
THE SCHISTOSOMIASIS ACTION PLAN: NEXT GENERATION RESEARCH ON THE ROAD TOWARDS ELIMINATION

28TH OCTOBER 2018

JW MARRIOTT NEW ORLEANS

SUMMARY

The GSA held a research-focused meeting on the 28th of October 2018 in New Orleans. The meeting was organized by the co-chairs of the GSA Research Working Group, Dr Poppy Lamberton and Dr Jutta Reinhard-Rupp. The meeting opened with Professor David Rollinson, Director of the GSA, giving an update on the GSA Action Plan for schistosomiasis followed by an overview of the GSA's Working Groups. This was followed by updates from the leads of COR NTD Schistosomiasis related workshops, particularly focused on operational research priorities and next steps.

The meeting session on morbidity started with a call to action on Female Genital Schistosomiasis (FGS) from Dr Pamela Mbabazi (WHO, Geneva), a scrutiny of FGS early detection markers and other morbidity markers by Dr Amaya Bustinduy (LSHTM) and an outline of the Morbidity Operational Research for Bilharziasis Implementation Decisions (MORBID) study by Dr Evan Secor (CDC). The next session looked at novel research in new technologies starting with the use of transgenics in *Biomphalaria glabrata* and implications for snail control by Dr Nic Wheeler (Merck – Wisconsin Madison), Dr Meta Roestenberg (LUMC) discussed her work on assessing the feasibility of developing a controlled human infection model (CHIM) to test schistosomiasis vaccines, new *S. haematobium* antigen targets for an antibody-based point of care diagnostic tests presented by Prof. Alex Loukas (James Cook) and two talks on schistosomiasis vaccine candidates: Prof. Afzal Siddiqui (TTUHSC) presented research on the Sm-p80 vaccine candidate, and Dr Maria-Elena Bottazzi (BCM) on the Phase 1 trials of the Sm-TSP-2 vaccine. The final session of the meeting looked at the progress towards schistosomiasis elimination with Dr Jaspreet Toor (Imperial College) presenting modelling insights into achieve WHO schistosomiasis targets and elimination goals, Dr Fatma Kabole (Ministry of Health, Zanzibar) highlighting lessons learnt from the Zanzibar Elimination of Schistosomiasis Transmission programme and Dr Pauline Mwinzi (WHO AFRO) who gave an overview of ESPEN and programmatic challenges for schistosomiasis elimination.

MEETING REPORT

I. WELCOME, GSA UPDATE AND SCHISTOSOMIASIS ACTION PLAN – DAVID ROLLINSON

Professor Rollinson, Director of the GSA, started the meeting by highlighting the Action Plan (AP) for Schistosomiasis, summarizing its first iteration presented at the 2017 GSA Baltimore meeting and its refinement at the GSA London meeting in April 2018. He explained that this meeting would cover some of the items in the AP and that there will be an opportunity for discussions during the meeting and beyond. Prof. Rollinson

described how the GSA had reconfigured its working groups (WG) and activities to fit with the AP. The current GSA working groups are: implementation, research, M&E and behaviour change.

- A. Implementation WG: Current chairs Dr Michael French and Prof. Alan Fenwick. Purpose: To find ways to strengthen the landscape and bring different organizations together to progress schistosomiasis programmes. Next steps and priorities include identifying gaps and coalitions/collaborations. <https://www.eliminatestschisto.org/working-groups/implementation>
- B. M&E WG: Chairs Dr Fiona Fleming and Prof. Louis-Albert Tchuem Tchuente. Purpose: To provide evidence-based strategies, develop quality mapping support, optimize research and micro targeting, diagnostic surveys. Next steps to include precision mapping and diagnostic surveys. <https://www.eliminatestschisto.org/working-groups/behaviour-change>
- C. Behaviour change WG: chairs Ms Willemijn Zaardnoordijk and Dr Bobbie Person. Purpose: To advocate for and serve as a catalyst for the integration of evidence-based behaviour change and health education strategies into existing and new schistosomiasis control and elimination programmes. Next steps include identifying gaps in schistosomiasis behaviour change knowledge, particularly evidence-based methodologies and evaluation, and liaising with cross-cutting disease groups (e.g. NNN WASH) to create a menu of techniques and technologies that are available for NTD programmes to consider. <https://www.eliminatestschisto.org/working-groups/monitoring-and-evaluation>
- D. Research WG: Dr Poppy Lamberton, Dr Jutta Reinhard-Rupp. Purpose: To promote, communicate and support operational and next generation research to accelerate progression towards the schistosomiasis control and elimination goals. Next steps include diagnostics, pre-SAC and FGS. <https://www.eliminatestschisto.org/working-groups/research>

II. SUMMARY OF COR-NTD – CHAIRED BY ALAN FENWICK

This session was opened by Prof. Alan Fenwick and aimed to give an overview and update of the COR NTD schistosomiasis sessions.

1. Identifying and responding to non-responsive schistosomiasis and STH areas following treatment

Dr French gave an overview of the session which he highlighted identified more questions than answers. Talks during the COR-NTD breakout session had been given by: Dr Boubacar Diop who discussed non-responsive *Schistosoma haematobium* areas; Dr Rubina Imtiaz discussed the development of a failure checklist for areas of persistent STH transmission; and Dr Jahirul Karim discussed areas of very STH high infection in Bangladesh even after 21 rounds of treatment. Discussions focused on three questions:

- Definition of non-responsive area?
- How can programmes identify persistent non-responsive areas?
- How can programmes determine the cause of these non-responsive areas?

Breakout group discussions identified common themes including the importance of differentiating reinfection vs non-response, i.e. biological hotspot vs programmatic hotspot, that definitions of non-responsive areas will likely vary according to programmatic goal and by species, location, culture, ethnic group, genetics, age. Context specific information/microdata would be needed and using GIS covariates (WASH, temperature, proximity to water, presence of snails, poverty etc.) could be used to rule out areas and identify where further investigation would be needed. The breakout groups developed potential Operational Research questions to tackle the knowledge or programmatic gaps of Non-responsive areas: What is need for the development and testing of standardized protocols – Who do you test? How often? Which diagnostics? Can we redefine efficacy of drugs,

the opinion is that efficacy is reducing over the last 10-15 years? What is the evidence base for existing thresholds for MDA?

2. Shrinking the Map for Schistosomiasis

Dr Fleming gave an overview of the COR-NTD session “Shrinking the Map for Schistosomiasis: Identify the Operational Research Needs for Precision Mapping”. The COR-NTD session started by talks from: Professor Louis-Albert Tchuem Tchuente, highlighting the need for precision mapping/micro-mapping by showing the conflicting implications in terms of PZQ need when using mean district prevalence vs. highest site prevalence; Dr Pauline Mwinzi covering the current WHO AFRO mapping initiative and sampling strategies called Filling in the Gap and focused at the sub-district level; Dr Hugh Sturrock presented on the key principles around mapping and probability and introduced mapping software used to determine hotspot transmission areas for malaria and LF; Dr Penelope Vounatsou gave a global picture of GIS models for predictive mapping and attempts to quantify changes in endemicity adjusting for environmental, WASH and PPC variables; Dr Rachel Pullman presented modelling simulations sampling at district and sub-district levels and showed that over or under treating was a greater risk when using district level data.

The consensus was that current mapping protocols are insufficient in elimination settings and also need improvement in gaining and sustaining control settings. Breakout groups during the session looked at various scenarios and discussed survey design, age groups, gaps in evidence and optimal operational research. Group discussion highlighted the capacity, cost and resources element was vital and that further analysis was needed as well as more detailed survey to understand challenges for micro/ precision mapping. Questions include: how is cost-effectiveness defined in short and long-term perspectives? Should snails be included? What is ratio of schools rather than administrative divisions? How to different treatment algorithms perform against drop-out?

3. Monitoring and Evaluation (M&E) for Effective STH and Schistosomiasis programmes

Dr Suzy Campbell (Evidence Action) presented the aims of the session which were to highlight cost-effective country-led M&E initiatives/strategies and to define operational research gaps, and the COR-NTD talks that set the scene: Dr Imtiaz introduced an M&E framework for STH, using a tier structure; Dr Fleming covered various components of M&E, an area of particular focus for many is the impact evaluation component; Dr Campbell presented on behalf of Dr Ajay Khera, on the M&E component of India's deworming programme, the biggest deworming programme in the world; and Dr Collins Okoyo presented impact evaluation undertaken of the first 5 years of Kenya's deworming programme which included a baseline, midline and end line. Group discussions focused on: performance monitoring and data quality, epidemiological monitoring & evaluation timelines, metrics, age-cohorts and capacity sustainability quantification, development and gap identification. Groups discussions identified the need for:

- Refined goal setting beyond 2020 for STH and SCH
- a revised and rigorous M&E framework, evidence-informed direction setting,
- a recognition that M&E must be responsive to capacity and maturity of programmes.

Additional highlights include the lack of evidence-based guidance in a number of areas including sample size calculations to meet statistical rigor, that more than the recommended 10% of overall programme costs should go to M&E (as is the case with other disease interventions e.g. Vaccinations), the need to look at M&E sustainability (capacity, resources etc.) and the continued issue of lack of evidence, e.g. for the interruption of transmission, makes it very hard to develop relevant M&E strategies.

4. Behaviour Change for MDA, WHO targets, WASH, & Morbidity

Dr Goylette Chami's COR NTD session focused on highlighting a set of methods for BC in NTD control. The overall question discussed was how does behaviour affect control and elimination efforts/programmes and what methodologies are being used. Aspects that were explored were transmission, treatment delivery, WASH components, morbidity and mathematical modelling. Presentations were given by: Professor Tchuem Tchuente on various Behaviour Change tools e.g.: Using real time feedback of water contact behaviour to mothers and children using GP loggers. Dr Geordie Woods on a method from behaviour economics called Behavioural Nudges, e.g. Linking soap to hall passes, making the soap already available, and convenient and if the pupil comes back with dry soap then the teacher can tell them off. Dr Deirdre Hollingsworth on what happens when we don't address behaviour on the ground, how does this impact modelling outputs that are used to direct programme decisions. And Dr Michal Bruck on interventions and methods used for WASH related BC, particularly looking at sustainability and community ownership e.g. If you build a tap you need to create a buy in strategy such as getting the community to invest 30% of funds to build the tap, they then have a stake in it working. Group discussions addressed Behaviour Change research needs in treatment delivery, open defecation and FGS.

Discussion:

Discussions highlighted that it was interesting to see similar issues coming up, especially regarding hotspots and the importance of M&E capacity, especially with increasing pressure by donors to pass on programmes relatively quickly to ministries of health. This is of concern regarding elimination efforts and guidance on approach is needed.

Rapporteur: Arminster Deol

III. FGS AND MORBIDITY – CHAIRED BY JUTTA REINHART-RUPP

The session was chaired by Dr Reinhard-Rupp in which there were 3 invited speakers: Drs Pamela Mbabazi (WHO, Geneva), Amaya Bustinduy (LSHTM, UK) and Evan Secor (CDC, USA). Dr Reinhard-Rupp outlined the rationale for a heightened focus on female genital schistosomiasis (FGS) alongside further scrutiny of morbidity markers in general and those judged useful for tracking disease control. After giving a personal perspective, she emphasized their importance about fulfilling the health sector ambition of the Merck praziquantel donation programme and research activities of the GSA.

1. FGS, HIV and the launch of the UNAIDS-WHO report

The connection between FGS, which is estimated to affect some 56 million women, and the HIV epidemic in sub-Saharan Africa was presented by Dr Mbabazi. She went on to describe recent clinical reviews/case studies and broader epidemiological studies as ongoing evidence that has enabled high-level dialogue/advocacy between WHO-NTD department and UNAIDS. Highlights include the soon-to-be-published joint report on FGS and HIV, several scientific meeting reports as well as outputs from focus groups as brought together by UNITED TO COMBAT NTDs with attention to gender, not forgetting male genital schistosomiasis. Dr Mbabazi call for urgent action to increase awareness among health works and policy makers, the need to scale up and sustain a public health approach to prevent FGS and the need to provide clinical treatment for women who develop FGS.

2. FGS and early detection morbidity markers

Current biomarkers of morbidity were reviewed by Dr Bustinduy, who used a hypothetical target product profile framework to make assessments and judge each biomarker in turn. In short, the repertoire for biomarkers associated with FGS is meagre, with assays for eosinophilic cationic protein and real-time PCR of lavage fluids most promising for being used in adjunct with clinical colposcopy and staging with the WHO FGS Pocket Atlas. More general markers included those associated with blood or inflammatory components in various body fluids,

e.g. faecal occult blood, and it was suggested that biomarkers associated with impaired growth such as osteopontin should be explored.

3. MORBID

Taking forward the potential list of morbidity assays into a research study was discussed by Dr Secor who outlined the MOBID study: Morbidity Operational Research for Bilharziasis Implementation Decisions. Focus was on *S. mansoni* and *S. haematobium* infections and how these parasites give rise to disease which may be averted with praziquantel treatment schedules. This large-scale study is seeking funds from USAID to implement on a large-scale typically investigating some 50-75 individuals each with pre-school-aged, school-aged and adult groups, with approximately 120 villages across key infection thresholds (i.e. 0%, 0.1-10.0%, 10.1-25.0%, >25.1%). It was hoped that at the end of this study a much deeper insight into the long-term dynamics of morbidity could be made which would provide evidence to validate predictive simulation models.

Rapporteur: Russell Stothard

IV. ADVANCES IN VACCINES, DIAGNOSTICS AND SNAIL CONTROL -CHAired BY POPPY LAMBERTON

This session was opened by Dr Poppy Lambertson, introducing novel research on new technologies with the potential of being the next generation of schistosomiasis diagnostics and control and elimination interventions.

1. Vector control using new molecular techniques

New technologies using the genome of *Biomphalaria* snails may open new opportunities for snail control. Dr Nic Wheeler (Merck – Wisconsin Madison) presented his novel research on the transgenics in *Biomphalaria glabrata* and implications for snail control. Dr Wheeler argued that *Biomphalaria glabrata* embryonic cell line was an under used resource and could be used in knockdown expression of gene/s of interest. This new technology can formulate gene drive, using a driving endonuclease gene, making homozygous genetically engineered individuals, thus modifying population progeny to drive helminth resistant genes in snail populations. Dr Wheeler highlighted his next steps and main goals, adapting existing transgenic protocols and establish a delivery technique to develop transgenesis in the snail egg stage, then in the snail adult stage without reducing oviposition or survival of the snail. This technique could be a new tool in control schistosomiasis transmission in sites by driving schistosome resistance in snail populations.

2. Dissecting immune responses following controlled human schistosomiasis infections to guide vaccine design

One of the challenges for the development of a vaccines is the lack of an appropriate cost-effective model to test a vaccine candidate. Dr Meta Roestenberg discussed her work on assessing the feasibility of developing a controlled human infection model (CHIM) to test schistosomiasis vaccines. Dr Roestenberg is monitoring immune responses following controlled human schistosomiasis infections with male only cercariae (no eggs = no tissue damaged). She is using a dose escalation design with small groups of volunteers, escalating from 10-30 cercariae. Side effect were reported in one of the individuals exposed to 30 cercariae and therefore all future exposures were limited to 20 cercariae maximum. Volunteers reported symptoms from tingling sensation, development of mild rash after 2 weeks, headaches, night sweats and general malaise, one volunteer developed Katayama fever. The study monitored antibody and antigen measurements through infections timelines. Dr Roestenberg highlighted how infection dose impacts on several immune related findings, with dose-dependent effects on CAA in serum, tolerability and the number of adverse events. Dr Roestenberg also noted that based on serum CAA at week 4-6 post exposure 40mg/kg PZQ is insufficient to achieve 100% cure even at these low levels of infection. IgM seroconversion exists at 4-5 weeks post infection which makes it a relevant diagnostic for travellers. Dr Roestenberg highlighted that this is a model and not representative of what's happening in the field.

3. Discovery of *S. haematobium* diagnostic antigens using an 'Immunomics' approach.

There is a need for a sensitive, easy to use *S. haematobium* diagnostic, Prof. Alex Loukas presented his research to identify antigens to diagnose *S. haematobium* infection using antibody profiling of the urine and serum of

infected individuals. He used protein microarrays to select appropriate antigens for the development of an antibody-based point of care diagnostic tests. Prof. Loukas's research used a mixture of proteome datasets and bioinformatic analysis of 1053 proteins which were selected for testing. Zimbabwe urine and serum samples were stratified into groups based on their intensity of infection, egg negative and CAA positive category. The first step of this study was to identify antibodies from serum/urine that are detectable in all infected cohorts. The second step was to identify the minimal antibody signature from serum and/or urine which could discriminate between individuals with very low intensity infection (egg negative CAA positive) and no infection (egg negative CAA negative). Prof. Loukas summarised that his research has developed an array with 993 antigens, with the top-ranked discriminatory antigens having predictive values of infection that exceed SEA (the ELISA gold standard). These can be reproduced in the lab. Prof. Loukas is now looking at producing these antigens in yeast and *E. coli* to validate the proteome array results, he will be looking at the kinetics of antibody response after treatment (how quickly do they disappear after treatment) and would carefully consider, with a GSA consultation, the TPP of an antibody-based diagnostic test for use in an elimination setting. Prof. Loukas highlighted that to further this research he needs access to more samples from *S. haematobium* endemic areas with matching urine/serum samples and CAA data.

4. Sm-p80-based schistosomiasis vaccine: Preparation for human clinical trials

Schistosomiasis vaccines have an important role to play and are making great strides. Prof. Afzal Siddiqui presented research on the Sm-p80 vaccine candidate. The immediate target for a schistosomiasis vaccine is the reduction of morbidity rather than sterile immunity. Prof Siddiqui outlined a framework highlighting the necessary characteristics of vaccine to be taken into the field. These included prevention of infection by one of the three human schistosome parasite species and a vaccine that can be administered to adults in high risk occupations/areas and school aged children (3-12years old). The *Schistosoma mansoni*-p-80 vaccine should reduce at least 75% of infection of one of the schistosomes species (egg output/worm burden) and offer protection for at least 2-3 years after the last dose. Dosage and cost should allow parental administration and co-administration with local MDA/other interventions. Prof. Siddiqui summarised the findings of the double-blind preclinical trial of Sm-p80 in Baboons (Ann. N.Y. Acad. Sci. 1425 (2018) 38–51, <https://doi.org/10.1111/nyas.13866>), looking at the efficacy using egg reduction and worm burden in control baboons and in baboons who were given the Sm-p80 vaccine. Prof. Siddiqui highlighted that a unique finding for the experiment was that about 90% of female worms were killed. He reported fewer eggs being produced in tissues and in faeces, between 80-90% reduction, and a reduction in hatching of eggs too. The vaccine is affecting every developmental stage of the life cycle. In blind modelling the data showed that vaccine efficacy of 60% will interrupt transmission in communities with low and moderate transmission settings. The same data was sent to Warwick/Oxford for blind modelling, and findings were similar. When looking at how to implement the vaccine several scenarios were tested including treating chronic infections first with PZQ and then immunizing with Sm-p-80. This showed that when treatment failure happens Sm-p-80 was able to reduce egg burden and prevent female worms and showed some ability to kill established worms. Prof. Siddiqui's team have also looked at *S. haematobium* in hamsters and *S. japonicum* in mice, they also plan to look at *S. japonicum* in water buffalo. In the presented Roadmap for Sm-p80/GLA-SE Vaccine (SchistoShield®), the team will be looking at doing clinical trials in Africa within 2019-2022. Prof. Siddiqui urged people who are working in the field to share lessons learnt and experiences, so mistakes aren't repeated.

5. Phase 1 trials of the Sm-TSP-2 schistosomiasis vaccines

Continuing the focus on schistosomiasis vaccines Dr Maria-Elena Bottazzi gave an overview of the Phase 1 trials of the Sm-TSP-2 vaccine being implemented under a partnership model. Components of why TSP (tetraspanin) was chosen as a potential vaccine candidate included that it was uniquely recognized by individuals who are naturally resistant to *S. mansoni*, it is an accessible antigen on the surface of schistosomula, it protected different strains of mice by reducing number of adult worms, liver egg and faecal eggs compared to controls, and this protection was maintained when formulated with various adjuvants including aluminium hydroxide. Dr Bottazzi described the clinical development stages (Phase I, phase Ib, phase I/Ib) being tested in three different trial sites (USA, Brazil and Uganda). Safety immunogenicity results of the first completed trial in the USA showed the vaccine was safe and well tolerated, with some tenderness and pain at injection site. Headache and fatigue were the most common vaccine related reactogenicity events. No SAEs were reported. Seroconversion rates were

observed after 3 doses of vaccine and showed that the vaccine will need to continue incorporating GLA into the formulation to increase the percentage of seroconversion. Proportions of subjects seroconverting were highest in the 30mcg group. In January 2019 the approved phase I/IIb clinical trials in Uganda will begin which will include a repetition of the Phase I trial and will include a look at a signal of efficacy. Participants will have an 18 month follow up and end points are EPG and CAA.

Discussion

Discussions after the presentations highlighted research needs on the antibody titres, the importance of collaboration and harmonization between the different vaccine studies, especially when reaching phase 3 trials which will require significant investment, the potential of using the Controlled Human Infection model to help overcome the investment road block when vaccines candidates reach phase 3 trials, the importance of doing exhaustive testing of the vaccine and the importance of engaging in dialogue with NTD programmes on how a vaccine could be implemented. Further discussions focused on the regulatory agencies in the EU and the USA (FDA, GNP) for these technologies.

Rapporteur: Rachel Francoeur

V. PROGRESS TOWARDS SCHISTOSOMIASIS ELIMINATION – CHAIRED BY DAVID ROLLINSON

Professor Rollinson opened the final session on schistosomiasis elimination and introduced the three final speakers: Dr Jaspreet Toor from Imperial College London on modelling of SCH elimination and prediction; a real-life case from Zanzibar by Dr Fatma Kabole from MoH Zanzibar and some insights from the programmatic aspect by Dr Pauline Mwinzi by ESPEN.

1. Modelling insights into schistosomiasis elimination

Dr Toor presented some of the work done within the NTD Modelling Consortium. The NTD Modelling Consortium aims at answering relevant policy questions through mathematical modelling of NTDs. Multiple modelling groups work on the same question to investigate model structure uncertainty and the importance of underlying assumptions of each model type. The two models for schistosomiasis transmission and control are developed at Imperial College London and at Case Western Reserve University by the group led by Charlie King.

Dr Toor gave presented an overview of findings published in *Clinical Infectious Diseases*, Volume 66, Issue suppl_4, 1 June 2018, Pages S245–S252 (<https://doi.org/10.1093/cid/ciy001>). The article used modelling data to see if current WHO guidelines are sufficient to achieve the goals set out in the WHO Roadmap. The modelling findings highlighted that current WHO guidelines are sufficient in low prevalence settings but not in moderate and high prevalence areas, where the coverage needs to be increased. The article also looked at whether MDA treatment could be stopped earlier and still maintain control of the disease. The modelling data showed that it was possible to stop treatment after a few rounds if the baseline prevalence is low. However, in moderate and high prevalence settings adult treatments needs to be included. Dr Toor also presented findings from a second paper focusing on M&E strategies, (*PLoS Neglected Tropical Diseases* 12(10) <https://doi.org/10.1371/journal.pntd.0006717>). Here using a deterministic mathematical model, they showed that it is important to gather information on (and treat) young adults as well because they are likely to be infected. For moderate prevalence settings, treating school-aged children only may achieve the WHO goals, regardless of the burden of infection in adults. However, for high prevalence settings, treatment of adults as well as SAC is required within the treatment programme, with coverage levels varying with the burden of infection in adults.

Using a stochastic Individual based model they also investigate the progress towards elimination in different settings. Dr Toor highlighted key findings that when adult infection burden is low, there is a low risk of recrudescence after stopping treatment (90% chance to eliminate) however when adult infection burden is high elimination is not possible.

However, there is a logistical challenge in including adults in survey but including education activities to sensitize could help. Their future work include investigating the impact of diagnostics and migration and extending the results to *S. haematobium*.

2. Programme managers view on elimination in Zanzibar

A programme managers perspective on Schistosomiasis elimination was presented by Dr Fatma Kabole who gave her insights on the Zanzibar Elimination of Schistosomiasis Transmission (ZEST) programme. The ZEST programme intervention and study design used semi-annual MDA in communities and schools in Zanzibar, snail control in 30 randomized shehias (districts), and behavioural changing interventions in 30 randomized shehias. Dr Kabole described the main results and challenges of the ZEST programme (2012-2017).

- *S. haematobium* prevalence went from >50% in 1980 to 20% in 2003, 10% in 2011 and <2% in 2017!
- Schistosomiasis has almost been eliminated as a public health problem in Zanzibar, however there is the challenge of hotspot areas that remain.

Dr Kabole argued that the main challenge of hotspots areas where prevalences kept bouncing back require an improved package of interventions and high coverage. Another key need is for a new highly sensitive point-of-need diagnostics for effective surveillance. Essential cross-cutting components for elimination are:

- Political commitment and active government engagement
- Strong advocacy at all levels
- Intersectoral collaboration
- Funding and fund raising
- Coordination

3. Programmatic challenges for elimination - ESPEN

Dr Pauline Mwinzi gave an overview of schistosomiasis programmes in the AFRO region where 41 countries require preventative chemotherapy and are at different implementation levels however twenty-three countries in the AFRO region have mature MDA programmes at 100% geographical coverage, only 3 have no MDA programme. Across the African region the following countries have developed Master Plans: Lesotho (STH), Swaziland, Botswana, South Africa, Namibia, Zambia, Zimbabwe and Kenya. There are a few countries with “low hanging fruits” for schistosomiasis elimination: Eritrea and Niger. And there are two countries waiting for assessment of elimination status: Algeria and Mauritius. Dr Mwinzi underlined the importance of using the PHASE approach to combat schistosomiasis.

- P - preventative chemotherapy - medicines
- H - health education - communications
- A - Access to safe water - WASH
- S – sanitation - WASH
- E - environmental management e.g. snail control and infrastructure

The Expanded Special Project for Elimination of Neglected Tropical Diseases (ESPEN) Annual Report (2017) has now been finalized and is available on line. All the countries have prepared a second-generation master plan. Now that post 2020 targets are being considered, they should take into consideration that NTD programmes are at different levels of maturity. In April 2018 the WHO organised a regional workshop on master plans to eliminate NTDs in selected southern African countries. Some of the key components of the master plans included aligning the NTD elimination master plans to country’s national health sector strategic plan, expanding treatment to all at risk groups, sourcing medicines for adult treatments, integrating surveillance into national health information systems and initiate routine testing and reporting, accelerate efforts on WASH, vector control and environmental management and include them in the master and annual plans, adopt indicators WASH indicators and include behaviour change communication in primary and secondary schools.

Dr Mwinzi highlighted the following main action points for schistosomiasis:

- Investing in the quality of MDAs, e.g. increase coverage (in 2017 treatment coverage was 41%)
- Supporting impact assessments including morbidity monitoring and drug efficacy surveys. Dr Mwinzi highlighted 25 countries that are conducting or ready to conduct impact assessments for SCH&STH.
- Treating adults, in high prevalence areas treat adults through community MDA, in moderate risk areas treat high risk adult groups and in low risk areas make PZQ available in health facilities.
- Investing in the rest of the PHASE package, i.e. Health education and Behaviour Change, link with WASH and environmental sector and report WASH indicators, where appropriate implement snail control using the WHO Field use of molluscicides in schistosomiasis control operational manual.
- Shrinking the SCH map, support making intervention decisions at sub-district/implementation unit level using precision mapping.
- Supporting national ownership by aligning with the country NTD Master plan and providing technical and resources support.
- Increase transparency and accountability, open sharing of NTD data and budgets will avoid duplication and accelerate progress. Use the ESPEN data portal.

Discussion

The behaviour change interventions in the ZEST programme were discussed, particularly the schools related activities and the clothes washing infrastructure. Dr Kabole reported that access to water is 92% but availability is lacking.

Discussion on elimination highlighted that although the elimination objective may be difficult in parts of the country where prevalence is high, documenting and using lessons learnt from other NTDs such as LF and successful elimination in particular areas of Kenya can show how scaling down may be possible. These documented cases can be used to encourage and support suitable countries to pursue elimination efforts. The district by district approach is possible.

Further discussions covered the need for capacity building (supported by the entire schistosomiasis community) and better diagnostics in low settings (moving to CAA, ESPEN provided funding for mapping 30 countries), the sustainability of country programmes when they are in the elimination as a public health problem and beyond, the spatial and social heterogeneity context that influences the definition of an elimination goal, tackling hotspots and how they could really inform when elimination is evidenced and the need to focus on other interventions, WASH, behavioural change and snail control but also surveillance. Elimination requires adaptive progress, focused interventions and rapid response in low endemic areas.

The meeting closed with Professor Rollinson and Dr Lamberton thanking Merck for supporting the meeting and all presenters and delegates for their contributions. Dr Johannes Waltz on behalf of GSA and Merck thanked all the participants for the interesting discussions and looked forward to welcoming delegates to futures GSA meetings.

Rapporteur: Frederica Giardina