trial in Bangladesh and India that led to the adoption of these new treatments, specifically single-dose liposomal amphotericin B, which is safe, drastically shortens the length of treatment for kala-azar, and has cure rates of over 95%.

India also introduced liposomal amphotericin B following the evidence generated by our trial, and it too now hopes to announce elimination of kala-azar in the coming years.

These victories serve as proof of the vital role of innovation – the development of new treatments, diagnostics, and preventative tools – in eliminating neglected diseases.

Perhaps nowhere is this link between innovation and elimination clearer than with the case of the most common form of African sleeping sickness. After decades of facing toxic, ineffective, and potentially fatal treatments, patients across endemic countries in sub-Saharan Africa now have access to fexinidazole, the first safe, simple, all-oral treatment for the disease developed by DNDi, Sanofi, and national control programmes in Africa.

Sleeping sickness cases are declining rapidly, even in the Democratic Republic of the Congo (DRC) – long the epicentre of this nightmare disease, with twice as many new cases over the past three decades as all other countries combined. Meanwhile, Guinea, which had the highest burden of the disease in West Africa and whose health system was devastated by the 2014 Ebola epidemic, is now hoping to soon receive WHO certification for **eliminating sleeping sickness as a public health threat.**

But elimination poses its own challenges.

Complacency from global health donors or treatment programmes in endemic countries is a major threat. After all, history has shown that sleeping sickness and kala-azar both occur in cyclical waves – the minute the focus moves elsewhere, resurgence can and will occur. Climate change and human migration could also wreak havoc on the best-laid plans to control these diseases, particularly in areas prone to civil unrest.

Elimination requires sustained deployment of the package of tried-and-true public health tools that have underpinned progress in countries like Bangladesh, India, and the DRC: active disease surveillance, vector control, and prompt access to diagnosis and treatment.

Sustainable elimination also requires its own new dose of medical innovation. As cases get fewer and rarer, meeting the WHO's 2030 targets for zero sleeping sickness and eliminating kala-azar as a public health problem will require therapeutic options that are not just safe and effective, but also specifically designed to take us across the elimination finishing line. Sustaining elimination might only be possible with drugs that can be taken in remote areas with poor health infrastructure: ideally oral treatments that combine high efficacy with an excellent safety profile, where treatment length is short, the threat of drug resistance is low, and the interactions with drugs used for other common diseases, such as malaria, are minimal.

Aarti Devi, from Bihar, India, is one of over 1 million female Accredited Social Health Activists (ASHAs) working across the country to support maternal care, childhood immunization, nutrition, control of neglected tropical diseases, and other public health priorities. Acting as a critical bridge between the healthcare system and the community, ASHAs have played a central role in India's strides towards eliminating visceral leishmaniasis as a public health problem.

This is why DNDi's investments in R&D for sleeping sickness and kala-azar must continue.

In 2023, we continued work to complete the development of acoziborole, our novel sleeping sickness treatment to accelerate elimination, in partnership with Sanofi (read more on page 23). Acoziborole is safe and well-tolerated, but importantly, it can be administered in a single dose – so it can be given to infected patients and also people with potential infection. Along with the Institute of Tropical Medicine Antwerp and other partners, DNDi is running the STROGHAT clinical trial in a remote region of Northwest DRC to demonstrate how acoziborole can be used to treat entire villages when suspected cases of sleeping sickness occur. If approved, acoziborole – along with new point-of-care tests for sleeping sickness and vector control efforts – could be the tool that national control programmes use to stamp out the last cases of the disease in the most hard-to-reach areas. For good.

Meanwhile, with South Asian countries looking to soon eliminate kala-azar, countries in Eastern Africa are also looking to jumpstart their elimination plans. While existing treatments for kala-azar in Eastern Africa are effective, entirely new medicines are needed. Current treatments require hospitalization, have potential toxicity, and are beginning to show resistance.

To address these limitations, we launched clinical trials in 2023 and 2024 in India and Ethiopia, respectively, for a **promising new patient-friendly oral drug for leishmaniasis: LXE408** (read more on page 26). If the clinical trial is successful, the treatment could be taken at home and easily given to patients at the primary healthcare level, making it much easier to cure sick patients quickly and halt onward transmission – boosting prospects for the sustainable elimination of the disease.

As recent victories in disease elimination prove, investment in medical innovation to go that last mile can pay off, breaking vicious circles of illness and poverty for generations to come.

Confronting the double neglect of women and children

An R&D agenda to upend a harmful status quo

Chagas disease in Colombia. Dengue fever in Sri Lanka. Mycetoma in Sudan. Some of these so-called neglected tropical diseases are viral, some protozoan, some fungal, but all bring the same anguish to affected families across the globe, particularly when the treatments are painful, toxic, barely effective, or require lengthy hospitalization far from home. The anguish is even greater when these diseases affect young children or pregnant women.

Women and children are doubly neglected when it comes to the availability of safe, appropriate, and effective treatments for neglected diseases.

Innovation for children's treatment needs

Children have unique treatment needs that change as they grow. Very young children cannot swallow pills. Crushed tablets can be bitter-tasting and challenging to administer and dose accurately. Simple oral treatments adapted for different ages would be best. However, developing medicines for children can be expensive and difficult, requiring specialized studies for drugs that will ultimately be ordered only in small quantities. So, child-friendly medicines tend to come late or not at all.

DNDi is tackling this treatment gap by accelerating the development of new treatments and child-friendly formulations that meet the unique needs of kids with neglected diseases. Since 2003, we have developed four affordable treatments for malaria, Chagas disease, and HIV for children, and two treatments for sleeping sickness and leishmaniasis that are suitable for both children and adults. We are now working to develop new child-appropriate treatments for at least six neglected diseases.

In 2023, DNDi and partners published a study evaluating the effectiveness of a new combined visceral leishmaniasis (VL) treatment with fewer injections and a shorter hospital stay: miltefosine, the only oral drug available for leishmaniasis, and paromomycin, an injectable antibiotic. We studied the results in children at the same time as adults to avoid any delay in the availability of a better treatment for young patients. The positive results of this and other studies looking at how well these drugs functioned and were absorbed in children and adults in a 14-day regimen in Eastern Africa have been reviewed by the World Health Organization with the goal of an updated treatment recommendation in 2024.

The year also saw other positive advancements for children. DNDi has partnered with Novartis to develop an oral drug candidate, LXE408, currently in clinical trials for VL in India and Ethiopia, with plans for a child-friendly formulation and future studies on its effectiveness for Chagas disease, another disease that affects children. DNDi is working with Sanofi to develop acoziborole for sleeping sickness, a single-dose oral treatment that is being evaluated for children. For river blindness, DNDi is working with Insud Pharma to develop an ivermectin formulation for small children, collaborating with Bayer AG to assess emodepside, and working with the eWHORM consortium to develop oxfendazole.

Cooperation is essential. In 2023, as a Global Accelerator for Paediatric Formulations (GAP-f) partner, DNDi worked with experts from health ministries, research institutions, and health facilities in affected countries to produce the **first-ever list of priority drug formulations for children affected by five neglected tropical diseases**.

A watch list of the most promising drugs in the development pipeline now includes LXE408 for VL, acoziborole for sleeping sickness, and paediatric formulations of ivermectin, emodepside, and oxfendazole for treating river blindness – all drugs in DNDi's portfolio.

DNDi also consulted experts and caregivers when defining the desired characteristics of a **new treatment for kids living with Chagas disease** and is now testing shorter benznidazole regimens in children to reduce the side effects of the current treatment.

Mary, from West Pokot County, Kenya, lost 35 kg (77 lbs) and was too weak to walk by the time she was diagnosed with visceral leishmaniasis, but she couldn't be treated with the usual drugs because she was pregnant. She was cured after receiving liposomal amphotericin B, an expensive treatment for special populations such as pregnant women, the elderly, and children under two.

Developing safe and effective treatments for women at all stages of life

Women, too, have unique treatment needs that can change at different ages, but they are often excluded from the clinical trials that would provide essential data on sex-specific physiological differences and on medicine safety and efficacy during pregnancy or breastfeeding. As a result, safe treatment options for women affected by neglected diseases can be limited. In some cases, women may have to delay treatment until they are no longer pregnant or breastfeeding.

DNDi is committed to implementing best practices in gender-responsive drug development and access by promoting the inclusion of women in clinical trials and, when safe, including pregnant and breastfeeding women.

Some medicines, and therefore participation in clinical trials by women during their child-bearing years, may require the use of contraceptives to prevent pregnancy, which may not be acceptable to some women or their communities. In 2023, DNDi worked with the University of Geneva to conduct a literature review on the acceptability of contraceptive use in Eastern Africa in different contexts. As a next step, partners in Kenya, Brazil, and Colombia are planning a project to assess the acceptability of contraceptive use when medically indicated for the treatment of Chagas disease and leishmaniasis in endemic regions of Africa and Latin America.

DNDi also continued evaluations of its drug development programmes to prioritize drug candidates that are safe for everyone at all stages of life, including by ensuring that gender-specific considerations are part of all disease strategies.

DNDi now ensures that **clinical study protocols explicitly include women,** or justify any exclusion, and our teams are working towards reporting fully disaggregated results to uncover differences between the sexes at every stage of a study. DNDi is also ensuring that partners' Phase I trial facilities can accommodate both women and men.

In 2024, DNDi will investigate the possibility of conducting laboratory studies to **evaluate reproductive toxicity earlier in the development process to facilitate earlier and better-informed decisions about the safety of priority drug candidates during pregnancy.**

DNDi is committed to developing new treatments that are safe, effective, and affordable for everyone at all stages of life.

Responding to the climate crisis

Innovation and advocacy for the most neglected

For the second time in just a few years, Brazil's army has been forced to deploy field hospitals to cope with an overwhelming number of patients in need of medical care. This time, the problem isn't COVID-19, it's dengue. Millions of infections have occurred in only a few short months – Brazil's worst dengue crisis on record.

Explosive recent dengue outbreaks have also overwhelmed hospitals in other Latin American countries. Other continents have seen similar outbreaks, with notable crises in places as diverse as Bangladesh and Burkina Faso. The dengue virus is carried by mosquitoes. As the climate warms, their range has been expanding, and the number of people they infect has been dramatically increasing.

Other vector-borne diseases are also expanding: Chagas disease is emerging in previously unaffected areas – including North America. Climate modelling suggests the more acute form of sleeping sickness caused by *T.b. rhodesiense* will spread upwards into the Eastern African highlands, putting millions more people at risk by the end of the century. As well as allowing new threats to emerge, changing weather patterns also threaten to undo decades of progress – against leishmaniasis, for example, especially in Eastern Africa, which bears the greatest burden of disease.

Climate change has a disproportionate impact on the poorest and most marginalized communities, exacerbating insecurity and displacement and threatening access to food and clean water. The same communities are also hit hardest by vector-borne neglected tropical diseases (NTDs), many of which are on the rise due to changing weather patterns. Even small fluctuations in temperature, humidity, and rainfall can alter vector breeding patterns, biting rates, and geographic range – with devastating consequences.

Yet the data is often lacking – research on climate and health has historically been centred on high-income countries rather than on those settings where the impacts of climate change will most be felt. A recent WHO-led scoping review examined over 42,000 articles in the scientific literature and concluded that there was not yet sufficient understanding of the actual and potential impacts of changes to climate patterns on NTDs, with the link between climate change and some diseases not covered by a single paper.

Guarding against these growing threats to vulnerable communities around the world requires decisive action and sustained commitment to developing simple, safe, and effective health tools, including tests and treatments adapted specifically to the needs of patients and the health systems they rely on.

Across five continents in 2023, our teams continued advancing our response to the climate crisis.

Innovating for climate-sensitive diseases

There is no drug that can cure dengue or halt progression of the disease. Through the Dengue Alliance, we are joining with leading research institutes in Brazil, India, Malaysia, and Thailand to identify and develop treatments that can prevent people from developing severe dengue and its life-threatening complications. We are also conducting much-needed research into the burden of dengue in Africa, where knowledge gaps hinder the development of evidence-based responses.

With six all-new drug candidates for leishmaniasis progressing in our R&D portfolio, DNDi and partners marked a major milestone in 2023, with our first new molecular entity – LXE408 – entering Phase II clinical trials in Ethiopia and India. For sleeping sickness, we moved towards completing clinical trials of acoziborole, a single-dose oral treatment that could be incorporated into test-and-treat strategies needed to sustain elimination of the fatal disease in endemic countries.

Across our Chagas disease, mycetoma, and river blindness programmes, our teams and partners are working to replenish the R&D pipeline, advance pre-clinical research, and conduct clinical trials to deliver new and better cures to millions at risk.

Read more about our R&D progress across these climate-sensitive diseases beginning on page 22.

Patients are monitored in an improvised emergency care unit set up in Belo Horizonte, Brazil to accommodate the massive influx of people in need of medical care during the country's most recent dengue outbreak. With no specific treatment available for the disease, medical care is limited to symptomatic relief and round-the-clock monitoring for warning signs of progression to severe dengue.

Advocating for increased investment in R&D

The Intergovernmental Panel on Climate Change estimates that **70% of annual global deaths are due to climate-sensitive diseases** – and this number is expected to rise.

Contributing to the first **Global Stocktake of the Paris Agreement** that concluded at COP28 in 2023, **we highlighted the impact of climate change on the geographical spread and global burden of NTDs and called for increased investment in R&D to facilitate climate adaptation and resilience** in the hardest-hit regions. The framework of the **Global Goal on Adaptation (GGA)** adopted at COP28 reflected growing recognition that the climate crisis is a health crisis – and included a dedicated health target on achieving resilience against climate-related health impacts, especially among the most vulnerable communities. In response, **we advocated for the development and adoption of specific health metrics related to climate-sensitive diseases as part of the GGA,** highlighting the need for increased investment and improved global policies to facilitate biomedical innovation and equitable access to new and existing health technologies.

At the inaugural **Africa Climate Summit** organized by the African Union in Nairobi in September 2023, **DNDi appealed for new partnerships in medical innovation to be placed at the core of climate change adaptation strategies on the continent.** And in the run-up to and during the WHO Executive Board meeting in January 2024, DNDi again spotlighted the impact of climate change on vulnerable populations, calling for concerted action to tackle climate-sensitive infectious diseases with improved health tools developed alongside affected communities and made accessible to all.

Reducing our own environmental impact

In partnership with the Climate Action Accelerator, we completed work in 2023 to assess DNDi's baseline carbon emissions and develop specific, measurable steps to reduce the environmental impact of our operations and activities. Published in 2023, **the DNDi Climate and Environmental Roadmap represents a major step forward in our environmental efforts and pledge to cut our carbon emissions in half by 2030.** Making key commitments across our R&D and treatment access activities, travel, energy, offices, procurement, and people, the roadmap also aims to catalyze collective efforts with partners and suppliers to find emission-reduction solutions in pharmaceutical R&D.

Preparing for future pandemics

Driving research and advocacy for the benefit of all

The World Health Organization (WHO) declared an end to the emergency phase of the COVID-19 pandemic in May 2023. And although the virus continues to circulate – along with painful memories of the devastation and disruption the pandemic delivered at its peak – attention has turned to preparing for the next crisis.

When the next pandemic hits, will the world have the testing, treatment, and vaccine solutions it needs to respond? Will the poorest and most vulnerable communities have access, too? We're working with our partners to help make sure that the answer to both questions is yes.

Leveraging our two decades of experience driving not-for-profit R&D for the most neglected, our teams and partners continued work in 2023 to help operationalize equity in pandemic preparedness and response – both through efforts to discover new, 'fit-for-future' drugs against pandemic-prone viruses and by advocating for the shared commitments needed to ensure all people have access to the life-saving medical tools they need.

Fit-for-future drug discovery

In the complex field of drug discovery for diseases of pandemic potential, our teams and partners are united by a common goal: placing on humanity's shelf a collection of potential broad-spectrum antiviral drugs that will be ready for scale-up manufacturing and clinical evaluation when the next pandemic strikes, and which could be developed quickly into affordable, globally accessible treatments. **We worked with a wide range of research partners around the globe in 2023, utilizing AI, open science, and cutting-edge discovery tools to advance our efforts.**

Together with Diamond Lightsource, Stanford University, PostEra, MedChemica, and the Memorial Sloan Kettering Cancer Center, DNDi is a leading partner of the **AViDD ASAP Consortium.** Since 2022, international scientists in the Consortium have applied X-ray fragment screening supported by machine learning to identify new inhibitors of key viral proteins, including SARS, MERS, dengue, and Zika. Several promising compounds have already advanced to the lead optimization phase. The ASAP consortium exhaustively shares protocols, results, and structure information, as well as regular updates on the project progress, via an extensive, free-to-access web platform. Its extraordinary commitment to data sharing earned it the 2023 DataWorks! Prize from the US National Institutes of Health and Federation of American Societies for Experimental Biology.

With partners in the **COVID Moonshot,** the ASAP project's predecessor, we continued work in 2023 to optimize an antiviral discovered by Moonshot – DNDi-6510 – that has shown excellent safety and *in vivo* efficacy in pre-clinical models. The success and unique features of the partnership are also attracting attention: with over 27,000 downloads, our article published in *Science Magazine* in November detailed the powerful roles that open science and crowdsourcing at a massive scale played in identifying DNDI-6510 – and how our approach could be emulated in future pandemics to rapidly deliver affordable, 'straight-to-generic' drugs.

In India, **our teams continued work on broad-spectrum antivirals with SVKM's NMIMS and the Indian Institute of Technology,** which led to identifying novel analogue compounds with improved microsomal clearance. We also enhanced our understanding of antiviral structure activity relationships for host-targeting antivirals, comprised of new derivatives showing potent antiviral activity against a broad range of viruses, including SARS-CoV-2, influenza, and dengue.

Our collaboration with the **Nucleoside Booster** – a network of German high-security laboratories and university research centres led by Heidelberg University Hospital – also yielded significant results. After screening 128 compounds against some of the most dangerous pathogens known to exist, partners have identified four nucleosides with broad-spectrum antiviral activity and 19 with narrow-spectrum activities.

Researchers conduct laboratory assessments at the Kenyatta University Teaching and Referral Hospital in Nairobi, Kenya – one of 17 African research sites that participated in DNDi's COVID-19 clinical trial.

Getting it right the next time

At the start of the COVID-19 pandemic, world leaders projected confidence that the global response would be an exercise in solidarity – that we could overcome national self-interest and make our shared protection from the virus our prerogative. While international collaboration saw the development of life-saving tests, treatments, and vaccines at record speed, the glimmers of unity faded quickly thereafter. People in lower-income countries were unable to secure access to the medical tools they needed, especially vaccines, resulting in preventable suffering and death from COVID-19 and countless other illnesses for which access to medical services and essential tools was widely curtailed.

The barriers to access and affordability that surfaced for COVID-19 health tools were acute examples of the chronic failures DNDi and our partners have worked to overcome for more than two decades.

In 2023, we continued speaking out for change that we know from our experience can help shift the status quo. Our peer-reviewed paper **'Striking fair deals for equitable access to medicines'*** detailed examples of the gold-standard access clauses DNDi builds into our collaboration and licensing agreements with public and private partners. They enable us to ensure equitable and affordable access to the treatments we develop and can serve as a model that other stakeholders, including public and philanthropic R&D funders, can replicate to do the same.

We continued sharing our experience and well-tested strategies like these with decision-makers throughout 2023 – with a primary focus on the WHO pandemic agreement under negotiation among WHO Member States since 2022. Had more public funders put explicit access provisions in place in the early days of the pandemic, people in low- and middle-income countries would have had far greater access to the vaccines they needed – far faster.

As a public return on their public investments, governments have the power and leverage to achieve greater equity in access to life-saving medical tools. Although WHO Member States were unable to finalize negotiations by June 2024 as initially targeted, we are as certain as ever that the world needs a robust pandemic agreement. DNDi will continue to advocate for its successful completion – and for the inclusion of binding obligations that ensure fairness and equity for all people.

*Available at: dndi.org/fairdeals

DNDi worldwide

Putting patients first through partnerships that span the globe

Fostering inclusive and sustainable solutions

While a wide range of strategic alliances power our progress, DNDi's partnerships with public health and scientific experts in countries most affected by neglected diseases contribute in unique and vital ways to fostering new innovation ecosystems centred on patients' needs.

Through disease-specific research networks established by DNDi and partners in Africa, Asia, and Latin America, hundreds of medical, science, and civil society actors are working together to consolidate and strengthen R&D capacity and clinical trials expertise, promote scientific exchange, facilitate access to and uptake of new treatments, and advocate for an enabling policy and regulatory environment to meet the needs of the most neglected.

In 2023, DNDi teams and research networks trained nearly 700 individual health workers, researchers, and community leaders in clinical trials, treatment guidelines, advocacy, and community health.

Learn more:
dndi.org/global-networks

225

R&D and access partners in 47 countries

68

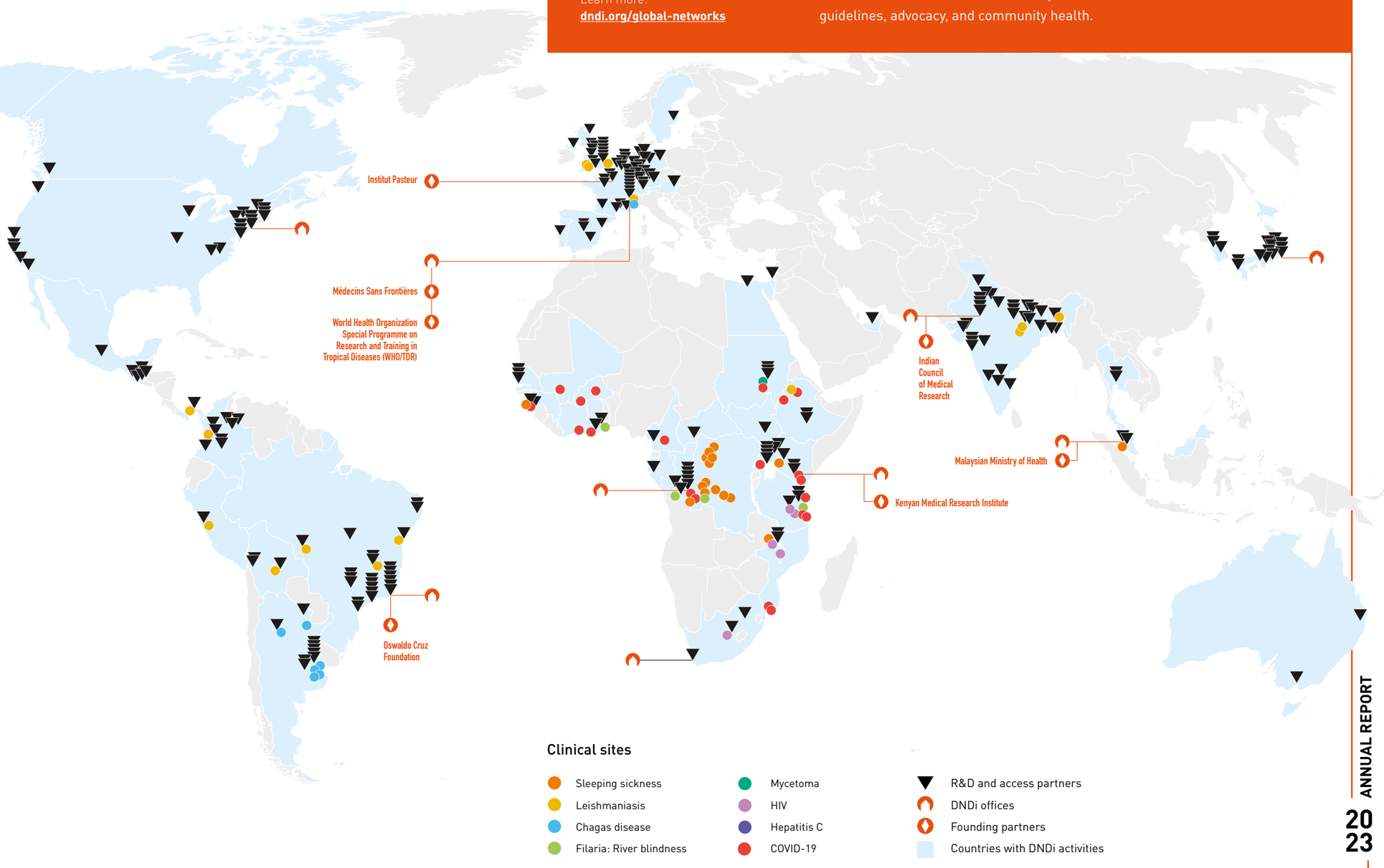
clinical sites in 25 countries, active in 8 disease areas

9

offices on 5 continents

7

founding partners



DNDi R&D PORTFOLIO (December 2023)

Acting as a 'conductor of a virtual orchestra', we collaborate with research partners around the world at all stages of the R&D process. Our R&D portfolio includes 9 disease areas and 45 projects, 20 of which are focused on identifying or developing new chemical entities.

	DISCOVERY			TRANSLATION			DEVELOPMENT		IMPLEMENTATION
	SCREEN	HIT-TO-LEAD	LEAD OPTIMIZATION	PRE-CLINICAL	PHASE I	PHASE IIa/ PROOF-OF-CONCEPT	PHASE IIb/III	REGISTRATION	TREATMENT ACCESS
SLEEPING SICKNESS							Acoziborole ⊕		Fexinidazole for *T.b. gambiense** ⊕
									Fexinidazole for *T.b. rhodesiense** ⊕
									Nifurtimox-eflornithine combination therapy (NECT)*
LEISHMANIASIS	Screening		S07 series ⊕	DNDI-6174 ⊕	DNDI-6148 ⊕	LXE408 Novartis for VL ⊕	Miltefosine + thermotherapy for CL	Miltefosine + paromomycin for VL (Africa)	SSG&PM (East Africa)*
					DNDI-0690 ⊕				New VL treatments (South Asia)*
					DNDI-6899 (GSK899 DDD853651) ⊕		LAmB +/- miltefosine for PKDL (Asia)	Miltefosine + paromomycin or LAmB for PKDL (Sudan)	New treatments for VL/HIV*
									New VL treatments (Latin America)
					CpG-D35 (DNDI-2319) ⊕				
					GSK245 (DDD1305143) ⊕				
CHAGAS DISEASE	Screening ★	Hit-to-lead	UW series ⊕	Biomarkers	DNDI-6148 ⊕		New benznidazole regimens		Benznidazole paediatric dosage forms*
FILARIA: RIVER BLINDNESS				DNDI-6166 (CC6166) ⊕		Emodepside ⊕			
						Oxfendazole ⊕			
MYCETOMA								Fosravuconazole ★	New treatments for mycetoma
DENGUE				Pre-clinical profiling					
HIV						SR 5FC (cryptococcal meningitis)			Super-booster for children with HIV/TB*
									4-in-1 (ABC/3TC/LPV/r)* and other DAAs
									5FC, LAmB access (cryptococcal meningitis)
									2-in-1 LPV/r pellets
HEPATITIS C									Ravidasvir* and other DAAs ⊕
COVID-19 AND PANDEMIC PREPAREDNESS	Nucleoside Booster		TMEM16 series ⊕				ANTICOV		
			Moonshot ⊕						
			AViDD ASAP ⊕						
MALARIA »									Fixed-dose combination ASMQ*
									Fixed-dose combination ASAQ*

Opportunity assessment

In addition to implementing projects in our R&D portfolio in 2023, DNDi:

- Advanced our feasibility assessment of partnering in the field of **schistosomiasis,** with a focus on antiparasitic treatments complementary to praziquantel and tools for morbidity management of female genital schistosomiasis;
- Advanced our feasibility assessment of partnering to develop a treatment for **symptomatic rabies,** including review of additional pre-clinical data; and
- Welcomed WHO's publication of the first target product profiles for animal plasma-derived antivenoms for **snakebite envenoming** (SBE), developed in collaboration with DNDi, while continuing negotiations on collaborations to develop and promote access to promising small-molecule treatments for SBE.

» Implementation transferred to the Medicines for Malaria Venture in 2015

▶ Treatments not delivered by DNDi, but DNDi working on access

⊕ New chemical entity (NCE) or NCE-enabling project

* Treatments delivered by DNDi with partners

★ 2023 DNDi Project of the Year

FACTS

1.5 million people with moderate to high risk of being infected

80% of reported cases in the last 10 years were in the DRC

97% reduction in reported cases in the last 25 years

SLEEPING SICKNESS

Delivering all-new treatments to eliminate a deadly disease

Sleeping sickness – or human African trypanosomiasis (HAT) – is caused by a parasite spread by the bite of the tsetse fly. It can result in severe neuropsychiatric symptoms and is almost always fatal if left untreated. Until 2008, the most widely available treatment for advanced sleeping sickness was melarsoprol, an arsenic-derivative drug so toxic it killed 1 in 20 patients.

The push for progress

DNDi and partners have revolutionized the treatment of sleeping sickness since our founding in 2003. In 2009, working closely with Epicentre, Médecins Sans Frontières (MSF), Swiss Tropical and Public Health Institute, and the national HAT control programmes of the Democratic Republic of the Congo (DRC) and Republic of the Congo, we completed the development of nifurtimox and eflornithine combined treatment (NECT), a safer treatment for the advanced stage of the most common form of the disease, caused by *T.b. gambiense*. In 2018, DNDi, Sanofi, and partners delivered fexinidazole, a paradigm-changing all-oral treatment for both stages of *T.b. gambiense* sleeping sickness. In a further success for DNDi and partners, the treatment's indication is now being expanded to include the less common but more acute form of the disease caused by *T.b. rhodesiense*. Fexinidazole is donated to the World Health Organization (WHO) by Sanofi's Foundation S for distribution to all national sleeping sickness control programmes.

Thanks to the HAT Platform, a DNDi-supported network of 120 experts from over 20 research institutions and programmes in affected countries, research efforts have been actively coordinated and new treatments evaluated, registered, and made accessible to patients across affected countries. We also coordinated the HAT-r-ACC consortium, which brought together a broad range of partners with research, training, and community engagement expertise in remote settings in Uganda and Malawi – where *T.b. rhodesiense* sleeping sickness is endemic.

Our goal is now to finalize the development of an all-new, single-dose oral drug, acoziborole, that can be given at the point of care in primary healthcare settings. If successful, the treatment would provide a powerful boost to efforts to achieve the WHO target of sustainably eliminating sleeping sickness as a public health problem. Until acoziborole is registered, we continue to promote access to fexinidazole for both forms of sleeping sickness by supporting national control programmes and strengthening pharmacovigilance systems in endemic countries.

Fexinidazole: extending use against the most lethal form of the disease

Following the completion of successful Phase II/III trials with our partners in Malawi and Uganda, the European Medicines Agency adopted a positive opinion in December 2023 extending fexinidazole's indication for the treatment of *T.b. rhodesiense* sleeping sickness. The opinion paves the way for the update of WHO treatment guidelines, approvals for use in endemic countries, and discontinuation of toxic melarsoprol as a first-line treatment option – an extraordinary leap forward for patients. Safer, simpler treatments are also a critical pillar of 'One Health' strategies for the control of *T.b. rhodesiense* sleeping sickness and response to future outbreaks that could result from the wide range of domestic and wildlife species that act as reservoirs for this form of disease.

"*T.b. rhodesiense* sleeping sickness is a terrifying disease, killing quickly if untreated. A simpler, safer oral treatment will help us save many lives.

Dr Westain Nyirenda is the principal investigator for DNDi and partners' clinical trial that tested fexinidazole for the most severe form of sleeping sickness at Rumphi Hospital in northern Malawi. Here, he consults with **Matrida,** a mother and sleeping sickness survivor who was cured with the new treatment.

In 2023, through the HAT Platform, we supported endemic countries by facilitating fexinidazole pharmacovigilance activities and training healthcare workers on updated treatment guidelines. Together with the HAT-r-ACC consortium, we also supported the national sleeping sickness control programmes in Malawi and Uganda to raise awareness of *T.b. rhodesiense* sleeping sickness among affected communities so that new cases can be quickly identified and treated.

Acoziborole: pursuing the promise of sustainable elimination

DNDi and partners have collaborated on the development of acoziborole since 2009, following the earlier identification of a related compound in the Anacor Pharmaceuticals chemical library. In 2020, we joined with our industrial partner, Sanofi, to continue development of the new drug. Our teams and partners completed a pivotal clinical trial demonstrating the safety and efficacy of acoziborole in 2022. A further trial testing for safety in individuals who are parasitologically unconfirmed but serologically reactive for sleeping sickness was completed in 2023, with 1,208 participants treated with acoziborole or placebo. Results expected in 2024 will complement the evidence needed to roll out simplified 'screen and treat' approaches that do not require complex laboratory testing.

Prioritizing young children's needs

Current treatments for children with *T.b. gambiense* sleeping sickness who are less than six years old or under 20 kilograms still require painful diagnostic lumbar punctures and drugs administered through intravenous infusion, requiring hospitalization or injection. DNDi is working with African and European experts in the ACOZI-KIDS consortium on a clinical trial of single-dose acoziborole to make treatment for children with sleeping sickness much simpler – and less painful.

Among participants who have completed their 12-month follow-up visit in the ongoing trial, all children were cured, no safety concerns were noted, and no relapses were observed. Trial recruitment will continue in the DRC and Guinea in 2024.

FACTS

Over 600 million people at risk of VL worldwide

Over 600 thousand new cases of CL every year

About 50% of people with VL are children

LEISHMANIASIS

Delivering safer, simpler treatments to save lives and reduce social stigma

Caused by parasites transmitted through the bite of a sandfly, leishmaniasis has strong links to poverty, taking its heaviest toll on people affected by malnutrition, poor housing, and displacement.

Visceral leishmaniasis (VL) – also known as kala-azar – is the second deadliest parasitic disease after malaria and causes fever, weight loss, spleen and liver enlargement, and, if not treated, death. Cutaneous leishmaniasis (CL) leaves lifelong scars, including on the face, causing social stigma, particularly for women and children. Leishmaniasis treatment depends on several factors including the form of the disease, parasite species, and geographic location. For decades, treatments have required long hospital stays and painful injections of toxic antimonial drugs, such as sodium stibogluconate.

The push for progress

With our partners, DNDi has to date delivered four improved VL treatments that have replaced more toxic treatments requiring long hospitalization. Through our long-term strategy, we have replenished the R&D pipeline with an unprecedented portfolio of all-new potential drugs that could revolutionize treatment and accelerate progress towards global elimination goals. The Leishmaniasis East Africa Platform (LEAP), founded by DNDi in 2003, includes 60 experts from 20 institutions who have helped drive progress against the disease in Kenya, Ethiopia, Uganda, and Sudan. In 2014, we established redeLEISH, a network of CL experts working across 90 institutions in 28 countries to share know-how and to design and conduct vital clinical research.

Our goal is now **to achieve our final short-term ambitions in delivering safer, shorter treatments with existing drugs, while completing the longer-term development of all-new drugs to save lives, reduce social stigma, and eliminate leishmaniasis as a public health problem.**

An improved standard of care for children and adults in Eastern Africa

Safer, simpler alternatives to the current standard treatment for VL in Eastern Africa are urgently needed – especially for children, who comprise up to 70% of cases. DNDi partnered with the AfriKADIA consortium to launch a Phase III study in Ethiopia, Kenya, Sudan, and Uganda in 2018 to compare the combination of miltefosine and paromomycin (MF+PM) against the current standard treatment, sodium stibogluconate and paromomycin (SSG+PM). Results published in 2022 showed that MF+PM was as effective as SSG+PM but with fewer injections, a shorter treatment duration, no risk of SSG-related toxicity, and a decreased risk of subsequent post-kala-azar dermal leishmaniasis (PKDL).

Ensuring adequate paediatric exposure to MF+PM is crucial for combatting VL in the region and providing better care to the most vulnerable. In September 2023, the results of DNDi and partners' follow-on population pharmacokinetics study published in the *Journal of Antimicrobial Therapy* confirmed that exposure levels of MF and PM were within the desired parameters in both patients ⩽12 years old and patients >12 years old, supporting implementation of the shorter 14-day regimen in both paediatric and adult patients.

DNDi disseminated the trial results to experts at the 7th World Congress on Leishmaniasis and 28th LEAP Platform meeting, as well as to leishmaniasis technical and advisory groups in the region and communities where the studies were conducted. At the same time, the WHO Guideline Development Group began reviewing the evidence generated in DNDi's Phase III trial to inform revised treatment guidelines for adults and children with VL in Eastern Africa.

PKDL: Breaking the cycle of infection

PKDL is a complication of VL that appears as a rash or skin condition months or years after successful VL treatment. Although it is not deadly, it can be highly stigmatizing. Because PKDL can act as a reservoir for VL infection, early and effective PKDL treatment is critical to achieving sustained reductions in VL transmission.

DNDi completed two Phase II studies in 2021, one testing liposomal amphotericin B (LAmB)+MF and MF+PM in Sudan, and one testing LAmB monotherapy and LAmB+MF in India and Bangladesh. Findings from the Phase II trial in Sudan were published in the journal *PLOS Neglected Tropical Diseases* in November 2023, and findings from the Phase II trial in South Asia were published in the same journal in June 2024. With both trials bringing evidence for shorter, safer treatments to replace the current 60- to 90-day antimonial treatment in Sudan and 12-week miltefosine monotherapy treatment in South Asia, it is expected these alternative therapies will be recommended for patients with PKDL.

“She was so young back then. If there was a simpler treatment instead of injections, that would have made the experience much better – but I know that day is coming.

Selena (right) chats with her daughter, **Tegla,** and grandchildren at their home in the village of Lopedot in Amudat District, Uganda. Tegla was diagnosed with visceral leishmaniasis at a very young age. After unsuccessful treatment, Selena took Tegla to Amudat Hospital, where she received the right medication and was cured. Selena hopes that treatment will become easier – especially for children.

Pursuing the promise of all-new, all-oral drugs

By delivering safer, shorter treatments utilizing existing drugs, DNDi and our partners have helped equip doctors and patients with life-saving alternatives to decades-old toxic antimonials. Together with vector control and other community health efforts spearheaded by health authorities, the improved treatments have contributed to the tremendous strides made by countries in South Asia towards the elimination of leishmaniasis as a public health problem. **But continued innovation remains critical** (see page 10). **New drugs and drug combinations are needed to sustain elimination in South Asia and achieve it in eastern Africa** – and will also be essential to countering future outbreaks, and fully meeting the needs of patients with VL, PKDL, and VL/HIV coinfection.

DNDi has been working on developing all-new, all-oral treatments for leishmaniasis since our founding in 2003. Together with our partners, we have screened hundreds of thousands of compounds, evaluated promising leads, and optimized these into promising drug candidates that can enter the drug development process.

In 2023, our teams and partners made significant advances in the development of new molecular entities that have the potential to revolutionize leishmaniasis treatment and support elimination of the disease as a public health problem.

DNDi is collaborating with Novartis on the joint development of LXE408, a first-in-class compound. Following results from a Novartis Phase I study completed in 2021 that showed good tolerability and exposure, the compound progressed to a Phase II study in India in late 2022. A second site for the study in India was initiated in August 2023, with 39 patients enrolled by the end of the year. In parallel, institutional ethics committee and regulatory approvals were obtained for a similar Phase II study in Ethiopia, with the first patient enrolled in April 2024. A total of 140 participants are expected to be enrolled across the two studies by 2025.

With a similar mode of action to LXE408, the compound GSK245 was developed through a collaboration between DNDi, GSK Global Health Unit, and the Drug Discovery Unit at the University of Dundee. After further investigations into the pharmacokinetics of the compound were completed, the development of GSK245 continued in 2023 with the completion of a Phase I single ascending dose study in healthy volunteers sponsored by GSK.

Following a scientific meeting with the UK Medicines and Healthcare Products Regulatory Agency in early 2023, DNDi and partners also resumed development of DNDI-6899 because of its unique mode of action demonstrated by the University of Dundee. The active pharmaceutical ingredient stored at WuXi AppTech was successfully reprocessed and formulated to support the initiation of a Phase I multiple ascending dose study in 2024.

DNDI-6174 presents a new mode of action among compounds in DNDi's leishmaniasis portfolio, as well as a predicted low human dose and a promising safety margin. Collaborating on the development of DNDI-6174 since its nomination as a drug candidate in 2019, DNDi and Eisai Co., Ltd. worked in 2023 to extend our knowledge of the compound's non-clinical profile with the goal of progressing to a first-in-human clinical trial. The outcomes of DNDi's previous work together with GSK and the University of Dundee on the discovery of DNDI-6174 that led to its nomination as a drug candidate for VL were published in *Science Translational Medicine* in December 2023.

The development of DNDI-6148 and DNDI-0690 remained on hold in 2023 in favour of the other promising compounds above.

CUTANEOUS LEISHMANIASIS

> **There was one time they applied the injection right in the wound. And it hurts a lot.**

Jorge is a fruit farmer living with cutaneous leishmaniasis near Santa Fe de Antioquia, Colombia. He struggles to access medical care, living outside of a major urban area, and has to travel long distances to reach his treatment centre.

Shorter, safer, more effective treatments to replace toxic antimonials

For nearly 70 years, treatments for cutaneous leishmaniasis (CL) have been costly and have often required weeks of painful injections of toxic antimonials. In 2019, DNDi conducted a Phase II study showing that a combination of thermotherapy – where heat is applied to a person's lesions – and a short course of miltefosine yielded better outcomes than thermotherapy alone in treating uncomplicated CL in the Americas.

Based on results from our Phase II study, we initiated a Phase III study at four sites in Brazil, Panama, and Peru in 2021, and at a fifth site in Bolivia in 2022. The last patient visit in the trial was completed in January 2024 – with a total of 182 patients enrolled across the treatment arms. Final study results are expected in late 2024.

Stimulating the immune system's response to fight infection

Leishmania parasites can persist in human cells by evading or exploiting immune mechanisms. Together with our partners Ajinomoto Bio-Pharma Services (GeneDesign, Inc.) and the University of Tokyo, our teams are developing CpG-D35 (DNDI-2319) as a therapeutic 'booster' to promote the immune system's response against the parasitic infection that causes CL and improve the efficacy of existing drugs. DNDi is also exploring CpG-D35 for the important role it could play in preventing PKDL following VL infection.

DNDi completed a Phase I single ascending dose study in 2021. Results analysed in 2022 showed CpG-D35 to be safe and well tolerated after a single subcutaneous dose and supported advancement to a Phase I multiple ascending dose study in patients with uncomplicated CL, now underway in Colombia. Anticipating CpG-D35 use under real-life conditions, a more convenient, field-adapted lyophilized formulation of CpG-D35 was developed. Plans to assess this formulation in a Phase I multiple ascending dose study are ongoing.

FACTS

>6 million
people living with
Chagas worldwide

About
35%
experience
cardiac or other
organ damage

The disease
is endemic in 21
countries
in the Americas

CHAGAS DISEASE

Searching for shorter, safer, more effective treatments to stop a silent killer

Chagas disease, also known as American trypanosomiasis, is a life-threatening disease caused by the *T. cruzi* parasite, which is spread mainly by the bite of the 'kissing bug'. In Latin America, it causes more deaths than any other parasitic disease. Although Chagas can go unnoticed for years, it can eventually cause irreversible damage to the heart and other vital organs. An estimated 70 million people are at risk, and only 10% of people living with the infection are diagnosed. Current treatments for the disease were discovered over 50 years ago, must be taken for at least eight weeks, and sometimes have serious side effects. Human migration is expanding the distribution of Chagas, mainly in the Americas and Europe, and vector-borne transmission is increasing in new geographies due to climate change and deforestation.

The push for progress

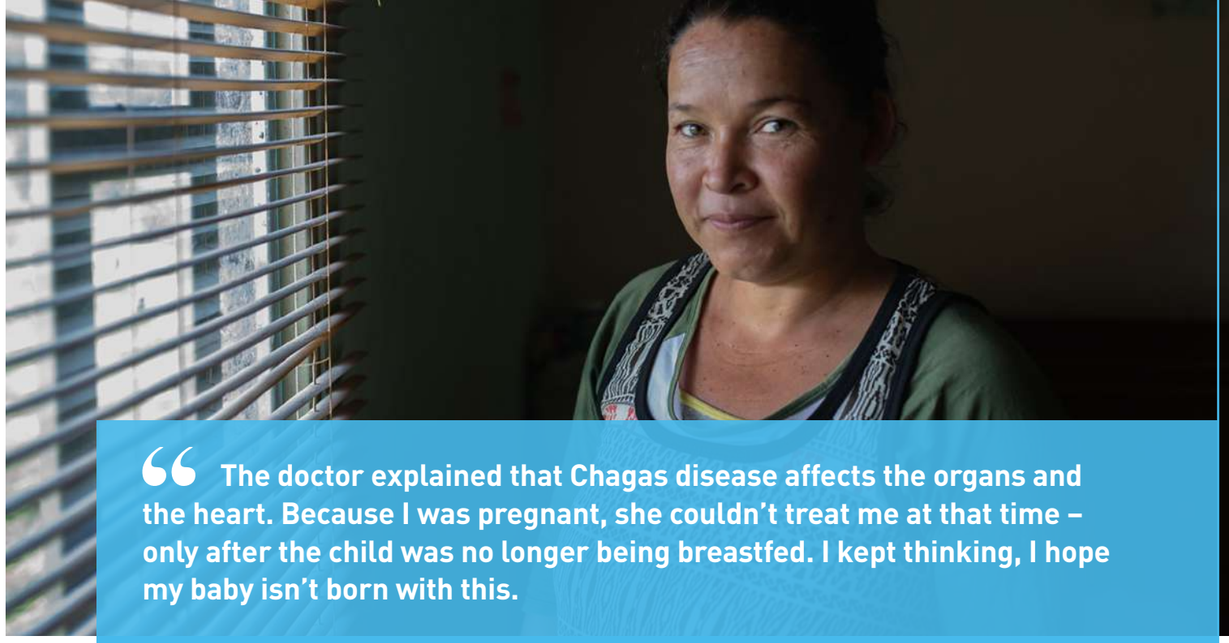
Together with our partners, DNDi delivered the first formulation of the drug benznidazole for infants and children with Chagas in 2011 and later piloted a simplified model of care for adults and children, promoting 'test-and-treat' approaches in Colombia, Guatemala, and Argentina. In 2009, we established the Chagas Clinical Research Platform, now a network of over 500 members from more than 120 institutions in 24 countries working to address research gaps, coordinate the response, promote scientific exchange, and advocate for access to diagnosis and treatment with and for people most at risk.

Our goal is now **to improve current treatments in the near term by developing a safer, shorter treatment with benznidazole. We aim to help limit mother-to-child transmission through targeted treatment of women of childbearing potential and help strengthen access to prompt diagnosis and treatment of newborns, for whom early treatment with existing medicines is highly efficacious.** Our teams are also working to reach more people living with Chagas disease in remote areas in Latin America by simplifying diagnosis, treatment, and tests of cure. Looking to the longer term, we are working to discover and develop entirely new medicines – with the aim of launching at least one Phase III trial by 2028.

Delivering safer, shorter treatments

Alongside our focus on accelerating access to testing and treatment with partners in Latin America, our teams have continued work to develop improved treatment regimens based on existing drugs for Chagas. Together with partners including the Fundación Mundo Sano and Laboratorio Elea Phoenix, DNDi reinitiated the NuestroBen clinical trial in Argentina, with the first participant in the redesigned trial enrolled in August 2023.

The objective of NuestroBen is to compare the safety and efficacy of shorter benznidazole regimens for the treatment of chronic Chagas disease of indeterminate form or with mild cardiac progression – with shorter treatment durations potentially maintaining efficacy while minimizing side effects and encouraging adherence. The redesigned study protocol allows results to be compared across NuestroBen and Benlatino, a similar trial led by the Oswaldo Cruz Foundation that will take place in Colombia and Bolivia. By the end of 2023, four study sites were opened in Buenos Aires and northern Argentina, with a total of 300 participants expected to be recruited by the first quarter of 2025. The Chagas Clinical Research Platform played an active role in the design of both trials, ensuring that results can be harmonized to deliver robust scientific evidence for safer, shorter benznidazole treatment regimens in Latin America.



“ The doctor explained that Chagas disease affects the organs and the heart. Because I was pregnant, she couldn't treat me at that time – only after the child was no longer being breastfed. I kept thinking, I hope my baby isn't born with this.

Sara lives in Colombia with her husband and three children. She remembers playing with kissing bugs in bottles when she was little. When she was diagnosed, she realized that she must have had Chagas for a long time.

Advancing towards a test of cure and disease progression

A major challenge for test-and-treat strategies – and the development of new treatments for Chagas disease – is the lack of analytical tools suitable for monitoring disease progression and response to treatment at the point of care. Working with InfYnity Biomarkers, we are now at an advanced stage of developing and testing the MultiCruzi assay as a simple test of cure with potential for use in decentralized healthcare settings. In 2023, analysis of samples from two clinical trials using MultiCruzi showed promising results, allowing for adequate measurement of reductions in serum antibody levels – an indicator of parasitological cure.

Tackling the urgent need for innovation

New drugs that can cure Chagas disease and prevent the development of life-threatening complications are urgently needed. In 2023, DNDi and partners advanced drug discovery projects aimed at identifying and developing all-new treatments suitable for children and women of childbearing potential.

Working with the University of Washington (UW), University of Dundee Drug Discovery Unit, and GSK, DNDi continued to optimize a new generation of *T. cruzi* inhibitors in the UW series of compounds. First identified at the UW, the novel mode of action and promising efficacy profile of leads from the series suggest the possibility of providing a single-compound cure for Chagas disease.

Earning recognition as DNDi's 2023 Project of the Year in pre-clinical research, collaborations to identify new hit series from new collections of compounds from both natural and synthetic origins advanced with support from partners including Institut Pasteur Korea, Nagasaki University, Swiss Tropical and Public Health Institute, and University of Dundee. In parallel, several promising compounds identified in previous years entered hit-to-lead projects in 2023, and ongoing hit-to-lead projects continued to progress with support from partners including Mitsubishi Tanabe Pharma Corporation, with at least two chemical series with advanced leads showing promising efficacy in translational models.

FACTS

19 million people living with river blindness

240 million people at risk of being infected

97% of people with river blindness experience vision loss

FILARIA: RIVER BLINDNESS

Searching for a cure for millions at risk

Filarial diseases are a debilitating group of diseases caused by parasitic worms transmitted by the bite of blood-feeding insects. **People with river blindness (also known as onchocerciasis) are infected by the bites of blackflies that breed in fast-flowing rivers. The flies transmit worms that can cause severe itching and disfiguring skin lesions. If the worms migrate to the eyes, they can cause permanent blindness. There is no cure.**

Current strategies that aim to control the spread of the disease through mass administration of the drug ivermectin are resource-intensive and only partially effective. Ivermectin kills juvenile worms, but not adult worms that can live for more than 10 years in the human body. As a result, the drug must be administered every year, and large numbers of people go untreated, including young children, pregnant women, and those living in remote and insecure areas. Due to a risk of serious side effects, it also cannot be used in areas of West and Central Africa where another disease – loiasis, or African eye worm – is endemic.

New tools that can permanently sterilize or kill the adult worms that cause river blindness are urgently needed to treat patients who develop chronic symptoms, break the cycle of transmission, and make sustainable elimination possible.

The push for progress

In 2019, DNDi joined forces with the Swiss Tropical and Public Health Institute (Swiss TPH)-coordinated Helminth Elimination Platform (HELP), a consortium of research institutes, universities, NGOs, and pharmaceutical companies committed to developing new treatments for infections caused by parasitic worms. In 2023, we kicked off our collaboration with eWHORM, a partnership coordinated by the University Hospital Bonn, Germany, that aims to develop and test safer and more effective treatments for filarial and other helminth diseases.

Our goal is now **to continue our work with partners to raise the profile of helminth diseases and advance the development of new drug candidates that can treat not only river blindness but also a range of helminth diseases.**

Potential cures in clinical trials

Emodepside originated at Japanese pharmaceutical company Astellas Pharma Inc. and was commercialized as a veterinary anti-helminthic. In collaboration with Bayer AG, DNDi is evaluating emodepside as a potential anti-parasitic macrofilaricidal treatment for river blindness in humans. If proven safe and effective, emodepside will eliminate not only juvenile worms but also adult worms responsible for river blindness and other diseases caused by nematodes. The Phase II trial of the drug was completed in April 2023 at study sites in Ghana, with partners KCCR and KNUST, and the Democratic Republic of the Congo (DRC), in partnership with the national

“ I depend totally on my wife. She feeds and dresses me, and she also doesn’t have a job. After I lost my sight, we couldn’t send any of our children to school.

Akoyo, from the Democratic Republic of the Congo, used to be a fisherman. After contracting river blindness, he started having difficulties seeing and lost his sight completely the following year. His son Aito also has the disease and had to leave school to help take care of his father.

treatment programme. Initial findings are expected to be released in late 2024. Recent Phase II trials conducted separately by partner Swiss TPH have demonstrated emodepside’s notable efficacy against *Trichuris trichiura* and hookworm infections, positioning it as a promising candidate for pan-nematode treatment.

Oxfendazole was identified in 2016 as a potential treatment for river blindness capable of eliminating adult worms. Based on encouraging pre-clinical data, DNDi and our partners in the HELP Consortium – and now those in eWHORM – are moving forward with the pharmaceutical development of the compound. To evaluate the bioavailability of oxfendazole in humans, Ifakara Health Institute, Swiss TPH, and other HELP Consortium partners concluded a Phase I clinical trial in Tanzania in 2023, opening the path to the next stage of clinical development. In 2023, the eWHORM partnership began designing a Phase II proof-of-concept adaptive basket trial for oxfendazole, targeting river blindness, loiasis, mansonellosis, and trichuriasis. This innovative trial design aims to expedite drug development, improve trial efficiency, optimize resource utilization, and ultimately enable swifter access to improved treatments for patients.

Although DNDi’s Phase II proof-of-concept trial of flubentylosin showed it to be well tolerated in all patients, development was halted in 2023 after trial results showed a lack of efficacy. Investments into the research capacity of the two upgraded sites in the DRC used to implement the trial will continue to be harnessed for further studies of treatments for river blindness and other filarial diseases.

Advancing pre-clinical research

To help meet the critical need to have back-up compounds in the pipeline that could enter future clinical trials, pre-clinical development continued in 2023 for DNDI-6166 (formerly CC6166), a potential treatment for river blindness first identified in 2016 through active screening of drug libraries and lead optimization conducted by DNDi in partnership with Celgene (now part of Bristol-Myers Squibb). Progress has included the optimization of a suitable formulation for further development and future Phase I studies.

Meeting the needs of the most neglected

Ivermectin has long been used to prevent river blindness in endemic areas, but young children are excluded from mass drug administration programmes because there is no formulation suited to their unique needs. In 2023, DNDi worked with the WHO Global Accelerator for Paediatric Formulations (GAP-f) – a global network of more than 30 partners working to develop and improve access to appropriate, quality, affordable medicines for children, including exploring strategies for the development of a formulation of ivermectin that can be administered safely to young children.

FACTS

MYCETOMA

Developing safe, affordable treatments to prevent devastating disability

Unknown
burden hinders global response

Often leads to amputation

Occurs most often in the so-called ‘mycetoma belt’ between latitudes 15° S and 30° N

One of the world’s most neglected diseases, mycetoma is a devastating, slow-growing infection that destroys skin, muscle, and bone. Most likely transmitted after a thorn prick or cut allows fungi or bacteria from soil to enter the body, it mainly affects the feet and legs. Mycetoma occurs in multiple countries across the ‘mycetoma belt’, which stretches across five continents between the latitudes of 15° S and 30° N. The fungal version of mycetoma, known as eumycetoma, can cause severe deformities, disability, and mental health issues due to the stigma associated with the chronic, unrelenting course of the disease and lack of effective treatment, which often leads to amputation.

The push for progress

Following advocacy from DNDi and our partners, the World Health Organization (WHO) added mycetoma to its list of neglected tropical diseases (NTDs) in 2016 – an important step in raising awareness of the disease and encouraging investment in research for diagnostics and treatments. In 2017, DNDi partnered with the Mycetoma Research Center (MRC), a WHO collaborating centre in Khartoum, Sudan, and Japanese pharmaceutical company Eisai Co., Ltd., to begin enrolling patients in the first-ever randomized controlled clinical trial for eumycetoma treatment. Completed in 2021, the trial showed that the drugs fosravuconazole and itraconazole are both effective – but much more is needed.

Our goal is now to develop new treatments for mycetoma that can prevent devastating amputation and disability – and ensure access to available treatments for all people in need.

Moving forward with a simpler, more affordable treatment

Initiated by DNDi and partners in 2017, the **first-ever double-blind, randomized clinical trial for fungal mycetoma** tested the efficacy of a weekly dose of fosravuconazole compared with daily itraconazole – the current standard of care – in treating moderate-sized lesions in patients requiring surgery. Results presented at the 13th European Congress on Tropical Medicine and International Health in November 2023 suggested that fosravuconazole 200 mg and itraconazole 400 mg combined with surgery had similar efficacy under clinical trial conditions.
The itraconazole regimen is administered twice daily with food; the fosravuconazole regimen is administered weekly with no food requirement and with limited drug-drug interactions. Long-term follow-up completed in 2023 showed recurrence rates remained low for both regimens. This project was recognized as DNDi’s 2023 Project of the Year in clinical research.

“ I am slowly losing hope for the future that I was looking forward to. What spouse will want a partner who cannot support his family?

Meles, from the Amhara Region of Ethiopia, was first diagnosed with mycetoma when he was seven years old and has lived with the disease for over 20 years. Having undergone eight rounds of surgery on his affected foot over the years, he had to sell his car when he became unable to drive – losing his only source of income.

Expanding access to treatment

DNDi continued moving forward with efforts to support the registration of fosravuconazole in Sudan in 2023 despite ongoing conflict in the country, while also working to expand registration and access to both itraconazole and fosravuconazole in Africa and South Asia. In July 2023, DNDi met with Senegalese health authorities and a multi-disciplinary team working on mycetoma at Cheikh Anta Diop University and Gaston Berger University, as well as with patients and communities in the Louga region of the country. The visit was critical to establishing a common agenda for mycetoma patients in Senegal, including agreeing on the need to incorporate the disease into national NTD control programmes, understand its burden, rapidly increase access to current treatments, and pave the way for new treatments as they become available.

Convening research experts

In June 2023, DNDi organized a meeting of mycetoma clinical experts in Nairobi, including representatives from seven African countries, Europe, India, Japan, and Mexico, to set out a framework for much-needed epidemiological studies to fill knowledge gaps on the burden of mycetoma across multiple continents. The meeting also addressed important aspects of clinical trial design and drug development for new treatments that are not only simpler and more effective, but also suitable for children and women of childbearing potential.

Two meetings with experts in pre-clinical research were held in Geneva in July and Utrecht in November with participants from Belgium, Brazil, Mexico, the Netherlands, Sudan, and Sweden. Participants concluded that mycetoma drug discovery requires the development and validation of new pre-clinical models for eumycetoma.

Identifying new drug candidates: MycetOS

The Mycetoma Open Source project (MycetOS) uses an ‘open source pharma’ approach to discover new treatments targeting *Madurella mycetomatis,* the most common cause of fungal mycetoma. Participating researchers engage through community-driven, in-kind scientific contributions, with all ideas and results published immediately in real time to an open-access database free of intellectual property constraints.

Drug discovery efforts continued throughout 2023 with support from Erasmus MC, University College London, University of Sydney, and the University of Bayreuth. New participants joining the MycetOS community allowed for modelling activities to be incorporated into the collaboration. The project remained focused on finding novel treatments for eumycetoma through compound screening, *in vitro* testing, and translational modelling.

FACTS

3.9 billion people at risk

About 390 million infections per year

Endemic in 129 countries around the world

DENGUE

Leveraging global partnerships to tackle a rapidly spreading climate-sensitive disease

The World Health Organization (WHO) classifies dengue as one of the top 10 threats to global health, yet there is no cure. Caused by a virus that is spread by the bite of the Aedes mosquito, dengue symptoms can include fever, nausea, vomiting, rashes, fatigue, and intense eye, muscle, joint, and bone pain. For some, dengue infection can be severe due to plasma leakage – a serious complication that can result in shock, organ dysfunction, bleeding, and death. Pregnant women, children, the elderly, and people with comorbidities are most at risk.

The most common mosquito-borne viral disease in the world, dengue is spreading rapidly due to climate change, urbanization, and population growth. Now endemic in more than 100 countries from the Americas to Africa to South-East Asia, some estimates suggest 60% of the world's population will be at risk by 2080. Recent dengue outbreaks have been explosive, overwhelming hospitals in many regions. But despite its prevalence and severity, there is no specific treatment or cure for dengue. Medicines that can treat the disease – and prevent mild cases from becoming severe – are urgently needed.

The push for progress

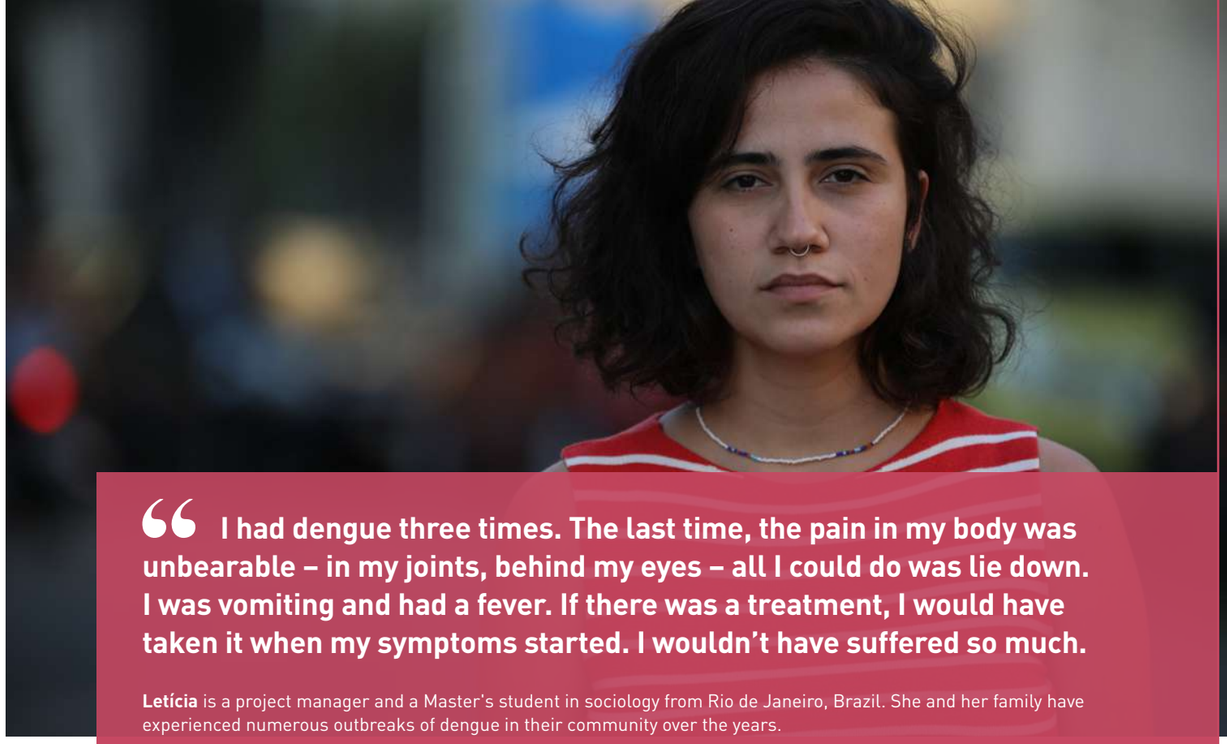
We established the Dengue Alliance, a truly global partnership of leading public health institutes in endemic countries working with industry allies to develop new treatments that are effective against the disease. Our teams and partners are also carrying out much-needed research on the burden of dengue in African countries.

Our goal is now to complement vaccine and vector control strategies by delivering an affordable and accessible dengue treatment solution, completing our assessment of the dengue burden in Africa, and supporting the identification of better diagnostics and biomarkers that can accurately predict progression to severe dengue.

A global partnership led by endemic countries

The Dengue Alliance is a global partnership led by institutions from dengue-endemic countries that aims to develop affordable and accessible treatments for dengue. Members include the Translational Health Science and Technology Institute (THSTI), India; Faculty of Medicine Siriraj Hospital, Mahidol University, Thailand; Ministry of Health, Malaysia; Oswaldo Cruz Foundation (Fiocruz), Brazil; Federal University of Minas Gerais, Brazil; and DNDi.

At meetings of Alliance members hosted by THSTI and Fiocruz in 2023 and the Ministry of Health of Malaysia in early 2024, experts and scientists explored recent progress in pre-clinical profiling, clinical trial design, and identification of biomarkers and better point-of-care diagnostics – and set objectives for the development of an affordable, effective treatment for dengue within the next five years.



"I had dengue three times. The last time, the pain in my body was unbearable – in my joints, behind my eyes – all I could do was lie down. I was vomiting and had a fever. If there was a treatment, I would have taken it when my symptoms started. I wouldn't have suffered so much.

Letícia is a project manager and a Master's student in sociology from Rio de Janeiro, Brazil. She and her family have experienced numerous outbreaks of dengue in their community over the years.

Advancing innovation for millions at risk

Dengue Alliance partners continued to evaluate existing direct-acting antiviral (DAA) compounds in 2023, with prioritized compounds progressing in *in vivo* testing in India and Brazil. The Alliance is also collaborating with researchers at Duke-NUS Medical School, which will conduct pre-clinical evaluation of existing host-directed therapies (HDTs), including a compound identified by BenevolentAI's artificial intelligence-driven drug discovery platform. With the nomination of DAA and HDT candidates expected in 2024, DNDi and partners also advanced preparations for clinical trials and initiated discussions with potential partners on integrating novel DAAs and HDTs into dengue treatment strategies alongside repurposed drugs.

Overcoming knowledge gaps to inform the global response

To help inform strategy and the design of clinical trials, DNDi joined with research partners on three continents in 2023 to initiate observational research studies to investigate disease characteristics and severity as well as healthcare-seeking behaviour in hospitals and outpatient facilities. Study results from Brazil, Burkina Faso, and India will help build evidence of patients' experience of severe complications, knowledge of dengue warning signs, motivations for seeking medical care, and other factors critical to developing treatments adapted to patients' needs.

Although dengue has been reported in 34 African countries, its burden on the continent is unclear and reported case numbers are unlikely to represent true infection rates. New data on the prevalence of dengue in African countries is urgently needed to enable informed decision-making on the cost-effective use of vaccine and vector control strategies and future treatments.

Together with Imperial College London and our research partners in Africa, DNDi neared completion of a first-of-its-kind assessment of the prevalence of dengue in Senegal, the Democratic Republic of the Congo, and Ghana. Known as SERODEN, the retrospective study involves analysing blood samples from previous studies to determine the burden of dengue and several other arboviruses to enable global, regional, and country-level decision-making around prevention, treatment, and control. By December 2023, laboratory analyses of samples from the three countries were completed. The findings and a review of scientific literature from 2014-2023 will be used to generate new data on the global burden of disease, inform dengue strategies, and model their potential impact.

FACTS

1.5 million children are living with HIV

Only 57% of children with HIV are receiving life-saving antiretroviral treatment

630 thousand people die from advanced HIV-related illnesses every year

HIV

Ensuring access to optimal treatment for children and people with advanced HIV disease

Improved access to better antiretroviral treatment (ART) has prevented over 20 million deaths in the past three decades, but not everyone is benefiting equally. **Gaps in treatment access and pharmaceutical R&D continue to claim more than half a million lives every year. Access to treatment among children living with HIV continues to lag behind adults, with barely half receiving life-saving ART. People with advanced HIV disease (AHD) remain extremely vulnerable to opportunistic infections** such as cryptococcal meningitis, which can lead to life-threatening swelling of the membrane surrounding the brain and spinal cord in people with severe immune suppression. The fungal infection is the second leading cause of death among people living with AHD.

The push for progress

Together with our partners, we developed an easy-to-administer fixed-dose formulation of four drugs recommended for children with HIV. The '4-in-1' combination treatment comes in strawberry-flavoured granules that are palatable and can easily be sprinkled on water, milk, or food. Our teams are now working to develop a simpler, sustained-release formulation of flucytosine – a key component of WHO-recommended treatment for cryptococcal meningitis – while working with partners to improve access to life-saving interventions against AHD, including medicines for cryptococcal meningitis that are already available.

Our goal is now **to make sure optimal ART is available to all children who need it and that all people with cryptococcal meningitis are treated promptly and effectively, no matter where they live. Together with partners, we are exploring ways to close access gaps and advance pharmaceutical R&D that will save lives now and in years to come.**

Improving access to child-friendly medicines

In a long overdue 'treatment revolution' for children living with HIV, multiple new child-friendly ART regimens are being introduced in high-burden African countries. Developed in partnership with Cipla and first approved in South Africa in 2022, **the 4-in-1 is now registered as an alternative treatment in six African countries, with Mali, Uganda, Kenya, Mozambique, and the Democratic Republic of the Congo (DRC) adding their approval in 2023.** DNDi continued to support the roll-out of optimal HIV treatments for children throughout the year, with specific projects aimed at boosting access in the DRC, Senegal, and South Africa. This included work to **extend access to HIV services for young children** in two previously underserved provinces of the DRC, achieved in partnership with PNLS, the DRC's national AIDS programme.

Ensuring access to life-saving treatment for people with advanced HIV disease

Over 70% of people who develop cryptococcal meningitis can survive if they receive early treatment, but left undiagnosed and untreated, the disease is usually fatal. Access to diagnostics and medicines – including WHO standard-of-care liposomal amphotericin B (LAmB) and flucytosine – remains a major challenge in sub-Saharan African countries.

In 2023, DNDi and Georgetown University's HIV Policy Lab completed development of the Advanced HIV Disease (AHD) Policy Dashboard, an online resource that maps national guidelines for AHD and cryptococcal meningitis across 35 African countries. The dashboard serves to monitor progress and encourage countries to fast-track the full adoption of life-saving interventions against AHD. It also aims to reduce the time lag between the generation of scientific evidence and policy adoption by national health authorities. The AHD dashboard and an accompanying policy brief were launched at the 22nd International Conference on AIDS and STIs in Africa (ICASA) in December 2023.

DNDi has also continued to work with partners Unitaid, Clinton Health Access Initiative, and St George's, University of London to lower the cost of LAmB in sub-Saharan African countries and to advocate for better access to diagnostics for AHD and cryptococcal meningitis.

Working towards simpler, safer treatments for cryptococcal meningitis

Standard formulations of flucytosine – delivered in four doses per day – are poorly adapted for use in understaffed and overburdened hospitals in resource-constrained settings. For critically ill patients, the drug often needs to be crushed and given by nasogastric tube. DNDi began developing a sustained-release formulation of flucytosine in 2020 together with our partner Mylan Laboratories Limited, India (a Viatris Company).

Aiming to deliver a simpler, easier-to-administer formulation of the drug that is affordable and accessible to more people, the project is also strengthening existing local clinical trial capacities. A Phase I trial at FARMOVS in Bloemfontein, South Africa, was completed in early 2023 and enabled the selection of a sustained-release prototype formulation and dosage for use in Phase II clinical trials set to begin in Tanzania and Malawi in 2024. Training of local healthcare workers on pharmacokinetic sampling processes and other preparatory activities critical to conducting Phase II clinical trials continued in 2023 with partners including the National Institute for Medical Research, Tanzania; University of North Carolina Project, Lilongwe, Malawi; Luxembourg Institute of Health; St George's, University of London; and FARMOVS.

"It would make a huge difference to be able to administer flucytosine only two times per day instead of four, especially as we have so many patients to look after in our hospitals. And it would also help encourage patients to complete their full course of treatment once they return home.

Ida Oliphant, a nurse, helps treat patients with cryptococcal meningitis at Khayelitsha Hospital in Cape Town, South Africa.

FACTS

50 million people are living with chronic HCV globally

Only 20% of diagnosed cases are treated

>650 people die from HCV every day

HEPATITIS C

Supporting global elimination efforts by accelerating access to affordable treatments

Hepatitis C is caused by the blood-borne hepatitis C virus (HCV) and can lead to chronic liver disease, cirrhosis, cancer, and, if not treated, death. Symptoms can take decades to develop, and most people living with the disease do not know they are infected. As a result, HCV is a silent epidemic.

The past decade has seen a revolution in medical innovation for HCV, which can now be cured with just 8 to 24 weeks of safe, simple treatment. And yet, only 13% of people living with the disease worldwide have benefited. While treatment has become more affordable, it remains priced out of reach for vulnerable populations in many middle-income countries. 'Test-and-treat' strategies have the potential to eliminate HCV altogether – a perhaps unique opportunity in the field of infectious diseases – but high prices and a lack of prioritization in many countries leave these strategies underused.

The push for progress

In 2021, we completed development of a simple-to-use, affordable cure for HCV through a unique South-South collaboration in close partnership with the ministries of health of Malaysia and Thailand and pharmaceutical companies in Egypt and Malaysia. Together, we demonstrated that ravidasvir, a direct-acting antiviral (DAA), can cure the disease in 12 to 24 weeks when used with sofosbuvir. Ravidasvir acts as both a powerful new therapeutic option and as a market shaper to bring down the cost of other life-saving HCV drugs in countries where they are priced out of reach. Added to the World Health Organization Essential Medicines List in 2023, the treatment is already contributing to paving the way for more cost-effective cures for HCV.

With our partners in the Hepatitis C Partnership for Control and Treatment (Hep C PACT), governments, and civil society organizations, we have advocated for the roll-out of affordable all-oral cures, community-based testing, and improved access in key countries.

Our goal is now to continue working with our partners and allies to extend access to ravidasvir and affordable DAAs more broadly, foster the political will needed for wide-scale roll-out of test-and-treat strategies, and ensure that people facing stigma, discrimination, and other barriers have equitable access to life-saving diagnosis and treatment. We are also considering further studies to evaluate ravidasvir for specific patient populations.

Expanding access to cost-effective treatment

In 2023, post-registration activities in Malaysia led to the inclusion of ravidasvir in Malaysia's Ministry of Health Medicines Formulary and National Essential Medicines List, as well as its recommendation as an alternative treatment for people living with both HIV and HCV in the Malaysian Consensus Guidelines on Antiretroviral Therapy. In early 2024, ravidasvir was granted full registration in the country.

Further registration ambitions continue in Thailand, where DNDi joined forces with Mahidol University and Egyptian pharmaceutical company Pharco in early 2024. With registration pending, ravidasvir was included in one of the treatment arms of the C-FREE-CSEA continuation study led by Dreamlopments. Started in April 2023, the study assesses the real-life effectiveness of ravidasvir + sofosbuvir in treating patients living with HCV. DNDi worked with the Drug Technology Institute (Farmanguinhos), Oswaldo Cruz Foundation, and Pharco Pharmaceuticals to prepare for registration of ravidasvir in Brazil. A regulatory dossier was submitted to the Brazilian Health Regulatory Agency (Anvisa) in early 2024. Together with partners Laboratorio Elea Phoenix, Grupo Insud, and Fundación Mundo Sano, we also advanced efforts to register ravidasvir in Argentina.

DNDi also continued providing support for evidence of ravidasvir's therapeutic potential, notably in Malaysia, where the Ministry of Health-led 'EASE' study completed recruitment in 2023 for its evaluation of the safety and efficacy of shorter courses of ravidasvir in patients without cirrhosis.

"I did not know about the disease when the doctor mentioned that they suspected I had hepatitis C. I was told that it can attack the liver at any time, but by then it might be too late. I was very shocked and scared.

Shahrudin, a father of five from Kedah, Malaysia, is pictured with **Rohani,** his wife of over 30 years. Shahrudin found out that he had hepatitis C after blood tests conducted during his annual check-up. As a participant in the STORM-C-1 study conducted by DNDi and the Ministry of Health, Malaysia, he was treated with a combination of ravidasvir and sofosbuvir. He is now cured.

Partnering to strengthen national responses

Working with Argentina's National Programme for Hepatitis Control, DNDi conducted a pilot training designed to reinforce the skills of 200 primary healthcare physicians, nurses, and community health workers in Córdoba Province – serving as the basis for further scale-up in other provinces.

In Bangladesh, DNDi worked with Hep C PACT, Médecins Sans Frontières (MSF), Bangladesh Ministry of Health and Family Welfare, and Interactive Research and Development (IRD) Bangladesh to complete a situation analysis of HCV and HBV testing and treatment in the country, with the aim of strengthening healthcare services for people at risk.

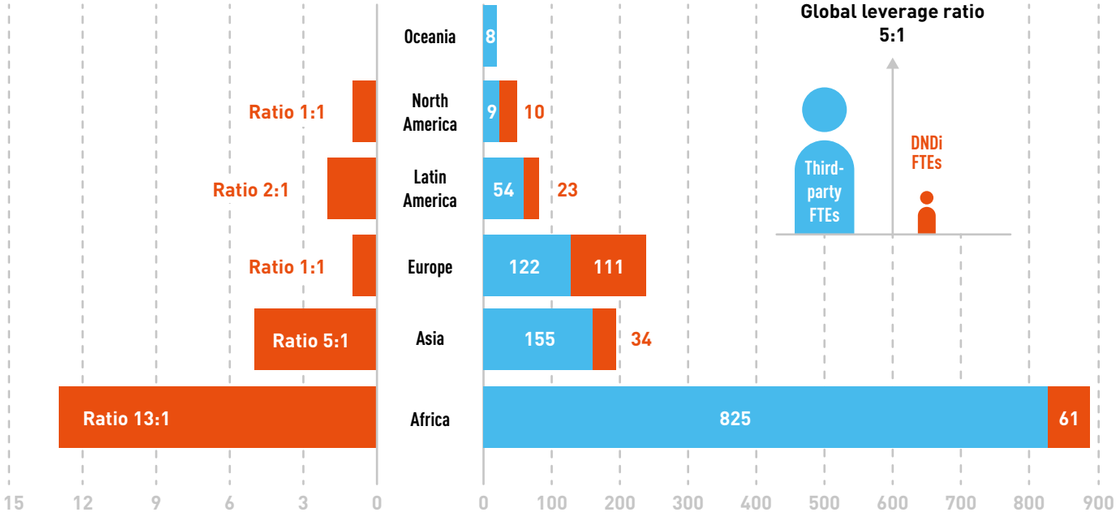
The Hep C PACT concluded its work to advocate for the roll-out of all-oral cures, scale up community-based testing, and address domestic financing challenges and access barriers with achievements in Bangladesh, Cambodia, Malaysia, Brazil, and Argentina. **DNDi is building on these successes by providing technical and advisory support to ministries of health, civil society organizations, and other partners working to improve access to treatment – and ultimately eliminate HCV.**

OUR R&D PARTNERS

DNDi is deeply grateful to our 225 R&D partners around the world who have propelled progress for neglected patients since 2003

Collaboration is at the core of DNDi's model

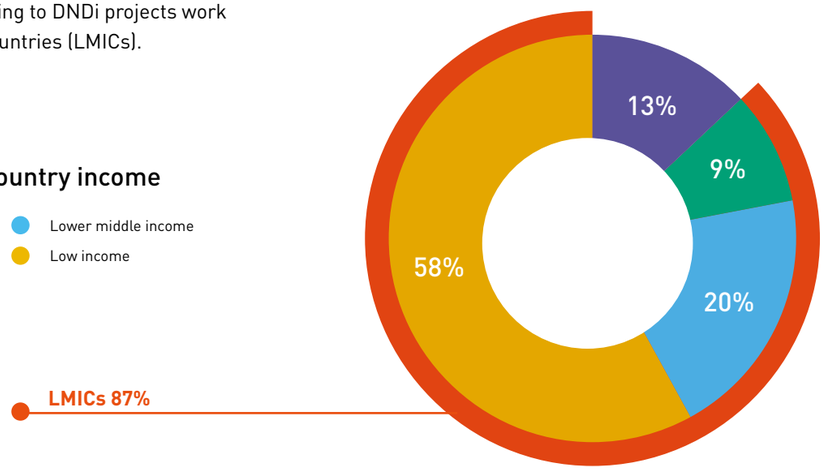
DNDi's 220+ R&D partners based in 47 countries contribute to our strong global leverage ratio: for every full-time staff member at DNDi in 2023, we could count on five more among our partners globally.



87% of partner staff contributing to DNDi projects work in low- and middle-income countries (LMICs).

DNDi partner staff by country income

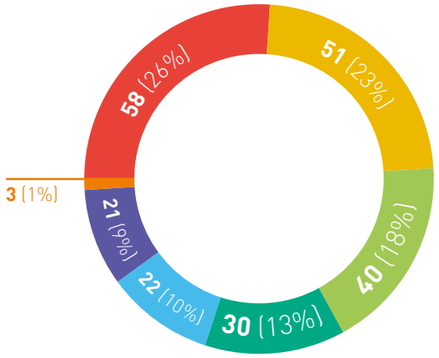
- High income
- Upper middle income
- Lower middle income
- Low income



Staffing figures on this page presented in full-time equivalents, with ratios adjusted to reflect staff engaged on a part-time basis.

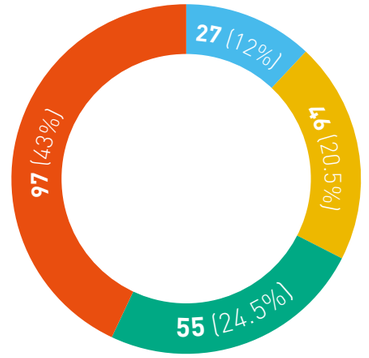
DNDi's worldwide footprint is anchored in endemic countries

57% of DNDi partner institutions are based in LMICs.



Partner institutions by region

- Europe & Central Asia
- North America
- Latin America & Caribbean
- East Asia & Pacific
- Sub-Saharan Africa
- Middle East & North Africa
- South Asia



Partner institutions by country income group

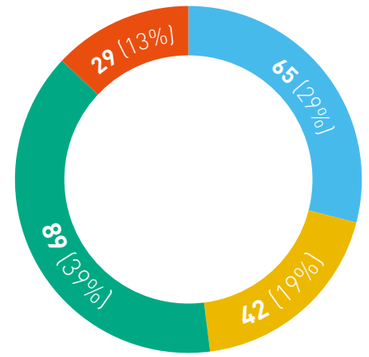
- Low income
- Upper middle income
- Lower middle income
- High income

A diverse range of alliances

A wide variety of essential public and private partners power our collaborative efforts.

Partner institutions by type

- Ministries of health and governments
- Universities, research centres, and healthcare providers
- Industry
- Not-for-profits and foundations



We are grateful to the public and private partners who provided EUR 11.6 million in in-kind contributions of goods and services to DNDi programmes in 2023.*

AbbVie, USA; Centro De Desenvolvimento Tecnológico Em Saúde, Fiocruz, Brazil; Centro de Quimica Medicinal, Fiocruz, Brazil; Daiichi Sankyo Company, Limited, Japan; Eisai Co., Ltd., Japan; Eurofarma Laboratórios, Brazil; Faculty of Medicine Siriraj Hospital, Mahidol University, Thailand; Fundação Oswaldo Cruz (Fiocruz), Brazil; Indian Institute of Technology Gandhinagar, India; Institut Pasteur Korea, South Korea; Instituto de Física de São Carlos, Brazil; Instituto Nacional de Infectologia Evandro Chagas, Fiocruz, Brazil; Laboratorio Elea Phoenix, Argentina; Medicines for Malaria Venture (MMV), Switzerland; Ministry of Health Malaysia; Mitsubishi Tanabe Pharma Corporation, Japan; Mylan Laboratories Limited, India (a Viatris Company); National Institute of Pathology, Indian Council of Medical Research; Novartis Pharma AG, Switzerland; Pharco Pharmaceuticals, Egypt; Pharmaniaga, Malaysia; Rajendra Memorial Research Institute of Medical Sciences, Indian Council of Medical Research; Sanofi, France; Shobhaben Pratapbhai Patel School of Pharmacy & Technology Management, India; Swiss Tropical and Public Health Institute; Takeda Pharmaceutical Company Limited, Japan; Translational Health Science and Technology Institute, India; Universidade de São Paulo, Brazil; Universidade Estadual de Campinas, Brazil; Universidade Federal de Minas Gerais, Brazil; University of Tokyo, Japan.

To view a full list of DNDi partners, visit: dndi.org/partnerships

*Partners listed submitted auditable records of 2023 in-kind contributions for DNDi programmes.
Since 2009, a total of EUR 100 million in in-kind contributions has been provided to DNDi by our partners.

PERFORMANCE

In 2023, DNDi disbursed EUR 66.9 million in support of its activities.

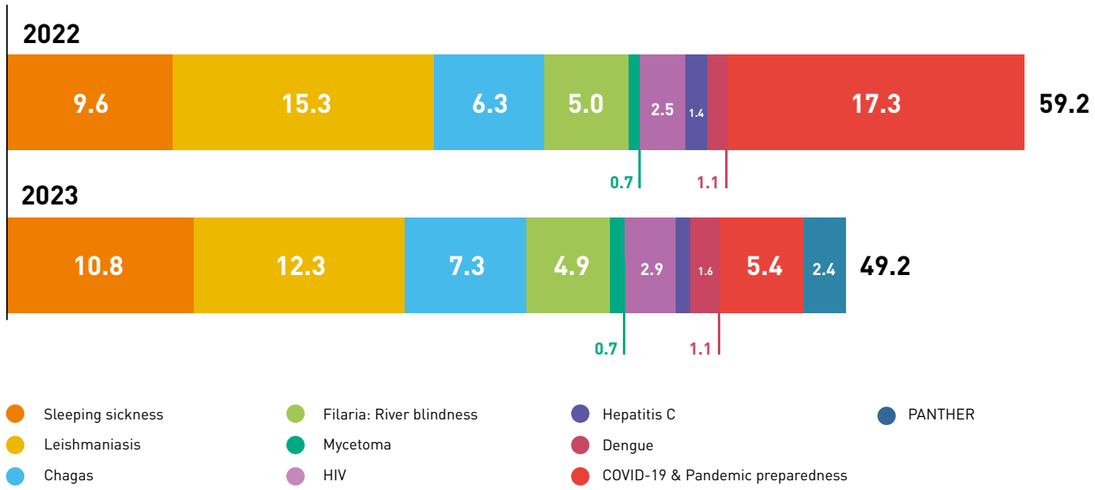
We are grateful to the government, multilateral, philanthropic, and other donors who sustained our progress this year (see page 46). To learn more about our finances, please visit: **dndi.org/Financial-Report-2023**

88% of 2023 DNDi expenditure was for our social mission across R&D and access, capacity strengthening, and advocacy.

2023 expenditure on R&D and access activities

R&D expenditure decreased by EUR 10 m from 2022 to 2023 as a result of the planned completion of COVID-related activities.

R&D expenditure by disease area (EUR million)*



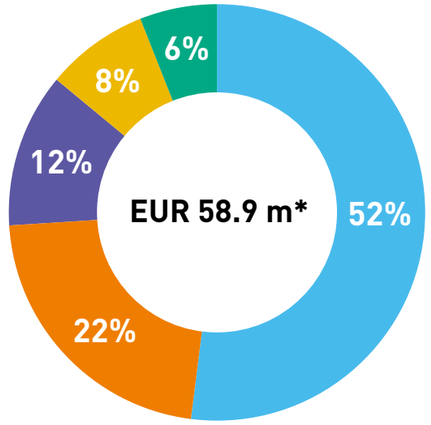
*Figures by disease include a proportion of R&D coordination expenditure. GARDP expenditure is not included in this graph

2023 expenditure by donor

made possible by a diverse array of committed public and private partners

EUR 8.1 million in programme-related financing and other income excluded

- **Government donors –** UK International Development (19.4%); Federal Ministry of Education and Research (BMBF) through KfW (6.5%) and Federal Ministry for Economic Cooperation and Development (BMZ) through KFW, Germany (6.1%); Dutch Ministry of Foreign Affairs (DGIS) (4.8%); Global Health Innovative Technology Fund, Japan (4.8%); Swiss Agency for Development and Cooperation (3.5%); Government of Norway (3.4%); French Development Agency (AFD) (2.2%); and others
- **Major science donors –** Bill & Melinda Gates Foundation (14%); Wellcome (8.2%)
- **Multilateral donors –** European and Developing Countries Clinical Trials Partnership (EDCTP) (11.2%); Unitaid (0.4%)
- **Founding partners –** Médecins Sans Frontières (MSF) (7.9%)
- **Other partners and philanthropies –** Takeda Pharmaceutical Company Limited Global CSR Program (2.7%), Dioraphte Foundation (0.7%); Dutch Postcode Lottery (0.5%); and other individuals and private organizations

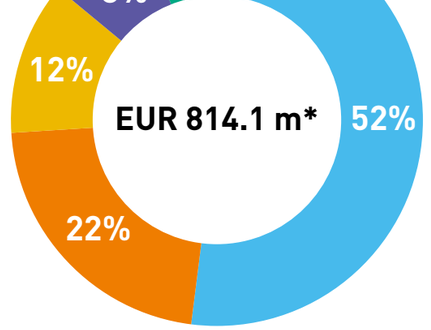


Donor contributions 2003-2023

powering 20 years of progress for neglected patients

EUR 73.3 million in programme-related financing and other income excluded

- **Government donors –** UK International Development (21.6%); Federal Ministry of Education and Research (BMBF) through KfW, Germany (6.4%); Dutch Ministry of Foreign Affairs (DGIS) (6.2%); Global Health Innovative Technology Fund, Japan (4.1%); Swiss Agency for Development and Cooperation (3.4%); French Development Agency (AFD) (3.0%); Federal Ministry for Economic Cooperation and Development (BMZ) through KFW, Germany (2.5%); Spanish Agency for International Development (AECID) (1.5%); US Government (NIH/NIAID/USAID) (1.2%); Government of Norway (0.9%); and others
- **Major science donors –** Bill & Melinda Gates Foundation (18.2%); Wellcome (4.3%)
- **Founding partners –** Médecins Sans Frontières (MSF) (11.7%); World Health Organization TDR (0.4%)
- **Multilateral donors –** European and Developing Countries Clinical Trials Partnership (EDCTP) (4.7%); Unitaid (3.3%); and others
- **Other partners and philanthropies –** Takeda Pharmaceutical Company Limited Global CSR Program (0.9%); Medicor Foundation (0.6%); and other individuals and private organizations
- **GARDP incubation –** Funding allocated to GARDP activities from the following donors in the 2016-2019 incubation period: governments of Germany, the Netherlands, Switzerland, and UK; Grand Duchy of Luxembourg; Principality of Monaco; Bill & Melinda Gates Foundation; Wellcome; MSF; South Africa Medical Research Council; and Leo Model Foundation



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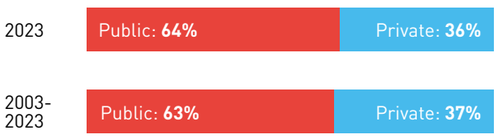

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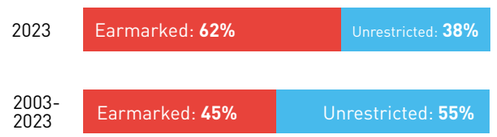

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Malaysia - Institute for Medical Research (IMR)

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9 2021 to 2023
10 Discovery of hits and proof of concept of new leads for Chagas disease

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