



Report

A global vision for meningitis by 2030 and an action plan to get there

Monday 8 – Wednesday 10 May 2017 | WP1521



Report

A global vision for meningitis by 2030 and an action plan to get there

Monday 8 – Wednesday 10 May 2017 | WP1521

Executive summary

From Monday 8 May to Wednesday 10 May 2017, Wilton Park¹ hosted an international gathering of experts to outline a vision for meningitis to 2030. Led by the Meningitis Research Foundation² (MRF) in collaboration with the World Health Organization³ (WHO) more than 50 people including representatives from governments, global health organisations, public health bodies, academia, private sector and civil society shared expertise and perspectives, concluding with a call for a new global plan to defeat meningitis by 2030.

To achieve a balance of consideration between global and regional issues the meeting was divided into three themes rather than on geographic lines:

- **Prevention**, the role of vaccines;
- **Diagnosis and treatment**, which looked at rapid diagnosis and health system capacity; and
- **Support and information**, which examined the role of civil society in raising awareness and supporting people and patients with long term after effects.

This initial meeting considered the global challenges of meningitis and many of the discussions drew on expertise from the African meningitis belt. This was the first step in building a coordinated response to defeating meningitis by 2030 that will harness perspectives and expertise from around the world.

Key meeting outcome: WHO commitment to answer the call

At the end of the meeting, acknowledging the content of the three days of discussions, the WHO representatives confirmed they had heard the call of this expert group to make progress towards a new plan for meningitis that inherits the success of the past two decades and looks to address the challenges of the next 13 years to 2030, to transform our world and “leave no one behind” (United Nations Sustainable Development Goals, 2030 Agenda).

To help achieve this WHO representatives announced they will answer the call putting meningitis high on the global agenda and coordinating progress in five areas. The focus would be to work on eliminating epidemic meningitis from the African meningitis belt and examining the potential for a more global agenda as identified by the meeting. Specifically it will focus on;

1. Ensuring long-term protection against MenA for the entire at-risk population in the meningitis belt, building on the success of recent vaccination campaigns.
2. Improving outbreak response and control of meningococcal epidemics in the meningitis belt, as well as management of patients and survivors.
3. Enhancing disease surveillance in the meningitis belt.
4. Promoting development and public health use of affordable vaccines that tackle different causes of meningitis in the meningitis belt.
5. Calling for meningitis expertise to address globally the many different causes of meningitis around the world.

Prevention: Key calls to action from the meeting

Globally applicable

- To create a new global goal for meningitis vaccines to protect the populations at risk through routine programme, catch-up and outbreak strategies.
- The creation of a new plan to ensure sustainable vaccine supply for epidemic and routine programmes.
- Continued research into the pathogens that cause meningitis.
- Further strengthening collaboration between international health bodies, governments, health providers and pharmaceutical companies on approaches including better establishing pharmaceutical companies' needs in terms of minimum supply cycles.
- Maintain momentum on improving current vaccines and approaches, and developing new vaccines including:
 - More broadly protective pneumococcal and GBS vaccines
 - Exploration of vaccines that are "non-invasive" e.g. via oral administration
 - Introducing thermostable vaccines that do not require a cold chain thereby greatly simplifying supply and storage.
 - The future development of a 'magic bullet' single shot, multivalent vaccine that does not require boosters and/or follow ups and induces herd immunity.
- A step change in data quality at all touch points of the patient and 'meningitis' journey from the home of the patient through the health system to national and international data available about meningitis.
- Better support of public understanding of the data to help organisations who are attempting to advocate for action and help attract resources, e.g. quantify the costs of meningitis epidemics vs. the costs of proactive, preventative action.
- Better use of technology to support better data capture, analysis and sharing into widely used and applicable technologies.

Meningitis Belt specific

- Ensure maximum benefit from existing vaccines. For example, introduce the MenA conjugate vaccine in routine schedules along with catch up campaigns.
- Introduce risk informed targeted campaigns and new multivalent conjugate vaccine as soon as possible.
- Greater consideration of MenB and a plan for protection against future pneumococcal meningitis epidemics.
- Optimise the country access to emergency vaccines

Diagnosis and treatment: Calls to action

Globally applicable

- A new scalable, rapid diagnostic test is crucial and long overdue.
- Engage with healthcare systems and workers to identify training needs.
- Using this insight, develop basic training packages on themes such as emergency triage and treatment and integrate with existing routine training for healthcare workers who are the first point of contact with people with suspected meningitis.
- Gain feedback on these actions to constantly refine the educational support given to healthcare workers on the ground.

Meningitis belt specific

- Further strengthen the capacity of networks and integration of networks and laboratories working in the meningitis belt.
- Identify best practices — including response approaches and technologies — and share these throughout the network to begin standardising laboratory responses to outbreaks.
- In epidemic-prone areas, ensure availability of antibiotics is systematic.
- Examine ways to ensure a supply of simplified antibiotic treatments that are easier to administer.

Support and information: Calls to action

Global and Meningitis Belt applicable

- Provide a step-change in support available to survivors and their families.
- Work with national and regional healthcare systems to promote information over time about meningitis to populations — making meningitis education a routine part of health information campaigns.
- Further develop a standardised rapid response/disaster recovery education strategy that can automatically kick in during epidemics giving populations they need to know, when they need to know it.
- Create a new template of resources for meningitis education materials.
- Work with healthcare professionals on the ground in meningitis hotspots to identify cultural factors and potential barriers and adapting the materials mentioned above to meet needs precisely.
- Establish national and international networks of best practice to deliver awareness raising that will:
 - Support meaningful engagement with governments. This will ensure the effectiveness of both national and multinational responses.
 - Provide data and analysis to governments on, for example, the economic and social costs of meningitis outbreaks — helping to increase its visibility and raise it on government agendas.
 - Be the gateway to resources and best practices available to governments in the event of a meningitis outbreak.
- Ensure survivor care is seen as an intrinsic part of any meningitis response — a distinct strand but fully integrated in these responses.
- Survivor support is included in all available information about meningitis available to people and communities.

- Use cross-channel communications channels (e.g. social media where applicable) to raise awareness of meningitis survivors – increase their visibility and inspire public action.
- Identify and share success stories and best practices – disseminate these to healthcare systems. Use this and other levers to help healthcare systems and civil society build capabilities.
- Collect data on the real impact of long term sequelae (after effects) of meningitis, particularly in developing countries.

Report

A global vision for meningitis by 2030 and an action plan to get there

Monday 8 – Wednesday 10 May 2017 | WP1521

Meningitis

Meningitis is the inflammation of the lining around the brain and spinal cord. It can be fatal and develops very rapidly. Survivors can have life-long disabilities. It is most commonly caused by bacteria or viruses. Other causes include fungal infections and more rarely other microbes. Viral meningitis is rarely life threatening. Bacterial meningitis is more serious and can be caused by a range of different bacteria. The leading causes of bacterial meningitis in children, and to a lesser extent adults, are meningococcal infection (categorised into 13 serogroups of which the most common are A, B, C, W, Y and X and referred to as MenA, MenB etc.), pneumococcal infections (caused by more than 90 different serotypes) and *Haemophilus influenzae b* (Hib). The leading causes in children less than 3 months of age are Group B Streptococcal (GBS), *E. coli* and *Listeria*. The main meningitis pathogens are also major causes of septicaemia (blood-poisoning) and pneumonia.

Introduction

From Monday 8 May to Wednesday 10 May 2017, Wilton Park hosted an international gathering of experts to outline a vision for meningitis to 2030. Led by the Meningitis Research Foundation (MRF) in collaboration with the World Health Organization (WHO), more than 50 people including representatives from governments, global health organisations, public health bodies, academia, private sector and civil society shared expertise and perspectives, concluding with a call for a new global plan to defeat meningitis by 2030.

Major progress has been made in recent years in the fight against meningitis. Successful routine Hib, pneumococcal, and meningococcal vaccination programmes around the world, combined with a successful programme against MenA (the Meningitis Vaccine Project⁴), which since 2010 has vaccinated over 280 million people across 21 of the 26 sub-Saharan countries known as the meningitis belt, have been major contributors. But the meeting identified that significantly more needs to be done to sustainably and equitably reduce the burden of the disease around the world in support of the United Nations Sustainable Development Goals (SDGs)⁵.

In 2015, there were approximately 380,000 deaths caused by meningitis as estimated by IHME⁶. It remains the world's sixth largest infectious disease killer. Sepsis/meningitis is the third biggest killer of neo-nates (under 1 month old)⁷. At the same time, there are real questions about the veracity of available dataⁱ when many countries rely on modelled rather than real data about casesⁱⁱ, deathsⁱⁱⁱ and health burden represented by disability^{iv v}.

ⁱ "There are no reliable estimates of global meningococcal disease burden due to inadequate surveillance in several parts of the world": <http://www.who.int/immunization/diseases/meningitis/en/>

ⁱⁱ The total number of people who experience invasive bacterial infection that cause meningitis.

ⁱⁱⁱ People who die from invasive bacterial infection that caused meningitis. Around 10% of people who get bacterial meningitis will die from it.

^{iv} Survivors who experience ongoing impacts on their health or wellbeing (such as a disability) arising from their meningitis are described as having sequelae as a collective term for the after effects of the disease.

The highest burden of meningitis^{vi} is in the meningitis belt. In that region, epidemics of meningitis remain a real threat today. 2015 saw an epidemic that exceeded 11,000 cases due to MenC which had not been recorded in the belt since the 1970's⁸. The largest outbreak of pneumococcal meningitis ever seen occurred in Ghana in 2016⁹. Nigeria has had a significant outbreak in 2017 with nearly 5000 cases and over 500 deaths predominantly from MenC¹⁰. Though populations are protected from MenA today, the bacteria are still circulating¹¹ and could return over time if routine schedules are not adopted. The transition to routine vaccinations following the Meningitis Vaccination Project has significantly progressed, but implementation is still lagging in some of the largest countries.

Targeting policy and resources on areas of the world with the highest burden of disease makes sense. At the same time, focussing on epidemics alone risks missing the bigger global picture. Epidemics are a comparatively small proportion of total meningitis cases. Epidemics in the meningitis belt are often thought of through a 'meningococcal meningitis' perspective, despite pneumococcal epidemics arising in the belt. A highly diverse set of pathogens – including the pneumococcus, which is a major killer of under 5's globally – can cause meningitis and these are rarely considered together. If they were, it is likely meningitis would be seen as a major global health issue especially as antimicrobial resistance is growing against pathogens that are significant causes of meningitis¹²¹³.

With this in mind, the meeting called for concrete change. Country representatives demanded further financing and development of effective, affordable vaccines for use in epidemics and routine schedules. In-country vaccine policy needs to be improved so that vaccines are introduced effectively and distributed fairly. Health systems also need strengthening so they can administer national immunisation programmes as well as diagnose and treat cases that are not yet vaccine-preventable, or where access to vaccines is limited. Health workers need training so that they are ready and able to respond to both endemic and epidemic cases.

There is an urgent need for the development and introduction of affordable rapid diagnostics test/s that can be used at scale. All countries need to better understand the long term impact of meningitis on people and communities. This needs to be in combination with better support and information for people living with after effects and to make those at risk aware of signs and symptoms. Together with more support for civil society groups representing people and patients to advocate for effective vaccines and health systems, real change could be possible. It will be demanded by populations that most likely ensures the introduction of sustained, comprehensive vaccination programmes.

Objectives and format of the meeting

The Wilton Park/MRF dialogue format was designed to encourage free thinking on what 2030 will look like for meningitis and the steps needed to get there. The dialogue was designed as an opportunity for global experts on various aspects of meningitis, health systems and patient advocacy to think collectively about long term goals towards defeating meningitis by 2030.

In addition, the meeting was established to ensure that delegates from countries in the meningitis belt and in resource poor settings could share their experience of the high burden this disease places on their countries and their plans for tackling these challenges.

^vAround 20% of people who get meningitis will have sequelae, and the risk of sequelae is almost three times higher in Africa and Asia than in Europe (Edmond K et al. Lancet Infect Dis. 2010;10(5):317-28.)

^{vi}A calculation about the long term impact on survivors, families and communities of those who survive the disease. This is most commonly assessed using a framework called a 'Disability Adjusted Life Year' or 'DALY' http://www.who.int/healthinfo/global_burden_disease/metrics_daly/en/

By necessity, discussions therefore often moved between issues that were priorities for those regions and issues that had universal global applicability.

To achieve a balance of consideration between global and regional issues the meeting was divided into three themes rather than on geographic lines:

- **Prevention**, the role of vaccines;
- **Diagnosis and treatment**, which looked at rapid diagnosis and health system capacity; and
- **Support and information**, which examined the role of civil society in raising awareness and supporting people and patients with long term after effects.

All delegates noted the interrelated nature of these topics and the artificiality of separating them in this way whilst accepting the usefulness of doing so for the purpose of this meeting.

By necessity, the dialogue was a high level overview of key themes, with many essential topics being touched on lightly in order to bring a variety of views from different stakeholders. Plenary sessions and presentations set the scene for breakout sessions. The gathering was designed to give delegates a space to think about a global vision and to consider the elements needed to build a multi-component roadmap aimed at defeating meningitis.

It is important to note that the dialogue — and this report — are not attempting to set the final vision or action plan. This report represents the first step in building a coordinated response to defeating meningitis by 2030 and the delegates at the dialogue expressed a desire to be part of a community taking this forward.

1. Prevention – the call to reduce the global burden and impact of meningitis by 2030 through effective vaccination

The meeting heard that preventing meningitis is the most important way to reduce burden and impact of the disease in the future and that achieving this means improving access to effective and affordable vaccines. There was agreement that the majority of meningitis cases could be prevented through effective vaccines, even though it is highly unlikely that meningitis will ever be fully eradicated because of the diversity and nature of pathogens that cause it.

Suitable and affordable vaccines need to be available for epidemics and routine schedules to deliver long lasting protection. Over time, an integrated approach to routine and epidemic vaccination programmes could lead to sustainable reduction of the disease burden and impact to levels that warrant saying the disease is being defeated.

Prevention challenges

Vaccines are needed in both epidemic and routine contexts and the meeting identified specific challenges for each:

Epidemics are unpredictable

By nature, meningitis epidemics are unpredictable and therefore ensuring the availability of vaccines as and when needed is problematic. The challenges caused by unpredictability have been known for a long time and remain an ongoing issue for countries affected and global health organisations including WHO, UNICEF, MSF and IFRC in responding to outbreaks today. They include:

- Vaccines are needed in advance of an outbreak so they are available for rapid response but stockpiling vaccines is costly. This is true when they are held centrally, but costs and complexity are multiplied when they need to be distributed to locations closer to likely outbreaks.
- Vaccines that are produced and waiting for use go out of date if they are unused, potentially leading to massive waste if an outbreak does not occur.

- Spare vaccines that could be donated from one country to another – left over from previous epidemics, for example – might not meet demand for outbreak response where they don't cover appropriate strains of the disease and therefore are unsuitable for use.
- Polysaccharide vaccines¹⁴ are generally cheaper than multivalent conjugate vaccines and can be effective in curtailing epidemics if response is timely. They do not induce herd immunity (otherwise called 'community' immunity)^{vii}. Whilst inducing herd immunity is not the primary purpose of outbreak control, using conjugate vaccines, such as MenA, in outbreaks would be more effective in interrupting disease transmission and produce longer lasting protection.
- Vaccine manufacturers struggle to produce a reliable supply of polysaccharide meningococcal vaccines because they are not used in routine programmes and demand for epidemics is difficult to predict. Manufacturers prioritise the manufacture of conjugate vaccines for routine programmes because this is a more sustainable business model.
- Conjugate pneumococcal vaccines are not currently used to control pneumococcal epidemics. It has not been shown whether conjugate pneumococcal vaccines would be effective in controlling pneumococcal epidemics, although both currently available conjugate pneumococcal vaccines cover the serotype that is causing epidemics.

Financing routine vaccines and vaccines for epidemics

For routine programmes in low- and some middle-income countries, GAVI - the vaccine alliance¹⁵, works on providing a reliable market mechanism to supply vaccines at affordable cost. It does this by supporting a market pipeline for vaccine manufacturers so they can take the business risk to develop and produce vaccines over a number of years at a cost effective price.

Delegates – particularly in country representatives from the meningitis belt –raised the issue of long-term financing to maintain programmes after GAVI graduation.

For epidemics, manufacturers at the meeting stressed that they cannot 'mothball' a vaccine when it is not needed and press a button to begin creating new stocks – reinstating production can be costly and involve timescales that make it impossible.

Delegates were sympathetic to the challenges facing pharmaceutical companies and their business models, whilst representatives from these companies were keen to help surmount them.

Multiple causes = multiple vaccines = increased vaccine hesitancy and lower confidence

The meeting heard that meningitis is caused by many pathogens and within each pathogen there are multiple types or strains. Consequently, there is currently no single vaccine even for the various strains of meningococcal meningitis that commonly occur in the meningitis belt. This complicates the vaccination programme challenge and approaches to eliminate the disease because getting protected from meningitis requires multiple vaccinations for what sounds like the same disease – 'meningitis'. This can be very confusing for the general public and could potentially reduce confidence in the efficacy of vaccinations and reduce uptake, ultimately with a negative impact on direct protection and achieving herd immunity.

^{vii}When a critical portion of a community is immunized against a contagious disease, most members of the community are protected against that disease because there is little opportunity for an outbreak. Even those who are not eligible for certain vaccines—such as infants, pregnant women, or immunocompromised individuals—get some protection because the spread of contagious disease is contained. This is known as "community immunity." Taken from <https://www.vaccines.gov/basics/protection/index.html>

There was agreement at the meeting that vaccine hesitancy needs to be addressed in both resource poor and high income countries. In developed economic settings delegates heard of vaccine hesitancy problems where the public mistrust the safety of programmes due to negative publicity or misinformation about vaccinations.

The meeting identified many other challenges in the area of vaccines, some which are extremely difficult to overcome. Multiple doses are costly and complicated to administer. The time lapse between an initial dose and booster can increase the likelihood that people will not present for follow up appointments – reducing the efficacy of programmes. Vaccinations that need to be kept cold place demands on logistic storage and supply chains – particularly in rural areas – increasing cost and complexity. Invasive interventions, such as injections, can lessen the likelihood that people will present for vaccination.

This ‘magic bullet’ universal meningitis vaccine that is thermostable^{viii}, delivered non-invasively and induces herd immunity continues to remain elusive. Significant doubts exist about whether any future single vaccine will ever cover all meningitis pathogens or address all of these issues, but the challenges still need to be highlighted and recognised.

Bad data = poor response and policy

In various presentations, the meeting heard of the importance for international health bodies, governments and health workers to have access to comprehensive and accurate data in order to run effective vaccination programmes on a sustainable basis. This is difficult to achieve because it relies on stretched healthcare resources as well as health information gathering systems. Each data point ultimately represents a person. Getting data about a person faces challenges at all levels, beginning with that person seeking care and reaching a health system and their illness being detected in order to start their ‘data journey’. There are then challenges with capturing the data about them, their interaction with the system, their diagnosis, samples taken and analysed or sent for analysis and the treatments administered. Next there are challenges with aggregating and sharing data to create national and international information. The reality of doing this today, especially in resource poor countries, is that data can often be inaccurate, outdated and incomplete.

A lack of data insights can hinder outbreak responses. National governments may not be aware of the scale of a particular outbreak until late in its development. This partial picture can contribute to them failing to recognise the costs (both financial and social) of the disease, making it hard to provide and deploy resources effectively.

A lack of relevant data can also hamper NGO attempts to persuade governments to take action. Some governments can be reluctant to share data relating to health systems – perceiving outbreaks as ‘failures’ that can reflect badly on them.

Inconsistent coding and case definitions, as well as missing, contradictory or incomplete data, hinders effective use.

Opportunities

Whilst acknowledging the challenges, the meeting also heard about significant opportunities to strengthen protection for populations using vaccines:

Past experience is good

The group heard that governments, manufacturers and the global community has risen to major challenges before and can draw on the Meningitis Vaccine Project and the accelerated roll out of Hib and pneumococcal vaccines as successful models for the introduction of vaccines in resource poor settings. MenAfriVac has been hugely successful, with over 280 million people vaccinated against MenA in 21 meningitis belt countries since 2010. In 2017, there have been just two confirmed cases of MenA in the belt.

^{viii} ‘Thermostable’ means it can be transported and stored without extensive use of cold storage without damaging the vaccine. This was a big advantage with MenAfriVac in the Meningitis Vaccine Project that helped enable its widespread use across Africa.

Pipeline vaccines are promising

There was also optimism amongst delegates that an improved multivalent vaccine for meningococcal meningitis is likely given that work is already progressing on the NmCV-5 conjugate vaccine (ACYWX¹⁶) which has been developed in a partnership between the Serum Institute and PATH, with additional funding from the UK's Department for International Development. The collaborating parties intend it to be an affordable and thermostable vaccine and are encouraged by promising results in Phase 1 trials.

For pneumococcal meningitis, delegates heard of two strategies: increasing use of conjugate pneumococcal vaccines in formats more suitable for routine immunisation in resource poor countries and making them more affordable through lower unit costs and reducing the number of doses needed^{17,18}, and, given the challenge of serotype replacement, a longer-term plan to introduce a low cost common protein vaccine for broad coverage. Whole cell vaccines trials are ongoing with Phase 1 and 2 trials in Kenya but some common protein vaccine candidates have already failed and the pathway for licensing such a vaccine remains unclear. In addition, clinical trials of a promising GBS vaccine are imminent.

Given the current vaccines available globally and knowledge of new vaccines in development, the meeting saw reduced global burden and impact – 'defeating meningitis' – as realistic goal for 2030 (so long as this did not mean complete eradication) and that vaccine development was accompanied by an enabling environment including supportive national policy, and national and international financing.

The global environment is supportive

The meeting considered the wider enabling environment for strengthening prevention through vaccines and especially Sustainable Development Goal 3¹⁹ 'Ensure healthy lives and promote well-being for all at all ages' which includes a commitment to bring, "...access for all to safe, effective, quality and affordable medicines and vaccines." This was seen by all as a highly enabling goal within an international, universally applicable framework. It therefore had relevance to meningitis belt countries and more globally as well. In the meningitis belt, where the majority of countries are classed as low- or middle-income, the principle within the SDGs of 'leaving no one behind' and the principle of equitable development were also highly relevant. Both were seen to strengthen the case for a new plan for the next phase of tackling meningitis globally following the success of the Meningitis Vaccine Project.

Alongside this, the meeting noted the importance of keeping meningitis at the top table of health priorities through stronger global awareness, coordination and action. Global battles against malaria²⁰ and AIDS/HIV have been taken up by the UN General Assembly and the World Health Organisation (WHO) and it is this focus that is turning the tide for those diseases. There was agreement that current work on meningitis could be expanded and thought of as a global issue to ensure greater progress.

Countries in the meningitis belt are demanding action

The meeting heard compelling accounts of why progress on vaccines, supported by developments across other areas discussed at the meeting, were so needed in the meningitis belt. Country representatives at the meeting made specific calls for the needs of their region.

With this context in mind, the meeting heard specific calls for any future plan to address a range of issues to better support the development and introduction of effective vaccination programmes:

Prevention: Calls to action

Globally applicable

- To create a new global goal for meningitis vaccines to induce herd immunity at country level and use this to inform routine programme, catch-up and outbreak response strategies.
- The creation of a new plan to ensure sustainable vaccine supply for epidemic and routine programmes.
- Continued research into the pathogens that cause meningitis.
- Further strengthening collaboration between international health bodies, governments, health providers and pharmaceutical companies on approaches including better establishing pharmaceutical companies' needs in terms of minimum supply cycles.
- Maintain momentum on improving current vaccines and approaches, and developing new vaccines including:
 - More broadly protective pneumococcal and GBS vaccines
 - Exploration of vaccines that are non-invasive e.g. via oral administration
 - Introducing thermostable vaccines that do not require a cold chain thereby greatly simplifying supply and storage.
 - The future development of a 'magic bullet' single shot, multivalent vaccine that does not require boosters and/or follow ups and induces herd immunity.
- A step change in data quality at all touch points of the patient and 'meningitis' journey from the home of the patient through the health system to national and international data available about meningitis.
- Better support of public understanding of the data to help organisations who are attempting to advocate for action and help attract resources, e.g. quantify the costs of meningitis epidemics vs. the costs of proactive, preventative action.
- Better use of technology to support better data capture, analysis and sharing into widely used and applicable technologies.

Meningitis Belt specific

- Ensure maximum benefit from existing vaccines. For example, the MenA vaccine available in routine schedules along with catch up campaigns.
- Introduce smarter targeted campaigns and new multivalent conjugate vaccine as soon as possible
- Greater consideration of MenB and a plan for protection against future pneumococcal meningitis epidemics.
- Explore better ways of creating dispersed vaccine stockpiles, so that vaccines can be stored where they are needed.

2. Diagnosis and treatment – the call for integrated thinking on new technology and capacity

Whilst all present wanted to see meningitis prevented wherever possible, there was an acceptance that in the current absence of vaccines against all forms of meningitis, fairly delivered in effective routine schedules, epidemics are likely to occur over the next few years, and the burden of meningitis due to endemic causes around the world will remain. Meningitis due to endemic causes would continue to exceed epidemic cases.

With this in mind, the ability of health workers and systems to correctly diagnose and treat meningitis remains a global priority for the foreseeable future.

Challenges

The meeting heard that there were challenges specifically relating to meningitis for better diagnosis and treatment. In addition there are also many issues to address that have commonalities across diseases that are not specific to meningitis such as a general weakness of healthcare systems in resource poor settings. The issues noted here are

those that are more specific to meningitis:

An affordable, scalable point of care/rapid diagnostic test does not exist

We are still relying on a point of care test for meningitis developed 40 years ago, and agreed that this was unacceptable. The problem has been discussed back and forth for years and a sense of urgency is needed. There was a consensus that this meeting should be used as an opportunity to bring this issue to the fore.

Today only one rapid diagnostic test is in widespread use in the meningitis belt as it alone can detect all the main meningitis pathogens (Hib, pneumococcal, meningococcal strains, and GBS). However, it is based on 40-year-old technology (latex agglutination). It requires refrigeration and laboratory equipment, relies on a sample of spinal fluid from the patient taken by lumbar puncture, and is relatively expensive. Other diagnostic techniques include staining and examining the spinal fluid, which provides more rudimentary information and can be done in low-tech, peripheral laboratories, or growing bacteria from the sample and PCR^{ix} which can only be done in high-tech reference laboratories.

There are drawbacks in relying on lumbar puncture:

- Some countries require lumbar puncture to be performed by trained medical staff even though lower-cadre workers routinely undertake this in many meningitis belt countries. Medically trained staff are largely absent from primary health care settings and remote areas.
- The procedure itself can be seen as invasive and painful and can infrequently cause side effects (including headaches, bleeding and infection). Cultural barriers to adoption persist where awareness of meningitis is low.
- Beyond the procedure itself, spinal fluid samples transported to reference laboratories require stocks of trans-isolate medium which need to be kept cold, then incubated and kept free from contamination, which places demands on logistics systems as they are transported — often across long distances — to laboratories. Tests then must be conducted, results interpreted and diagnoses confirmed in laboratories that lack facilities and staff.

Laboratories lack resources and capacity

National laboratories were identified as a significant bottleneck in any coordinated attempt to identify and deal with meningitis outbreaks in particular. It is the nature of outbreaks that they often occur in remote areas — which means access to laboratories is difficult and time consuming. Laboratory capacity is in an issue, with the significant ramping up of testing during outbreak periods (which are difficult to predict) placing huge burdens on existing infrastructure. Laboratories are often not part of a centralised control structure — belonging to national governments or NGOs, for example. This non-alignment makes coordination and the linking of data particularly difficult — hampering case based surveillance.

Health workers lack awareness and training

Ensuring that healthcare staff on the ground are adequately trained to deal with meningitis outbreaks is critical. Currently, skill levels are mixed, within and between countries. There is a lack of training in spotting the first signs of meningitis and this can adversely affect surveillance and rapid response — allowing outbreaks to become established before action is taken. The relative complexity of procedures such the lumbar puncture can put demands on even adequately trained staff. Poor training can result in ineffective testing, adverse patient reactions, loss of confidence in 'Western' medicine and antipathy to vaccination programmes.

Issues in treatment

While acute treatment of meningitis and management of after effects was not a main focus of discussion, possibly because the expertise present at the meeting, several issues with

^{ix} Polymerase chain reaction, a technique that can detect small fragments of bacterial DNA, thus identifying the pathogen even when no live bacteria can be grown from the patient's sample

treatment were highlighted.

Currently treatment means 5 to 14 days of injected antibiotics that have to be delivered in a health centre, although a single injection is possible in confirmed meningococcal meningitis outbreaks in the meningitis belt. Ceftriaxone is the antibiotic of choice in both high income and resource poor settings. Although meningococci remain susceptible, other pathogens, notably pneumococci, are developing resistance.

The increasing need to cover potential pneumococcal infection in outbreaks in the meningitis belt means longer treatment regimens which can place a tremendous burden on families looking after sick relatives and on health centres.

Opportunities

Key opportunities for improving diagnosis and treatment were recognised at the meeting:

A new Rapid Diagnostic Test (RDT)

A rapid diagnostic test that ideally did not rely on lumbar puncture and could be used at the point of care to improve speed of treatment and communication and response to cases and outbreaks was seen as highly desirable. There was major consensus at the meeting calling for greater efforts here. The conditions for success were identified as:

- **Low cost:** for any RDT to be effective, it must be affordable at scale.
- **Robust:** capable of being stored safely and easily over long periods of time, even in difficult conditions.
- **Reliable:** ideally a non-CSF based RDT to provide diagnosis at point of care with levels of certainty equal to that of the tools it replaces.
- **Immediate:** provide diagnosis at the point of care and within minutes of testing. Amongst other benefits, this would enable the correct treatment to be given and reduce the need for expensive and complex logistics services.
- **Non-invasive:** a test that significantly reduces the impact on the patient – ideally using saliva or urine, but a pin-prick blood test would be more acceptable to patients and easier to administer than lumbar puncture.
- **Comprehensive:** the test will ideally be able to identify and differentiate all strains of meningitis.
- **Simple:** requiring minimal training from staff using the tool.
- **Innovative:** the potential to integrate the RDT into technologies such as smartphones, which can help in the analysis of samples, storage of results and transmission of these results to a central repository.
- **Integrated:** able to identify meningitis but also used able to be adopted within or alongside other RDTs for other pathogens to minimise barriers to adoption within the health system.

The meeting heard that barriers to the development of better rapid diagnostic tests include the size of the market. High income countries can rely on culture and PCR and their lower meningitis disease burden does not create sufficient demand for point of care testing.

There was a suggestion that the advance market commitment model that had been successful for vaccines might be applied here where donors guaranteed that if companies made a vaccine there would be a market. This was in the context of a global demand for a vaccine, and a strong global voice would be needed calling for a rapid diagnostic test.

Train health workers

The meeting saw the skills of healthcare workers as a critical element in both routine and epidemic scenarios. Health workers are at the front line of both surveillance and response as the meeting heard from delegates from Malawi. Their ability to identify potential cases of meningitis alongside other disease and appropriately prioritise them for treatment is critical. This needs considering as part of horizontal training and development, not vertically as a

pathogen-specific issue for meningitis. If integrated into existing training, alongside or in complementary programmes it could have a transformative effect.

Effective treatment

An ideal treatment could be given orally in a single dose, enabling faster treatment in remote areas and reducing burden on both health facilities and families.

Effective meningitis treatment needs to be delivered soon after the onset of illness, so horizontal healthcare systems/packages such as emergency triage and treatment and integrated management of childhood illness that enable recognition of the sick patient and immediate action are important, and especially so in low-prevalence settings.

Diagnosis and Treatment: Calls to action

Globally applicable

- A new scalable, rapid diagnostic test is crucial and long overdue
- Engage with healthcare systems and workers to identify training needs.
- Using this insight, develop basic training packages on themes such as emergency triage and treatment and integrate with existing routine training for healthcare workers who are the first point of contact with people with suspected meningitis.
- Gain feedback on these actions to constantly refine the educational support given to healthcare workers on the ground.

Meningitis belt specific

- Further strengthen the capacity of networks and integration of networks and laboratories working in the meningitis belt.
- Identify best practices — including response approaches and technologies — and share these throughout the network to begin standardising laboratory responses to outbreaks.
- In epidemic prone areas, ensure availability of antibiotics is systematic.
- Examine ways to ensure a supply of simplified antibiotic treatments that are easier to administer.

3. Support and Information: a new call to build awareness by better engaging with people, populations and civil society

The group recognised the vital importance that engaged communities play in delivering better health outcomes. Whether it is ensuring that symptoms are recognised and reported early or reducing vaccine hesitancy, health interventions will fail without community involvement.

Until meningitis is defeated, supporting those affected by the disease is also key. In developing countries particularly, those with long term after effects and disabilities caused by meningitis are often forgotten.

Challenges

Lack of awareness

At an individual and health system level, the meningitis ‘success’ of the last few decades now creates new barriers to prioritising meningitis as an issue which creates real risks to the next stage of development. Today, across the world there is still relatively:

- Low awareness of the symptoms of meningitis.
- Low awareness in the actions to take once symptoms have been identified.
- Limited understanding of the various strains of meningitis.
- Limited understanding of the devastating effects of the disease.
- Uncertainty around vaccines — particularly their efficacy and safety.
- Potential religious and/or cultural barriers to vaccinations.

The consequence of this is that people are needlessly getting meningitis; are not getting

the treatment and diagnosis they need; and governments are struggling to prioritise it as an issue.

This is compounded by the fact that governments also lack awareness and knowledge about the disease and its long term impacts. For many governments in the meningitis belt, the disease is just one among many priorities. Its non-blockbuster status can mean that it can slip down government agendas. Owing to its relative invisibility, governments may not be fully aware of the costs of meningitis epidemics in terms of strains on healthcare systems and social and economic damage. Low awareness of the dangers of meningitis can mean that responses are slow, under resourced and uncoordinated. Uneven national responses limit the efficacy of response to a disease that pays no attention to borders. An effective response in one country can be undermined by an ineffective response in another.

Lack of survivor and family support

Whilst much has been achieved in tackling meningitis, delegates identified the area of survivor support as a major omission in current approaches. Understandably, much of the focus has been on reducing fatalities — but those left to pick up the pieces after they or a family member have survived the disease have, to date, have been largely ignored. The meeting acknowledged a wide variation in levels of support open to survivors and their families. It heard that meningitis survivors are often unable to work and are totally reliant on family support networks, which are limited owing to the fact that these family members must also work to support them. Even in well-resourced healthcare systems that might save the life of a meningitis patient, they can be completely unprepared to cope with their needs in the aftermath. Consequently, lack of care for meningitis survivors can represent a huge drain on the financial resources of families, communities, health systems and countries — amplifying the impact for years and even decades after an outbreak.

Delegates noted that this is an area where action is urgently needed and must not be forgotten in any plan to 2030.

Opportunities

Increase awareness

All populations and governments need to be increasing awareness of meningitis to help people get vaccinations they need; to ensure people seek diagnosis and treatments when they need to; and to ensure the health system then meets their needs.

In the Meningitis Belt, due to the high burden of the disease, people have known about meningitis for many years, and high uptake of MenAfriVac shows what good communications and strong government sponsorship can do to help reduce vaccine hesitancy in specific circumstances.

At the same time, ongoing and sustained population awareness, supported by active civil society, has been shown to encourage not just one-off campaigns, but the adoption of vaccination programmes that provide the widest possible protection in developed economic settings. This has helped deliver historically low levels of both cases and deaths.

Whilst the issue of 'awareness' might be considered a 'softer' challenge to those identified elsewhere, the meeting saw it as a major potential barrier to effective vaccination programmes and building the necessary herd immunity needed to eradicate meningitis. It wanted to see strengthened approaches in several areas:

Improve support for survivors and families

Patients, carers and civil society organisations need to be empowered to ask more of their governments.

While awareness campaigns and pressure from large international organisations can help here, data is also needed on the burden of meningitis to encourage greater focus on the hidden costs of disability for governments, such as decreased contribution to the economy.

Capacity building and knowledge sharing could help existing patient groups to do more.

Awareness of available services and support also needs to increase to help families and

individuals.

Treatment of long term after affects also needs to be improved through greater recognition and a better understanding of a patient's needs.

Support and Information: Calls to action

Global & Meningitis Belt applicable

- Provide a step-change in support available to survivors and their families.
- Work with national and regional healthcare systems to promote information over time about meningitis to populations — making meningitis education a routine part of health information campaigns.
- Further develop a standardised rapid response/disaster recovery education strategy that can automatically kick in during epidemics giving populations they need to know, when they need to know it.
- Create a new template of resources for meningitis education materials.
- Work with healthcare professionals on the ground in meningitis hotspots to identify cultural factors and potential barriers and adapting the materials mentioned above to meet needs precisely.
- Establish national and international networks of best practice to deliver awareness raising that will:
 - Support meaningful engagement with governments. This will ensure the effectiveness of both national and multinational responses.
 - Provide data and analysis to governments on, for example, the economic and social costs of meningitis outbreaks — helping to increase its visibility and raise it on government agendas.
 - Be the gateway to resources and best practices available to governments in the event of a meningitis outbreak.
- Ensure survivor care is seen as an intrinsic part of any meningitis response — a distinct strand but fully integrated in these responses.
- Survivor support is included in all available information about meningitis available to people and communities.
- Use cross-channel communications channels (e.g. social media where applicable) to raise awareness of meningitis survivors — increase their visibility and inspire public action.
- Identify and share success stories and best practices — disseminate these to healthcare systems. Use this and other levers to help healthcare systems and civil society build capabilities.
- Collect data on the real impact of long term after effects of meningitis, particularly in developing countries.

Key meeting outcome: WHO commitment to a new partnership

At the end of the meeting, acknowledging the content of the three days of discussions the WHO representatives confirmed they had heard the call of this expert group to make progress towards a new plan for meningitis that inherits the success of the past two decades and looks to address the challenges of the next 13 years to 2030.

To help achieve this WHO representatives announced they will answer the call putting meningitis high on the global agenda and coordinating progress in five areas. The focus would be to work on eliminating epidemic meningitis from the meningitis belt and examining the potential for a more global agenda as identified by the meeting. Specifically it will focus on;

- Ensuring long-term protection against MenA for the entire at-risk population in the meningitis belt, building on the success of recent vaccination campaigns.
- Improving outbreak response and control of meningococcal epidemics in the meningitis belt, as well as management of patients and survivors.
- Enhancing disease surveillance in the meningitis belt.
- Promoting development and public health use of affordable vaccines that tackle

different causes of meningitis in the meningitis belt.

- Calling for meningitis expertise to address globally the many different causes of meningitis around the world.

Conclusion

The Meningitis Research Foundation/Wilton Park dialogue on meningitis to 2030 was seen as a hugely useful – and motivating – first step to combatting the disease and its devastating effects on populations.

Eradicating meningitis as a global healthcare problem by 2030 is an ambitious vision, but as successes in other disease areas have shown, ambition acts as a rallying call that brings disciplines together to enact change. The areas identified – vision; coordination; surveillance; vaccines; education and training; and survivor support – will help to inform subsequent action.

Delegates also appreciated the unique Wilton Park framework: offering a very rare opportunity to bring experts from a range of different disciplines together – sharing experiences, expertise and understanding. Many delegates suggested that meetings of a similar format become regular events in the meningitis calendar. Importantly, future meetings should include representatives of funding organisations, to close the loop on the expertise needed to eradicate meningitis.

WHO's announcement that it now sees meningitis as a disease area ready for global organisation and action – and will take forward discussions on this – was a powerful conclusion to a highly effective dialogue.

At the Wilton Park dialogue, representatives from WHO announced that the organisation, "...hears the call for a global meningitis agenda," and has committed to report back on taking the lead in the fight against meningitis.

Adam Toms, Vinny Smith

Wilton Park | May 2017

Wilton Park reports are intended to be brief summaries of the main points and conclusions of a conference. Reports reflect rapporteurs' accounts of the proceedings and do not necessarily reflect the views of the rapporteur. Wilton Park reports and any recommendations contained therein do not necessarily represent the views of or institutional policy for Wilton Park, the FCO or the UK government.

Should you wish to read other Wilton Park reports, or participate in upcoming Wilton Park conferences, please consult our website www.wiltonpark.org.uk. To receive our e-newsletter and latest updates on conferences subscribe to <https://www.wiltonpark.org.uk/newsletter/>

-
- ¹<https://www.wiltonpark.org.uk>
 - ²<http://www.meningitis.org>
 - ³<http://www.who.int/csr/disease/meningococcal/en/>
 - ⁴<http://www.meningvax.org/>
 - ⁵ <http://www.un.org/sustainabledevelopment/sustainable-development-goals>
 - ⁶<https://vizhub.healthdata.org/gbd-compare/>
 - ⁷Liu et al. (2016) Global, regional, and national causes of under-5 mortality in 2000–15: an updated systematic analysis with implications for the Sustainable Development Goals
 - ⁸http://www.who.int/csr/disease/meningococcal/Facing_NmC_Epidemics_Meningitis_Belt.pdf
 - ⁹WHO Weekly Epidemiological Record, June 2016
 - ¹⁰<http://www.who.int/emergencies/nigeria/meningitis-c/en/>
 - ¹¹http://www.who.int/csr/disease/meningococcal/Bulletin_Meningite_S21_2017.pdf?ua=1
 - ¹²<http://www.who.int/mediacentre/news/releases/2017/bacteria-antibiotics-needed/en/>
 - ¹³https://amr-review.org/sites/default/files/160525_Final%20paper_with%20cover.pdf
 - ¹⁴<https://www.cdc.gov/vaccines/pubs/pinkbook/downloads/prinvac.pdf>
 - ¹⁵<http://www.gavi.org/about/>
 - ¹⁶http://who.int/immunization/research/meetings_workshops/Kulkarni_LaForce_MVPconf16.pdf
 - ¹⁷<http://www.who.int/ith/vaccines/pneumococcal/en/>
 - ¹⁸<http://www.path.org/vaccineresources/details.php?i=1048>
 - ¹⁹<http://www.un.org/sustainabledevelopment/health/>
 - ²⁰WHO Malaria Technical action plan to 2030: http://www.who.int/malaria/areas/global_technical_strategy/en/