MENINGOCOCCAL MENINGITIS: A RARE BUT POTENTIALLY DEVASTATING DISEASE

KEY FACTS

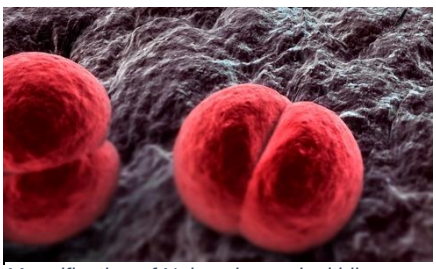
Invasive Meningococcal Disease (IMD) is a rare but potentially devastating bacterial infection. It commonly presents as an infection of the brain (meningitis) and/or infection of the blood (septicemia or blood poisoning). Despite advances in medical care, the disease can kill in a matter of hours or cause severe long-term sequelae with devastating effects on the individuals and their families [(1)] with significant lifelong economic impact on society [(2)]. It is highly unpredictable, and can affect anyone, at any age, anywhere in the world [(1)].

- *Current vaccines/vaccination programs: there is no universal vaccine offering protection against meningococcal meningitis, however, to date, five (ABCWY) of the most common bacterial serogroups are vaccine preventable. Vaccines that help to prevent meningococcal meningitis include quadrivalent vaccines against 4 serogroups (ACWY) with one single vaccine, and monovalent vaccines against A, B or C serogroups [(3)].*
- *The unmet need: despite the severity and unpredictability of the disease, there is still a long way to go to ensure routine, broad immunization across serogroups, age groups and countries. Immunization programs vary greatly from country to country [(4)], leaving room for outbreaks in unprotected populations.*
- *Sanofi empowering life: at Sanofi Pasteur, we believe in a world where no one suffers or dies from vaccine preventable diseases and that everyone should have access to the broadest protection. Building on 40 years of science-led research in meningococcal infection, we are committed to advancing the fight against meningococcal disease and to supporting broader prevention strategies by expanding the availability of routine meningococcal immunization options across age groups and countries [(5)].*

A HIGHLY UNPREDICTABLE DISEASE

Meningococcal meningitis and septicemia is a bacterial infection caused by *Neisseria meningitidis*. It commonly presents as an infection of the brain (meningitis) and infection of the blood (septicemia or blood poisoning) [(1)].

It is a rare but potentially devastating disease that can claim a life in as little as 24 hours. One in 10 people who develop the disease will die from it and up to 10-20% of survivors suffer from serious complications such as amputation, scars, deafness or brain damage [(6,7)].



Magnification of Neisseria meningitidis, a gram-negative bacterium that can cause meningococcal meningitis

In addition to the devastating effect on the individuals and their family, severe meningococcal infections result in significant while underestimated lifetime costs for society (more than £1.8 million of societal lifelong costs reported in the UK) [(2)].

TRANSMISSION

About 1 in 10 people (1 out of 4 in adolescence) have meningococcal bacteria in the back of their nose or throat with no signs or symptoms of the disease; this is known as being 'a carrier' [8].

But the bacteria may invade the body and cause infections. Meningococcal disease is spread through respiratory droplets (e.g. coughing, sneezing) and direct contact with someone who is infected (e.g. coughing or kissing). Fortunately, meningococcal disease is not as easily transmitted as other infections such as influenza or the common cold, but the infection is far deadlier [8].

ANYONE CAN BE AT RISK OF BEING INFECTED

While meningococcal meningitis mainly affects children below the age of five, adolescents and young adults, it can affect anyone, anywhere in the world. Most meningococcal meningitis occurs in otherwise healthy individuals without identifiable risk factors. Notably, a relatively large number of cases are also observed among older adults [9].

Increased risk factors include:

- Living in community settings (e.g. military and college students in dormitories) or participating in mass gathering events such as the Hajj, an annual Islamic pilgrimage to Mecca [10];
- Certain medical conditions, including HIV infection / asplenia / a compromised immune system / deficiencies of either immunoglobulins or complement [10];
- Travelling to endemic areas such as the meningitis belt in sub-Saharan Africa [10].

SYMPTOMS AND DIAGNOSIS

The early symptoms can be misleading as they are flu-like in nature (e.g. irritability, fever, loss of appetite) [11], making diagnosis difficult [12]. It is important to react quickly as the disease can lead to death in less than 24 hours [13].

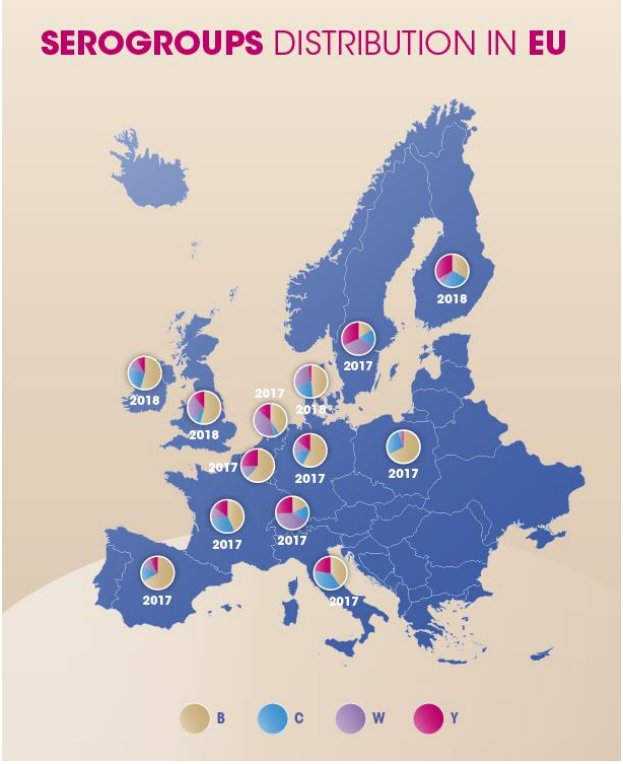
Classic signs of meningococcal meningitis include fever, headache and stiff neck. Other symptoms include nausea, vomiting, photophobia (being sensitive to light) and confusion [11].

To diagnose meningococcal meningitis, samples of blood or cerebrospinal fluid are tested for the *Neisseria meningitidis* bacteria [12].

TREATMENT

Fast diagnosis and treatment, with appropriate antibiotics, is imperative as death can occur as rapidly as within 24 hours of disease onset [12, 13]. As a precaution, people who have been in close contact with anyone infected with meningococcal disease should also receive antibiotics to help protect against an infection [14].

Depending on how serious the infection is, people with meningococcal meningitis may need other treatments including breathing support, medications to treat low blood pressure, and wound care for areas with damaged skin [12].



Neisseria meningitis serogroup distribution across Europe [15]

TYPES OF MENINGOCOCCAL MENINGITIS

There are many different serogroups (or types) of bacteria that can cause meningococcal meningitis, the most common being A, B, C, W, Y and more recently, X in Africa [16]. Their circulation worldwide is highly unpredictable and varies overtime across age groups and geographies [1].

An example of the unpredictable nature of meningococcal meningitis is the recent spread of a virulent W serogroup which caused outbreaks across the UK and several other European countries, South Africa, Brazil, Argentina, Chile and Australia [17].

MOST MENINGOCOCCAL MENINGITIS CAN BE PREVENTED THROUGH VACCINATION

There is no universal vaccine that helps to protect against meningococcal meningitis, however, to date, five (ABCWY) of the most common bacterial serogroups are vaccine preventable [3]. Vaccines against meningococcal diseases include quadrivalent vaccines to offer protection against 4 serogroups (ACWY) with one single vaccine, and monovalent vaccines to protect against A, B or C serogroups [3].

CURRENT VACCINES AND COUNTRY IMMUNIZATION PROGRAMS

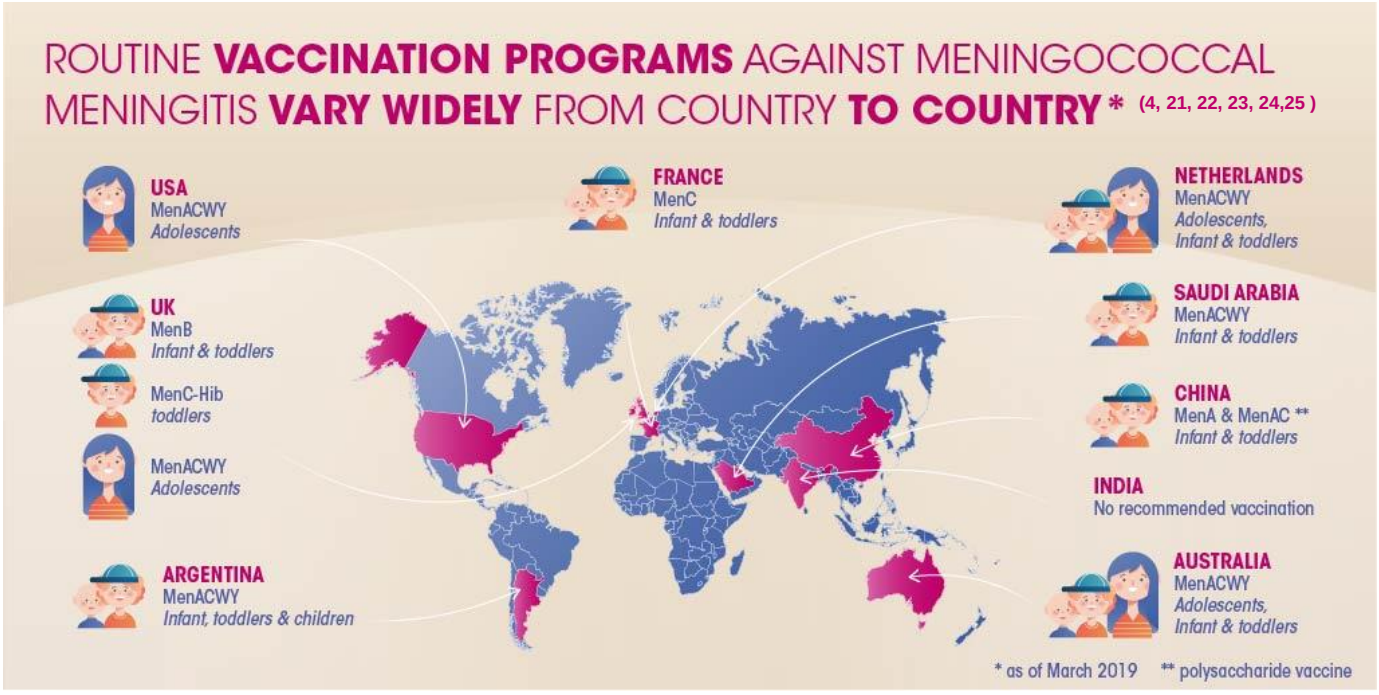
Despite the unpredictability and severity of the disease and the benefits of vaccination for all age groups, given the low incidence of the disease, routine immunization programs tend to focus on the populations with higher risk of meningococcal meningitis such as infants / toddlers, adolescents (for direct and indirect protection), immunocompromised individuals, people in mass gathering or community setting situations such as pilgrims and the military [18]. No program to date covers the elderly population despite a proven increased rate of infection in those over 65 [19].

VACCINATION STRATEGIES [20]:

3 MAIN OPTIONS:

- Offer direct protection to population of higher risk of meningococcal disease
- Offer indirect protection by vaccinating the age group (adolescents) with the highest carrier rate of the bacteria to reduce transmission to other age groups over time
- Implement both strategies.

Immunization programs vary greatly from country to country. While the ACWY serogroups remain the cause of a significant proportion of the disease, there is still a long way to go to ensure routine, broad immunization across age groups and countries [2].



SANOFI PASTEUR'S LEGACY: 40 YEARS FIGHTING MENINGOCOCCAL MENINGITIS

At Sanofi Pasteur, we believe in a world where no one suffers or dies from vaccine preventable diseases. For over 40 years, Sanofi Pasteur has worked passionately to innovate and develop preventative strategies and therapies helping society to fight meningococcal meningitis, as well as outbreak control [5].

Sanofi Pasteur shares the view with partners and experts around the globe that meningococcal disease is a significant personal and public health challenge. We support key patient groups and scientific organizations to enhance global scientific and academic research to prevent potential epidemics through new innovative vaccine solutions. We are actively involved with public health partners, patient associations, scientific and medical experts to achieve our united goal of broader protection and are committed to playing our part in achieving the WHO and MRF stated vision of a world free from meningitis by 2030.

For decades, Sanofi Pasteur has been at the forefront in combating meningococcal epidemics

In 1974, we created the first monovalent A vaccine used in Africa, followed by the first bivalent AC vaccine in 1975, the first ACWY quadrivalent polysaccharide vaccine in 1981 and the first ACWY quadrivalent conjugate vaccine in 2005. Today, we continue to work towards defeating this disease [5].

ADVANCING MENINGOCOCCAL DISEASE PROTECTION

Sanofi Pasteur believes that the most effective vaccination strategies should be available to everyone and we are committed to developing cutting-edge vaccination technology and expanding meningococcal vaccine availability worldwide. We want to ensure that no individuals are impacted by devastating vaccine preventable diseases such as meningococcal meningitis and call for routine immunization programs that provide optimal protection across all age groups, to help keep our loved ones safe.

Sanofi Pasteur is continuously developing and enhancing manufacturing capacities to support increased vaccination programs as well as supporting fast, efficient and reliable epidemic responses. We contribute to the WHO stockpile of meningococcal meningitis vaccinations [26] and are working to develop new vaccines to fight the global burden of meningococcal disease. We aim to play a critical role in controlling meningococcal disease and helping reduce its impact and incidence globally.

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