The people #MakingSchistory: The global fight against schistosomiasis

Stories of how people across the world are working to consign schistosomiasis to history.

GSA
GLOBAL SCHISTOSOMIASIS ALLIANCE

Foreword

We are at an important moment in the fight against one of the world's deadliest tropical diseases, schistosomiasis. It is a tipping point in the struggle to overcome an ancient disease that does more than sicken – it holds back hundreds of millions of people from reaching their full potential.

Facing us are huge opportunities that could help change the impact of schistosomiasis forever, but we're also confronted by challenges that could hinder our ability to eliminate this disease.

While we should primarily be focused on what needs to be done, we must take time to reflect on the progress and accomplishments that have marked the journey as well. In some countries in Africa we have seen the numbers of people infected drop markedly and serious cases of the disease almost disappear altogether. These achievements are testament to the determination of individuals and the collective commitment of healthcare professionals, public health officials, researchers, academics, funders, industry partners, the World Health Organization (WHO) and non-governmental organizations (NGOs).

The call for more global action to eliminate schistosomiasis has been put into focus this year as the Merck-WHO praziquantel donation program marks its tenth year. The importance of donated medicines in tackling neglected tropical diseases (NTDs) 'cannot be over-emphasised', says the WHO when assessing progress in its roadmap towards elimination. The WHO and its donor partners (Merck, RTI International, the Schistosomiasis Control Initiative, the UK Department for International Development, USAID and World Vision), provide free praziquantel, the only effective treatment for schistosomiasis, to people all over Africa; in 2015 alone, 66.5 million treatments were donated.

The availability of such drugs has enabled the first generation of children to break the cycle of misery caused by the disease which means that, freed from debilitating sickness, they are poised to enter adulthood and make the most of their opportunities.

Yet elimination will only be possible through a combination of measures including treatment, full access to safe water, waste disposal, basic sanitation, education, vector control and improved living conditions.

A future free from schistosomiasis is the goal uniting efforts across all these areas and progress will be made possible by working together.

This report aims to tell the story of schistosomiasis through the eyes, experiences and passion of those who are Making Schistory every day.

We are at the point of a significant leap forward in the fight against this disease. Elimination is possible. Join us in #MakingSchistory.

Prof David Rollinson,
Director of WHO Collaborating Centre on Schistosomiasis,
Natural History Museum, London

'WE MUST TAKE TIME TO REFLECT ON THE PROGRESS AND ACCOMPLISHMENTS THAT HAVE MARKED THE JOURNEY'

'A FUTURE FREE FROM SCHISTOSOMIASIS IS THE GOAL... AND PROGRESS WILL BE MADE POSSIBLE BY WORKING TOGETHER.'

200 MILLION

MORE THAN 200 MILLION PEOPLE WORLDWIDE ARE BELIEVED TO BE INFECTED BUT THE FIGURE COULD BE TWICE AS HIGH.

IT KILLS AN ESTIMATED 280,000 PEOPLE EACH YEAR.

SWIMMING, BATHING, FISHING, AND DOMESTIC CHORES SUCH AS WASHING CLOTHES PUT PEOPLE AT RISK OF INFECTION.

SYMPTOMS INCLUDE:

HIGH TEMPERATURE (FEVER)

ITCHY, RED, BLOTCHY AND RAISED RASH

COUGH

MUSCLE AND JOINT PAIN

STOMACH PAIN AND DIARRHOEA

GENERAL SENSE OF FEELING UNWELL

92%

OF SCHISTOSOMIASIS CASES ARE FOUND IN SUB-SAHARAN AFRICA.

USUALLY SCHOOL AGE CHILDREN AGED 5 YEARS AND ABOVE CAN BE TREATED. A NEW FORMULATION IS IN THE PIPELINE TO TREAT YOUNGER CHILDREN WHICH WILL BE READY FOR SUBMISSION BY 2019.

5

ASSOCIATED WITH POVERTY & INADEQUATE SANITATION.

SCHISTOSOMIASIS IS CAUSED BY PARASITIC WORM INFECTIONS.

1. FRESH WATER SNAILS CARRYING THE PARASITE RELEASE SWIMMING LARVAE THAT TRAVEL THROUGH THE WATER UNTIL THEY COME INTO CONTACT WITH AN INDIVIDUAL AND PENETRATE THE SKIN.

2. INSIDE THE BODY, THE LARVAE DEVELOP INTO MALE AND FEMALE WORMS THAT PAIR UP AND LIVE TOGETHER INSIDE THE BLOOD VESSELS FOR YEARS.

3. FEMALE WORMS RELEASE THOUSANDS OF EGGS, SOME OF WHICH PASS OUT OF THE BODY IN URINE AND STOOLS. SOME EGGS REMAIN TRAPPED IN THE BODY, CAUSING SICKNESS AND DAMAGE TO ORGANS.

4. IF PEOPLE URINATE OR DEFECATE IN FRESH WATER, LARVAE HATCH AND INFECT SNAILS, AND THIS BEGINS THE CYCLE AGAIN.

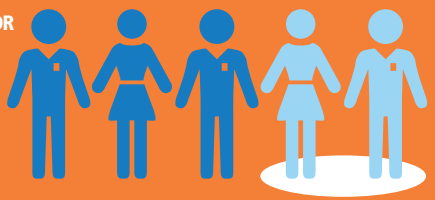
LONG-TERM PROBLEMS:

- ANEMIA
- STOMACH PAIN AND SWELLING
- DIARRHEA AND BLOOD IN STOOLS
- PAIN AND BLOOD WHEN URINATING
- BLADDER CANCER
- PERSISTENT COUGH, WHEEZING, SHORTNESS OF BREATH AND COUGHING UP BLOOD
- SEIZURES (FITS), HEADACHES, WEAKNESS AND NUMBNESS IN LEGS, AND DIZZINESS
- GROWTH AND COGNITIVE DEVELOPMENT STUNTED

250 MILLION

PRAZIQUANTEL TABLETS CAN TREAT SCHISTOSOMIASIS. THE DRUG IS ON THE WHO'S LIST OF ESSENTIAL MEDICINE.

MORE THAN 66.5 MILLION PEOPLE WERE REPORTED TO HAVE BEEN TREATED FOR SCHISTOSOMIASIS IN 2015;
13.3 MILLION ADULTS AND 53.2 MILLION SCHOOLCHILDREN – 42% OF THE WHO ROADMAP TARGET.



Partners in Health

The People #MakingSchistory

Over the last 30 years the fight against schistosomiasis has gathered pace and intensity. The goal of elimination could not have emerged without the efforts of many partners in health worldwide, working to battle schistosomiasis on several fronts. Some are on the ground, reaching out to rural African villages to administer treatment, while others are policy makers carving change from meetings.

The individuals involved are leaders of organizations, influential donors, committed scientists and doctors, and politicians, all fired by a passion to defeat this disease. It has been a sustained and determined drive, bringing together many talents, and it's not over yet. We talk to some of the people working towards the goal of elimination – they are all planning for a future free from schistosomiasis.

'THE INDIVIDUALS INVOLVED ARE LEADERS OF ORGANISATIONS, INFLUENTIAL DONORS, COMMITTED SCIENTISTS AND DOCTORS, AND POLITICIANS, ALL FIRED BY A PASSION TO DEFEAT THIS DISEASE'

The People's Champion

The patient who became the NTD champion

DR LESTER CHITSULO
Formerly Scientist, and Focal Point for Schistosomiasis Control, Department of Control of Neglected Tropical Diseases, World Health Organization

In my homeland, Malawi, having schistosomiasis was a rite of passage. Just growing up in a rural area doing the things children do was enough to get it. It was normal in the 1960s and 70s. I had a relatively light infection and got treated but it was hit and miss. People living close to health services would seek treatment, others would have traditional medicine. It left with me an overwhelming ambition to change things.

In 1979 I finally got the chance to get involved with schistosomiasis through a UK-sponsored project. It was the start of a career lasting nearly 40 years.

In those early days our team did schistosomiasis surveys in the field and we also tested ourselves. I discovered I had it again. Nothing could have given me more determination when I actually saw the worm eggs in my own urine sample under the microscope. They really jumped out at me. I had treatment but it completely changed my perception about the disease. I had been bathing in a big lake I believed to be safe. Suddenly I realised you never know where you're safe. Water is part of your daily life but it can also be your worst enemy.

I come from a rural area where relatives of mine are still living. It is an area that is often affected by floods. Apart from the obvious damage they cause, people are exposed to a lot more water and more risk. It's a constant reality affecting my community, it's always on my mind.

Elimination is feasible and I'm extremely hopeful, but the last mile is the hardest. The timeline would be much shorter if we were able to build access to water and sanitation, and strengthen health systems. Treatment has revolutionized the field but it's a double-edged sword. In some countries people don't see serious cases any more, the swollen bellies of the very sick. Some doctors don't even see symptoms, and everyone thinks the problem has been solved. Some countries in sub-Saharan Africa still have a long way to scale up schistosomiasis control, even though progress is being made.

There's a battered poster that's hung on the wall of my office for decades. It shows the life cycle of schistosomiasis and the parasite that causes this disease – life for the worms but a slow death for the dreams and aspirations of infected people.

We must continue the teamwork that got us this far and keep investing. The next generation of workers have to keep the momentum going, people may think this disease will go away by itself – but it won't."

'IN MY HOMELAND, MALAWI, HAVING SCHISTOSOMIASIS WAS A RITE OF PASSAGE'

'ELIMINATION IS FEASIBLE AND I'M EXTREMELY HOPEFUL, BUT THE LAST MILE IS THE HARDEST'

The Pioneer

Making schistosomiasis control a global issue

PROFESSOR ALAN FENWICK
Professor of Tropical Parasitology, Imperial College London and Director/Founder, Schistosomiasis Control Initiative

"I have worked on schistosomiasis throughout my life, from early days in the 1960s field testing praziquantel in Tanzania until today when we're treating millions of children every year.

I worked in several African countries where I had visited many schools and seen children desperate to learn. The parasitic infections cause ill health, affecting their learning and blighting their prospects so they remain mired in poverty. It is a vicious cycle.

In the developed world the knowledge and interest in schistosomiasis is very small. If the disease isn't 'visible' it can be very difficult to grasp its importance. You have to make people aware of the terrible effects of chronic infection, how important this disease is, that approximately one quarter of the population of Africa is infected and needs treatment.

In 1988 I went to Egypt to run programs for the World Bank and the United States Agency for International Development. Everybody in Egypt knew about the disease because a very famous singer Abdel Halim Hafez died from related liver disease in the 1960s – that brought it home to the nation. Before 1988 there was very little money available to treat the disease anywhere, but thanks to the use of praziquantel, as well as other interventions, and donor funding, we were able over 15 years to bring down the rates and intensity of schistosomiasis from a very high level where over 50% of the rural population was infected to around 2 or 3%. I was very lucky to be involved with the only country on the African continent at that time to embark on trying to control schistosomiasis.

The big challenge was then to expand disease control to less wealthy countries. The success of the program in Egypt helped us to convince the Bill and Melinda Gates Foundation to start funding NTDs, securing one of the earliest grants they ever made – a game changing $30 million. They recognized that the misery and suffering caused by this disease was entirely unnecessary.

With that grant we established the Schistosomiasis Control Initiative (SCI) – a charity within Imperial College London – and for the first time we could actually implement schistosomiasis control programs in sub-Saharan Africa.

The fight against schistosomiasis has changed incredibly since 2000 when there wasn't a single country in sub-Saharan Africa that had a control program. Now all endemic countries have national plans for controlling NTDs and we continue to work with governments to ensure people get treated.

A major turning point came 10 years ago when in 2007 Merck announced their donation of praziquantel through the WHO. Previously the SCI had to buy the drug and donate it to the countries. The initial donation enabled a number of smaller countries to start programs. Now in 2017 that donation is increasing with the commitment of up to 250 million tablets – enough to treat 100 million children per year.

'IF THE DISEASE ISN'T 'VISIBLE' IT CAN BE VERY DIFFICULT TO GRASP ITS IMPORTANCE'

'A MAJOR TURNING POINT CAME 10 YEARS AGO WHEN IN 2007 MERCK ANNOUNCED THEIR DONATION OF PRAZIQUANTEL THROUGH THE WHO'

Making schistosomiasis control a global issue continued

There will be places in Africa where the prevalence and intensity of schistosomiasis is medium and low so we will, with mass drug administration, be able to get very close to elimination. But there are many other places in Africa, particularly on the banks of the great lakes and where dams have been built, that the transmission of schistosomiasis is very heavy and the path to elimination will be tougher. Remember that you can't tell people to stay away from water on which they are totally dependent. In these areas, we may eventually need to treat people twice a year, and help with socio-economic development, water and sanitation.

There are now 15 countries with SCI-supported intervention programs. Last year the SCI and other agencies collectively treated around 60 million children so we've really got to ramp up what we do. We have a window of opportunity but elimination is not going to be easy. If we stop treating I fear within five years it will come back again."

ABDEL HALIM HAFEZ lives on as the 'King of Arabic music' despite his untimely death in 1977 from schistosomiasis-related complications aged just 47.

His death sent shockwaves throughout the Arab world where he was revered for his unique singing style, emotional songs and philanthropy.

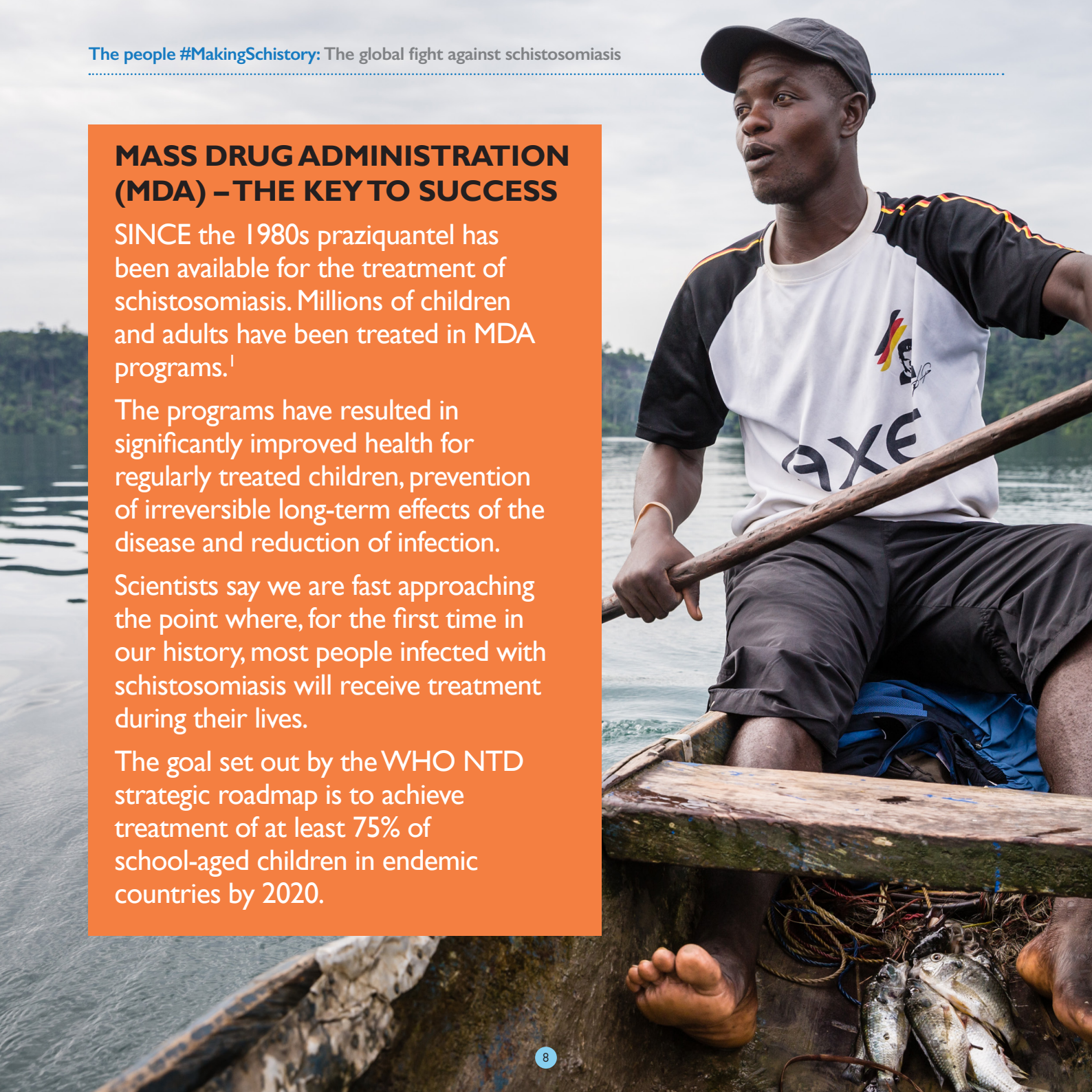
He contracted the disease at the age of 30 that eventually claimed his life. It afflicted him for most of his career but he refused to let the debilitating hold it had on his body affect his strength of mind, performing throughout the Middle East until the end.

Even today in Egypt everybody knows he died of schistosomiasis.

But his tragedy helped spur a nation into controlling the disease and its success led to a global response that remains one of the drivers towards #MakingSchistory.

'YOU CAN'T TELL PEOPLE TO STAY AWAY FROM WATER ON WHICH THEY ARE TOTALLY DEPENDENT'

'IF WE STOP TREATING I FEAR WITHIN FIVE YEARS IT WILL COME BACK AGAIN'



MASS DRUG ADMINISTRATION (MDA) – THE KEY TO SUCCESS

SINCE the 1980s praziquantel has been available for the treatment of schistosomiasis. Millions of children and adults have been treated in MDA programs.[1]

The programs have resulted in significantly improved health for regularly treated children, prevention of irreversible long-term effects of the disease and reduction of infection.

Scientists say we are fast approaching the point where, for the first time in our history, most people infected with schistosomiasis will receive treatment during their lives.

The goal set out by the WHO NTD strategic roadmap is to achieve treatment of at least 75% of school-aged children in endemic countries by 2020.

The Optimist

The Zanzibar story of success: how a passion for better health changed a community

DR LORENZO SAVIOLI
Former Director, Department of Control of Neglected Tropical Diseases, World Health Organization

"After studying medicine in Rome, I arrived in Zanzibar in 1979 as a member of one of the first Western teams of doctors to go there. We worked in a horrible hospital that was falling apart, it had nothing. All the kids were dying, it was tough. But we got on top of it and then I started to look at preventable diseases, at giving mass treatment beyond individual diagnosis. Schistosomiasis was so common nobody bothered coming to the clinic – people knew there was no treatment. But praziquantel had just come out and I wanted to get something done on a large scale. I contacted people around the world, in those days you sent a letter, not an email, and we set up a program in 1985.

When we started the program we employed five rural health assistants. I wanted to find young, bright people who we could give skills and knowledge to, so they could help their communities. Amour Khamis (also featured in this report) had just finished studying and had no specific experience in schistosomiasis but was passionate. Amour still to this day coordinates schistosomiasis programs on Pemba Island.

Given the high cost of the drug at the time, we selected symptomatic individuals with blood in their urine and achieved our study target in half the planned time – one year instead of two.

I remember the telex of congratulations from WHO Geneva. We had documented the proof of principle that it was possible to control schistosomiasis with regular treatment of school age children in spite of continuous transmission.

What immediately happened was that severe diseases caused by schistosomiasis, of the urinary, genital and intestinal tracts and cancer of the bladder, disappeared – and disappeared fast. 30 years on prevalence rates are kept low at 2%, compared with 65% in 1986. It's been a massive change, some people have been treated more than 40 times. The drugs have extremely high efficacy so if you've been treated previously, and are exposed to infection again, you'll never get it as bad compared to people who have never been treated.

Treatment has changed life for millions of people in Africa and continues to do so, but in areas of high transmission, what we call 'hotspots', water and sanitation have to be improved too. Schistosomiasis is a disease afflicting the rural poor. These are people who are far away from the cities and the politicians, and as a result often haven't been given the clean water they deserve. But if we seriously commit to tackling schistosomiasis we can stop transmission on this island – 2025 is a feasible finishing line! I'm an optimist; schistosomiasis elimination is possible in Africa. It's already been done with other parasites like guinea-worm disease in Asia. This is an amazing continent, we can build on the creativity and intelligence of the people, and natural resources, but we must not be delayed by complacency, we must be vocal."

'WE HAD DOCUMENTED THE PROOF OF PRINCIPLE THAT IT WAS POSSIBLE TO CONTROL SCHISTOSOMIASIS'

'TREATMENT HAS CHANGED LIFE FOR MILLIONS OF PEOPLE IN AFRICA AND CONTINUES TO DO SO'

THE SUCCESS STORIES

Schistosomiasis transmission is being targeted for large-scale treatment by the WHO in 52 endemic countries. Control has been successfully implemented over the past 40 years in several countries, including Brazil, Cambodia, China, Egypt, Mauritius, Islamic Republic of Iran and Saudi Arabia. Other countries reporting success include Japan, Tunisia, Puerto Rico and most of the Caribbean, while transmission has been interrupted in Morocco.[2]
Evidence from programs in Uganda, Burkina Faso and Niger confirms that the impact achieved in China or Egypt can be replicated in Africa, provided that sufficient resources are available and political commitment is strong, says the WHO. The success of China, for example, has been credited to large-scale spending: $1 billion on integrated control measures over 50 years, 20,000 full-time staff and an annual operating budget of $120 million.[3] Experts call for funds to be spent on poverty reduction and breaking the parasite's life cycle to prevent transmission, because a healthy well-nourished population once treated has a better chance to withstand infection.

The Local Expert

Helping to transform communities from within

AMOUR KHAMIS
Public Health Officer and Coordinator of Occupational Health Services, Mnazi Mmoja Hospital, Zanzibar, Tanzania

"I applied to work for the first national schistosomiasis control program in Tanzania in 1985. I was interviewed on the bigger island of Zanzibar by Dr Lorenzo Savioli, who was looking for five health assistants to get the program off the ground.

I come from a family of farmers and I was given the chance to study. My father funded me to do further studies and I got very good marks for my degree. I was given the opportunity to do more and I wanted to use it.

When I was asked in my interview if I knew about schistosomiasis I had to be frank. I didn't. But Lorenzo asked 'What do you want to do with your life?' I said 'I want to go back to my little island of Pemba and I want to make a difference to the health of poor people.' He said 'I'll teach you about schistosomiasis – you're in.'

I've spent all my working life helping to treat people on Pemba Island where there was lots of schistosomiasis and infections were rising – I know every corner of the island. In 1986 the first survey showed 65% of people tested in schools and the community were infected. With support from the WHO and the German Health Fund, we got access to treatment and succeeded in reducing prevalence down to 5%, even lower in some areas.

The fight to eliminate the disease has changed over the last 10 years. We're still doing mass drug administration and it's very important we don't lose the opportunity to get free drugs. But behavior change and snail control are also important. I think we have the chance to do it as we have small streams and small ponds on Pemba Island rather than lakes or rivers. If we can deal with the snails and get more support I think we can eliminate schistosomiasis.

Everyone on Pemba knows me for my long fight to control what we locally call 'KICHOCHO' and people have called me dedicated. I will be four times happier than ever before if we manage to eliminate it and my community will be happy as well."

'I'VE SPENT ALL MY WORKING LIFE HELPING TO TREAT PEOPLE ON PEMBA ISLAND WHERE THERE WAS LOTS OF SCHISTOSOMIASIS AND INFECTIONS WERE RISING – I KNOW EVERY CORNER OF THE ISLAND'

The National Trailblazer

Campaigning to end schistosomiasis in Cameroon

PROFESSOR LOUIS-ALBERT TCHUEM TCHUENTÉ
Professor of Parasitology, University of Yaoundé I, Director/ Founder, Research Centre for Schistosomiasis and Parasitology, Coordinator, National Programme for the Control of Schistosomiasis & STH, Cameroon, and NTD Ambassador, LSTM

"I started research into schistosomiasis in the mid-1980s in my birthplace of Cameroon before moving to Europe to study. During my PhD, I discovered a fundamental difference between my observations and what was written in all the books at the time about the schistosome parasite. It was held that each pair of schistosome mated for life and remained faithful until death - a key element in the life cycle - but in the laboratory I found this was not true. Nobody believed it at first but my experiments clearly demonstrated this and the textbooks had to be re-written. In fact, my research demonstrated three new findings: firstly the existence of a mate choice and preference, secondly the possibility of change of mate, and third the existence of a competitive exclusion in schistosomes. These discoveries contributed to a better understanding of the reproductive biology of schistosomes and the impact on disease epidemiology.

I returned to Cameroon in 1999 because Africa has the biggest infection rate and even then I wanted to link basic research with control activities.

Therefore, I created a research center for schistosomiasis and parasitology, and pushed for a national program because it was essential given the burden of disease in the country.

By 2003 the national program for the control of schistosomiasis and intestinal helminthiasis was created by the Ministry of Health and I was appointed the national coordinator. It was important to raise awareness and to get key stakeholders and influential people on board. The Minister of Health convened meetings with other ministers, stakeholders and different partners. I played a driving role but it wasn't easy, there were a lot of meetings and presentations! We had meetings right up to the level of the Prime Minister of Cameroon. Within a few years we had completely updated the national map for schistosomiasis, identified prevalence areas and agreed our strategy.

At first there was a reluctance for treatment among populations in some areas, a lack of understanding. But when they saw the benefits in their children, who had less blood in their urine and were healthier, then they were asking us when they could get this treatment.

Our achievement in Cameroon is recognized globally and shows the importance of strong government and country ownership for disease control and elimination. When these are in place, the government becomes the driving force to move other stakeholders and partners. Government involvement and leadership, where the country owns the program, is the key to tackling the challenges.

Years ago my friends in Europe tried to get me to stay, because of the opportunities there, but I wanted to go back and be useful to my own people. My work has helped reduce the suffering caused by the parasite, the communities we treat are grateful and happy. I think for a scientist it's a good contribution."

'MY EXPERIMENTS CLEARLY DEMONSTRATED THE TEXTBOOKS HAD TO BE RE-WRITTEN'

'OUR ACHIEVEMENT IN CAMEROON IS RECOGNISED GLOBALLY AND SHOWS THE IMPORTANCE OF STRONG GOVERNMENT AND COUNTRY OWNERSHIP FOR DISEASE CONTROL AND ELIMINATION'

MOVING ON – FROM CONTROL TO ELIMINATION

Schistosomiasis can be successfully controlled with the drug praziquantel used as preventive chemotherapy. But when combined with sanitation and clean water (WASH) and other measures, schistosomiasis could be eliminated entirely.

Three crucial elements are needed to achieve elimination: regular treatment of at-risk populations, improved water and sanitation, and vector control. These should be supported by health education about the disease for health workers and communities so they have the knowledge that can eventually lead to behavior change. Such integrated control strategies are vital for sustainability. In addition, stronger health systems in endemic areas should work towards removing the primary risk factors for NTDs – poverty and exposure.

The issue of 'hot' transmission spots – with 10-20% prevalence – is a major challenge and the consensus is that thorough investigation of local conditions is needed to achieve firstly control and then elimination. Meanwhile, the policy makers and program managers in endemic countries should continue to receive guidance and technical insight, says the WHO.[4] And the community of partners – including donors, pharmaceutical companies, agencies, NGOs, philanthropists and universities – must be encouraged to maintain and increase their commitments. The vision beyond the end of the decade is to eliminate schistosomiasis as a public-health problem in all endemic countries by 2025.[5]

Without change, scientists estimate that over two million disability-adjusted life-years and US $3.5 billion of economic productivity will be lost to schistosomiasis infections every year. The cost is comparable to recent epidemics of Ebola and Zika infections.[6]

The Scientist

Challenging us to think about schistosomiasis differently

DR POPPY LAMBERTON
Senior Lecturer, University of Glasgow, UK

"The main focus of my research is schistosomiasis. Working in this area allows me to improve the lives of others whilst being fascinated on a daily basis. I don't just want to do research for the sake of doing research. I'm driven by the need to use rigorous science to inform public health policy that will help people.

I was first attracted to the area after hearing a lecture delivered by Professor Joanne Webster, now at the Royal Veterinary College, that made me think, wow, parasites are amazing. This led me to complete my PhD on schistosomiasis involving field work in Uganda and I have now been working there for over 10 years.

I work in a district called Mayuge, on the shores of Lake Victoria. When I initially started my research I was stunned by the resilience of the children affected by this disease. They are just phenomenal individuals. When you ask them if they are ill, they say no. You then ask them if they have diarrhoea, a stomach ache, and blood in their stool, and they say yes. For them those symptoms are normal.

The kids are fantastic, when we are performing research there, they get very excited. I remember being in a school in Bwondha in Uganda when we got about 50 children, who don't really speak English, to do the hokey cokey. It's one of my all-time favourite memories.

Some of them are so anaemic they shouldn't even be able to stand and yet they're all running around doing sports, it's really humbling.

High intensity schistosomiasis infection is defined as anything over 400 eggs per gram/stool. We found a six year old girl in Uganda who was showing about 11,000 eggs per gram and was very sick. This was in 2013, over a decade into Uganda's control program. She was only in her first year of school and therefore hadn't been treated before by the school-based deworming. For me that was a moment where I thought, my God, we have to do something about this, as well as the praziquantel treatment. She, like so many others, was obviously collecting water or washing or playing in an area rife with schistosomiasis.

The frequency of schistosomiasis is still high and is continuing to have a big impact on the health of communities and the children. In my research I am trying to look at the problem from a different perspective. We need to understand the parasite and population better, and work with communities to help them reduce their own infection and transmission. We have just acquired a grant to try and see where children are being re-infected. We're going to use population genetics so we can actually target our limited supply of drugs to be most effective.

There have been some important moments in the battle to put schistosomiasis on the global health agenda and key individuals who stand out in their contribution. Professor Alan Fenwick, founder of the SCI (and featured in this report), has been beyond inspirational. But our fight continues. Mass drug administration is crucial, but sanitation and hygiene will be the turning points in the future. We really need to flip the concept of sanitation on its head so it's novel and sustainable. Let's look at community-led total sanitation, or poo in a bag, a biodegradable bag for example. People already use them for hiking, in snowfields, on the mountains and up Everest. Let's think outside the box, why not?"

'I WAS STUNNED BY THE RESILIENCE OF THE CHILDREN AFFECTED BY THIS DISEASE'

'I'M DRIVEN BY THE NEED TO USE RIGOROUS SCIENCE TO INFORM PUBLIC HEALTH POLICY THAT WILL HELP PEOPLE'

The Communicator

Connecting global communities to tackle the NTD burden

DR AMADOU GARBA DJIRMAY
Scientist, Schistosomiasis, Department of Control of Neglected Tropical Diseases, World Health Organization, Geneva

"My first involvement with schistosomiasis is very personal. As a young child in the 1970s I got infected by the disease. I grew up in Niger and at that time most people living around the irrigation fields along the Niger River Valley had it. There was no way you could avoid it. People had to go to the farms to get food for their families, or go to the canals to wash their dishes or do laundry. It was also extremely hot, and the only way to get relief was to bathe in the river. I was in primary school and went with some friends to swim in the river canal. Some days later I felt pain when urinating and saw drops of blood. My parents took me to the health center and I was prescribed the medicine Ambilhar. It had a lot of side effects and I felt ill for three years after being treated, although I was eventually cured. Luckily I didn't have any long-term problems.

Coming from an endemic country and having suffered from the disease I was naturally interested in the area and ended up studying it for my degree.

I went on to oversee a schistosomiasis control program in my country before moving to the WHO where I now assist all countries in sub-Saharan Africa to implement control and elimination programs.

Having worked in this area for so many years the thing I am really proud of is seeing the adoption of national control programs and the commitment of governments and personnel to fight the disease. Initially when the control programs started very few countries were implementing them. There was no care for people and no way of controlling schistosomiasis.

The first key development behind the uptake of control programs was increased availability of the drug praziquantel. Suddenly, mass drug administration was possible with an easy to use, single dose treatment. It also had very few side effects compared to the previous treatment and when the price fell markedly, followed by donation programs, wider access was possible. The second key development came in 2012 when an important partnership was formed, the London Declaration on NTDs.

In the future we need to expand treatment to all people in need of it. I am motivated by the belief that the elimination of schistosomiasis is feasible. We have seen many countries eliminate schistosomiasis as a public health problem. Beyond mass drug administration we need to focus on water, sanitation and hygiene activities, and snail control. Elimination is a long-term process that can take more than 20 or 30 years. We need to get governments to make financial contributions; we still have some endemic countries that have not started a control program – and we need to help them to do so."

'I AM MOTIVATED BY THE BELIEF THAT THE ELIMINATION OF SCHISTOSOMIASIS IS FEASIBLE'

'AS A YOUNG CHILD IN THE 1970s I GOT INFECTED BY THE DISEASE'

LONDON DECLARATION ON NTDS

The London Declaration on NTDs was a rallying point for the global health community to commit to a world free from NTDs. In January 2012 leaders from the WHO, the Bill & Melinda Gates Foundation, the World Bank, 13 pharmaceutical companies and seven governments gathered to sign the declaration in Britain's capital.[7]

Inspired by the WHO's Roadmap on NTDs, they pledged new and extended commitments in support of the WHO's goal to control or eliminate 10 NTDs, including schistosomiasis, by 2020. Since its launch, pharmaceutical companies have donated more than five billion tablets – making it the world's largest public health drug program.

But no one stakeholder can do it alone says the Declaration. It calls on the public and private sectors to seize the 'tremendous opportunity' to work together to help the world's poorest achieve healthier lives and build self-sufficiency.

THE GROWING GLOBAL FOCUS ON NTDS

In 2015, NTDs and corresponding targets were included in the Sustainable Development Goals (SDGs) – the global pledge to leave no one behind. The drive for Universal Health Coverage is a key part of the SDGs and emphasises the need for all to have access to quality essential healthcare services and medicines. Targets for access to water and sanitation are also outlined and this is recognized as critical to accelerating and sustaining progress on NTDs.

SNAIL CONTROL IS ANOTHER TOOL IN THE BOX

Water bodies of all sizes, including man-made lakes and irrigation systems, provide excellent habitats for freshwater snails. Many are intermediate hosts of schistosomiasis and play a critical role in the life cycle of these parasites. People become infected when their skin comes into contact with freshwater that contains the parasite.

However, these water bodies are also focal points for communities where people work, bathe, wash and play – and through repeated contact acquire and perpetuate schistosomiasis because the parasites breed in waters contaminated by the faeces and urine of infected people.[4]

Good water management practices, in some cases supplemented by the use of chemicals that kill the snails, may limit the distribution of these hosts. The WHO says snail control measures may be an additional cost-effective solution where disease is highly prevalent. Predatory river prawns re-introduced as an experiment in the Senegal River Basin, where they used to be native, could potentially reduce the abundance of infected snails.[8] Researchers involved say this approach has a role as a complementary strategy in areas native to the river prawn, when used in synergy with drug distribution.

The Activist

The promoter of health equality: schistosomiasis, poverty & the need for WASH

DAN IRVINE
Senior Director of Operations, Health and Nutrition, World Vision International

"For the last ten years I've been directing health and nutrition work for World Vision where our mission is to help the most vulnerable children in the world. Every year we still see almost 5.8 million children dying from preventable causes before the age of five, it's outrageous.

I work closely with our WASH department (Water, Sanitation and Hygiene) and we have prioritised NTDs, specifically soil transmitted helminths and schistosomiasis, within our strategy. It's where we can make a real difference because of the ill-health they cause for small children, especially those under five, as well as pregnant and lactating women. We're very concerned about the effect on nutrition outcomes and the anemia that's exacerbated by disease. The NTD factor is one we can't ignore if we are going to improve child and maternal health.

I've been working closely with the Global Schistosomiasis Alliance which provides the platform for all of us working together to move an integrated program forward on the ground and towards elimination of the disease.

I had first-hand exposure when I first went to Africa in 1991 as a Peace Corps volunteer and I lived in a rainforest area in the Republic of Congo. I contracted soil transmitted helminth infections at the time and had to treat myself – it was an awakening experience for me about the harsh reality for a lot of people living in these conditions.

For decades the international and humanitarian community have been investing to improve access to potable water and sanitation facilities, and hygiene practices. Some of the work in WASH is infrastructural and some is behavioral.

What is most important in schistosomiasis is to reduce or stop people's exposure to contaminated water. If you want to enable women to avoid contamination while washing clothes they must have an alternative water source that's safe, likewise with bathing.

But this sometimes means taking on practices and traditions that date for millennia, and we must understand the complexity. It's easy to see why people understand severe acute malnutrition where a small child is very visibly affected versus a parasitic infection which is a lot more difficult to detect and appears much less urgent. It does not manifest like malaria, for example, in a high grade fever yet it has significant health effects.

Once I was assisting with a schistosomiasis research on Lake Malawi, collecting snail specimens which we put in a clear container within water. At a certain point in the day they would start shedding, you could see with the naked eye the horrifying sight of all those parasites coming out of the snail in the thousands, just clouding the water. That's the kind of exercise which can help people see tangibly what's happening in their communities.

'WHAT IS MOST IMPORTANT IN SCHISTOSOMIASIS IS TO REDUCE OR STOP PEOPLE'S EXPOSURE TO CONTAMINATED WATER'

The promoter of health equality: schistosomiasis, poverty & the need for WASH continued

The London Declaration was the most significant global milestone in catalysing this work to a 2020 timeframe, along with the pharmaceutical commitments to providing the treatment, but it is really more about control than elimination. I think we're looking to 2030 towards elimination, but it's a high bar. We've seen collective action achieve the elimination of smallpox and near-elimination of polio. From a historical perspective this can be done and we can free children and adults from this terrible disease. It's within reach.

Working with the Global Schistosomiasis Alliance, we need to build on the treatment together with WASH work, behavior change, community mobilization and health care. NTDs really are diseases of the poor. They could be easily treated and diagnosed but those affected don't have reasonable access to health services. It's an equity issue which is heart-breaking."

WASH AIMS TO CLEAN UP

Millions of people around the world lack safe drinking water, sanitation and hygiene (WASH). This puts them at risk from many diseases, including NTDs. They thrive in areas that lack basic sanitation, primarily due to poverty. This increases exposure to infection, illness and disability, driving up medical costs.

Improved sanitation can prevent faeces and urine which contain worm eggs from contaminating water. This can reduce the transmission of schistosomiasis. As some species are also transmitted via animal waste, fresh water supplies need protection. These measures need to go hand in hand with a safe water supply to facilitate hygiene practices.

A global strategy has been launched by the WHO to strengthen efforts on WASH to accelerate progress against NTDs by 2020.[4]

The Innovator

Championing the health of the under-6s

JUTTA REINHARD-RUPP
Head of Global Health, Merck

"There is no treatment available for small children with schistosomiasis – we intend to change that. They are very vulnerable to infection and debilitating disease. We know young children can be infected early on because they get exposed to water every day, especially for bathing and playing. They offer the worm a hiding spot – a reservoir in which it cannot be attacked because praziquantel is licensed only for adults and children four years and older.

These young children may spend years stunted by hidden infection. In many cases, the parents don't notice anything, but the children fail to grow, are often fatigued and have difficulties learning. But the worst aspect is worms laying eggs in the children's tissues. These eggs can cause chronic damage to the children's organs – we just can't wait for them to be old enough for treatment.

Until now there have been no studies to determine the correct dosage for young children – it's not possible to simply divide up the big tablets because children are not just small adults, their metabolism is completely different from that of grown-ups. And younger children cannot swallow the current tablets, they need a pediatric formulation.

We created a public–private partnership, our Paediatric Praziquantel Consortium, of seven partners to develop a formulation for younger children. The research is unique and now in Phase 2 clinical development in Ivory Coast. For the first time we are doing a pediatric study in young African children in a rural setting.

A big problem we've had to solve is the bitter taste of the current tablet. It's not as simple as it sounds. We tested sweeteners for our new formulation with school children in Tanzania. We asked them to take the tablet, taste it and spit it out. Then on a scale with smileys they were asked to rank them. We found a sweetener that is definitely better but not so sweet the children like it too much!

The new tablet is small and dissolves in the mouth. You can put it in a spoon of water, see it dissolve and then easily swallow it. This is important for practical use in communities as young children may have to swallow three or four tablets depending on their weight. We hope this treatment will be available by 2019 or 2020 and we are already discussing with our partners how we are going to provide access.

With a disease like schistosomiasis, the way to success is about partnerships. It's a huge investment from all of us to develop this medicine. In fact, we had controversial discussions along the way as some wrongly believed younger children don't need treatment because they cannot be infected. But growing evidence shows they often are. Today, we assume that more than 20 million young children are already infected by schistosomes.

'THERE IS NO TREATMENT AVAILABLE FOR SMALL CHILDREN WITH SCHISTOSOMIASIS – WE INTEND TO CHANGE THAT'

'WITH A DISEASE LIKE SCHISTOSOMIASIS, THE WAY TO SUCCESS IS ABOUT PARTNERSHIPS'

Championing the health of the under-6s continued

An integrated approach is important. Current diagnostics are not sensitive enough. We may not be allowed to treat every child without diagnosing them, and we need to measure the impact in villages and schools. Countries need proof that they got rid of schistosomiasis. At Merck, we created a Global Health Institute to address these aspects of diagnostics, treatment and vector control, and in collaboration with external partners we are also testing new compounds with a different mechanism that could complement praziquantel.

You can only be serious about eliminating a disease when you see the need for an integrated approach, and we have to understand the many angles to deal with this disease in Africa. Ten years ago when I heard about our donation program I was doing something completely different in the company but now I think I have made my passion my profession."

THROUGH THE LOOKING GLASS FOR NEW TREATMENT CHOICES

LOOKING-GLASS chemistry is being used to make praziquantel even more patient-friendly.

This technique depends on the fact tha t some chemicals – like praziquantel – come in two forms, which differ in the same way that a left hand differs from a right hand; they are mirror images of each other.

Despite a close resemblance, significant differences in their biological properties can exist. Only one can be responsible for the desired physiologic effects while the other may be less active, inactive or even cause side effects.

In schistosomiasis scientists believe there is scope to improve treatment using this method. Praziquantel is a mixture of two mirror image molecules that have the same chemical composition, but mirror each other in their physical structure. They are not identical; they are reflections of each other like the right and left hands. One is critical for the medicinal effect, while the other is disproportionately responsible for the bitter taste.

Previously, only this mixture was available as a treatment but we can now produce the molecule's active type separately. When the inactive bitter type of the molecule is removed, the size of the tablet can be automatically halved.

The Donation Advocate

Driving partnerships for change

BELĒN GARIJO
Member of the Executive Board of Merck & CEO Healthcare

"The middle of April I was in Geneva for a very important conference to take stock of the campaign against Neglected Tropical Diseases. I want to share with you my feelings and the pride of Merck, our company, during this event.

By coincidence, we celebrated two anniversaries during this event. We marked five years since signing the London Declaration in 2012, but for us it was also the tenth anniversary, to the day, of what I consider an exciting but also demanding journey we embarked on when we at Merck signed an agreement with the World Health Organization.

That agreement in 2007 was the decision to supply our drug praziquantel to fight schistosomiasis, a neglected tropical disease that affects more than 200 million people, mainly in sub-Saharan Africa.

Originally, our donation was 25 million tablets; today it is up to ten times that, and we can now treat more than 100 million patients, mainly African schoolchildren. Yes, 100 million a year, significantly more children than there are people in all of Germany.

From the very beginning of our participation in the battle against schistosomiasis we wanted one day to achieve the elimination of this disease, but very quickly understood that this goal would be reachable only by adopting a multi-pronged approach which also requires a praziquantel pediatric form suitable for children younger than six years old. We have launched the development of such a pediatric form and this new formulation will be ready for submission by 2019.

But if you want to be a truly effective supporter of Global Health you know that drug donations alone are not enough, and you act accordingly. That's why we also created an information, education and communication campaign including 1.5 million educational booklets and 75,000 posters.

These materials promote simple preventive measures to avoid infection with schistosomiasis, identify the risks of swimming in lakes and rivers, and teach how to recognize the disease.

Starting from a campaign built around the donation of medicine, we have elaborated a holistic approach to fighting the disease. And since we believe firmly in collaboration, this approach has also included the establishment of partnerships with the main stakeholders involved in countering schistosomiasis. We have therefore initiated the Global Schistosomiasis Alliance, which brings together key stakeholders to jointly move towards the elimination of schistosomiasis.

But schistosomiasis is only one of 18 Neglected Tropical Diseases (NTDs), which is why, within the scope of our know-how, we at Merck also want to tackle some of the other NTDs, like human African trypanosomiasis, leishmaniasis and Chagas disease.

'ORIGINALLY, OUR DONATION WAS 25 MILLION TABLETS; TODAY IT IS UP TO TEN TIMES THAT'

Driving partnerships for change **continued**

Here, too, we believe in partnerships, and in the framework of agreements with the University of California at San Diego and, separately, with DNDi (Drugs for Neglected Diseases initiative), we will open our compound library to the screening capacity of these two partners. Our hope is that these collaborative efforts will accelerate the discovery of new compounds to fight NTDs.

In Geneva I was very honored in the name of Merck to discuss our efforts not only with The Gates Foundation in the presence of Bill Gates, but also with the assembled global health community, including WHO Director General Margaret Chan and the health ministers of many endemic countries.

In front of this community I reaffirmed our willingness to finish the job, so to speak, and achieve elimination.

It was a strong commitment not only for the elimination of schistosomiasis, but also to act in total transparency as a strong and responsible partner in Global Health.

The conference in Geneva strengthened yet further our resolve to make a positive difference, and I have decided since to create a Merck Global Health Institute (GHI). The GHI will regroup all our activities related to Global Health. The GHI will also help us to focus all our efforts in this context and to support the fight against NTDs and schistosomiasis even better.

‘OUR HOPE IS THAT THESE COLLABORATIVE EFFORTS WILL ACCELERATE THE DISCOVERY OF NEW COMPOUNDS TO FIGHT NTDS’

Timeline

4100 BC
Scientists in 2014 discovered in Northern Syria the first known case of infection in a child skeleton more than 6,200 years old.

450 BC
Schistosomiasis was endemic in ancient Egypt, documented by the ancient Greek historian Herodotus and found in mummies during modern times.

1851
Schistosomiasis – also called bilharzia after Theodor Bilharz – is first described by the German physician.

1958
Chairman Mao launches a crusade in China against 'snail fever' with his poem Farewell to the God of Plague – one of the most successful public health campaigns in history.

1972
The laboratories of Bayer discover the active ingredient and work with Merck to develop praziquantel – the first effective drug for schistosomiasis. It is launched under the brand name Biltricide.

1980s
The first mass drug administration programs get underway using paid-for treatment.

2002
The Schistosomiasis Control Initiative is established to help governments in African countries fight the disease.

2007
WHO first meeting of global partners to tackle NTDs, leading to the roadmap of goals towards elimination.

2007
Merck and the WHO join forces to fight schistosomiasis in African school children. Merck's initial commitment includes the donation of 200 million praziquantel tablets to the WHO.

2012
The London Declaration on NTDs is endorsed to end the neglect of diseases like schistosomiasis and reach 2020 goals. Within this framework Merck commits to increase its annual donation tenfold from 25 million to up to 250 million tablets a year until the disease is eliminated in Africa.

2014
The Global Schistosomiasis Alliance is formed with founding members including the Bill & Melinda Gates Foundation, SCI, the US Agency for International Development and World Vision International.

2017
Anniversary of 10 years of donated treatment – 500 million tablets donated and 100 million people, primarily school children, treated.

Biographies

Amour Khamis Amour studied at Zanzibar Health College in 1983-1984, then received a Diploma at Muhimbili University of Health Science between 2005 and 2008 and undertook short courses at the Danish Bilhazia Laboratory in 1990 and the South Africa Kwazulu-Natal of Parasitic Disease in 2000.

Dr Lester Chitsulo was born in Mvuma, Zimbabwe, but finished primary and started secondary education in Ntcheu, Malawi. He completed secondary school in Atlantic, Iowa, then graduated with a BSc. Degree in biology from Brown University, an MSc. in Medical Parasitology from the London School of Hygiene and Tropical Medicine, and a PhD. in Parasitology from Tulane University. A citizen of Malawi, he lives in Lilongwe.

Before joining the WHO, Lester Chitsulo worked for the Ministry of Health, Malawi, from 1979 to 1997. He worked on schistosomiasis control and then took on responsibility for communicable diseases control. He coordinated health research for the Ministry of Health and from January 1996 to August 1997 was Programme Manager of the National AIDS Control Programme, Malawi.

Dr Chitsulo first joined the Department of Control of Tropical Diseases, WHO, in 1997 to work on schistosomiasis. From December 2000 to July 2006 he worked in the Special Programme for Research and Training in Tropical Diseases (WHO/TDR) on research capacity strengthening in the Least Developed Countries, as well as coordinating the program's research efforts on schistosomiasis.

Dr Amadou Garba Djirmay is in charge of schistosomiasis control at the WHO's Department of Control of Neglected Tropical Diseases in Geneva, Switzerland. Before moving to WHO Headquarters in 2015, he worked for the WHO Regional Office for Africa to scale up control programs in the region.

Dr Garba is a clinician with research and public health experience and has worked for more than 25 years on the research and control of schistosomiasis and other neglected tropical diseases.

He graduated from the University of Niamey, Niger (MD), the University of Benin (MPH) the University of Bordeaux 2, France (MSc) and the University of Basel (Swiss TPH), Switzerland (PhD). He managed national schistosomiasis control programs in Niger and set up the Neglected Tropical diseases Control Programme of Niger.

Earlier in his career he served as researcher at CERMES in Niamey, a WHO collaborating center on schistosomiasis control. He conducted research on schistosomiasis morbidity and the regressions of the related lesions using ultrasound, schistosomiasis mass drug administration frequency, praziquantel efficacy trials and schistosomiasis risk assessment surveys prior to dam constructions, including Burkina Faso and Benin.

He conducted research and consultancies on several health issues such as meningococcal meningitis control, vaccines trials, HIV surveys and school health policy, and has authored book chapters and more than 60 scientific articles in peer review journals.

Dr Garba is a member of several scientific societies including the Royal Society of Tropical Medicine and Hygiene and the French society "Société de pathologie Exotique".

Professor Alan Fenwick OBE is a leading international figure in the world of neglected tropical diseases. He has dedicated his life to the research and control of schistosomiasis, founding and directing the Schistosomiasis Control Initiative, which works with countries to eliminate the debilitating tropical disease.

For 35 years he has worked and studied schistosomiasis in Tanzania, the Sudan, and Egypt before moving back to London with the SCI. He was awarded an OBE by the Queen in 1988 for his work in Sudan plus gold medals "d'honneur" from Burkina Faso and Niger. He has received other awards from the UK Royal Society of Tropical Medicine and Hygiene and the US American Society for Tropical Medicine and Hygiene. He has been a Professor of Tropical Parasitology at Imperial College since 2002.

Belén Garijo is a Member of the Executive Board of Merck since January 2015. She is responsible for the Healthcare business sector, comprising the Biopharma, Consumer Health, Allergopharma and Biosimilars businesses. Since 2013 she also acts as President and CEO of the Biopharma business, where she started in 2011 as Chief Operating Officer.

Before joining Merck, Belén Garijo was employed by Sanofi-Aventis as Senior Vice President Global Operations Europe, serving as a member of the Management Committee of the Sanofi-Aventis Group and of the Management Board of the Sanofi-Pasteur vaccines joint venture with MSD. In 2011, she took on the additional role of Global Integration Leader for the Genzyme acquisition. From 2003 to 2006, Belén Garijo was General Manager of Aventis Spain, subsequently leading the merger of Sanofi-Aventis in 2004. From 2000 to 2003 she served as Global Vice President Oncology at Aventis and from 1996 as Director of the Oncology Business Unit in the predecessor company Rhône-Poulenc Rorer.

Prior to this she worked in R&D for eight years, initially as the Medical Director of the Abbott Laboratories Spanish affiliate, before moving to lead International Medical Affairs at the Abbott headquarters in Illinois, USA.

Belén Garijo is a medical doctor, specialized in clinical pharmacology. She worked as a practicing physician for six years, before moving to the pharmaceutical industry. Belén Garijo is married and has two daughters.

Dan Irvine is the Senior Director of Operations, Health and Nutrition for World Vision International. He directs World Vision's maternal, new-born, child health and nutrition strategy across 100 countries, championing community system strengthening and ending preventable illness and malnutrition, especially for the most vulnerable. Dan has served on the advisory groups for the Global Schistosomiasis Alliance and the Soil Transmitted Helminthe Coalition, where he has advocated for disease elimination efforts in the spirit of the London Declaration. He believes that elimination requires greater collective prioritisation and action amongst diverse stakeholders with potential contributions to this effort.

Dan holds a BSc. in Community Psychology and a MSc. in Public Policy. He has taught at George Mason University, and regularly lectures. He worked in Africa for 15 years, with the U.S. Peace Corps and as a consultant, prior to returning to the U.S. to engage in global policy and advocacy.

Dr Poppy Lamberton is a senior lecturer at the University of Glasgow whose research focuses on schistosomiasis and has first-hand experience of the disease having spent ten years working in Uganda. Her research uses field epidemiological data, laboratory experiments and population genetics to develop an understanding of the parasite population structure, disease transmission and the effects of long term mass drug administration.

Dr Lamberton has recently received a Medical Research Council Global Challenges Research Fund award to work with social scientists, complementing her European Research Council funded work, to understand more about how to reduce transmission and improve sanitation within Ugandan communities.

Jutta Reinhard-Rupp is the Head of the Global Health Institute at Merck. Her focus is the discovery and development of new health solutions including drugs and diagnostics for most vulnerable populations such as children and their mothers in developing countries suffering from infectious diseases.

Jutta Reinhard-Rupp studied Biology in Mainz and Tübingen and received her PhD at the Max-Planck Institute in Tübingen. After her postdoctoral training at Novartis she was lab head at Evotec Biosystems in Hamburg. In 1997 she joined Aventis in various assignments in Research and Development with increasing responsibility. Under her leadership, an innovative gene therapy project was moving into clinical phase III worldwide.

Since January 2008 she has been working at Merck in Switzerland with responsibilities on the implementation of key strategic initiatives in drug discovery and development; she led the internal Innovative Medicine Initiatives office and the stem cell research strategy for Merck. Jutta is now the Head of the Merck Global Health Institute steering a comprehensive portfolio including the development of a new pediatric formulation of praziquantel to treat schistosomiasis in young children, the development of new anti-malarial treatments and new child-friendly diagnostics as well as improved devices. She also serves as scientific advisor at various boards including CouNTDown in the UK and EDCTP, the European & Developing Countries Clinical Trials Partnership.

Dr Lorenzo Savioli is well known for his pioneering work establishing and implementing the public health strategies for schistosomiasis in Zanzibar, Tanzania. After studying at the University of Rome and the London School of Hygiene and Tropical Medicine he joined the WHO in 1991 and, over the next 14 years initiated and coordinated programs for the control of schistosomiasis and other parasitic diseases. In 2005 he was appointed the Director of the Department of Control of Neglected Tropical Diseases where he oversaw projects and programs for 17 NTDs.

Under his leadership, Dr Savioli has ensured the expanded support from the WHO for prevention and elimination programs for NTDs and established public health standards allowing large scale interventions, benefitting the lives of millions.

Professor Louis-Albert Tchuem Tchuenté is Professor of Parasitology at the University of Yaoundé, Founding Director of the Research Centre for Schistosomiasis & Parasitology, Coordinator of the National Programme for the Control of Schistosomiasis and Intestinal Helminthiasis, Coordinator of the COUNTDOWN Project on Neglected Tropical Diseases (NTDs) in Cameroon, and NTD Ambassador. He has over 30 years of experience in various aspects of management, research and control of schistosomiasis, soil-transmitted helminthiasis and other NTDs.

Through his scientific discoveries, he contributed to a better knowledge of the reproductive biology of schistosomes and its implications on the epidemiology of schistosomiasis. He provided strategic direction and built high political commitments for the control of NTDs in Cameroon, with significant achievements.

He joined the World Health Organization Regional Office for Africa in 2012-2015 where he worked as focal person for preventive chemotherapy NTDs and provided technical assistance to African countries. He served as focal point for the China-Africa collaboration for the elimination of schistosomiasis in Africa.

Prof. Tchuem Tchuenté is member of several international Advisory Committees, and is on the editorial board of several international journals. He serves as the Regional Adviser for Africa of the UK Royal Society of Tropical Medicine and Hygiene. He has published over 100 papers in peer-reviewed journals. He received several awards and distinctions, and was raised to the dignity of Commander of the National Order of Valour of Cameroon.

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Location photography Marcus Perkins