

## Immunogenicity and Safety Study of an Investigational Quadrivalent Meningococcal Conjugate Vaccine Administered Concomitantly with Routine Pediatric Vaccines in Healthy Infants and Toddlers

Phase III, modified double-blind, randomized, parallel group, active-controlled, multi-center study to compare the immunogenicity of MenACYW conjugate vaccine with that of MENVEO<sup>®</sup>, describe the immunogenicity of MenACYW conjugate vaccine and Menactra<sup>®</sup>, and describe the safety of MenACYW conjugate vaccine, MENVEO<sup>®</sup>, and Menactra<sup>®</sup> when administered in a 1 + 1 schedule concomitantly with routine pediatric vaccines to healthy infants and toddlers in the United States

### Clinical Study Protocol Amendment 2

**Health Authority File Number:** BB-IND #: 14171  
**WHO Universal Trial Number (UTN):** U1111-1205-2836  
**Study Code:** MET61  
**Development Phase:** Phase III  
**Sponsor:** Sanofi Pasteur Inc.  
Discovery Drive, Swiftwater, PA 18370-0187, USA  
**Investigational Product:** MenACYW Conjugate Vaccine: Meningococcal Polysaccharide (Serogroups A, C, Y, and W) Tetanus Toxoid Conjugate Vaccine  
**Form / Route:** Liquid Solution / Intramuscular  
**Indication For This Study:** MenACYW conjugate vaccine administered as a 2-dose series to healthy infants and toddlers  
**Manufacturer:** Same as Sponsor  
**Coordinating Investigator:**  
  
**Sponsor's Responsible Medical Officer:**  
  
**Pharmacovigilance Global Safety Officer:**  
  
**Clinical Study Manager:**

**Version and Date of the Protocol:** Version 4.0 dated 12 May 2022

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## History of Protocol Versions

Version*	Date	Comments
1.0	31 May 2018	Version not submitted to the IEC/IRB
<b>2.0</b>	<b>06 June 2018</b>	<b>Original study protocol (first version used in the study)</b>
<b>3.0</b>	<b>04 March 2021</b>	<b>Protocol Amendment 1</b>

\*Version in bold font have been approved by the Independent Ethics Committee(s) (IEC[s]) / Institutional Review Board(s) (IRB[s]) and used in the study.

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## Synopsis

<b>Company:</b>	Sanofi Pasteur
<b>Investigational Product:</b>	MenACYW conjugate vaccine
<b>Active Substances:</b>	Capsular polysaccharide from meningococcal serogroups A, C, Y, and W conjugated to tetanus toxoid
<b>Title of the Study:</b>	Immunogenicity and Safety Study of an Investigational Quadrivalent Meningococcal Conjugate Vaccine Administered in Healthy Infants and Toddlers
<b>Development Phase:</b>	Phase III
<b>Coordinating Investigator:</b>	Dr. [REDACTED]
<b>Study Sites:</b>	This will be a multi-center study conducted at approximately 30 sites in the United States (US).  Investigators and sites are listed in the “List of Investigators and Centers Involved in the Trial” document.
<b>Planned Study Period:</b>	Q3 2018 to Q3 2023
<b>Study Design, Schedule of Study Procedures, and Methodology:</b>	A Phase III, randomized, parallel group, active-controlled, multi-center study to compare the immunogenicity and describe the safety of MenACYW conjugate vaccine and MENVEO® when administered in a 1 + 1 schedule and concomitantly with routine pediatric vaccines in healthy infants and toddlers in the US. This study will also describe the safety and immunogenicity of MenACYW conjugate vaccine and Menactra® when administered in a 1 + 1 schedule to healthy toddlers in the US. For each age group at enrollment, the study will have a modified double-blind design, i.e., modified double-blind between Group 1 and Group 2, and between Group 3 and Group 4.
	Approximately 1070 subjects will be enrolled. Approximately 870 healthy infants 6 to 7 months of age will be randomized 1:1 to 2 groups, and 200 healthy toddlers 17 to 19 months of age will be randomized 1:1 to 2 groups: <ul style="list-style-type: none"> <li>• Group 1: MenACYW conjugate vaccine + routine pediatric vaccines at 6 to 7 months of age and 12 to 13 months of age</li> <li>• Group 2 MENVEO® + routine pediatric vaccines at 6 to 7 months of age and 12 to 13 months of age</li> <li>• Group 3: MenACYW conjugate vaccine at 17 to 19 months of age and 20 to 23 months of age</li> <li>• Group 4: Menactra® at 17 to 19 months of age and 20 to 23 months of age</li> </ul>
	All subjects in Group 1 and Group 2 will receive a dose of either MenACYW conjugate vaccine or MENVEO® with the following routine pediatric vaccines to ensure compliance with the Advisory Committee on Immunization Practices (ACIP) recommendations:

	<ul style="list-style-type: none"> <li>• Diphtheria, tetanus and acellular pertussis (DTaP) at 6 months of age</li> <li>• Inactivated poliovirus (IPV) at 6 months of age</li> <li>• <i>Haemophilus influenzae</i> type b (Hib) at 6 months of age*</li> <li>• Pneumococcal 13-valent conjugate (Prenar 13®, PCV13) at 6 and 13 months of age</li> <li>• Rotavirus (RotaTeq®) at 6 months of age</li> <li>• Hepatitis B at 6 months of age</li> </ul>
	<ul style="list-style-type: none"> <li>• Measles, mumps, and rubella (M-M-R®II) at 12 months of age</li> <li>• Varicella (Varivax®) at 12 months of age</li> </ul>
	<p>*In children immunized with PedvaxHIB® at 2 and 4 months of age, a third dose of Hib vaccine at 6 months of age is not required. The routine pediatric vaccines recommended at 6 months of age will be given as per standard of care during the first study visit (Visit 1) along with the corresponding study vaccine. The dose of Prenar 13® and Hib (for children vaccinated with monovalent Hib vaccine at 2, 4, and 6 months of age) recommended in the second year of life may be given as per standard of care at the last study visit after completing all the study procedures (Visit 4). Routine pediatric vaccines recommended at 6 months of age and the dose of Prenar 13® and Hib (for children vaccinated with monovalent Hib vaccine at 2, 4, and 6 months of age) recommended in the second year of life will not be provided by the Sponsor but procured by the sites as per their standard practices.</p>
	<p><u>Blood Sampling</u></p> <p>All subjects in Group 1 and Group 2 will provide 3 blood samples for immunogenicity assessment:</p> <ul style="list-style-type: none"> <li>• A blood sample before the first study vaccination at Visit 1 (all subjects)</li> <li>• A blood sample 30 days after administration of the first dose of MenACYW conjugate vaccine or MENVEO® at Visit 2 (only from approximately the first 50% of the subjects in Group 1 and Group 2)</li> <li>• A blood sample before the 12-month vaccination at Visit 3 (only from the remaining approximately 50% of subjects in Group 1 and Group 2, who did not have a blood draw at Visit 2)</li> <li>• A blood sample 30 days after administration of the second dose of MenACYW conjugate vaccine or MENVEO® at Visit 4 (all subjects in Group 1 and Group 2)</li> </ul>
	<p>All subjects in Group 3 and Group 4 will provide 2 blood samples for immunogenicity assessment:</p> <ul style="list-style-type: none"> <li>• A blood sample before the first study vaccination at Visit 1</li> <li>• A blood sample 30 days after administration of the second dose of MenACYW conjugate vaccine or Menactra® at Visit 3</li> </ul>

	<p><u>Collection of Safety Data</u></p> <p><u>All subjects will be followed for safety from Visit 1 to 6 months after the last vaccination.</u></p> <ul style="list-style-type: none"> <li>Immediate unsolicited systemic adverse events (AEs) will be collected within 30 minutes after each vaccination. Solicited AEs will be collected from Day (D) 0 to D07 after each vaccination; unsolicited AEs will be collected from D0 after each vaccination to the next study visit; serious adverse events (SAEs) (including adverse events of special interest [AESIs]) and medically attended adverse events (MAAEs) will be collected throughout the study from Visit 1 (first vaccination visit) until the end of the 6-month follow up period after the last vaccinations.</li> </ul>
	<ul style="list-style-type: none"> <li>All subjects will be observed for 30 minutes after each vaccination, and any unsolicited systemic AEs occurring during that time will be recorded as immediate unsolicited systemic AEs in the electronic case report book (CRB).</li> <li>The subject's parent / guardian will record information in a diary card about solicited reactions from D0 to D07 after each vaccination and unsolicited AEs from D0 after each vaccination to the next study visit.</li> </ul>
	<ul style="list-style-type: none"> <li>SAEs (including AESIs) and MAAEs will be recorded throughout the study. For Groups 1 and 2, the subject's parent/guardian will record information in a diary card about SAEs (including AESIs) and MAAEs from Visit 1 to Visit 2, from Visit 2 to Visit 3, and from Visit 3 to Visit 4. For Groups 1 and 2, SAEs (including AESIs) and MAAEs will also be recorded in a memory aid from Visit 4 until the 6-month follow up phone call. For Groups 3 and 4, the subject's parent/ guardian will record information in a diary card about SAEs (including AESIs) and MAAEs from Visit 1 to Visit 2, and from Visit 2 to Visit 3. For Groups 3 and 4, SAEs (including AESIs) and MAAEs will also be recorded in a memory aid from Visit 3 until the 6-month follow up phone call. The subject's parent/ guardian will be asked to notify the site immediately about any potential SAEs (including AESIs) at any time during the trial.</li> <li>Staff will contact the subjects' parent/ guardian by telephone 8 days (+2 days) after each vaccination visit to identify the occurrence of any SAEs (including AESIs) not yet reported and to remind them to complete the diary card after each vaccination visit and to bring it back at the subsequent visit.</li> <li>The completed diary cards will be collected and reviewed with the subject's parent/ guardian at the subsequent visit.</li> <li>For Group 1 and Group 2: Staff will contact the subjects' parent / guardian by telephone within 14 days before Visit 3 to remind them of the forthcoming study visit. If the subject's participation in the study is discontinued, the information recorded on the diary card will be reviewed at this time and the subject's parent /guardian will be asked to mail the diary card to the site.</li> <li>Staff will contact the subjects' parent / guardian by telephone at 6 months (+30 days) after the last vaccination visit to review the memory aid and identify the occurrence of any SAEs (including AESIs), as well as MAAEs that have not been reported.</li> </ul>
<b>Interruption of the Study</b>	<p>The study may be discontinued if new data about the investigational product resulting from this study or any other studies become available; or for</p>

	<p>administrative reasons; or on advice of the Sponsor, the Investigators, the IECs/IRBs, or the governing regulatory authorities in the country where the study is taking place.</p> <p>If the study is prematurely terminated or suspended, the Sponsor shall promptly inform the Investigators, the IECs/IRBs, the regulatory authorities, and any contract research organization(s) used in the study of the reason for termination or suspension, as specified by the applicable regulatory requirements. The Investigator shall promptly inform the subjects' parents/guardians and should assure appropriate subject therapy and/or follow-up.</p> <p>There will be an internal team at the level of the Sponsor (Safety Management Team, [SMT]), which will review the data being generated from all the ongoing studies with MenACYW conjugate vaccine at regular intervals for any new safety signals or safety concerns. The SMT is empowered to recommend a pause in both recruitment and / or further vaccination while it investigates any potential signal or concern.</p>
<b>Primary Objective:</b>	<p>To demonstrate the non-inferiority of the vaccine seroresponse* to meningococcal serogroups A, C, Y, and W following administration of 2 doses of MenACYW conjugate vaccine compared to 2 doses of MENVEO® when given concomitantly with routine pediatric vaccines to infants and toddlers at 6 to 7 months of age and 12 to 13 months of age.</p> <p>*Vaccine seroresponse is measured with the serum bactericidal assay using human complement (hSBA). hSBA vaccine seroresponse for serogroups A, C, Y, and W is defined as:</p> <ul style="list-style-type: none"> <li>• For a subject with a pre-vaccination titer &lt; 1:8, the post-vaccination titer must be ≥ 1:16</li> <li>• For a subject with a pre-vaccination titer ≥ 1:8, the post-vaccination titer must be ≥ 4-fold greater than the pre-vaccination titer</li> </ul>
<b>Primary Endpoint:</b>	<p>Meningococcal serogroups A, C, Y, and W antibody titers measured by hSBA, before the first study vaccination (Visit 1) and 30 days after the second dose of MenACYW conjugate vaccine or MENVEO® (Group 1 versus [vs] Group 2)</p>
<b>Secondary Objectives:</b>	<ol style="list-style-type: none"> <li>1) To demonstrate the non-inferiority of the percentage of subjects with hSBA titers to meningococcal serogroups A, C, Y, and W ≥ 1:8 following administration of 2 doses of MenACYW conjugate vaccine compared to 2 doses of MENVEO® when given concomitantly with pediatric routine vaccines to infants and toddlers at 6 to 7 months of age and 12 to 13 months of age</li> <li>2) To describe the antibody response against meningococcal serogroups A, C, Y, and W 30 days after the second vaccination at 12 to 13 months of age with MenACYW conjugate vaccine or MENVEO®</li> <li>3) To describe the antibody response against meningococcal serogroups A, C, Y, and W 30 days after the first vaccination at 6 to 7 months of age with MenACYW conjugate vaccine or MENVEO® (in a subset of subjects)</li> <li>4) To describe the antibody response against meningococcal serogroups A, C, Y, and W 6 months after the first vaccination at 6 to 7 months of age with MenACYW conjugate vaccine or MENVEO® (in a subset of subjects)</li> <li>5) To describe the antibody response against meningococcal serogroups A, C, Y, and W 30 days after the second vaccination at 20 to 23 months of age with MenACYW conjugate vaccine or Menactra®</li> </ol>
<b>Secondary Endpoints:</b>	<p>The following serological endpoints will be assessed.</p>

	<ol style="list-style-type: none"> <li>1) Meningococcal serogroups A, C, Y, and W antibody titers <math>\geq 1:8</math> measured by hSBA 30 days after the second dose of MenACYW conjugate vaccine or MENVEO<sup>®</sup> (Group 1 vs Group 2)</li> <li>2) 30 days after the second vaccination at 12 to 13 months of age with MenACYW conjugate vaccine or MENVEO<sup>®</sup> (Group 1 and Group 2): <ul style="list-style-type: none"> <li>• hSBA meningococcal serogroups A, C, Y, and W antibody titers</li> <li>• Geometric mean titers (GMTs) with 95% CI</li> <li>• Titer distribution and reverse cumulative distribution curves (RCDCs)</li> <li>• Percentage of subjects with titer <math>\geq 4</math>-fold rise from pre-vaccination to post-vaccination and 95% CI</li> </ul> </li> <li>3) 30 days after the first vaccination at 6 to 7 months of age with MenACYW conjugate vaccine or MENVEO<sup>®</sup> (Group 1 and Group 2): <ul style="list-style-type: none"> <li>• hSBA meningococcal serogroups A, C, Y, and W antibody titers</li> <li>• GMTs with 95% CI</li> <li>• Titer distribution and RCDCs</li> <li>• Percentage of subjects with titer <math>\geq 4</math>-fold rise from pre-vaccination to post-vaccination and 95% CI</li> <li>• Percentage of subjects with hSBA vaccine seroresponse and 95% CI</li> </ul> </li> <li>4) 6 months after the first vaccination at 6 to 7 months of age with MenACYW conjugate vaccine or MENVEO<sup>®</sup> (Group 1 and Group 2): <ul style="list-style-type: none"> <li>• hSBA meningococcal serogroups A, C, Y, and W antibody titers</li> <li>• GMTs with 95% CI</li> <li>• Titer distribution and RCDCs</li> <li>• Percentage of subjects with titer <math>\geq 4</math>-fold rise from pre-vaccination to post-vaccination and 95% CI</li> <li>• Percentage of subjects with hSBA vaccine seroresponse and 95% CI</li> </ul> </li> <li>5) 30 days after the second vaccination at 20 to 23 months of age with MenACYW conjugate vaccine or Menactra<sup>®</sup> (Group 3 and Group 4): <ul style="list-style-type: none"> <li>• hSBA meningococcal serogroups A, C, Y, and W antibody titers</li> <li>• GMTs with 95% CI</li> <li>• Titer distribution and RCDCs</li> <li>• Percentage of subjects with titer <math>\geq 4</math>-fold rise from pre-vaccination to post-vaccination and 95% CI</li> <li>• Percentage of subjects with hSBA vaccine seroresponse and 95% CI</li> </ul> </li> </ol>
<b>Observational Objectives:</b>	<ol style="list-style-type: none"> <li>1) To describe the safety profile of MenACYW conjugate vaccine and MENVEO<sup>®</sup> when administered concomitantly with routine pediatric vaccines in healthy infants and toddlers</li> <li>2) To describe the safety profile of MenACYW conjugate vaccine and Menactra<sup>®</sup> administered in toddlers</li> </ol>
<b>Observational Endpoints:</b>	The following endpoints will be used for all subjects:

	<ul style="list-style-type: none"> <li>• Occurrence, nature (Medical Dictionary for Regulatory Activities [MedDRA] preferred term), duration, intensity, relationship to vaccination, and whether the event led to early termination from the study, of any unsolicited systemic AEs reported within 30 minutes after each vaccination.</li> <li>• Occurrence, time of onset, number of days of occurrence, intensity, action taken, and whether the reaction led to early termination from the study, of solicited (prelisted in the subject's diary card and CRB) injection site reactions occurring up to D07 after each vaccination.</li> <li>• Occurrence, time of onset, number of days of occurrence, intensity, action taken, and whether the reaction led to early termination from the study, of solicited (prelisted in the subject's diary card and CRB) systemic reactions occurring up to D07 after each vaccination.</li> <li>• Occurrence, nature (MedDRA preferred term), time of onset, duration, intensity, action taken, relationship to vaccination, and whether the event led to early termination from the study, of unsolicited AEs up to D30 after each vaccination.</li> <li>• Occurrence, nature (MedDRA preferred term), time of onset, duration, seriousness criteria, relationship to vaccination, outcome, and whether the event led to early termination from the study, of SAEs (including AESIs) throughout the trial from Visit 1 up to the 6 month follow-up contact after the last vaccination.</li> <li>• Occurrence, nature (MedDRA preferred term), time of onset, duration, intensity, action taken, relationship to vaccination, and whether the event led to early termination from the study for MAAEs throughout the trial from Visit 1 up to the 6 month follow-up contact after the last vaccination.</li> </ul>
<b>Planned Sample Size:</b>	<p>Approximately 1070 subjects are planned to be enrolled:</p> <ul style="list-style-type: none"> <li>• Group 1 (MenACYW conjugate vaccine and routine vaccines): n = 435 enrolled, at least 261 evaluable</li> <li>• Group 2 (MENVEO® and routine vaccines): n = 435 enrolled, at least 261 evaluable</li> <li>• Group 3 (MenACYW conjugate vaccine): n = 100 enrolled</li> <li>• Group 4 (Menactra®): n = 100 enrolled</li> </ul>
<b>Duration of Participation in the Study:</b>	<p>For Group 1 and Group 2, the duration of each subject's active participation in the study will be approximately 1 year including a safety follow-up contact at 6 months after the last vaccinations. For Group 3 and Group 4, the duration of each subject's active participation in the study will be approximately 10 months, including a safety follow-up contact at 6 months after the last vaccinations.</p>

<b>Investigational Product:</b>	<b>MenACYW conjugate vaccine:</b> Meningococcal Polysaccharide (Serogroups A, C, Y, and W) Tetanus Toxoid Conjugate Vaccine (Sanofi Pasteur Inc., Swiftwater, PA, USA)
<b>Form:</b>	Liquid solution
<b>Composition:</b>	Each 0.5 milliliter (mL) dose of MenACYW conjugate vaccine is formulated in sodium acetate buffered saline solution to contain the following ingredients:  Meningococcal capsular polysaccharides: Serogroup A ..... 10 micrograms (µg) Serogroup C ..... 10 µg Serogroup Y ..... 10 µg Serogroup W ..... 10 µg Tetanus toxoid protein carrier ..... approximately 55 µg* * Tetanus toxoid protein quantity is approximate and dependent on the polysaccharide-to-protein ratio for the conjugates used in each formulation.
<b>Route:</b>	Intramuscular (IM)
<b>Batch Number:</b>	To be determined
<b>Control Product 1:</b>	<b>MENVEO®:</b> Meningococcal (Groups A, C, Y and W-135) Oligosaccharide Diphtheria CRM <sub>197</sub> Conjugate Vaccine (GSK Vaccines, Srl, Bellaria-Rosia 53018, Sovicille [SI], Italy)
<b>Form:</b>	Lyophilized powder and liquid components are combined to produce a solution for IM Injection
<b>Composition:</b>	Each 0.5 mL dose of vaccine contains the following active ingredients: MenA oligosaccharide ..... 10 µg MenC oligosaccharide ..... 5 µg MenY oligosaccharide ..... 5 µg MenW-135 oligosaccharide ..... 5 µg CRM <sub>197</sub> protein ..... 32.7 to 64.1 µg Other ingredients per 0.5 mL dose: residual formaldehyde ≤ 0.30 µg.
<b>Route:</b>	IM
<b>Batch Number:</b>	To be determined
<b>Control Product 2:</b>	<b>Menactra®:</b> Meningococcal (Groups A, C, Y and W-135) Polysaccharide Diphtheria Toxoid Conjugate Vaccine (Sanofi Pasteur Inc., Swiftwater, PA, USA)
<b>Form:</b>	Liquid Solution
<b>Composition:</b>	Each 0.5 mL dose of vaccine is formulated in sodium phosphate buffered isotonic sodium chloride solution to contain the following ingredients: Serogroup A ..... 4 µg Serogroup C ..... 4 µg Serogroup Y ..... 4 µg Serogroup W-135 ..... 4 µg Diphtheria toxoid protein carrier ..... approximately 48 µg
<b>Route:</b>	IM
<b>Batch Number:</b>	To be determined



<b>Other Product 1:</b>	<b>Pentacel®:</b> (Diphtheria and Tetanus Toxoids and Acellular Pertussis Adsorbed, Inactivated Poliovirus and Haemophilus b Conjugate (Tetanus Toxoid Conjugate) Vaccine (Sanofi Pasteur Ltd, Toronto, Ontario, Canada)
<b>Form:</b>	Liquid DTaP-IPV used to reconstitute lyophilized ActHIB®
<b>Composition:</b>	<p>Each 0.5 mL dose contains:</p> <p>Diphtheria toxoid ..... 15 Limit of Flocculation (Lf)</p> <p>Tetanus toxoid ..... 5 Lf</p> <p>Acellular pertussis antigens:</p> <p>    Pertussis toxin (PT) .....20 µg</p> <p>    Filamentous hemagglutinin (FHA) .....20 µg</p> <p>    Pertactin (PRN).....3 µg</p> <p>    Fimbriae Types 2 and 3 (FIM).....5 µg</p> <p>Inactivated polioviruses:</p> <p>    Type 1 (Mahoney) .....40 D-antigen units (DU)</p> <p>    Type 2 (MEF-1)..... 8 DU</p> <p>    Type 3 (Saukett) ..... 32 DU</p> <p><i>H. influenzae</i> type b (PRP) .....10 µg</p> <p>Tetanus toxoid (PRP-T).....24 µg</p>
	<p>Excipients:</p> <p>Aluminum phosphate (0.33 mg aluminum) (adjuvant).....1.5 mg</p> <p>Polysorbate 80 ..... approximately 10 ppm by calculation</p> <p>Sucrose .....42.5 mg</p> <p>Residual formaldehyde ..... ≤ 5 µg</p> <p>Residual glutaraldehyde.....&lt; 50 nanograms (ng)</p> <p>Residual bovine serum albumin.....≤ 50 ng</p> <p>2-phenoxyethanol .....3.3 mg (0.6% v/v)</p> <p>Neomycin ..... &lt; 4 picograms (pg)</p> <p>Polymyxin B sulfate .....&lt; 4 pg</p>
<b>Route:</b>	IM
<b>Batch Number:</b>	Commercial batches
<b>Other Product 2:</b>	<b>Pediarix®:</b> (Diphtheria and Tetanus Toxoids and Acellular Pertussis Adsorbed, Hepatitis B (Recombinant) and Inactivated Poliovirus Vaccine) (GlaxoSmithKline Biologicals, Rixensart, Belgium)
<b>Form:</b>	Suspension for injection
<b>Composition:</b>	<p>Each 0.5 mL dose contains:</p> <p>Diphtheria toxoid ..... 25 Lf</p> <p>Tetanus toxoid ..... 10 Lf</p> <p>Acellular pertussis antigens:</p> <p>    Inactivated PT .....25 µg</p> <p>    FHA .....25 µg</p> <p>    PRN .....8 µg</p> <p>    HBsAg .....10 µg</p> <p>Inactivated polioviruses:</p> <p>    Type 1 (Mahoney) .....40 DU</p> <p>    Type 2 (MEF-1)..... 8 DU</p> <p>    Type 3 (Saukett) ..... 32 DU</p>

	<p>Excipients:</p> <p>Aluminum salt (adjuvant) ..... not more than 0.85 mg by assay</p> <p>Sodium chloride ..... 4.5 mg</p> <p>Polysorbate 80 ..... ≤ 100 µg</p> <p>Residual formaldehyde ..... ≤ 100 µg</p> <p>Neomycin ..... ≤ 0.05 ng</p> <p>Polymyxin B ..... ≤ 0.01 ng</p>
<b>Route:</b>	IM
<b>Batch Number:</b>	Commercial batches
<b>Other Product 3:</b>	<p>Haemophilus b conjugate vaccine: either <b>ActHib®</b>, <b>Hiberix®</b> or <b>PedvaxHIB®</b></p> <p><b>ActHib®</b>: Haemophilus b Conjugate Vaccine (Tetanus Toxoid Conjugate) (Sanofi Pasteur Inc., Swiftwater, PA, USA)</p> <p><b>Hiberix®</b>: Haemophilus b Conjugate Vaccine (Tetanus Toxoid Conjugate) (GlaxoSmithKline Biologicals 441 Rixensart, Belgium)</p> <p><b>PedvaxHIB®</b>: Haemophilus b Conjugate Vaccine (Meningococcal Protein Conjugate) (Merck &amp; Co., Inc., West Point, PA, USA)</p>
<b>Form:</b>	<p><b>ActHib® and Hiberix®</b>: lyophilized powder and liquid diluent are combined to produce a solution for IM injection</p> <p><b>PedvaxHIB®</b>: Solution for IM injection</p>
<b>Composition:</b>	<p><b>ActHib®</b>: After reconstitution, each 0.5 mL dose contains:</p> <p><i>Haemophilus influenzae</i> type b polysaccharide..... 10µg (polyribosylribitol phosphate, PRP)</p> <p>conjugated to tetanus toxoid as carrier protein..... 24 µg</p> <p>Sucrose..... 8.5%</p>
	<p><b>Hiberix®</b>: After reconstitution, each 0.5 mL dose contains:</p> <p><i>Haemophilus influenzae</i> type b polysaccharide..... 10µg (polyribosylribitol phosphate, PRP)</p> <p>conjugated to tetanus toxoid as carrier protein..... approximately 25µg</p> <p>Lactose..... 12.6 mg</p> <p>Residual formaldehyde..... &lt;0.5 µg</p>
	<p><b>PedvaxHIB®</b>: Each 0.5 mL dose contains:</p> <p><i>Haemophilus influenzae</i> type b polysaccharide..... 7.5µg (polyribosylribitol phosphate, PRP)</p> <p><i>Neisseria meningitidis</i> outer membrane protein complex..... 125µg</p> <p>Aluminum as amorphous aluminum hydroxyphosphate sulfate..... 225 µg</p> <p>Sodium chloride..... 0.9%</p>
<b>Route:</b>	IM
<b>Batch Number:</b>	Commercial batches

<b>Other Product 4:</b>	<b>Prevnar 13®:</b> Pneumococcal 13-valent Conjugate Vaccine (Diphtheria CRM <sub>197</sub> Protein) (Wyeth Pharmaceuticals, Inc., a subsidiary of Pfizer Inc, Philadelphia, PA, USA)
<b>Form:</b>	Suspension for injection
<b>Composition:</b>	Each 0.5 mL dose of the vaccine is formulated to contain <i>Streptococcus pneumoniae</i> serotypes 1, 3, 4, 5, 6A, 7F, 9V, 14, 18C, 19A, 19F, 23F saccharides ..... approximately 2.2 µg of each 6B saccharides ..... 4.4 µg CRM <sub>197</sub> carrier protein..... 34 µg Polysorbate 80 ..... 100 µg Succinate buffer ..... 295 µg Aluminum as aluminum phosphate adjuvant ..... 125 µg
<b>Route:</b>	IM
<b>Batch Number:</b>	Commercial batches
<b>Other Product 5:</b>	<b>RotaTeq®:</b> (Rotavirus Vaccine, Live, Oral, Pentavalent) (Merck Sharp & Dohme Corp., a subsidiary of Merck & Co., Inc., Whitehouse Station, NJ, USA)
<b>Form:</b>	Oral Solution
<b>Composition:</b>	Each 2 mL dose contains the following 5 live reassortant rotaviruses: G1 serotype ..... 2.2 x 10 <sup>6</sup> infectious units (IU) G2 serotype ..... 2.8 x 10 <sup>6</sup> IU G3 serotype ..... 2.2 x 10 <sup>6</sup> IU G4 serotype ..... 2.0 x 10 <sup>6</sup> IU P1A(8) ..... 2.3 x 10 <sup>6</sup> IU The reassortants are suspended in a buffered stabilizer solution. Each 2 mL vaccine dose also contains sucrose, sodium citrate, sodium phosphate monobasic monohydrate, sodium hydroxide, polysorbate 80, cell culture media, and trace amounts of fetal bovine serum.
<b>Route:</b>	Oral
<b>Batch Number:</b>	Commercial batches
<b>Other Product 6:</b>	Hepatitis B Vaccine: either <b>ENGRIX-B®</b> or <b>Recombivax HB®</b> <b>Engerix-B®:</b> (Hepatitis B Vaccine [Recombinant]) (GlaxoSmithKline Biologicals 441 Rixensart, Belgium) <b>RecombivaxHB®:</b> (Hepatitis B Vaccine [Recombinant]) (Merck Sharp & Dohme Corp., a subsidiary of Merck & Co., Inc., Whitehouse Station, NJ, USA)
<b>Form:</b>	Suspension for injection
<b>Composition:</b>	<b>Engerix-B®:</b> Each 0.5 mL pediatric/adolescent dose contains 10 µg of hepatitis B virus surface antigen (HBsAg) adsorbed on 0.25 mg aluminum as aluminum hydroxide. Excipients: Sodium chloride ..... 9 mg/mL Disodium phosphate dehydrate ..... 0.98 mg/mL Sodium dihydrogen phosphate dehydrate ..... 0.71 mg/mL

	<p><b>RecombivaxHB®:</b> Each 0.5 mL pediatric/adolescent dose contains 5µg of HBsAg adsorbed onto approximately 0.5 mg of aluminum (provided as amorphous aluminum hydroxyphosphate sulphate)</p> <p>Excipient: Residual formaldehyde ..... &lt; 15 mg/mL</p>
<b>Route:</b>	IM
<b>Batch Number:</b>	Commercial batches
<b>Other Product 7:</b>	<b>M-M-R® II</b> (Measles, Mumps, and Rubella Virus Vaccine Live) (Merck Sharp & Dohme Corp., a subsidiary of Merck & Co., Inc., Whitehouse Station, NJ, USA)
<b>Form:</b>	Lyophilized live virus vaccine
<b>Composition:</b>	<p>Each 0.5 mL dose contains live, attenuated virus:</p> <p>Measles virus (derived from Ender's Edmonston strain) propagated in chick embryo cell culture ..... not less than 1000 TCID<sub>50</sub>*</p> <p>Mumps virus (Jeryl Lynn™ [B level] strain) propagated in chick embryo cell culture ..... not less than 12,500 TCID<sub>50</sub>*</p> <p>Rubella virus (Wistar RA 27/3 strain) propagated in WI-38 human diploid lung fibroblasts ..... not less than 1000 TCID<sub>50</sub>*</p> <p>*TCID<sub>50</sub> = tissue culture infectious doses 50%</p> <p>Each 0.5 mL dose is calculated to contain sorbitol (14.5 mg), sodium phosphate, sucrose (1.9 mg), sodium chloride, hydrolyzed gelatin (14.5 mg), recombinant human albumin (≤ 0.3 mg), fetal bovine serum (&lt; 1 ppm), other buffer and media ingredients and approximately 25 µg of neomycin.</p>
<b>Route:</b>	Subcutaneous (SC)
<b>Batch Number:</b>	Commercial batches
<b>Other Product 8:</b>	<b>Varivax®:</b> Varicella Virus Vaccine Live (Merck Sharp & Dohme Corp., a subsidiary of Merck & Co., Inc., Whitehouse Station, NJ, USA)
<b>Form:</b>	Suspension for injection supplied as lyophilized vaccine to be reconstituted using the accompanying sterile diluent
<b>Composition:</b>	<p>Each approximately 0.5 mL dose contains:</p> <p>Active:</p> <p>Oka/Merck varicella virus at least 1350 plaque-forming units (PFU)</p>
	<p>Excipients:</p> <p>Sucrose ..... 25 mg</p> <p>Hydrolyzed gelatin ..... 12.5 mg</p> <p>Sodium chloride ..... 3.2 mg</p> <p>Monosodium L-glutamate ..... 0.5 mg</p> <p>Sodium phosphate dibasic ..... 0.45 mg</p> <p>Potassium phosphate monobasic ..... 0.08 mg</p> <p>Potassium chloride ..... 0.08 mg</p> <p>The vaccine contains residual components of MRC-5 cells including DNA and protein and trace quantities of sodium phosphate monobasic, EDTA, neomycin, and fetal bovine serum. The product contains no preservative.</p>
<b>Route:</b>	SC
<b>Batch Number:</b>	Commercial batches

<b>Inclusion Criteria:</b>	<p>An individual must fulfill <i>all</i> of the following criteria to be eligible for study enrollment:</p> <ol style="list-style-type: none"> <li>1) Aged 6 to 7 months of age (168 to 224 days)* or 17 to 19 months of age on the day of the first visit  *At Visit 1, subjects must be at least 24 weeks of age (168 days, the minimum age for the final dose of hepatitis B vaccine in the vaccine series), and no more than 32 weeks of age (224 days, the maximum age for the 3rd dose of rotavirus vaccine administration).</li> <li>3) Informed consent form has been signed and dated by the parent(s) or guardian and by an independent witness if required by local regulations</li> <li>4) Subject and parent/guardian are able to attend all scheduled visits and to comply with all trial procedures</li> <li>5) For subjects to be enrolled at 6 to 7 months of age (Group 1 and Group 2), documented history of having received 2 doses of DTaP, Hib, IPV, pneumococcal, hepatitis B (for children who received Pediarix® at 2 and 4 months of age, prior receipt of 3 doses of hepatitis B), and rotavirus (Rotateq®) vaccines</li> <li>6) For subjects to be enrolled at 17 to 19 months of age (Group 3 and Group 4), documented history of having received all routine pediatric vaccines recommended by ACIP up to the age of enrollment</li> </ol>
<b>Exclusion Criteria:</b>	<p>An individual fulfilling <i>any</i> of the following criteria is to be excluded from study enrollment:</p> <ol style="list-style-type: none"> <li>1) Participation at the time of study enrollment or in the 4 weeks preceding the first trial vaccination or planned participation during the present trial period in another clinical trial investigating a vaccine, drug, medical device, or medical procedure</li> </ol>
	<ol style="list-style-type: none"> <li>2) Receipt of any vaccine in the 4 weeks preceding the first trial vaccination or planned receipt of any vaccine in the 4 weeks before and / or following any trial vaccination except for influenza vaccination, which may be received at least 2 weeks before or 2 weeks after any study vaccination. This exception includes monovalent pandemic influenza vaccines and multivalent influenza vaccines</li> </ol>
	<ol style="list-style-type: none"> <li>3) Previous vaccination against meningococcal disease with either the trial vaccine or another vaccine (i.e., mono- or polyvalent, polysaccharide, or conjugate meningococcal vaccine containing serogroups A, C, Y, or W; or meningococcal B serogroup-containing vaccine)</li> <li>4) For subjects to be enrolled at 6 to 7 months of age (Group 1 and Group 2), prior receipt of more than 2 doses of rotavirus vaccine (Rotateq), DTaP, Hib, IPV, pneumococcal, hepatitis B: for children who received Pediarix® at 2 and 4 months of age, prior receipt of more than 3 doses of hepatitis B vaccine.</li> <li>5) For subjects to be enrolled at 6 to 7 months of age, receipt of 2 doses of rotavirus vaccine, Rotarix® at 2 and 4 months of age.</li> <li>6) Receipt of immune globulins, blood, or blood-derived products in the past 3 months</li> </ol>

	<p>7) Known or suspected congenital or acquired immunodeficiency or receipt of immunosuppressive therapy such as anti-cancer chemotherapy or radiation therapy within the preceding 6 months; or long-term systemic corticosteroid therapy (prednisone or equivalent for more than 2 consecutive weeks) within the past 3 months</p> <p>8) Family history of congenital or hereditary immunodeficiency, until the immune competence of the potential vaccine recipient is demonstrated</p> <p>9) Individuals with blood dyscrasias, leukemia, lymphoma of any type, or other malignant neoplasms affecting the bone marrow or lymphatic systems</p>
	<p>10) Individuals with active tuberculosis</p> <p>11) History of any <i>Neisseria meningitidis</i> infection, confirmed either clinically, serologically, or microbiologically</p>
	<p>12) History of diphtheria, tetanus, pertussis, poliomyelitis, hepatitis B, hepatitis A, measles, mumps, rubella, varicella; and <i>Haemophilus influenzae</i> type b, <i>Streptococcus pneumoniae</i>, and /or rotavirus infection or disease</p> <p>13) At high risk for meningococcal infection during the trial (specifically, but not limited to, subjects with persistent complement deficiency, with anatomic or functional asplenia, or subjects travelling to countries with high endemic or epidemic disease)</p> <p>14) History of intussusception</p> <p>15) History of any neurologic disorders, including any seizures and progressive neurologic disorders</p> <p>16) History of Arthus-type hypersensitivity reaction after a previous dose of tetanus toxoid-containing vaccine</p> <p>17) History of Guillain-Barré syndrome</p> <p>18) Known systemic hypersensitivity to any of the vaccine components or to latex, or history of a life-threatening reaction to the vaccine(s) used in the trial or to a vaccine containing any of the same substances, including neomycin, gelatin, and yeast</p>
	<p>19) Verbal report of thrombocytopenia contraindicating intramuscular vaccination in the investigator's opinion</p> <p>20) Bleeding disorder, or receipt of anticoagulants in the 3 weeks preceding inclusion, contraindicating intramuscular vaccination in the investigator's opinion</p>
	<p>21) Receipt of oral or injectable antibiotic therapy within 72 hours prior to the first blood draw</p> <p>22) Chronic illness that, in the opinion of the investigator, is at a stage where it might interfere with trial conduct or completion</p>
	<p>23) Any condition which, in the opinion of the investigator, might interfere with the evaluation of the study objectives</p>

	<p>24) Moderate or severe acute illness/infection (according to investigator judgment) on the day of vaccination or febrile illness (temperature <math>\geq 38.0^{\circ}\text{C}</math> [<math>\geq 100.4^{\circ}\text{F}</math>]). A prospective subject should not be included in the study until the condition has resolved or the febrile event has subsided</p> <p>25) Identified as a natural or adopted child of the investigator or employee with direct involvement in the proposed study</p>
<b>Statistical Methods:</b>	<p><b>Primary Objective</b></p> <p>Thirty days after receiving MenACYW conjugate vaccine at 12 months of age, the hSBA vaccine seroresponse* rates against meningococcal serogroups A, C, Y, and W in Group 1 is non-inferior to the corresponding hSBA vaccine seroresponse rates against meningococcal serogroups A, C, Y, and W in Group 2.</p> <p>Null hypothesis (<math>H_0</math>): <math>p(\text{men}, G1) - p(\text{men}, G2) \leq -10\%</math></p> <p>Alternative hypothesis (<math>H_1</math>): <math>p(\text{men}, G1) - p(\text{men}, G2) &gt; -10\%</math></p>
	<p>where <math>p(\text{men}, G1)</math> and <math>p(\text{men}, G2)</math> are the percentages of subjects who achieve hSBA vaccine seroresponse in Group 1 and Group 2, respectively. Each of the serogroups A, C, Y, and W will be tested separately. Assuming the difference between the 2 proportions is normally distributed, if the lower limit of the 2-sided 95% confidence interval (CI) of the difference between the 2 proportions is <math>&gt; -10\%</math>, the inferiority assumption will be rejected. For the non-inferiority hypotheses using the seroresponse rates, the CI of the difference in proportions is computed using the Wilson Score method without continuity correction.</p> <p>*hSBA vaccine seroresponse for serogroups A, C, Y and W is defined as:</p> <ul style="list-style-type: none"> <li>• For a subject with a pre-vaccination titer <math>&lt; 1:8</math>, the post-vaccination titer must be <math>\geq 1:16</math></li> <li>• For a subject with a pre-vaccination titer <math>\geq 1:8</math>, the post-vaccination titer must be <math>\geq 4</math>-fold greater than the pre-vaccination titer</li> </ul> <p>Refer to <a href="#">Table S1</a> for power estimates to reject the primary null hypothesis.</p>
	<p><b>Secondary Objective</b></p> <p>Thirty days after receiving MenACYW conjugate vaccine at 12 months of age, the hSBA vaccine seroprotection rates against meningococcal serogroups A, C, Y, and W in Group 1 is non-inferior to the corresponding hSBA vaccine seroprotection rates against meningococcal serogroups A, C, Y, and W in Group 2.</p> <p>Null hypothesis (<math>H_0</math>): <math>p(\text{men}, G1) - p(\text{men}, G2) \leq -10\%</math></p> <p>Alternative hypothesis (<math>H_1</math>): <math>p(\text{men}, G1) - p(\text{men}, G2) &gt; -10\%</math></p>
	<p>where <math>p(\text{men}, G1)</math> and <math>p(\text{men}, G2)</math> are the percentages of subjects who achieve hSBA vaccine seroprotection† in Group 1 and Group 2 respectively. Each of the serogroups A, C, Y, and W will be tested separately. Assuming the difference between the 2 proportions is normally distributed, if the lower limit of the 2-sided 95% CI of the difference between the 2 proportions is <math>&gt; -10\%</math>, the inferiority assumption will be rejected. The CI of the difference in proportions is computed using the Wilson Score method without continuity correction.</p>
	<p>†hSBA vaccine seroprotection for serogroups A, C, Y and W is defined as titers <math>\geq 1:8</math></p> <p>Refer to <a href="#">Table S2</a> for power estimates to reject the secondary null hypothesis.</p>

	<p>In general, categorical variables will be summarized and presented by frequency counts, proportion percentages, and CIs. The 95% CIs of point estimates will be calculated using the normal approximation for quantitative data and the exact binomial distribution (Clopper-Pearson method) for proportions. For GMTs and geometric mean concentrations (GMCs), 95% CIs of point estimates will be calculated using normal approximation assuming they are log-normally distributed.</p>																														
	<p><b>Observational Objective</b></p> <p><i>Safety</i></p> <p>Safety results will be described for subjects in all study groups. The main parameters for the safety endpoints will be described by 95% CIs (based on the Clopper-Pearson method).</p>																														
	<p><b>Calculation of Sample Size:</b></p> <p>Approximately 870 subjects will be enrolled in Group 1 and Group 2. An estimated around 20% to 30% and not higher than 40% of non-evaluable subjects will result in at least 522 subjects in the Per-Protocol population available for immunogenicity analyses. Group 1 will have 435 enrolled subjects and 261 evaluable subjects. Group 2 will have 435 enrolled subjects and 261 evaluable subjects. In addition, 200 subjects will be enrolled in Group 3 and Group 4.</p>																														
	<p><b>For the Primary Objective:</b></p> <p><i>Thirty days after the month 12 vaccination (after the second dose vaccination)</i></p> <p>With at least 261 evaluable subjects in Group 1 and at least 261 evaluable subjects in Group 2, the study will have around 90.0% power by using Farrington and Manning’s method to declare the non-inferiority of Group 1 vs Group 2.</p> <p><b>Table S1: Power estimates to reject primary null hypothesis</b></p> <table><tr><th>Antigen</th><th>Endpoint</th><th>Estimated response (%)*</th><th>Non-inferiority margin</th><th>Power (%)</th></tr><tr><td>A</td><td>Seroresponse Rate</td><td>97.7</td><td>10%</td><td>100</td></tr><tr><td>C</td><td>Seroresponse Rate</td><td>97.8</td><td>10%</td><td>100</td></tr><tr><td>Y</td><td>Seroresponse Rate</td><td>93.3</td><td>10%</td><td>99.0</td></tr><tr><td>W</td><td>Seroresponse Rate</td><td>86.7</td><td>10%</td><td>91.0</td></tr><tr><td colspan="4">Overall</td><td>90.0</td></tr></table> <p>Note: Evaluable subjects: Group 1 = 261 subjects; Group 2 = 261 subjects</p> <p>*Estimated responses are based on results observed in MET39</p>	Antigen	Endpoint	Estimated response (%)*	Non-inferiority margin	Power (%)	A	Seroresponse Rate	97.7	10%	100	C	Seroresponse Rate	97.8	10%	100	Y	Seroresponse Rate	93.3	10%	99.0	W	Seroresponse Rate	86.7	10%	91.0	Overall				90.0
Antigen	Endpoint	Estimated response (%)*	Non-inferiority margin	Power (%)																											
A	Seroresponse Rate	97.7	10%	100																											
C	Seroresponse Rate	97.8	10%	100																											
Y	Seroresponse Rate	93.3	10%	99.0																											
W	Seroresponse Rate	86.7	10%	91.0																											
Overall				90.0																											



	<p><b>For the Secondary Objective:</b>  <i>Thirty days after the month 12 vaccination (after the second dose vaccination)</i>            With 261 evaluable subjects in Group 1 and 261 evaluable subjects in Group 2, the study will have 100% power by using Farrington and Manning's method to declare the non-inferiority of Group 1 vs Group 2.</p>																																	
	<p><b>Table S2: Power estimates to reject the secondary null hypothesis</b></p> <table> <tr> <th>Antigen</th><th>Endpoint</th><th>Estimated response (%)*</th><th>Non-inferiority margin</th><th>Power (%)</th></tr> <tr> <td>A</td><td>% <math>\geq</math>1:8</td><td>&gt;99.9</td><td>10%</td><td>100</td></tr> <tr> <td>C</td><td>% <math>\geq</math>1:8</td><td>&gt;99.9</td><td>10%</td><td>100</td></tr> <tr> <td>Y</td><td>% <math>\geq</math>1:8</td><td>97.8</td><td>10%</td><td>100</td></tr> <tr> <td>W</td><td>% <math>\geq</math>1:8</td><td>97.8</td><td>10%</td><td>100</td></tr> <tr> <td colspan="4"><b>Overall</b></td><td>100</td></tr> </table> <p>Note: Evaluable subjects: Group 1 = 261 subjects; Group 2 = 261 subjects            *Estimated responses are based on results observed in MET39</p>				Antigen	Endpoint	Estimated response (%)*	Non-inferiority margin	Power (%)	A	% $\geq$ 1:8	>99.9	10%	100	C	% $\geq$ 1:8	>99.9	10%	100	Y	% $\geq$ 1:8	97.8	10%	100	W	% $\geq$ 1:8	97.8	10%	100	<b>Overall</b>				100
Antigen	Endpoint	Estimated response (%)*	Non-inferiority margin	Power (%)																														
A	% $\geq$ 1:8	>99.9	10%	100																														
C	% $\geq$ 1:8	>99.9	10%	100																														
Y	% $\geq$ 1:8	97.8	10%	100																														
W	% $\geq$ 1:8	97.8	10%	100																														
<b>Overall</b>				100																														

## Table of Study Procedures – Group 1 and Group 2

Phase III Study, 4 Visits, 2 Vaccinations visits, 3 Blood Samples, 4 Telephone Calls and 12 Months Duration per Subject

Visit (V) / Contact	Visit 1	Telephone Call (TC) 1*	Visit 2	TC 2†	Visit 3	TC 3*	Visit 4	TC 4 Follow-up contact‡
Approximate age of subjects	6 to 7 months§		7 to 8 months	11.5 to 12.5 months	12 to 13 months		13 to 14 months	18 to 19 months
Study timelines (days)	D0	Visit 1 +8 days	Visit 1 +30 days	Visit 3 -14 days	≥6 months post-Visit 1	Visit 3 +8 days	Visit 3 +30 days	Visit 3 +180 days
Time windows (days)		+2 days	+21 days			+2 days	+21 days	+30 days
Informed consent	X							
Inclusion/exclusion criteria	X							
Collection of demographic data	X							
Medical history	X							
Physical examination (including temperature measurement) **	X				X			
Contact interactive response technology (IRT) system for randomization/allocation of subject number/vaccine group assignment	X							
Review of temporary contraindications for blood sampling††	X		X		X		X	
Blood sampling (BL) (3 mL)	BL0001‡‡		BL0002A§§		BL0002B‡‡***		BL0003	
Review of warning and precautions to vaccinations	X				X			
Review of contraindications to subsequent vaccinations and conditions for withdrawal†††					X			
Contact IRT system for vaccine assignment	X				X			
Vaccination with MenACYW conjugate vaccine or MENVEO®	X				X			
Vaccination with routine pediatric vaccines‡‡‡	X§§§				X		X****	
Immediate surveillance (30 minutes)	X				X			

Visit (V) / Contact	Visit 1	Telephone Call (TC) 1*	Visit 2	TC 2†	Visit 3	TC 3*	Visit 4	TC 4 Follow-up contact‡
Approximate age of subjects	6 to 7 months§		7 to 8 months	11.5 to 12.5 months	12 to 13 months		13 to 14 months	18 to 19 months
Study timelines (days)	D0	Visit 1 +8 days	Visit 1 +30 days	Visit 3 -14 days	≥6 months post-Visit 1	Visit 3 +8 days	Visit 3 +30 days	Visit 3 +180 days
Time windows (days)		+2 days	+21 days			+2 days	+21 days	+30 days
Diary card provided	DC1		DC2		DC3			
Telephone Call		X		X		X		X
Diary card reviewed and collected			DC1		DC2		DC3	
Recording of solicited injection site and systemic reactions†††	X				X			
Recording of unsolicited adverse events	Recorded from D0 to D30 after each vaccination visit							
Reporting of SAEs (including AESIs) and MAAEs‡‡‡‡	To be reported throughout the study period							
Collection of reportable concomitant medications	X		X		X		X	
Memory Aid (MA) provided							X§§§§	
Completion at End of study							X	

\*This call will be made 8 days after the respective vaccinations. If day 8 falls on a weekend or holiday, the telephone call may be made on the following business day. During this telephone call, the staff will find out whether the subject experienced any SAE and/or MAAE not yet reported, and will remind the subject's parent / guardian to continue using the diary card, to bring the diary card to the study center at the next visit, and to confirm the date and time of the next visit.

†Staff will contact the subjects' parent / guardian by telephone within the 14 day time period before Visit 3 to remind them about the forthcoming study visit. If the subject's participation in the study is discontinued, the information recorded on the diary card will be reviewed at this time and the diary card will be retrieved by the site.

‡Staff will contact the subject's parent/ guardian by telephone at 6 months (+ 30 days) after the last vaccination visit to identify the occurrence of any SAEs (including any AESIs) and MAAEs not yet reported

§At Visit 1, subjects must be at least 24 weeks of age (168 days, the minimum age for the final dose of hepatitis B vaccine in the vaccine series) (1), and no more than 32 weeks of age (224 days, the maximum age for the 3rd dose of rotavirus vaccine administration).

\*\*Physical examination should be performed as per routine standard of care. Temperature should be measured before vaccination and recorded in the source documents.

††Should a subject receive oral or injectable antibiotic therapy within 3 days prior to any blood draw, the investigator will postpone that blood draw until it has been 3 days since the subject last received oral or injectable antibiotic therapy. Postponement must still be within the timeframe for blood draw. If postponement would result in the sample collection falling outside of this timeframe, the blood sample should be collected without postponement, and it should be documented appropriately that the sample was taken less than 3 days after stopping antibiotic treatment.

‡‡Blood sample will be drawn prior to vaccinations.

§§Blood sample at Visit 2 is applicable only to approximately the first 50% of the subjects in Group 1 and Group 2.

\*\*\*Blood sample at Visit 3 is applicable only to the subjects in Group 1 and Group 2 who did not provide a blood sample at Visit 2 (approximately 50% of subjects in each group).

†††Physical examination should be performed on the basis of relevant medical history at the time of the visit according to the investigator's clinical judgment. Temperature should be measured before each vaccination and recorded in the source documents.

‡‡‡In children immunized with PedvaxHIB® at 2 and 4 months of age, a third dose of Hib vaccine at 6 months of age is not required.

§§§Routine pediatric vaccines recommended at this age are to be given as per standard of care, and will not be provided by the Sponsor.

\*\*\*\*PCV13 will not be provided by the Sponsor. PCV13 may be given as per standard of care outside of the study during the last study visit after completing all the study procedures (Visit 4).

††††Solicited injection site and systemic reactions will be recorded from D0 through D07 after each vaccination visit.

‡‡‡‡AESIs will be collected throughout the trial as SAEs to ensure that the events are communicated to the Sponsor in an expedited manner, and followed up until the end of the follow-up period or resolution, as per the assigned causality.

§§§§The memory aid will be used only for the recording of SAEs (including AESIs) and MAAEs from Visit 4 to the 6-month follow-up phone call (TC4).

## Table of Study Procedures – Group 3 and Group 4

Phase III Study, 3 Visits, 2 Vaccination visits, 2 Blood Samples, 10-month Duration per Subject

Visit / Contact	Visit 1	TC 1*	Visit 2	TC 2*	Visit 3	TC 3 Follow-up contact†
Approximate age of subjects	17 to 19 months		20 to 23 months		21 to 24 months	27 to 30 months
Study timelines (days)	D0	Visit 1 +8 days	≥3 months post- Visit 1	Visit 2 +8 days	Visit 2 +30 days	Visit 2 +180 days
Time windows (days)		+2 days		+2 days	+21 days	+30 days
Informed consent	X					
Inclusion/exclusion criteria	X					
Collection of demographic data	X					
Medical history	X					
Physical examination (including temperature)‡	X					
Randomization/allocation of subject number	X					
Review of temporary contraindications for blood sampling§	X				X	
Blood sampling (BL) (3 mL)	BL0001**				BL0002	
Review of warning and precautions to vaccinations	X		X			
Review of contraindications to subsequent vaccinations and conditions for withdrawal††			X			
Contact IRT system for vaccine assignment	X		X			
Vaccination with MenACYW conjugate vaccine or Menactra®	X		X			
Immediate surveillance (30 minutes)	X		X			
Diary card provided	DC1		DC2			
Telephone Call		X		X		X
Diary card reviewed and collected			DC1		DC2	
Recording of solicited injection site and systemic reactions‡‡	X		X			
Recording of unsolicited adverse events	Recorded from D0 to D30 after each vaccination visit					
Reporting of SAEs (including AESIs) and MAAEs§§	To be reported throughout the study period					
Collection of reportable concomitant medications	X		X		X	
MA provided					X	
Completion at End of study					X	

\*This call will be made 8 days after the respective vaccinations. If day 8 falls on a weekend or holiday, the telephone call may be made on the following business day. During this telephone call, the staff will find out whether the subject experienced any SAE and/or MAAE not yet reported, and will remind the subject's parent / guardian to continue using the diary card, to bring the diary card to the study center at the next visit, and to confirm the date and time of the next visit.

†Staff will contact the subject's parent / guardian by telephone at 6 months (+ 30 days) after the last vaccination visit to identify the occurrence of any SAEs (including any AESIs) and MAAEs not yet reported.

‡Physical examination should be performed as per routine standard of care. Temperature should be measured before each vaccination and recorded in the source documents.

§Should a subject receive oral or injectable antibiotic therapy within 3 days prior to any blood draw, the investigator will postpone that blood draw until it has been 3 days since the subject last received oral or injectable antibiotic therapy. Postponement must still be within the timeframe for blood draw. If postponement would result in the sample collection falling outside of this timeframe, the blood sample should be collected without postponement, and it should be documented appropriately that the sample was taken less than 3 days after stopping antibiotic treatment.

\*\*Blood sample will be drawn prior to vaccinations.

††Physical examination should be performed on the basis of relevant medical history at the time of the visit according to the investigator's clinical judgment. Temperature should be measured before vaccination and recorded in the source documents.

‡‡Solicited injection site and systemic reactions will be recorded from D0 through D07 after each vaccination visit.

§§AEIS will be collected throughout the trial as SAEs to ensure that the events are communicated to the Sponsor in an expedited manner and followed up until the end of the follow-up period or resolution, as per the assigned causality.

## List of Abbreviations

AAP	American Academy of Pediatrics
ACIP	Advisory Committee on Immunization Practices
AE	adverse event
AESI	adverse event of special interest
AIDS	acquired immune deficiency syndrome
AR	adverse reaction
BL	blood sampling
CDM	Clinical Data Management
CI	confidence interval
CQA	Clinical Quality Assessment
CRA	Clinical Research Associate
CRB	(electronic) case report book [all the case report forms for a subject]
CRF	(electronic) case report form
CTA	clinical trial agreement
CTL	Clinical Team Leader
D	day
DC	diary card
DTaP	diphtheria tetanus acellular pertussis vaccine
DU	D-antigen units
EDC	electronic data capture
FAS	full analysis set
FDA	Food and Drug Administration
FHA	filamentous hemagglutinin
FIM	fimbriae types 2 and 3
FVFS	first visit, first subject
FVLS	first visit, last subject
GCI	Global Clinical Immunology
GCP	Good Clinical Practice
GMT	geometric mean titer
GPV	Global Pharmacovigilance
Hib	<i>Haemophilus influenza</i> type b
HIV	human immunodeficiency virus
hSBA	serum bactericidal assay using human complement
IATA	International Air Transport Association
ICF	informed consent form
ICH	International Council for Harmonisation

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IEC	Independent Ethics Committee
IM	intramuscular
IMD	invasive meningococcal disease
IME	important medical event
IOM	Institute of Medicine
IPV	poliovirus [inactivated] vaccine
IRB	Institutional Review Board
IRT	interactive response technology
ITP	idiopathic thrombocytopenic purpura
IU	international unit
LCLS	last contact, last subject
Lf	Limit of Flocculation
LLOQ	lower limit of quantification
LLT	lowest level term
MA	memory aid
MAAE	medically-attended adverse event
MedDRA	medical dictionary for regulatory activities
MCV4	quadrivalent meningococcal conjugate vaccine
MMR	measles, mumps, rubella
NIMP	non-investigational medicinal product
NSAID	non-steroidal anti-inflammatory drug
PCV13	pneumococcal 13-valent conjugate vaccine
PFU	plaque-forming unit
PPAS	per-protocol analysis set
PRN	pertactin
PRP	polyribosyl-ribitol phosphate
PS	polysaccharide
PT	pertussis toxoid / toxin
PV	Pharmacovigilance
RCDC	reverse cumulative distribution curve
RMO	Responsible Medical Officer
RBM	risk based monitoring
rSBA	serum bactericidal assay using baby rabbit complement
SAE	serious adverse event
SafAS	safety analysis set
SAP	statistical analysis plan
SC	subcutaneous
SMT	Safety Management Team



SOC	system organ class
TBD	to be determined
TC	telephone call
TMF	trial master file
US	United States
vs	versus
WHO	World Health Organization

# 1 Introduction

## 1.1 Background

This study (MET61) will evaluate the safety and immunogenicity of MenACYW conjugate vaccine compared to the licensed comparator vaccine, MENVEO® [meningococcal (Groups A, C, Y and W-135) oligosaccharide diphtheria CRM<sub>197</sub> conjugate vaccine], when administered concomitantly with routine pediatric vaccines in infants and toddlers as a 2-dose series at 6 to 7 months of age and 12 to 13 months of age in United States (US). MET61 will also evaluate the safety and immunogenicity of MenACYW conjugate vaccine compared to the licensed comparator vaccine, Menactra® (meningococcal [Groups A, C, Y and W-135] polysaccharide diphtheria toxoid conjugate vaccine), when administered in US toddlers as a 2-dose series at 17 to 19 months of age and 20 to 23 months of age.

Invasive meningococcal disease (IMD) is a serious illness caused by the bacterium *Neisseria meningitidis* (*N. meningitidis*), a Gram-negative diplococcus found exclusively in humans. Symptoms may include headache, fever, nausea, vomiting, photophobia, stiff neck, lethargy, myalgia, and a characteristic petechial rash (1). At least 12 different meningococcal serogroups have been classified based on the immunochemistry of the capsular polysaccharides (PS). Some strains are more likely than others to cause infection (1) (2) (3). Worldwide, most cases of meningococcal disease are caused by serogroups A, B, C, X, Y, and W (2) (3) (4). Serogroup B is responsible for endemic disease and some outbreaks, while serogroup C is responsible for large outbreaks (5). Serogroup A remains the main cause of epidemics in the world and is especially dominant in Africa and Asia. Serogroup W has been observed in Africa, as well as the United Kingdom, in residents who participated in the Hajj pilgrimage to the Kingdom of Saudi Arabia (4) (6) (7) and more recently in Chile (8), Turkey (9) (10), China (11) (12), Argentina (13), Brazil (14) (15), and other parts of the world. Serogroup X causes substantial meningococcal disease in parts of Africa, but rarely causes disease in other parts of the world (2) (16). Serogroup Y has not been associated with outbreaks, but the frequency with which it causes sporadic cases has gradually increased in the US and more recently in Canada and Europe (17) (18) (19). The Y serogroup is commonly associated with meningococcal pneumonia, particularly in older adults ≥ 65 years of age (20). Outbreaks of serogroup B meningococcal disease have also been reported on college campuses in the US during the last five-year period: a prolonged outbreak of serogroup B on a university campus in Ohio from 2008 – 2010 and 2 universities in New Jersey and California in 2013 (21) (22).

The epidemiology of *N. meningitidis* can be described as complex, unpredictable, geographically variable, and changing over time. Meningococcal disease occurs worldwide in both endemic and epidemic forms with seasonal variation. In Europe, the incidence rate of IMD has remained stable over the last 5 to 10 years, with the highest peak occurring in the population less than 4 years of age and a smaller peak in the 15 to 19 year old group. The highest incidence rate in Europe is caused by serogroup B, followed by C (23). The highest proportion of meningococcal cases was due to serogroup B in the population under 5 years of age. The highest proportion of serogroup C cases was observed in the population 25 to 44 years of age while the proportion of serogroup Y cases was highest in the population aged 65 years and above.

Surveillance data from England and Wales showed an increase in endemic meningococcal serogroup W disease across all age groups, accounting for 15% of all IMD cases in 2013 - 2014 compared with an average of 1% to 2% of all IMD cases in earlier years (24). A gradual increase in serogroup Y IMD has also been recently reported in England and Wales between 2007 - 2009 (25) and in Sweden during 2005 – 2012 (26) (27). Nearly 50% of all IMD in Sweden was caused by serogroup Y in 2012 (26). Similarly, an increase in the proportion of IMD caused by serogroup Y has been observed in other Nordic countries, accounting for 31% in Norway in 2009 – 2010 (28) and 38% in Finland in 2010 (29).

In the US, the incidence rate of IMD was 0.14 per 100,000 in all ages; 0.83 per 100,000 in infants less than 1 year; 0.62 per 100,000 in toddlers 1 year of age; 0.27 per 100,000 in children 2 to 4 years of age; and 0.02 per 100,000 in children 5 to 17 years of age in 2013. The age specific incidence rate per 100,000 was 0.08 in adults 50 to 64 years of age, 0.03 in adults 65 to 74 years of age, 0.14 in adults 75 to 84 years of age, and 0.43 in adults 85 years of age and older in 2013 (30). Serogroups B, C, and Y are the major causes of meningococcal disease in the US, each being responsible for approximately one-third of the overall cases. The proportion of cases caused by each serogroup varies by age group. Serogroups C, W, or Y, which are included in vaccines available in the US, cause 73% of all cases of meningococcal disease among persons 11 years of age or older (31). Approximately 60% of disease among children aged 0 through 59 months is caused by serogroup B, for which no conjugate vaccine is licensed or available in the US. More than 50% of meningococcal disease in children 0 to 6 months of age is caused by serogroup B; serogroup Y is also more prevalent in this age group (20).

The goal for MenACYW conjugate vaccine is to provide broad protection against IMD caused by serogroups A, C, Y, and W in all age groups including children as young as 6 weeks of age, adolescents, and adults (including those 56 years of age and older).

## 1.2 Background of the Investigational Product

### 1.2.1 Clinical

The MenACYW conjugate vaccine formulation was finalized based on data provided by 2 studies: MET28, a Phase I study in infants, toddlers, and adults 18 to < 40 years of age; and MET32, a Phase I/II study in toddlers.

The formulation has been evaluated in over 2000 subjects (infants, toddlers, adolescents, and adults > 56 years of age) in completed studies MET39, MET44, MET50, MET54, and MET56. MenACYW conjugate vaccine is also being evaluated in ongoing Phase III studies: MET51 and MET57 (toddlers 12 to 23 months of age); MET35 (children 2 to 9 years of age); MET43 (adolescents and adults 15 to 55 years of age); and MET49 (older adults ≥ 56 years of age).

MenACYW conjugate vaccine was found to be well tolerated and no unanticipated or new significant safety concerns have been identified in the clinical trials completed to date. The relevant Phase II studies are discussed below.

### 1.2.1.1 Study MET39 (Phase II)

MET39 was a Phase II, randomized, open-label, multi-center study conducted in the US for which 580 healthy subjects from 2 to 15 months of age were enrolled. This study evaluated the optimal vaccination schedule in the infant/toddler population. Subjects in Group 1 through Group 4 received 1, 2, or 3 primary doses plus an additional dose of the MenACYW conjugate vaccine in the second year of life, concomitantly with routine pediatric vaccines at several different vaccination schedules. Subjects in Group 5 received 1 dose of the MenACYW conjugate vaccine concomitantly with routine pediatric vaccines. The routine pediatric vaccines given concomitantly with MenACYW conjugate vaccine at various schedules included Prevnar<sup>®</sup> (pneumococcal conjugate vaccine) or Prevnar 13<sup>®</sup> (pneumococcal 13-valent conjugate vaccine [PCV13]), Pentacel<sup>®</sup> (diphtheria, tetanus, pertussis [acellular, component]-poliovirus [inactivated]//*Haemophilus influenzae* type b [DTaP-IPV//Hib]), ROTARIX<sup>®</sup> (monovalent rotavirus vaccine [RV1]) or RotaTeq<sup>®</sup> (pentavalent rotavirus vaccine [RV5]), hepatitis B vaccine, M-M-R<sup>®</sup> II vaccine (measles, mumps, and rubella vaccine [MMR]), and VARIVAX<sup>®</sup> (varicella vaccine).

#### *Immunogenicity*

After the primary series consisting of 1, 2, or 3 doses of MenACYW conjugate vaccine, protective threshold antibody titers of  $\geq 1:8$  [serum bactericidal assay using human complement (hSBA)] were attained by  $> 88\%$  of subjects for serogroup C and by 62% to 74% of subjects for serogroup A. For serogroups Y and W,  $\geq 90\%$  of subjects achieved the threshold titer after 3 doses, 75% to 84% of subjects after 2 doses, but only 25% of subjects after a single dose administered at 6 months of age.

After an additional dose of MenACYW conjugate vaccine in the second year of life (12 or 15 months of age), between 91% and 100% of subjects achieved the protective threshold regardless of the number of doses they received in the first year of life.

#### *Safety*

MenACYW conjugate vaccine was well tolerated in infants and toddlers regardless of the immunization schedule and the number of doses administered. Safety results were comparable to those seen in control group subjects regardless of the immunization schedule and the number of doses administered. The safety profile of the licensed vaccines given concomitantly with MenACYW conjugate vaccine was similar to that of the licensed vaccines given concomitantly without MenACYW conjugate vaccine.

No deaths occurred within 30 days. There were 2 subjects in Group 4 who died during the study, 1 as a result of hypoxic ischemic encephalopathy which started 96 days after the 6-month vaccination and 1 as a result of non-accidental head trauma 36 days after the 12-month vaccination. These events were considered by the Investigator as unrelated to study vaccine. There were 2 other subjects who discontinued the study due to a serious adverse event (SAE) and the receipt of intravenous immunoglobulin treatment: 1 subject in Group 2 with Kawasaki disease, 106 days after the 6-month vaccination; and 1 subject in Group 3 with middle lobe pneumonia and Kawasaki disease, 50 and 52 days, respectively, after the 4-month vaccinations.

One other subject in Group 4 was discontinued due to a non-serious adverse event (AE) (viral rash 1 day after the 6-month vaccinations). None of these AEs leading to discontinuation were considered by the Investigator as related to the vaccine. There were no vaccine-related SAEs during this study.

### 1.2.1.2 Study MET54 (Phase II)

MET54 was a Phase II, randomized, open-label, active-controlled, multi-center study conducted in Europe (Finland). This study evaluated the immunogenicity and safety profile of a single dose of MenACYW conjugate vaccine when given alone in healthy, meningococcal-vaccine naïve toddlers compared to that of the licensed vaccine Nimenrix®. A total of 188 meningococcal vaccine naïve subjects 12 to 23 months of age on the day of enrollment were randomized to 1 of 2 groups. Group 1 received a single dose of MenACYW conjugate vaccine and Group 2 received a single dose of Nimenrix®.

#### *Immunogenicity*

Antibody responses to the antigens (serogroups A, C, Y, and W) were evaluated by serum bactericidal assay using baby rabbit complement (rSBA) and human complement (hSBA). MenACYW conjugate vaccine immune responses evaluated by rSBA and hSBA were generally comparable to Nimenrix® immune responses with some variation by serogroup.

#### *hSBA*

Most subjects in both groups had hSBA titers  $\geq 1:8$  at D30: the percentages after MenACYW conjugate vaccine for serogroups A, Y, and W (ranging from 97.8% [89/91] to 98.9% [90/91]) were comparable to those after Nimenrix® (ranging from 91.9% [79/86] to 100.0% [86/86]). The percentage of subjects with hSBA titers  $\geq 1:8$  for serogroup C was higher after MenACYW conjugate vaccine (100.0% [91/91]) than after Nimenrix® (89.5% [77/86]). At D30, most subjects in both groups demonstrated an hSBA vaccine seroresponse. The percentage of subjects with an hSBA vaccine seroresponse for serogroups A, Y, and W was comparable in both groups (ranging from 96.7% [87/90] to 98.9% [90/91] after MenACYW conjugate vaccine and from 91.9% [79/86] to 98.8% [85/86] after Nimenrix®). The percentage of subjects with an hSBA vaccine seroresponse for serogroup C was higher after MenACYW conjugate vaccine (100.0% [91/91]) than after Nimenrix® (86.0% [74/86]).

#### *rSBA*

Most subjects had rSBA titers  $\geq 1:128$  at D30. The percentages after MenACYW conjugate vaccine were similar (100.0% [91/91] for serogroups A, Y, and W) or numerically higher (100.0% [91/91] for serogroup C) compared to Nimenrix® (100.0% [86/86] for serogroups A, Y, and W and 94.2% [81/86] for serogroup C). At D30, most subjects in both groups demonstrated an rSBA vaccine seroresponse as defined in the SAP and as defined in the protocol. The percentage of subjects with any rSBA vaccine seroresponse by either definition for serogroup A was numerically lower after MenACYW conjugate vaccine (91.2% [83/91]) than Nimenrix® (98.8% [85/86]) and the percentages of subjects with any rSBA vaccine seroresponse

by either definition were similar or comparable between the 2 groups for serogroups C, Y, and W (all > 96%).

### ***Safety***

Overall, vaccination with MenACYW conjugate vaccine among toddlers 12 to 23 months of age was found to be safe with no safety concerns identified. The MenACYW conjugate vaccine was well tolerated with no immediate AEs or adverse reactions (ARs), no discontinuations due to an SAE or other AE, and no related SAEs.

The safety profile of MenACYW conjugate vaccine was comparable to that of the licensed vaccine Nimenrix®.

No new clinically important safety findings were identified with administration of the MenACYW conjugate vaccine. The MenACYW conjugate vaccine was well tolerated and immunogenic. Single dose of the MenACYW conjugate vaccine demonstrated excellent potential to be an alternative vaccine option for toddlers, receiving meningococcal vaccination for the first time.

## **1.3 Potential Benefits and Risks**

### **1.3.1 Potential Benefits to Subjects**

MenACYW conjugate vaccine is an investigational vaccine that is undergoing active clinical investigation. There may be no direct benefit from receiving the MenACYW conjugate vaccine. However, based on the data generated from previous studies, the immunogenicity profile of the MenACYW conjugate vaccine in different age groups shows that the majority of subjects developed seroprotective levels of antibodies after vaccination. The safety evaluation indicates that the vaccine is well-tolerated, and no safety issues have been detected to date. In all, the data support further evaluation of the MenACYW conjugate vaccine in humans.

Subjects who receive MENVEO® or Menactra® will likely be protected against meningococcal disease caused by *N. meningitidis* serogroups A, C, Y, and W.

As with any vaccine, MenACYW conjugate vaccine, MENVEO®, and Menactra® may not protect 100% of individuals against the diseases they are designed to prevent.

### **1.3.2 Potential Risks to Subjects**

Like other vaccines, MenACYW conjugate vaccine, MENVEO®, or Menactra® may cause injection site reactions such as pain, swelling, and erythema, or certain systemic events such as fever, irritability, drowsiness, loss of appetite, abnormal crying, and vomiting when administered to infants / toddlers. There may be a rare possibility of an allergic reaction, which could be severe. There may also be a risk of febrile convulsion in some children who experience high fever. There may be other risks for MenACYW conjugate vaccine, MENVEO®, or Menactra® that are not yet known.

In a previous study with MenACYW conjugate vaccine (MET32), 1 SAE of reactive arthritis reported in a toddler was considered by the Investigator to be related to the investigational vaccine. The subject developed right knee inflammation the day after receiving MenACYW conjugate vaccine, given by IM injection in the right deltoid. The subject recovered after treatment with ibuprofen and antibiotics. Results of the reactive arthritis investigations performed as part of the workup were not indicative of any specific diagnosis. A point of further consideration was the monoarticular nature of the inflammation in this subject; reactive arthritis would typically be present clinically in a polyarticular fashion. Importantly, no similar cases have been reported following the administration of MenACYW conjugate vaccine in any other completed trials.

Guillain-Barré syndrome has been reported mostly in persons aged 11 to 19 years who had symptom onset within 6 weeks of administration of a US licensed meningococcal conjugate vaccine (32). A retrospective cohort study carried out in the US using healthcare claims data found no evidence of increased Guillain-Barré syndrome risk associated with the use of that vaccine. The study was able to exclude all but relatively small incremental risks (33).

A review by the Institute of Medicine (IOM) found inadequate evidence to accept or reject a causal relationship between tetanus toxoid containing vaccines and Guillain-Barré syndrome (34). The IOM found evidence for a causal relation between tetanus toxoid-containing vaccines and brachial neuritis (35). Arthus reactions are rarely reported after vaccination and can occur after tetanus toxoid-containing vaccines (36).

No occurrences of Guillain-Barré syndrome, brachial neuritis, or Arthus reaction have been reported with the use of MenACYW conjugate vaccine in the completed clinical trials.

The potential risks listed here are not exhaustive. Refer to the Investigator's Brochure of the investigational vaccine, package inserts for MENVEO® (37), Menactra® (38), and concomitant routine pediatric vaccines for additional information regarding potential risks.

## 1.4 Rationale for the Study

The MenACYW conjugate vaccine is designed for the immunization of individuals of all ages (infants 6 weeks of age and older through and including older adults > 56 years of age) against IMD. The purpose of the vaccine is to provide broad coverage against circulating meningococcal strains from serogroups A, C, Y, and W. Compared to a previous Sanofi Pasteur meningococcal conjugate vaccine, Menactra®, the MenACYW conjugate vaccine is prepared using tetanus toxoid as the carrier protein. Conjugation of PS antigens to a protein carrier can induce T cell-dependent immune responses, which are anticipated to give rise to higher antibody titers, longer duration of the immune response, and enhanced immunologic memory that allows for a booster response. The program targets licensure of the MenACYW conjugate vaccine in many countries in North America, Europe, Latin America, Africa, the Middle East, and Asia Pacific.

The MenACYW conjugate vaccine is designed to cover broader age groups than those covered by Menomune® -A/C/Y/W-135 and Menactra®. Menactra® has been very successful since its licensure in 2005; however, it is not licensed in Europe and is not indicated in persons 8 months

of age or younger or 56 years of age and older. While Menomune® -A/C/Y/W-135 and Menactra® are currently licensed in different parts of the world, the MenACYW conjugate vaccine is being developed by Sanofi Pasteur to ultimately replace Menomune® -A/C/Y/W-135 and Menactra® in the global market as a quadrivalent meningococcal conjugate vaccine indicated in infants/toddlers, children, adolescents, adults, and older adults > 56 years of age.

Meningococcal PS vaccines have two important limitations: a) the antibody response is age-dependent, with infants giving the poorest response; and b) PSs alone are T-cell independent immunogens, and therefore no anamnestic response is seen. The immunogenicity of PS vaccines in infants and children has been shown to be improved by conjugating the PSs to protein carriers. Among the key advantages expected of the tetanus carrier is improved immunogenicity in infants and older adults. Pre-clinical studies using a mouse model and investigating different carriers, showed significant levels of PS-specific total immunoglobulin G (IgG) and bactericidal responses in response to the formulations with tetanus toxoid as a carrier. Early Phase I/II trials including those with the final formulation (MET39 and MET44) showed the potential of the candidate vaccine as a very good immunogen in all age groups, including young infants and older adults. The MenACYW conjugate vaccine was found to be immunogenic and well tolerated; it did not raise any safety concerns in the above or subsequent trials using the final formulation or in the earlier trials.

MenACYW conjugate vaccine is being developed for the US infant/toddler population as a 4-dose (2, 4, 6, and 12 to 18 months of age) and 2-dose (6 to 7, and 12 to 13 months of age) series. Three Phase III studies (including MET61) will generate data to primarily support the licensing of the MenACYW conjugate vaccine in the US with an infant/toddler indication from 6 weeks of age. The purpose of the MET61 study is to evaluate the safety and immunogenicity of MenACYW conjugate vaccine and the comparator MENVEO® when administered in a 1 + 1 schedule and concomitantly with routine pediatric vaccines in healthy infants and toddlers in the US. This study will also describe the safety and immunogenicity of MenACYW conjugate vaccine and Menactra® when administered in a 1 + 1 schedule to healthy toddlers in the US. The MET61 study will generate data which will significantly contribute towards the overall safety database of the MenACYW conjugate vaccine in the US and in general.



## 2 Study Objectives

### 2.1 Primary Objective

To demonstrate the non-inferiority of the vaccine seroresponse<sup>a</sup> to meningococcal serogroups A, C, Y, and W following administration of 2 doses of MenACYW conjugate vaccine compared to 2 doses of MENVEO<sup>®</sup> when given concomitantly with routine pediatric vaccines to infants and toddlers 6 to 7 months of age and 12 to 13 months of age

The endpoint for the primary objective is presented in [Section 9.1.2.1](#).

### 2.2 Secondary Objectives

- 1) To demonstrate the non-inferiority of the percentage of subjects with hSBA titers to meningococcal serogroups A, C, Y, and W  $\geq 1:8$  following administration of 2 doses of MenACYW conjugate vaccine compared to 2 doses of MENVEO<sup>®</sup> when given concomitantly with pediatric routine vaccines to infants and toddlers at 6 to 7 months of age and 12 to 13 months of age
- 2) To describe the antibody response against meningococcal serogroups A, C, Y, and W 30 days after the second vaccination at 12 to 13 months of age with MenACYW conjugate vaccine or MENVEO<sup>®</sup>
- 3) To describe the antibody response against meningococcal serogroups A, C, Y, and W 30 days after the first vaccination at 6 to 7 months of age with MenACYW conjugate vaccine or MENVEO<sup>®</sup> (in a subset of subjects)
- 4) To describe the antibody response against meningococcal serogroups A, C, Y, and W 6 months after the first vaccination at 6 to 7 months of age with MenACYW conjugate vaccine or MENVEO<sup>®</sup> (in a subset of subjects)
- 5) To describe the antibody response against meningococcal serogroups A, C, Y, and W 30 days after the second vaccination at 20 to 23 months of age with MenACYW conjugate vaccine or Menactra<sup>®</sup>

The endpoints for the secondary objectives are presented in [Section 9.2.2.1](#).

### 2.3 Observational Objectives

#### *Safety*

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<sup>a</sup> Vaccine seroresponse is measured with hSBA. hSBA vaccine seroresponse for serogroups A, C, Y, and W is defined as:

- For a subject with a pre-vaccination titer  $< 1:8$ , the post-vaccination titer must be  $\geq 1:16$
- For a subject with a pre-vaccination titer  $\geq 1:8$ , the post-vaccination titer must be  $\geq 4$ -fold greater than the pre-vaccination titer

- 1) To describe the safety profile of MenACYW conjugate vaccine and MENVEO® when administered concomitantly with routine pediatric vaccines in healthy infants and toddlers
- 2) To describe the safety profile of MenACYW conjugate vaccine and Menactra® administered in toddlers

The endpoints for the observational objectives are presented in [Section 9.3](#).

### 3 Investigators and Study Organization

This study will be conducted in approximately 30 centers in the US. The Principal Investigators and any sub-investigators at the individual sites will be coordinated by 1 Coordinating Investigator. Details of the study centers, the Investigators at each center, and the Coordinating Investigator are provided in the “List of Investigators and Centers Involved in the Trial” document.

An internal safety management team (SMT) will review the data being generated from all the ongoing studies with MenACYW conjugate vaccine at regular intervals for any new safety signals or safety concerns.

The Sponsor’s Responsible Medical Officer (the RMO, the person authorized to sign this protocol and any amendments on behalf of the Sponsor) is [REDACTED]

### 4 Independent Ethics Committee / Institutional Review Board

Before the investigational product can be shipped to the investigational site and before the inclusion of the first subject, this protocol, the informed consent form (ICF), subject recruitment procedures, and any other written information to be provided to subjects must be approved by, and / or receive favorable opinion from the appropriate Independent Ethics Committee (IEC) or Institutional Review Board (IRB).

In accordance with Good Clinical Practice (GCP) and local regulations, each Investigator and / or the Sponsor are responsible for obtaining this approval and / or favorable opinion before the start of the study. If the protocol is subsequently amended, approval must be re-obtained for each substantial amendment. Copies of these approvals, along with information on the type, version number, and date of document, and the date of approval, must be forwarded by the Investigator to the Sponsor together with the composition of the IEC / IRB (the names and qualifications of the members attending and voting at the meetings).

The Investigator and Sponsor will submit written summaries of the status of the study to the IEC / IRB annually, or more frequently if requested. All SAEs occurring during the study that are related to the product administered will be reported by the Investigator to the IEC / IRB, according to the IEC / IRB policy.

## 5 Investigational Plan

### 5.1 Description of the Overall Study Design and Plan

#### 5.1.1 Study Design

This is a Phase III, randomized, parallel group, active-controlled, multi-center study to compare the immunogenicity and describe the safety of MenACYW conjugate vaccine and MENVEO<sup>®</sup> when administered in a 1 + 1 schedule and concomitantly with routine pediatric vaccines in healthy infants and toddlers in the US. This study will also describe the safety and immunogenicity of MenACYW conjugate vaccine and Menactra<sup>®</sup> when administered in a 1 + 1 schedule to healthy toddlers in the US. For each age group at enrollment, the study will have a modified double-blind design, i.e., modified double-blind between Group 1 and Group 2, and between Group 3 and Group 4.

Approximately 1070 subjects will be enrolled. Approximately 870 healthy infants 6 to 7 months of age will be randomized 1:1 to 2 groups, and 200 healthy toddlers 17 to 19 months of age will be randomized 1:1 to 2 groups:

- **Group 1:** MenACYW conjugate vaccine + routine pediatric vaccines at 6 to 7 months of age and 12 to 13 months of age
- **Group 2:** MENVEO<sup>®</sup> + routine pediatric vaccines at 6 to 7 months of age and 12 to 13 months of age
- **Group 3:** MenACYW conjugate vaccine at 17 to 19 months of age and 20 to 23 months of age
- **Group 4:** Menactra<sup>®</sup> at 17 to 19 months of age and 20 to 23 months of age

The vaccination schedule and blood sampling is further detailed in [Table 5.1](#) and [Table 5.2](#).

All subjects in Group 1 and Group 2 will receive a dose of either MenACYW conjugate vaccine or MENVEO<sup>®</sup> with the following routine pediatric vaccines to ensure compliance with the Advisory Committee on Immunization Practices (ACIP) recommendations:

- Diphtheria, tetanus and acellular pertussis (DTaP) at 6 months of age
- Inactivated poliovirus (IPV) at 6 months of age
- *Haemophilus influenzae* type b (Hib) at 6 months of age. In children immunized with PedvaxHIB<sup>®</sup> at 2 and 4 months of age, a third dose of Hib vaccine at 6 months of age is not required.
- Pneumococcal 13-valent conjugate (Prevnar 13<sup>®</sup>, PCV13) at 6 and 13 months of age
- Rotavirus (RotaTeq<sup>®</sup>) at 6 months of age

- Hepatitis B at 6 months of age
- Measles, mumps, and rubella (M-M-R<sup>®</sup>II) at 12 months of age
- Varicella (Varivax<sup>®</sup>) at 12 months of age.

The routine pediatric vaccines recommended at 6 months of age will be given as per standard of care during the first study visit (Visit 1) along with the corresponding study vaccine. The dose of Prevnar 13<sup>®</sup> and Hib (for children vaccinated with monovalent Hib vaccine at 2, 4, and 6 months of age) recommended in the second year of life may be given as per standard of care at the last study visit after completing all the study procedures (Visit 4). Routine pediatric vaccines recommended at 6 months of age and the dose of Prevnar 13<sup>®</sup> recommended in the second year of life will not be provided by the Sponsor but procured by the sites as per their standard practices.

### **Blood Sampling**

All subjects in Group 1 and Group 2 will provide 3 blood samples for immunogenicity assessment:

- A blood sample before the first study vaccination at Visit 1 (all subjects)
- A blood sample 30 days after administration of the first dose of MenACYW conjugate vaccine or MENVEO<sup>®</sup> at Visit 2 (only from approximately the first 50% of the subjects in Group 1 and Group 2)
- A blood sample before the 12-month vaccination at Visit 3 (only from the remaining approximately 50% of subjects in Group 1 and Group 2, who did not have a blood draw at Visit 2)
- A blood sample 30 days after administration of the second dose of MenACYW conjugate vaccine or MENVEO<sup>®</sup> at Visit 4 (all subjects in Group 1 and Group 2)

All subjects in Group 3 and Group 4 will provide 2 blood samples for immunogenicity assessment:

- A blood sample before the first study vaccination at Visit 1
- A blood sample 30 days after administration of the second dose of MenACYW conjugate vaccine or Menactra<sup>®</sup> at Visit 3

### **Collection of Safety Data**

Immediate unsolicited systemic AEs will be collected within 30 minutes after each vaccination. Solicited AEs will be collected from Day (D) 0 to D07 after each vaccination; unsolicited AEs will be collected from D0 after each vaccination to the next study visit; SAEs (including adverse events of special interest [AESIs]) and medically attended adverse events (MAAEs) will be collected throughout the study from Visit 1 (first vaccination visit) until the end of the 6-month follow up period after the last vaccinations.

#### **5.1.2 Justification of the Study Design**

The MET61 study is part of an ongoing development program that focuses on demonstrating that the safety profile of the MenACYW conjugate vaccine is acceptable and not different from that of licensed quadrivalent meningococcal conjugate vaccines (MCV4), and that the immunogenicity of the MenACYW conjugate vaccine is non-inferior to licensed comparators in direct comparison trials. MET61 is a pivotal Phase III immunogenicity and safety study in which the vaccine candidate will be evaluated in a 1 + 1 schedule in infants/toddlers receiving concomitantly licensed routine pediatric vaccines in the US.

The primary objective of study MET61 is to describe and evaluate the safety and immunogenicity of MenACYW conjugate vaccine compared to the licensed comparator vaccine, MENVEO<sup>®</sup>, when administered concomitantly with routine pediatric vaccines in US infants and toddlers as a 2-dose series administered at 6 to 7 months of age and 12 to 13 months of age. MET61 will also evaluate the safety and immunogenicity of MenACYW conjugate vaccine and the licensed control vaccine, Menactra<sup>®</sup>, when administered in US toddlers as a 2-dose series at 17 to 19 months of age and 20 to 23 months of age.

The concomitant administration of standard of care pediatric vaccines together with 5 different administration schedules of the MenACYW conjugate vaccine has been assessed in infants/toddlers 2 to 15 months of age in the US in the MET39 study. The subjects received during, or prior to the study, a number of licensed recommended vaccines at 2, 4, and 6 months of age: Pentacel<sup>®</sup>, either Prevnar<sup>®</sup> or Prevnar 13<sup>®</sup>, RotaTeq<sup>®</sup> or ROTARIX<sup>®</sup>, and ENGERIX-B<sup>®</sup> or RECOMBIVAX HB<sup>®</sup>. All subjects received M-M-R<sup>®</sup> II and VARIVAX<sup>®</sup> at 12 months of age. A total of 457 subjects completed the study. The immunogenicity and safety profiles of selected licensed pediatric vaccines (Pentacel<sup>®</sup>, Prevnar<sup>®</sup> or Prevnar 13<sup>®</sup>, M-M-R<sup>®</sup> II, and VARIVAX<sup>®</sup>) were assessed when administered either concomitantly with or without MenACYW conjugate vaccine. There was no evidence of interference with the pediatric routine vaccines administered concomitantly with MenACYW conjugate vaccine and the vaccine was safe and well tolerated regardless of the number of doses administered during the first year of life.

ACIP recommends routine administration of MCV4 for all persons aged 11 through 18 years. A single dose of vaccine should be administered at age 11 or 12 years, and a booster dose should be administered at age 16 years. In the US, meningococcal vaccination is not routinely recommended for children ≤ 10 years of age, however the vaccination is recommended for individuals at increased risk of disease. In infants at increased risk of disease starting vaccination at 8 weeks of age, the ACIP recommends a 4-dose series that includes doses at 2, 4, 6 and 12 months of age. In

children at increased risk of disease who initiate vaccination at 7 through 23 months of age, a 2-dose primary series with the second dose at least 12 weeks after the first dose and after the first birthday is recommended. Since MENVEO® is the only MCV4 licensed in US for use in infants as young as 2 months of age, the selection of MENVEO® as a comparator was considered most appropriate and aligned with the MET61 study design.

Given that the meningococcal vaccines (investigational and control) used in this study have different appearances and preparation methods the study has a modified double blind design for each group at enrollment, i.e., modified double-blind between Group 1 and Group 2, and between Group 3 and Group 4, and thus, with the exception of the personnel administering the vaccine, everyone involved in study (participants, care provider, investigator, safety outcomes assessor, Sponsor) is blinded to avoid any bias.

### 5.1.3 Study Plan

#### Vaccination and Blood Sampling

A schedule of assessments, study vaccinations, and blood draws is provided in the Table of Study Procedures and [Table 5.1](#) and [Table 5.2](#).

**Table 5.1: Vaccination and blood sampling schedule - Group 1 and Group 2**

Age in months	6 to 7 months		7 to 8 months	12 months		13 months	
Visit #	Visit 1		Visit 2	Visit 3		Visit 4	
Procedure	Blood Draw*	Vaccines†	Blood Draw‡	Blood Draw§	Vaccines	Blood Draw	Vaccines**
<b>Group 1</b>	X	<b>MenACYW</b> DTaP IPV Hib PCV13 Rotavirus HB	X	X	<b>MenACYW</b> MMR Varicella	X	PCV13 Hib
<b>Group 2</b>	X	<b>MENVEO</b> DTaP IPV Hib PCV13 Rotavirus HB	X	X	<b>MENVEO</b> MMR Varicella	X	PCV13 Hib

\* Blood will be drawn prior to vaccinations.

† Routine pediatric vaccines recommended at this age are to be given as per standard of care, and will not be provided by the Sponsor.

‡ Blood sample at Visit 2 is applicable only to approximately the first 50% of the subjects in Group 1 and Group 2.

§ Blood sample at Visit 3 is applicable only to the subjects in Group 1 and Group 2 who did not provide a blood sample at Visit 2 (approximately 50% in each group).

\*\* PCV13 and Hib may be given as per standard of care outside of the study during the last study visit after completing all the study procedures (Visit 4). PCV13 and Hib will not be provided by the Sponsor.

**Table 5.2: Vaccination and blood sampling schedule - Group 3 and Group 4**

Age in months	17-19 months		20-23 months	21-24 months
Visit #	Visit 1		Visit 2	Visit 3
Procedure	Blood Draw*	Vaccine	Vaccine	Blood Draw
Group 3	X	MenACYW	MenACYW	X
Group 4	X	Menactra	Menactra	X

\*Blood will be drawn prior to vaccinations.

### **Collection of Safety Data**

All subjects will be followed for safety from Visit 1 to 6 months after the last vaccination.

- All subjects will be observed for 30 minutes after each vaccination, and any unsolicited systemic AEs occurring during that time will be recorded as immediate unsolicited systemic AEs in the electronic case report book (CRB).
- The subject's parent / guardian will record information in a diary card about solicited reactions from D0 to D07 after each vaccination and unsolicited AEs from D0 after each vaccination to the next study visit.
- SAEs (including AESIs) and MAAEs will be recorded throughout the study. For Groups 1 and 2, the subject's parent/guardian will record information in a diary card about SAEs (including AESIs) and MAAEs from Visit 1 to Visit 2, from Visit 2 to Visit 3, and from Visit 3 to Visit 4. For Groups 1 and 2, SAEs (including AESIs) and MAAEs will also be recorded in a memory aid from Visit 4 until the 6-month follow up phone call. For Groups 3 and 4, the subject's parent/ guardian will record information in a diary card about SAEs (including AESIs) and MAAEs from Visit 1 to Visit 2, and from Visit 2 to Visit 3. For Groups 3 and 4, SAEs (including AESIs) and MAAEs will also be recorded in a memory aid from Visit 3 until the 6-month follow up phone call. The subject's parent/ guardian will be asked to notify the site immediately about any potential SAEs (including AESIs) at any time during the trial.
- Staff will contact the subjects' parent / guardian by telephone 8 days (+2 days) after each vaccination visit to identify the occurrence of any SAEs (including AESIs) not yet reported and to remind them to complete the diary card after each vaccination visit and to bring it back at the subsequent visit.
- The completed diary cards will be collected and reviewed with the subject's parent/ guardian at the subsequent visit.
- Staff will contact the subjects' parent/ guardian by telephone at 6 months (+30 days) after the last vaccination visit to review the memory aid and identify the occurrence of any SAEs (including AESIs), as well as MAAEs that have not been reported.

#### 5.1.4 Visit Procedures

The visit procedures for Group 1 and Group 2 are described in [Section 5.1.4.1](#) and the visit procedures for Group 3 and Group 4 are described in [Section 5.1.4.2](#). The visits are listed separately because the age, vaccination schedule, and details of each visit vary for the 2 sets of groups.

##### 5.1.4.1 Visit Procedures for Group 1 and Group 2

###### **Visit 1 (6 to 7 months of age): Inclusion, Randomization, Blood Sampling, and Vaccination**

- 1) Give the subject's parent / guardian information about the study, obtain written informed consent, and provide a signed copy.
- 2) Check inclusion and exclusion criteria for eligibility.
- 3) Collect demographic data.
- 4) Obtain and collect verbal medical history about the subject, including ongoing medication.
- 5) Perform a physical examination, including, but not limited to, examination of the head (ear, nose, and throat), neck, heart, lungs, abdomen, and extremities. If a routine examination had been performed within the past week by a qualified health care provider, it does not need to be repeated unless there were changes in health status, in which case it may be limited to the affected area.
- 6) Measure temperature. If the temperature is  $\geq 38^{\circ}\text{C}$  ( $\geq 100.4^{\circ}\text{F}$ ), postpone vaccination until the condition is resolved.
- 7) Contact the interactive response technology (IRT) system for randomization, allocation of subject number, vaccine group assignment, and vaccine assignment.
- 8) Review temporary contraindications for blood sampling. Ensure the subject has not had any antibiotics within the previous 72 hours (3 days).
- 9) Collect 3 mL of blood (BL0001) (see [Section 7](#) for detailed instructions regarding the handling of blood samples). If the blood sample cannot be obtained, the parent/guardian should be given the opportunity to bring the subject back to the study site for another attempt, as long as the subject continues to remain eligible for the trial. All attempts should be made to obtain a blood sample; however, if the attempts are unsuccessful, the subject could continue in the study with all the study procedures including vaccination.
- 10) Review warnings and precautions to vaccinations.
- 11) Administer the following study vaccines. Each vaccine should be administered in the assigned location (see Operating Guidelines) and documented appropriately:



- Hepatitis B (or Haemophilus b conjugate vaccine if Pediarix<sup>®</sup> is used for DTaP/IPV/Hepatitis B immunization): inject IM into the anterolateral area of the thigh, preferably the right thigh
- In children immunized with PedvaxHIB<sup>®</sup> at 2 and 4 months of age, a third dose of Hib vaccine at 6 months of age is not required
- Diphtheria, tetanus and acellular pertussis vaccine (DTaP), inactivated poliovirus and *Haemophilus influenzae* type b (Hib) vaccine: inject IM into the anterolateral area of the left thigh (i.e., the opposite leg from that used for meningococcal vaccine administration)
- Pneumococcal 13-valent conjugate (Prevnar 13<sup>®</sup>, PCV13): inject IM into the anterolateral area of the thigh, preferably the left thigh (i.e., the opposite leg from that used for meningococcal vaccine administration)
- Rotavirus (RotaTeq<sup>®</sup>): administer orally per instructions in the package insert.

When multiple vaccines are administered at a single visit, each vaccine should be administered at a different anatomic site. If vaccines are given in the same limb, the injection sites should be separated by 1 inch or more, so that any local reactions can be differentiated.

Meningococcal vaccine and hepatitis B vaccine (Engerix-B<sup>®</sup> or RecombivaxHB) should be given in the same thigh. Do not administer DTaP vaccines or Prevnar 13<sup>®</sup> in the same thigh as the meningococcal vaccine. For details see Operating Guidelines.

Failure to administer vaccines in the designated limb will not constitute a protocol deviation, but should be recorded as a comment in the case report form (CRF).

- 12) Observe the subject for 30 minutes and record any AEs in the source document. In the event of a local reaction, indicate the associated vaccine.
- 13) Give the parent / guardian a diary card (DC1), a thermometer, and a ruler, and go over the instructions for their use. Instruct the parent / guardian to retain the thermometer and ruler throughout the duration of the study. At each subsequent visit, confirm that the parent /guardian has retained the thermometer and ruler, replace only as necessary.
- 14) Remind the parent / guardian to expect a telephone call 8 days after Visit 1 and to bring back the diary card when they return for Visit 2 at a specified date and time.
- 15) Remind the parent / guardian to notify the site in case of an SAE.
- 16) Complete the relevant CRFs for this visit.

**Telephone Call 1 (8 days [+2 days] after Visit 1)**

**Note:** If Day 8 falls on a weekend or a holiday, the telephone call may be made on the following business day.

- 1) Record relevant information concerning the subject's health status on the telephone contact form. If an SAE (including AESI) occurred, follow the instructions in [Section 10](#) for reporting it.
- 2) Remind the parent / guardian to do the following:
  - Complete the D0 to D07 pages of the diary card.
  - Complete the remaining pages of the diary card, and bring them to the next visit.
  - Notify the site in case of an SAE.

**Visit 2 (30 [+21] days after Visit 1): Collection of Safety Information and Blood Sample**

- 1) Collect and review the diary card (DC1) with the parent / guardian, including any AEs, medications, or therapy that occurred since vaccination. If an SAE, including an AESI, has occurred, follow the instructions in [Section 10](#) for reporting it.
- 2) For subjects providing a blood sample at Visit 2 (50% of the subjects enrolled in Group 1 and Group 2):
  - Review temporary contraindications for blood sampling. Ensure the subject has not had any antibiotics within the previous 72 hours (3 days).
  - Collect 3 mL of blood (BL0002A) (see [Section 7](#) for detailed instructions regarding the handling of blood samples).
- 3) Give the parent / guardian a diary card (DC2).
- 4) Remind the parent / guardian to expect a telephone call within 14 days before Visit 3 and to bring back the diary card when they return for Visit 3 at a specified date and time.
- 5) Remind the parent / guardian to notify the site in case of an SAE.
- 6) Complete the relevant CRFs for this visit.

**Telephone Call 2 (within 14 days before Visit 3, at 11.5 to 12.5 months of age)**

- 1) Contact the subjects' parent/ guardian by telephone within 14 days before Visit 3 to remind them about the forthcoming study visit.
- 2) If the subject will not continue in the study:

- Review the diary card. Ask the subject's parent / guardian if the subject has experienced any SAE and / or MAAE in the time since vaccination that has not been reported to the study personnel. If an SAE, including an AESI, has occurred, follow the instructions in [Section 10](#) for reporting it.
- Request the subject's parent / guardian to mail the diary card to the site.

**Visit 3 (6 months after Visit 1 [subjects must be 12 to 13 months of age]): Collection of Safety Information, Blood Sampling, and Vaccination**

- 1) Collect and review the diary card (DC2) with the parent / guardian, including any AEs, medications, or therapy that occurred since vaccination. If an SAE, including an AESI, has occurred, follow the instructions in [Section 10](#) for reporting it.
- 2) Perform a physical examination, including, but not limited to, examination of the head (ear, nose, and throat), neck, heart, lungs, abdomen, and extremities. If a routine examination had been performed within the past week by a qualified health care provider, it does not need to be repeated unless there were changes in health status, in which case it may be limited to the affected area.
- 3) Measure temperature. If the temperature is  $\geq 38^{\circ}\text{C}$  ( $\geq 100.4^{\circ}\text{F}$ ), postpone vaccination until the condition is resolved.
- 4) For subjects providing a blood sample at Visit 3 (50% of the subjects enrolled in Group 1 and Group 2):
  - Review temporary contraindications for blood sampling. Ensure the subject has not had any antibiotics within the previous 72 hours (3 days).
  - Collect 3 mL of blood (BL0002B) (see [Section 7](#) for detailed instructions regarding the handling of blood samples).
- 5) Review warnings and precautions to vaccinations.
- 6) Review contraindications for subsequent vaccinations and conditions for withdrawal
- 7) Contact IRT system for vaccine assignment.
- 8) Administer the following study vaccines. Each vaccine should be administered in the assigned location (see Operating Guidelines) and documented appropriately:
  - Meningococcal vaccine (MenACYW conjugate vaccine or MENVEO<sup>®</sup>): inject IM into the anterolateral area of the thigh, preferably the right thigh.
  - Measles, mumps, and rubella (M-M-R<sup>®</sup> II): administer SC injection in the outer aspect of the upper arm.

- Varicella (Varivax<sup>®</sup>): administer SC injection in the outer aspect of the upper arm.

When multiple vaccines are administered at a single visit, each vaccine should be administered at a different anatomic site. If vaccines are given in the same limb, the injection sites should be separated by 1 inch or more, so that any local reactions can be differentiated.

Failure to administer vaccines in the designated limb will not constitute a protocol deviation, but should be recorded as a comment in the CRF.

- 9) Observe the subject for 30 minutes and record any AEs in the source document. In the event of a local reaction, indicate the associated vaccine.
- 10) Give the parent / guardian a diary card (DC3).
- 11) Remind the parent / guardian to expect a telephone call 8 days after Visit 3 and to bring back the diary card when they return for Visit 4 at a specified date and time.
- 12) Remind the parent / guardian to notify the site in case of an SAE.
- 13) Complete the relevant CRFs for this visit.

#### **Telephone Call 3 (8 days [+2 days] after Visit 3)**

Refer to steps in Telephone Call 1.

#### **Visit 4 (30 [+21] days after Visit 3): Collection of Safety Information and Blood Sample**

- 1) Collect and review the diary card (DC3) with the parent / guardian, including any AEs, medications, or therapy that occurred since vaccination. If an SAE, including an AESI, has occurred, follow the instructions in [Section 10](#) for reporting it.
- 2) Review temporary contraindications for blood sampling. Ensure the subject has not had any antibiotics within the previous 72 hours (3 days).
- 3) Collect 3 mL of blood (BL0003) (see [Section 7](#) for detailed instructions regarding the handling of blood samples).
- 4) Give the parent / guardian a memory aid to record SAE and MAAEs from Visit 4 until the 6-month follow-up phone call.
- 5) Remind the parent / guardian to notify the site in case of an SAE.

- 6) Complete the relevant CRFs for this visit and trial termination record<sup>a</sup>.

**Safety Follow-up Telephone Call 4 (180 [+30] days after Visit 4): Collection of SAEs**

- 1) Ask the parent / guardian if the subject has experienced any SAE and / or MAAE since the last study visit. If an SAE, including an AESI, has occurred, follow the instructions in [Section 10](#) for reporting it.
- 2) Complete the relevant CRFs for this visit.

This call must be made by a qualified person.

A follow-up visit outside the scope of this study protocol can be arranged depending on the information recorded during the phone call.

**5.1.4.2 Visit Procedures for Group 3 and Group 4**

**Visit 1 (17 to 19 months of age): Inclusion, Randomization, Blood Sampling, and Vaccination**

- 1) Give the subject's parent / guardian information about the study, obtain written informed consent, and provide a signed copy.
- 2) Check inclusion and exclusion criteria for eligibility.
- 3) Collect demographic data.
- 4) Obtain and collect verbal medical history about the subject, including ongoing medication.
- 5) Perform a physical examination, including, but not limited to, examination of the head (ear, nose, and throat), neck, heart, lungs, abdomen, and extremities. If a routine examination had been performed within the past week by a qualified health care provider, it does not need to be repeated unless there were changes in health status, in which case it may be limited to the affected area.
- 6) Measure temperature. If the temperature is  $\geq 38^{\circ}\text{C}$  ( $\geq 100.4^{\circ}\text{F}$ ), postpone vaccination until the condition is resolved.
- 7) Contact the IRT system for randomization, allocation of subject number, and vaccine assignment.

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<sup>a</sup> The dose of Prevnar 13<sup>®</sup> and Hib (for children vaccinated with monovalent Hib vaccine at 2, 4, and 6 months of age) recommended in the second year of life may be given as per standard of care at the last study visit after completing all the study procedures (Visit 4). As per standard of care, the correspondent contraindications and precautions to vaccination should be reviewed before administering each vaccine.

- 8) Review temporary contraindications for blood sampling. Ensure the subject has not had any antibiotics within the previous 72 hours (3 days).
- 9) Collect 3 mL of blood (BL0001) (see [Section 7](#) for detailed instructions regarding the handling of blood samples). If the blood sample cannot be obtained, the parent/guardian should be given the opportunity to bring the subject back to the study site for another attempt, as long as the subject continues to remain eligible for the trial. All attempts should be made to obtain a blood sample; however, if the attempts are unsuccessful, the subject could continue in the study with all the study procedures including vaccination.
- 10) Review warnings and precautions to vaccinations.
- 11) Administer the study vaccines. The vaccine should be administered in the assigned location (see Operating Guidelines) and documented appropriately:
  - Meningococcal vaccine (MenACYW conjugate vaccine or Menactra<sup>®</sup>): inject IM into the anterolateral area of the thigh, preferably the right thigh.
- 12) Observe the subject for 30 minutes and record any AEs in the source document.
- 13) Give the parent / guardian a diary card (DC1), a thermometer, and a ruler, and go over the instructions for their use. Instruct the parent / guardian to retain the thermometer and ruler throughout the duration of the study. At each subsequent visit, confirm that the parent / guardian has retained the thermometer and ruler, replace only as necessary.
- 14) Remind the parent / guardian to expect a telephone call 8 days after Visit 1 and to bring back the diary card when they return for Visit 2 at a specified date and time.
- 15) Remind the parent / guardian to notify the site in case of an SAE.
- 16) Complete the relevant CRFs for this visit.

**Telephone Call 1 (8 days [+2 days] after Visit 1)**

**Note:** If Day 8 falls on a weekend or a holiday, the telephone call may be made on the following business day.

- 1) Record relevant information concerning the subject's health status on the telephone contact form. If an SAE (including AESI) occurred, follow the instructions in [Section 10](#) for reporting it.
- 2) Remind the parent / guardian to do the following:
  - Complete the D0 to D07 pages of the diary card.
  - Complete the remaining pages of the diary card, and bring them to the next visit.
  - Notify the site in case of an SAE.

**Visit 2 (3 months after Visit 1 [at 20 to 23 months of age]): Collection of Safety Information and Vaccination**

- 1) Review the diary card (DC1) with the parent / guardian, including any AEs, medications, or therapy that occurred since vaccination. If an SAE, including an AESI, has occurred, follow the instructions in [Section 10](#) for reporting it.
- 2) Perform a physical examination, including, but not limited to, examination of the head (ear, nose, and throat), neck, heart, lungs, abdomen, and extremities. If a routine examination had been performed within the past week by a qualified health care provider, it does not need to be repeated unless there were changes in health status, in which case it may be limited to the affected area.
- 3) Measure temperature. If the temperature is  $\geq 38^{\circ}\text{C}$  ( $\geq 100.4^{\circ}\text{F}$ ), postpone vaccination until the condition is resolved.
- 4) Review warnings and precautions to vaccinations.
- 5) Review contraindications for subsequent vaccinations and conditions for withdrawal
- 6) Contact IRT system for vaccine assignment.
- 7) Administer the study vaccines. The vaccine should be administered in the assigned location (see Operating Guidelines) and documented appropriately:
  - Meningococcal vaccine (MenACYW conjugate vaccine or Menactra<sup>®</sup>): inject IM into the anterolateral area of the thigh, preferably the right thigh.
- 8) Observe the subject for 30 minutes and record any AEs in the source document.
- 9) Give the parent / guardian a diary card (DC2).
- 10) Remind the parent / guardian to expect a telephone call 8 days after Visit 2 and to bring back the diary card when they return for Visit 3 at a specified date and time.
- 11) Remind the parent / guardian to notify the site in case of an SAE.
- 12) Complete the relevant CRFs for this visit.

### **Telephone Call 2 (8 days [+2 days] after Visit 3)**

Refer to steps in Telephone Call 1.

### **Visit 3 (30 [+21] days after Visit 2): Collection of Safety Information and Blood Sample**

- 1) Collect and review the diary card (DC2) with the parent / guardian, including any AEs, medications, or therapy that occurred since vaccination. If an SAE, including an AESI, has occurred, follow the instructions in [Section 10](#) for reporting it.
- 2) Review temporary contraindications for blood sampling. Ensure the subject has not had any antibiotics within the previous 72 hours (3 days).
- 3) Collect 3 mL of blood (BL0002) (see [Section 7](#) for detailed instructions regarding the handling of blood samples).
- 4) Give the parent / guardian a memory aid to record SAE and MAAEs from Visit 3 until the 6-month follow-up phone call.
- 5) Remind the parent / guardian to notify the site in case of an SAE.
- 6) Complete the relevant CRFs for this visit and trial termination record.

### **Safety Follow-up Telephone Call 4 (180 [+30] days after Visit 4: Collection of SAEs**

- 1) Ask the parent / guardian if the subject has experienced any SAE and / or MAAE since the last study visit. If an SAE, including an AESI, has occurred, follow the instructions in [Section 10](#) for reporting it.
- 2) Complete the relevant CRFs for this visit.

This call must be made by a qualified person.

A follow-up visit outside the scope of this study protocol can be arranged depending on the information recorded during the phone call.

### ***Follow-up of subjects with Related AEs or with AEs That Led to Study/Vaccination Discontinuation:***

A subject who experiences an AE (whether serious or non-serious) during the study must be followed until the condition resolves, becomes stable, or becomes chronic (even after the end of the subject's participation in the study) if *either* of the following is true:

- The AE is considered by the Investigator to be related to the product administered.
- The AE caused the discontinuation of the subject from the study or from vaccination.



### **5.1.5 Planned Study Calendar**

The following dates are approximate. The actual dates may differ as, for example, the study will not start until all the appropriate regulatory and ethical approvals have been obtained.

Planned study period - FVFS (first visit, first subject) to LCLS (last contact, last subject):  
04 October 2018 to 25 Aug 2023

Planned inclusion period - FVFS to FVLS (first visit, last subject): 05 October 2018 to 31 Jan 2022

Planned end of study: 25 Aug 2023

Planned date of final clinical study report: 1Q2024

The 6-month follow-up telephone call (TC 4 for Group 1 and Group 2 and TC3 for Group 3 and Group 4) of the last subject in all groups is considered to be the end of the study.

## **5.2 Enrollment and Retention of Study Population**

### **5.2.1 Recruitment Procedures**

Each site will be responsible for devising a recruitment plan for enrolling eligible subjects. Advertisements and other recruitment aids will be approved by Sanofi Pasteur and the site's IRB/IEC prior to use by the clinical site.

### **5.2.2 Informed Consent Procedures**

Informed consent is the process by which a subject and / or parent / guardian voluntarily confirms his or her willingness to participate in a particular study. Informed consent must be obtained before any study procedures are performed. The process is documented by means of a written, signed, and dated ICF.

In accordance with GCP, prior to signing and dating the consent form, the parent / guardian must be informed by appropriate study personnel about all aspects of the study that are relevant to making the decision to participate, and must have sufficient time and opportunity to ask any questions.

The actual ICF used at each center may differ, depending on local regulations and IEC / IRB requirements. However, all versions must contain the standard information found in the sample ICF provided by the Sponsor. Any change to the content of the ICF must be approved by the Sponsor and the IEC / IRB prior to the form being used.

If new information becomes available that may be relevant to the parent's / guardian's willingness to continue participation in the study, this will be communicated to him / her in a timely manner. Such information will be provided via a revised ICF or an addendum to the original ICF.

Informed consent forms will be provided in duplicate, or a photocopy of the signed consent will be made. The original will be kept by the Investigator, and the copy will be kept by the subject's parent / guardian.

Documentation of the consent process should be recorded in the source documents.

### 5.2.3 Screening Criteria

There are no screening criteria other than the inclusion and exclusion criteria.

### 5.2.4 Inclusion Criteria

An individual must fulfill *all* of the following criteria to be eligible for study enrollment:

- 1) Aged 6 to 7 months (168 to 224 days)<sup>a</sup> or 17 to 19 months on the day of the first visit<sup>b</sup>
- 3) Informed consent form has been signed and dated by the parent(s) or other guardian and by an independent witness if required by local regulations
- 4) Subject and parent/guardian are able to attend all scheduled visits and to comply with all trial procedures
- 5) For subjects 6 to 7 months of age at enrollment (Group 1 and Group 2), documented history of having received 2 doses of DTaP, Hib, IPV, pneumococcal, hepatitis B (for children who received Pediarix<sup>®</sup> at 2 and 4 months of age, prior receipt of 3 doses of hepatitis B), and rotavirus (Rotateq<sup>®</sup>) vaccines
- 6) For subjects to be enrolled at 17 to 19 months of age (Group 3 and Group 4), documented history of having received all routine pediatric vaccines recommended by ACIP up to the age of enrollment

### 5.2.5 Exclusion Criteria

An individual fulfilling *any* of the following criteria is to be excluded from study enrollment:

- 1) Participation at the time of study enrollment or in the 4 weeks preceding the first trial vaccination or planned participation during the present trial period in another clinical trial investigating a vaccine, drug, medical device, or medical procedure

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<sup>a</sup> At Visit 1, subjects must be at least 24 weeks of age (168 days, the minimum age for the final dose of hepatitis B vaccine in the vaccine series), and no more than 32 weeks of age (224 days, the maximum age for the 3rd dose of rotavirus vaccine administration).

<sup>b</sup> "6 to 7 months" means from the 6th month after birth to the day before the 8th month after birth. "168 to 224 days" means from the 168th day after birth to the day before the 225th day after birth. "17 to 19 months" means from the 17th month after birth to the day before the 20th month after birth.

- 2) Receipt of any vaccine in the 4 weeks preceding the first trial vaccination or planned receipt of any vaccine in the 4 weeks before and / or following any trial vaccination except for influenza vaccination, which may be received at least 2 weeks before or 2 weeks after any study vaccination. This exception includes monovalent pandemic influenza vaccines and multivalent influenza vaccines
- 3) Previous vaccination against meningococcal disease with either the trial vaccine or another vaccine (i.e., mono- or polyvalent, PS, or conjugate meningococcal vaccine containing serogroups A, C, Y, or W; or meningococcal B serogroup-containing vaccine)
- 4) For subjects to be enrolled at 6 to 7 months of age (Group 1 and Group 2), prior receipt of more than 2 doses of rotavirus vaccine (Rotateq), DTaP, Hib, IPV, pneumococcal, hepatitis B; for children who received Pediarix<sup>®</sup> at 2 and 4 months of age, prior receipt of more than 3 doses of hepatitis B vaccine
- 5) For subjects to be enrolled at 6 to 7 months of age (Group 1 and Group 2), receipt of 2 doses of rotavirus vaccine, Rotarix<sup>®</sup> at 2 and 4 months of age
- 6) Receipt of immune globulins, blood, or blood-derived products in the past 3 months
- 7) Known or suspected congenital or acquired immunodeficiency or receipt of immunosuppressive therapy, such as anti-cancer chemotherapy or radiation therapy within the preceding 6 months; or long-term systemic corticosteroid therapy (prednisone or equivalent for more than 2 consecutive weeks) within the past 3 months
- 8) Family history of congenital or hereditary immunodeficiency, until the immune competence of the potential vaccine recipient is demonstrated
- 9) Individuals with blood dyscrasias, leukemia, lymphoma of any type, or other malignant neoplasms affecting the bone marrow or lymphatic systems
- 10) Individuals with active tuberculosis
- 11) History of any *Neisseria meningitidis* infection, confirmed either clinically, serologically, or microbiologically
- 12) History of diphtheria, tetanus, pertussis, poliomyelitis, hepatitis B, hepatitis A, measles, mumps, rubella, varicella; and of *Haemophilus influenzae* type b, *Streptococcus pneumoniae*, and /or rotavirus infection or disease
- 13) At high risk for meningococcal infection during the trial (specifically, but not limited to, subjects with persistent complement deficiency, with anatomic or functional asplenia, or subjects travelling to countries with high endemic or epidemic disease)
- 14) History of intussusception

- 15) History of any neurologic disorders, including any seizures and progressive neurologic disorders
- 16) History of Arthus-type hypersensitivity reaction after a previous dose of tetanus toxoid-containing vaccine
- 17) History of Guillain-Barré syndrome
- 18) Known systemic hypersensitivity to any of the vaccine components or to latex, or history of a life-threatening reaction to the vaccine(s) used in the trial or to a vaccine containing any of the same substances, including neomycin, gelatin, and yeast<sup>a</sup>
- 19) Verbal report of thrombocytopenia contraindicating intramuscular vaccination in the investigator's opinion
- 20) Bleeding disorder, or receipt of anticoagulants in the 3 weeks preceding inclusion, contraindicating intramuscular vaccination in the investigator's opinion
- 21) Receipt of oral or injectable antibiotic therapy within 72 hours prior to the first blood draw
- 22) Chronic illness that, in the opinion of the investigator, is at a stage where it might interfere with trial conduct or completion<sup>b</sup>
- 23) Any condition which, in the opinion of the investigator, might interfere with the evaluation of the study objectives
- 24) Moderate or severe acute illness/infection (according to investigator judgment) on the day of vaccination or febrile illness (temperature  $\geq 38.0^{\circ}\text{C}$  [ $\geq 100.4^{\circ}\text{F}$ ]). A prospective subject should not be included in the study until the condition has resolved or the febrile event has subsided
- 25) Identified as a natural or adopted child of the investigator or employee with direct involvement in the proposed study

If the subject has a primary physician who is not the Investigator, the site must contact this physician with the parent's / guardian's consent to inform him / her of the subject's participation in the study. In addition, the site should ask this primary physician to verify exclusion criteria relating to previous therapies, such as receipt of blood products or previous vaccines.

### 5.2.6 Medical History

Prior to enrollment, subjects will be assessed for pre-existing conditions and illnesses, both past and ongoing. Any such conditions will be documented in the source document. Significant

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<sup>a</sup> The components of all study vaccines are listed in [Section 6.1.1.1](#) and in the Investigator's Brochure

<sup>b</sup> Chronic illness may include, but is not limited to, cardiac disorders, renal disorders, auto-immune disorders, diabetes, psychomotor diseases, and known congenital or genetic diseases.

(clinically relevant) medical history (reported as diagnosis) including conditions/illnesses for which the subject is or has been followed by a physician or conditions/illnesses that could resume during the course of the study or lead to an SAE or to a repetitive outpatient care will be collected in the CRB. The significant medical history section of the CRB contains a core list of body systems and disorders that could be used to prompt comprehensive reporting, as well as space for the reporting of specific conditions and illnesses.

For each condition, the data collected will be limited to:

- Diagnosis (this is preferable to reporting signs and symptoms)
- Presence or absence of the condition at enrollment

The reporting of signs and symptoms in lieu of a diagnosis is strongly discouraged.

Dates, medications, and body systems are not to be recorded, and the information collected will not be coded. Its purpose is to assist in the later interpretation of safety data collected during the study.

## **5.2.7 Contraindications for Subsequent Vaccinations**

### **5.2.7.1 Temporary Contraindications**

Should a subject experience one of the conditions listed below, the Investigator will postpone further vaccination until the condition is resolved. Postponement must still be within the timeframe for vaccination indicated in the Table of Study Procedures.

- Febrile illness (temperature  $\geq 38.0^{\circ}\text{C}$  [ $\geq 100.4^{\circ}\text{F}$ ]) or moderate or severe acute illness / infection on the day of vaccination, according to Investigator judgment.
- Receipt of any vaccine (other than the study vaccines) in the 4 weeks preceding the first study vaccination or planned receipt of any vaccine in the 4 weeks before and / or following any study vaccination except for influenza vaccination, which may be received at least 2 weeks before or 2 weeks after study vaccination. This exception includes monovalent pandemic influenza vaccines and multivalent influenza vaccines.

The following is a temporary contraindication to blood draw:

- Receipt of oral or injected antibiotic therapy within the 72 hours (3 days) prior to a study blood draw. Note: if a subject receives oral or injectable antibiotic therapy within 3 days prior to a blood draw, the investigator will postpone that blood draw until it has been 3 days since the subject last received oral or injectable antibiotic therapy. Postponement must still be within the timeframe for blood draw. If postponement would result in the sample collection falling outside of this timeframe, the blood sample should be collected without postponement, and it should be documented appropriately that the sample was taken less than 3 days after stopping antibiotic treatment.

### 5.2.7.2 Definitive Contraindications

Prior to vaccination, check the complete list of contraindications for each individual vaccine to be administered. For the licensed vaccines refer to the individual current package inserts. For MenACYW conjugate vaccine refer to the Investigator's Brochure.

Should a subject experience an anaphylactic or other significant allergic reaction to the previous dose of vaccine(s), the Investigator will discontinue vaccination.

The following AEs constitute absolute contraindications to subsequent vaccination with any of the study vaccines. If a subject should experience any of these events during the study, that subject is not to receive any additional study vaccines but should continue in the study and be followed up for safety only as per protocol up to 6 months after the last vaccinations received.

#### **Meningococcal vaccines (MenACYW conjugate vaccine, MENVEO® or Menactra®):**

- 1) History of Guillain-Barre syndrome within 6 weeks after vaccination with a tetanus toxoid-containing vaccine.
- 2) History of an Arthus-like hypersensitivity reaction after vaccination with a tetanus toxoid-containing vaccine.
- 3) Severe allergic reaction (e.g., anaphylaxis) after a previous dose of meningococcal capsular polysaccharide-, diphtheria toxoid- or CRM<sub>197</sub> –containing vaccines or to any component of meningococcal vaccines.

#### **M-M-R®II (measles, mumps, and rubella vaccine):**

- 4) Hypersensitivity to any component of the vaccine, including gelatin.
- 5) Anaphylactic or anaphylactoid reactions to neomycin.
- 6) Patients receiving immunosuppressive therapy. This contraindication does not apply to patients who are receiving corticosteroids as replacement therapy, e.g., for Addison's disease.
- 7) Individuals with newly diagnosed (after inclusion in the study) blood dyscrasias, leukemia, lymphomas of any type, or other malignant neoplasms affecting the bone marrow or lymphatic systems.
- 8) Newly diagnosed (after inclusion in the study) primary and acquired immunodeficiency states, including patients who are immunosuppressed in association with acquired immune deficiency syndrome (AIDS) or other clinical manifestations of infection with human immunodeficiency viruses; cellular immune deficiencies; and hypogammaglobulinemic and dysgammaglobulinemic states.
- 9) Individuals with family members newly diagnosed (after a subject's inclusion in the study) with congenital or hereditary immunodeficiency, unless immune competence of the potential vaccine recipient has been demonstrated.

**Varivax® (varicella vaccine):**

- 10) History of severe allergic reaction to any component of the vaccine (including neomycin and gelatin) or to a previous dose of varicella vaccine.
- 11) Newly diagnosed (after inclusion in the study) primary or acquired immunodeficiency states, leukemia, lymphoma or other malignant neoplasms affecting the bone marrow or lymphatic system, AIDS, or other clinical manifestations of infection with human immunodeficiency virus (HIV).
- 12) Individuals receiving immunosuppressive therapy, including individuals receiving immunosuppressive doses of corticosteroids. A substantially immunosuppressive steroid dose is considered to be  $\geq 2$  weeks of daily receipt of 20 mg or 2 mg/kg body weight of prednisone or equivalent. For further information on contraindications to Varivax vaccination in persons receiving immunosuppressive therapies, consult the General Best Practices Guidelines for Immunization, the Recommendations of the Advisory Committee on Immunization Practices (ACIP), and the Pinkbook (39) (40) (41)
- 13) Active untreated tuberculosis.

Subjects with a definitive contraindication will continue to be followed up for the study-defined safety and immunogenicity assessments, as applicable.

In the event of a local or national immunization program with a pandemic influenza vaccine, subjects who receive pandemic influenza vaccine at any time during the study will not be withdrawn from the study.

### **5.2.7.3 Warnings and Precautions to Vaccination**

Prior to vaccination, check the warnings and precautions for each individual vaccine to be administered. For the licensed vaccines, refer to the individual package inserts. For MenACYW conjugate vaccine, refer to the Investigator's Brochure.

### **5.2.8 Conditions for Withdrawal**

Parents / guardians will be informed that they have the right to withdraw their child from the study at any time.

A subject may be withdrawn from the study:

- At the discretion of the Investigator or Sponsor due to safety concerns or significant non-compliance with the protocol (based on the Investigator's judgment), without the subject's permission (withdrawal)
- At the request of the parent / guardian (dropout)

The reason for a withdrawal or dropout should be clearly documented in the source documents and on the CRB.

The Investigator must determine whether voluntary withdrawal is due to safety concerns (in which case, the reason for discontinuation will be noted as “Adverse Event”) or for another reason.

Withdrawn subjects will not be replaced.

### 5.2.9 Lost to Follow-up Procedures

In the case of subjects who fail to return for a follow-up examination, documented reasonable effort (i.e., documented telephone calls and certified mail) should be undertaken to locate or recall them, or at least to determine their health status while fully respecting their rights. These efforts should be documented in the CRB and in the source documents.

### 5.2.10 Classification of Subjects Who Discontinue the Study

For any subject who discontinues the study prior to completion, the most significant reason for early termination will be checked in the CRB. Reasons are listed below from the most significant to the least significant (refer to the CRB completion instructions for additional details and examples):

<b>Adverse Event</b>	To be used when the subject is permanently terminated from the study because of an AE (including an SAE), as defined in <a href="#">Section 9.3.2.1</a> . This category also applies if the subject experiences a definitive contraindication that is an SAE or AE.
<b>Lost to Follow-up</b>	To be used when the subject cannot be found or contacted in spite of efforts to locate him/her before the date of his/her planned last visit, as outlined in <a href="#">Section 5.2.9</a> . The certified letter was sent by the investigator and returned unsigned, and the parent/guardian did not give any other news and did not come to any following visit.
<b>Protocol Deviation</b>	To be used: <ul style="list-style-type: none"><li>• In case of significant noncompliance with the protocol (e.g., deviation of the Inclusion / Exclusion criteria, non-compliance with time windows, blood sampling or vaccination refusal, missed injection/treatment, or error in the vaccine/treatment administration).</li><li>• If the subject experiences a definitive contraindication that is a protocol deviation.</li><li>• The parent/guardian signed the certified letter sent by the investigator but did not give any other news and did not come to any following visit.</li></ul>
<b>Withdrawal by Parent / Guardian</b>	To be used: <ul style="list-style-type: none"><li>• When the subject or parent/guardian indicated unwillingness to continue in the study</li><li>• When the parent/guardian made the decision to discontinue participation in the study for any personal reason other than an SAE/AE (e.g., subject is relocating, inform consent withdrawal, etc.)</li></ul>



### 5.2.11 Follow-up of Discontinuations

The site should complete all scheduled safety follow-ups and contact any subject who has prematurely terminated the study because of an AE, a protocol deviation, or loss of eligibility, including definitive contraindications.

For subjects where the reason for early termination was lost to follow-up or if the subject withdrew informed consent and specified that they do not want to be contacted again and it is documented in the source document, the site will not attempt to obtain further safety information.

If the subject's status at the end of the study is "Withdrawal by Subject or Parent / Guardian / Legally Acceptable Representative", the site will attempt to contact them for the 6-month follow-up except if they specified that they do not want to be contacted again and it is documented in the source document.

For subjects where the reason for early termination is voluntary withdrawal, the site will attempt to contact them for the 6-month follow-up except if they specified that they do not want to be contacted again and it is documented in the source document.

## 5.3 Safety Emergency Call

If, as per the Investigator's judgment, a subject experiences a medical emergency, the Investigator may contact the Sponsor's RMO for advice on study related medical question or problem. If the RMO is not available, then the Investigator may contact the Call Center—available 24 hours a day, 7 days a week—that will forward all safety emergency calls to the appropriate primary or back-up Sanofi Pasteur contact, as needed. The toll-free contact information for the Call Center is provided in the Operating Guidelines.

This process does not replace the need to report an SAE. The investigator is still required to follow the protocol-defined process for reporting SAEs to the GPV Department (Please refer to [Section 10](#)).

In case of emergency code-breaking, the Investigator is required to follow the code-breaking procedures described in [Section 6.4](#).

## 5.4 Modification of the Study and Protocol

Any amendments to this study plan and protocol must be discussed with and approved by the Sponsor. If agreement is reached concerning the need for an amendment, it will be produced in writing by the Sponsor, and the amended version of the protocol will replace the earlier version. All substantial amendments (e.g., those that affect the conduct of the study or the safety of subjects) require IEC / IRB approval, and must also be forwarded to regulatory authorities.

An administrative amendment to a protocol is one that modifies some administrative, logistical, or other aspect of the study but does not affect its scientific quality or have an impact on the subjects' safety. The IECs / IRBs should only be notified, no formal approval is required.

The Investigator is responsible for ensuring that changes to an approved study, during the period for which IEC / IRB approval has already been given, are not initiated without IEC / IRB review and approval, except to eliminate apparent immediate hazards to subjects.

## 5.5 Interruption of the Study

The study may be discontinued if new data about the investigational product resulting from this or any other studies become available; or for administrative reasons; or on advice of the Sponsor, the Investigators, the IECs/IRBs, or the governing regulatory authorities in the country where the study is taking place.

If the study is prematurely terminated or suspended, the Sponsor shall promptly inform the Investigators, the IECs/IRBs, the regulatory authorities, and any contract research organization(s) used in the study of the reason for termination or suspension, as specified by the applicable regulatory requirements. The Investigator shall promptly inform the subjects' parents/guardians and should assure appropriate subject therapy and/or follow-up.

There will be an internal team at the level of the Sponsor (SMT), which will review the data being generated from all the ongoing studies with MenACYW conjugate vaccine at regular intervals for any new safety signals or safety concerns. The SMT is empowered to recommend a pause in both recruitment and / or further vaccination while it investigates any potential signal or concern.

## 6 Vaccines Administered

In the interest of the management, supply, and accountability of the products, MenACYW conjugate vaccine, MENVEO<sup>®</sup>, and Menactra<sup>®</sup> will be considered as Investigational Medicinal Products (IMP), MMR-II<sup>®</sup> and Varivax<sup>®</sup> will be considered as Non-Investigational Medicinal Products (NIMP) and all other vaccines will be classified as Other Products.

### 6.1 Identity of the Investigational Products

#### 6.1.1 Identity of Study Products

**MenACYW conjugate vaccine:** Meningococcal Polysaccharide (Serogroups A, C, Y, and W) Tetanus Toxoid Conjugate Vaccine (Sanofi Pasteur Inc., Swiftwater, PA, USA)

<b>Form:</b>	Liquid solution
<b>Dose:</b>	0.5 milliliter (mL)
<b>Route:</b>	IM
<b>Batch number:</b>	To be determined (TBD)

### 6.1.1.1 Composition

Each 0.5 mL dose of MenACYW conjugate vaccine is formulated in sodium acetate buffered saline solution to contain the following components:

Meningococcal capsular polysaccharides:

Serogroup A .....	10 µg
Serogroup C .....	10 µg
Serogroup Y .....	10 µg
Serogroup W .....	10 µg

Tetanus toxoid protein carrier ..... approximately 55 µg<sup>a</sup>

### 6.1.1.2 Preparation and Administration

MenACYW conjugate vaccine is supplied in single-dose vials (0.5 mL).

Prior to administration, all study products must be inspected visually for cracks, broken seals, correct label content (see [Section 6.3.1](#)), and extraneous particulate matter and / or discoloration, whenever solution and container permit. If any of these conditions exists, the vaccine must not be administered. A replacement dose is to be used, and the event is to be reported to the Sponsor.

The rubber stopper should not be removed from any of the vaccine vials.

After vaccine administration, the used syringe and needle will be disposed of in accordance with currently established guidelines.

Subjects must be kept under observation for 30 minutes after each vaccination to ensure their safety, and any reactions during this period will be documented in the CRB. Appropriate medical equipment and emergency medications, including epinephrine (1:1000), must be available on site in the event of an anaphylactic, vasovagal, or other immediate allergic reaction.

### 6.1.1.3 Dose Selection and Timing

- Subjects in Group 1 will receive 2 doses of MenACYW conjugate vaccine administered concomitantly with routine pediatric vaccines at 6 to 7 months of age and 12 to 13 months of age
- Subjects in Group 3 will receive 2 doses of MenACYW conjugate vaccine administered at 17 to 19 months of age and 20 to 23 months of age

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<sup>a</sup> Tetanus toxoid protein quantity is approximate and dependent on the PS-to-protein ratio for the conjugates used in each formulation.

### 6.1.2 Identity of Control Product 1

**MENVEO®:** Meningococcal (Groups A, C, Y and W 135) Oligosaccharide Diphtheria CRM<sub>197</sub> Conjugate Vaccine (GlaxoSmithKline Vaccines, Srl, Bellaria-Rosia 53018, Sovicille [SI], Italy)

**Form:** Lyophilized powder and liquid components are combined to produce a Solution for Intramuscular Injection

**Dose:** 0.5 mL

**Route:** IM

**Batch number:** To be determined

#### 6.1.2.1 Composition

Each 0.5 mL dose of vaccine contains the following active ingredients:

MenA oligosaccharide.....	10 µg
MenC oligosaccharide.....	5 µg
MenY oligosaccharide.....	5 µg
MenW-135 oligosaccharide.....	5 µg
CRM <sub>197</sub> protein.....	32.7 to 64.1 µg

Other ingredients per 0.5 mL dose: residual formaldehyde ..... ≤ 0.30 µg

#### 6.1.2.2 Preparation and Administration

MENVEO® is supplied in 2 vials, a lyophilized MenA conjugate vaccine component to be reconstituted with the accompanying MenCYW-135 liquid conjugate component. A single dose after reconstitution is 0.5 mL. See the MENVEO® package insert (37).

The procedures for administering the control product are the same as those described for the study product in [Section 6.1.1.2](#). Each 0.5 mL dose is to be injected IM as indicated in the Operating Guidelines and [Section 5.1.4](#).

#### 6.1.2.3 Dose Selection and Timing

- Subjects in Group 2 will receive 2 doses of MENVEO® administered concomitantly with routine pediatric vaccines at 6 to 7 months of age and 12 to 13 months of age

### 6.1.3 Identity of Control Product 2

**Menactra®:** Meningococcal (Groups A, C, Y and W-135) Polysaccharide Diphtheria Toxoid Conjugate Vaccine (Sanofi Pasteur Inc., Swiftwater, PA, USA)

**Form:** Solution for injection

**Dose:** 0.5 mL

**Route:** IM

**Batch number:** To be determined

#### 6.1.3.1 Composition

Each 0.5 mL dose of vaccine is formulated in sodium phosphate buffered isotonic sodium chloride solution to contain the following ingredients:

Serogroup A.....	4 µg
Serogroup C.....	4 µg
Serogroup Y.....	4 µg
Serogroup W-135 .....	4 µg
Diphtheria toxoid protein carrier .....	approximately 48 µg

#### 6.1.3.2 Preparation and Administration

Menactra<sup>®</sup> is supplied in single-dose (0.5 mL) vials. See the Menactra<sup>®</sup> package insert (38).

The procedures for preparing and administering the control product are the same as those described for the study product in [Section 6.1.1.2](#). Each 0.5 mL dose is to be injected IM as indicated in the Operating Guidelines and [Section 5.1.4](#).

### 6.2 Identity of Other Products

For each routine vaccine indication, all US licensed products are listed. Only one product per indication is to be used. As per ACIP guidelines, it is preferable that doses of vaccine in a series come from the same manufacturer. Hence, it is recommended that the 3<sup>rd</sup> dose of each routine vaccine (administered at 6 to 7 months of age as part of the study) come from the same manufacturer as the doses administered at 2- and 4- months of age.

#### 6.2.1 Identity of Other Product 1

**Pentacel<sup>®</sup>:** (Diphtheria and Tetanus Toxoids and Acellular Pertussis Adsorbed, Inactivated Poliovirus and Haemophilus b Conjugate (Tetanus Toxoid Conjugate) Vaccine (Sanofi Pasteur Ltd, Toronto, Ontario, Canada)

**Form:** Liquid DTaP-IPV used to reconstitute lyophilized ActHIB<sup>®</sup>

**Dose:** 0.5 mL

**Route:** IM

**Batch number:** Commercial batches

### 6.2.1.1 Composition

Each 0.5 mL dose of vaccine contains:

Diphtheria toxoid .....	15 Limit of Flocculation (Lf)
Tetanus toxoid .....	5 Lf
Acellular pertussis antigens:	
Pertussis toxin (PT) .....	20 µg
Filamentous hemagglutinin (FHA).....	20 µg
Pertactin (PRN) .....	3 µg
Fimbriae Types 2 and 3 (FIM) .....	5 µg
Inactivated polioviruses:	
Type 1 (Mahoney) .....	40 D-antigen units (DU)
Type 2 (MEF-1).....	8 DU
Type 3 (Saukett) .....	32 DU
<i>H. influenzae</i> type b (PRP) .....	10 µg
Tetanus toxoid (PRP-T).....	24 µg
Excipients:	
Aluminum phosphate (0.33 mg aluminum) (adjuvant) .....	1.5 mg
Polysorbate 80 .....	approximately 10 ppm by calculation
Sucrose .....	42.5 mg
Residual formaldehyde .....	≤ 5 µg
Residual glutaraldehyde .....	< 50 nanograms (ng)
Residual bovine serum albumin .....	≤ 50 ng
2-phenoxyethanol .....	3.3 mg (0.6% v/v)
Neomycin .....	< 4 picograms (pg)
Polymyxin B sulfate .....	< 4 pg

### 6.2.1.2 Preparation and Administration

Pentacel<sup>®</sup> is supplied as a liquid vaccine component (DTaP-IPV component) that is combined through reconstitution with a lyophilized vaccine component (ActHIB vaccine), both in single dose vials. A single dose after reconstitution is 0.5 mL. See the Pentacel<sup>®</sup> package insert (42).

The procedures for administering the product are the same as those described for the study product in [Section 6.1.1.2](#). Each 0.5 mL dose is to be injected IM as indicated in the Operating Guidelines and [Section 5.1.4](#).

### 6.2.1.3 Dose Selection and Timing

- Subjects in Group 1 and Group 2 will receive 1 dose of Pentacel<sup>®</sup> at 6 to 7 months of age as per the ACIP recommendations.

## 6.2.2 Identity of Other Product 2

**Pediarix®:** (Diphtheria and Tetanus Toxoids and Acellular Pertussis Adsorbed, Hepatitis B (Recombinant) and Inactivated Poliovirus Vaccine) (GlaxoSmithKline Biologicals, Rixensart, Belgium)

**Form:** Suspension for injection

**Dose:** 0.5 mL

**Route:** IM

**Batch number:** Commercial batches

### 6.2.2.1 Composition

Each 0.5 mL dose of vaccine contains:

Diphtheria toxoid.....	25 Lf
Tetanus toxoid .....	10 Lf
Acellular pertussis antigens:	
Inactivated PT.....	25 µg
FHA .....	25 µg
PRN .....	8 µg
HBsAg .....	10 µg
Inactivated polioviruses:	
Type 1 (Mahoney) .....	40 DU
Type 2 (MEF-1).....	8 DU
Type 3 (Saukett) .....	32 DU

Excipients:

Aluminum salt (adjuvant).....	not more than 0.85 mg by assay
Sodium chloride.....	4.5 mg
Polysorbate 80 .....	≤ 100 µg
Residual formaldehyde.....	≤ 100 µg
Neomycin .....	≤ 0.05 ng
Polymyxin B sulfate .....	≤ 0.01 ng

### 6.2.2.2 Preparation and Administration

Pediarix® is supplied as a single-dose prefilled syringe containing 0.5 mL suspension for injection. See the Pediarix® package insert (43).

The procedures for administering the product are the same as those described for the study product in [Section 6.1.1.2](#). Each 0.5 mL dose is to be injected IM as indicated in the Operating Guidelines and [Section 5.1.4](#).

### 6.2.2.3 Dose Selection and Timing

- Subjects in Group 1 and Group 2 will receive 1 dose of Pediarix<sup>®</sup> at 6 to 7 months of age as per the ACIP recommendations.

### 6.2.3 Identity of Other Product 3

#### Haemophilus b conjugate vaccines

**ActHIB<sup>®</sup>:** Haemophilus b Conjugate Vaccine (Tetanus Toxoid Conjugate) (Sanofi Pasteur Inc., Swiftwater, PA, USA)

**Form:** Solution for injection: lyophilized powder to be reconstituted in supplied 0.4% Sodium Chloride diluent

**Dose:** 0.5 mL

**Route:** IM

**Batch number:** Commercial batches

**Hiberix<sup>®</sup>:** Haemophilus b Conjugate Vaccine (Tetanus Toxoid Conjugate) (GlaxoSmithKline Biologicals 441 Rixensart, Belgium)

**Form:** Solution for injection: supplied as a vial of lyophilized vaccine to be reconstituted with the accompanying vial of saline diluent

**Dose:** 0.5 mL

**Route:** IM

**Batch number:** Commercial batches

**PedvaxHIB<sup>®</sup>:** Haemophilus b Conjugate Vaccine (Meningococcal Protein Conjugate) (Merck & Co., Inc., West Point, PA, USA)

**Form:** Solution for injection

**Dose:** 0.5 mL

**Route:** IM

**Batch number:** Commercial batches

#### 6.2.3.1 Composition

After reconstitution, each 0.5 mL dose of ActHIB<sup>®</sup> contains:

*Haemophilus influenzae* type b polysaccharide  
(polyribosylribitol phosphate, PRP) ..... 10 µg  
conjugated to tetanus toxoid as carrier protein ..... 24 µg  
Sucrose 8.5%



After reconstitution, each 0.5 mL dose of Hiberix<sup>®</sup> contains:

<i>Haemophilus influenzae</i> type b polysaccharide (polyribosylribitol phosphate, PRP) .....	10 µg
conjugated to tetanus toxoid as carrier protein .....	approximately 25µg
Lactose .....	12.6 mg
Residual formaldehyde .....	< 0.5 µg

Each 0.5 mL dose of PevaxHIB<sup>®</sup> contains:

<i>Haemophilus influenzae</i> type b polysaccharide (polyribosylribitol phosphate, PRP) .....	7.5 µg
<i>Neisseria meningitidis</i> outer membrane protein complex .....	125 µg
Aluminum as amorphous aluminum hydroxyphosphate sulfate .....	225 µg
Sodium chloride .....	0.9%

### 6.2.3.2 Preparation and Administration

ActHIB<sup>®</sup> is supplied as a lyophilized powder to be reconstituted in supplied 0.4% Sodium chloride diluent. A single dose after reconstitution is 0.5 mL. See the ActHIB<sup>®</sup> package insert (44).

Hiberix<sup>®</sup> is supplied as a lyophilized vaccine to be reconstituted with the accompanying vial of saline diluent. A single dose after reconstitution is 0.5 mL. See the Hiberix<sup>®</sup> package insert (45).

PevaxHIB<sup>®</sup> is supplied as a liquid vaccine. A single dose is 0.5 mL. See the PevaxHIB<sup>®</sup> package insert (46).

The procedures for administering the product are the same as those described for the study product in Section 6.1.1.2. Each 0.5 mL dose is to be injected IM as indicated in the Operating Guidelines and Section 5.1.4.

### 6.2.3.3 Dose Selection and Timing

- Subjects in Group 1 and Group 2 will receive 1 dose<sup>a,b</sup> of *Haemophilus b* conjugate vaccine at 6 to 7 months of age

<sup>a</sup> In children immunized with PedvaxHIB<sup>®</sup> at 2 and 4 months of age, a third dose of Hib vaccine at 6 months of age is not required.

<sup>b</sup> The dose of Hib (for children vaccinated with monovalent Hib vaccine at 2, 4, and 6 months of age) recommended in the second year of life may be given as per standard of care at the last study visit after completing all the study procedures (Visit 4).

#### 6.2.4 Identity of Other Product 4

**Prevnar 13®:** Pneumococcal 13-valent Conjugate Vaccine (Diphtheria CRM<sub>197</sub> Protein)  
(Wyeth Pharmaceuticals, Inc., a subsidiary of Pfizer Inc., Philadelphia, PA, USA)

**Form:** Suspension for injection

**Dose:** 0.5 mL

**Route:** IM

**Batch number:** Commercial batches

##### 6.2.4.1 Composition

Each 0.5 mL dose of the vaccine is formulated to contain:

<i>Streptococcus pneumoniae</i> serotypes 1, 3, 4, 5, 6A, 7F, 9V, 14, 18C, 19A, 19F, 23F saccharides .....	approximately 2.2 µg of each
6B saccharides .....	4.4 µg
CRM <sub>197</sub> carrier protein .....	34 µg
Polysorbate 80 .....	100 µg
Succinate buffer .....	295 µg
Aluminum as aluminum phosphate adjuvant .....	125 µg

##### 6.2.4.2 Preparation and Administration

Prenvar 13® is supplied in a single-dose prefilled syringe. See the Prenvar 13® package insert (47).

The procedures for administering the product are the same as those described for the study product in Section 6.1.1.2. Each 0.5 mL dose is to be injected IM as indicated in the Operating Guidelines and Section 5.1.4.

##### 6.2.4.3 Dose Selection and Timing

- Subjects in Group 1 and Group 2 will receive 1 dose<sup>a</sup> of Prenvar 13® at 6 to 7 months of age

#### 6.2.5 Identity of Other Product 5

**RotaTeq®:** (Rotavirus Vaccine, Live, Oral, Pentavalent) (Merck Sharp & Dohme Corp., a subsidiary of Merck & Co., Inc., Whitehouse Station, NJ, USA)

**Form:** Oral solution

**Dose:** 2 mL

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<sup>a</sup> The dose of Prenvar 13® recommended in the second year of life may be given as per standard of care at the last study visit after completing all the study procedures (Visit 4).

**Route:** Oral  
**Batch number:** Commercial batches

#### 6.2.5.1 Composition

Each 2 mL dose contains the following 5 live reassortant rotaviruses:

G1 serotype.....	2.2 x 10 <sup>6</sup> infectious units (IU)
G2 serotype.....	2.8 x 10 <sup>6</sup> IU
G3 serotype.....	2.2 x 10 <sup>6</sup> IU
G4 serotype.....	2.0 x 10 <sup>6</sup> IU
P1A(8) .....	2.3 x 10 <sup>6</sup> IU

The reassortants are suspended in a buffered stabilizer solution.

Each 2 mL vaccine dose also contains sucrose, sodium citrate, sodium phosphate monobasic monohydrate, sodium hydroxide, polysorbate 80, cell culture media, and trace amounts of fetal bovine serum.

#### 6.2.5.2 Preparation and Administration

RotaTeq<sup>®</sup> is supplied in a container consisting of a squeezable plastic dosing tube with a twist-off cap, allowing for direct oral administration. See the RotaTeq<sup>®</sup> package insert (48).

Each 2 mL dose is to be administered orally, as indicated in the Operating Guidelines and Section 5.1.4.

#### 6.2.5.3 Dose Selection and Timing

- Subjects in Group 1 and Group 2 will receive 1 dose of RotaTeq<sup>®</sup> at 6 to 7 months of age

#### 6.2.6 Identity of Other Product 6

##### Hepatitis B vaccines

**ENGRIX-B<sup>®</sup>:** (Hepatitis B Vaccine [Recombinant]) (GlaxoSmithKline Biologicals 441 Rixensart, Belgium)

**Form:** Suspension for injection

**Dose:** 0.5 mL

**Route:** IM

**Batch number:** Commercial batches

**RecombivaxHB<sup>®</sup>:** (Hepatitis B Vaccine [Recombinant]) (Merck Sharp & Dohme Corp., a subsidiary of Merck & Co., Inc., Whitehouse Station, NJ, USA)

**Form:** Suspension for injection

**Dose:** 0.5 mL  
**Route:** IM  
**Batch number:** Commercial batches

#### 6.2.6.1 Composition

Each 0.5 mL pediatric/adolescent dose of ENGERIX® contains 10 µg of hepatitis B virus surface antigen (HBsAg) adsorbed on 0.25 mg aluminum as aluminum hydroxide.

Excipients:

Sodium chloride..... 9 mg/mL  
Disodium phosphate dihydrate ..... 0.98 mg/mL  
Sodium dihydrogen phosphate dihydrate ..... 0.71 mg/mL

Each 0.5 mL pediatric/adolescent dose of RecombivaxHB® contains 5µg of HBsAg adsorbed onto approximately 0.5 mg of aluminum (provided as amorphous aluminum hydroxyphosphate sulphate)

Excipient:

Residual formaldehyde ..... < 15 mg/mL

#### 6.2.6.2 Preparation and Administration

ENGRIX-B® and RecombivaxHB® are supplied as 0.5 mL prefilled syringes. See the package inserts for ENGERIX-B® (49) and RecombivaxHB® (50).

The procedures for administering the product are the same as those described for the study product in Section 6.1.1.2. Each 0.5 mL dose is to be injected IM, as indicated in the Operating Guidelines and Section 5.1.4.

#### 6.2.6.3 Dose Selection and Timing

- Subjects in Group 1 and Group 2 will receive 1 dose of hepatitis vaccine at 6 to 7 months of age

#### 6.2.7 Identity of Other Product 7

**M-M-R® II** (Measles, Mumps, and Rubella Virus Vaccine Live) (Merck Sharp & Dohme Corp., a subsidiary of Merck & Co., Inc., Whitehouse Station, NJ, USA)

**Form:** Lyophilized live virus vaccine  
**Dose:** 0.5 mL  
**Route:** Subcutaneous (SC)

**Batch number:** Commercial batches

### 6.2.7.1 Composition

Each 0.5 mL dose contains live attenuated virus:

Measles virus (derived from Ender's Edmonston strain) propagated in chick embryo cell culture .....not less than 1000 TCID<sub>50</sub><sup>a</sup>  
Mumps virus (Jeryl Lynn™ [B level] strain) propagated in chick embryo cell culture .....not less than 12,500 TCID<sub>50</sub><sup>a</sup>  
Rubella virus (Wistar RA 27/3 strain) propagated in WI-38 human diploid lung fibroblasts .....not less than 1000 TCID<sub>50</sub><sup>a</sup>

Each 0.5 mL dose is calculated to contain sorbitol (14.5 mg), sodium phosphate, sucrose (1.9 mg), sodium chloride, hydrolyzed gelatin (14.5 mg), recombinant human albumin ( $\leq$  0.3 mg), fetal bovine serum ( $<$  1 ppm), other buffer and media ingredients and approximately 25  $\mu$ g of neomycin.

### 6.2.7.2 Preparation and Administration

M-M-R® II is supplied as a lyophilized vaccine to be reconstituted using the accompanying sterile diluent. See the M-M-R® II package insert (51).

The procedures for administering the product are the same as those described in [Section 6.1.1.2](#). Each 0.5 mL dose is to be injected as indicated in the Operating Guidelines and [Section 5.1.4](#).

### 6.2.7.3 Dose Selection and Timing

- Subjects in Group 1 and Group 2 will receive a dose of M-M-R® II at 12 to 13 months of age.

### 6.2.8 Identity of Other Product 8

**VARIVAX®:** Varicella Virus Vaccine Live (Merck Sharp & Dohme Corp., a subsidiary of Merck & Co., Inc., Whitehouse Station, NJ, USA)

**Form:** Suspension for injection supplied as lyophilized vaccine to be reconstituted using the accompanying sterile diluent

**Dose:** 0.5 mL

**Route:** SC

**Batch number:** Commercial batches

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<sup>a</sup> TCID<sub>50</sub> = tissue culture infectious doses 50%

### 6.2.8.1 Composition

Each approximately 0.5 mL dose contains:

Live, attenuated Oka/Merck varicella virus ..... at least 1350 plaque-forming units (PFU)

Excipients:

Sucrose .....	25 mg
Hydrolyzed gelatin .....	12.5 mg
Sodium chloride.....	3.2 mg
Monosodium L-glutamate .....	0.5 mg
Sodium phosphate dibasic .....	0.45 mg
Potassium phosphate monobasic .....	0.08 mg
Potassium chloride.....	0.08 mg

The vaccine contains residual components of MRC-5 cells including DNA and protein and trace quantities of sodium phosphate monobasic, EDTA, neomycin, and fetal bovine serum. The vaccine contains no preservative.

### 6.2.8.2 Preparation and Administration

VARIVAX<sup>®</sup> is supplied as a lyophilized vaccine to be reconstituted using the accompanying sterile diluent. See the VARIVAX<sup>®</sup> package insert (52).

The procedures for administering the product are the same as those described in [Section 6.1.1.2](#). Each 0.5 mL dose is to be injected as indicated in the Operating Guidelines [Section 5.1.4](#).

### 6.2.8.3 Dose Selection and Timing

- Subjects in Group 1 and Group 2 will receive a dose of VARIVAX<sup>®</sup> at 12 to 13 months of age.

## 6.3 Product Logistics

The following products will be provided by the Sponsor: MenACYW conjugate vaccine, MENVEO<sup>®</sup>, Menactra<sup>®</sup>, MMR<sup>®</sup>-II, and Varivax<sup>®</sup>.

The routine pediatric vaccines recommended at 6 months of age (DTaP-, IPV-, Hib-, hepatitis B- vaccines, PCV13 and RotaTeq<sup>®</sup>) will be procured by the sites and reimbursed by the Sponsor.

The dose of PCV13 and Hib vaccine recommended in the second year of life are outside the scope of the study. These vaccines will be procured by the sites and will not be reimbursed by the Sponsor.

### **6.3.1 Labeling and Packaging**

The investigational product, MenACYW conjugate vaccine (single-dose vials), and control products will be supplied with investigational labeling and packaging according to national regulations. Each single dose of investigational or control product will be identified by a unique number on the detachable label and on the outer carton label. The detachable label will be attached to the source documents by the sites. See the Operating Guidelines for additional label detail.

The investigational and control products are blinded at the carton level but not at the vial level. To avoid any bias and ensure blinding is maintained, only the personnel administering the vaccine will be authorized to open the carton.

All of the concomitant products (licensed routine vaccines) will retain original commercial labeling and packaging with no additional labels to be applied.

The concomitant products (licensed routine vaccines) are not blinded.

### **6.3.2 Product Shipment, Storage, and Accountability**

#### **6.3.2.1 Product Shipment**

The Clinical Logistics Coordinator or designee will contact the Investigator or a designee to determine the dates and times of delivery of products.

Each vaccine shipment will include a temperature-monitoring device to verify maintenance of the cold chain during transit. On delivery of the product to the site, the person in charge of product receipt will follow the instructions given in the Operating Guidelines including checking that the cold chain was maintained during shipment (i.e., verification of the temperature recorders).

If there is an indication that the cold chain was broken, this person should immediately quarantine the product, alert the Sanofi Pasteur representative, and request authorization from Sanofi Pasteur to use the product.

#### **6.3.2.2 Product Storage**

The Investigator will be personally responsible for product management or will designate a staff member to assume this responsibility.

At the site, products must be kept in a secure place with restricted access. The study and control products (MenACYW conjugate vaccine, MENVEO<sup>®</sup>, and Menactra<sup>®</sup>) will be stored in a refrigerator at a temperature ranging from +2°C to +8°C and never frozen. All commercially labeled products should be stored according to the manufacturer's instructions. The temperature must be monitored and documented (see the Operating Guidelines) for the entire time that the vaccine is at the study site. In case of accidental freezing or disruption of the cold chain, vaccines must not be administered and must be quarantined, and the Investigator or authorized designee should contact the Sanofi Pasteur representative for further instructions.

### **6.3.2.3 Product Accountability**

The person in charge of product management at the site will maintain records of product delivery to the study site, product inventory at the site, the dose(s) given to each subject, and the disposal of or return to the Sponsor of unused doses.

The necessary information on the product labels is to be entered into the source document and the CRB. If applicable, information may also be entered into the subject's vaccination card.

The Sponsor's monitoring staff will verify the study site's product accountability records against the record of administered doses in the CRBs and the communication from the IRT system (if applicable).

In case of any expected or potential shortage of product during the study, the Investigator or an authorized designee should alert the Sanofi Pasteur representative as soon as possible, so that a shipment of extra doses can be arranged.

### **6.3.3 Replacement Doses**

If a replacement dose is required (e.g., because the syringe broke or particulate matter was observed in the syringe), the site personnel must either contact the IRT system to receive the new dose allocation, or follow the instructions given in the Operating Guidelines.

### **6.3.4 Disposal of Unused Products**

Unused or wasted products provided by Sanofi Pasteur will be returned to the Sponsor in accordance with the instructions in the Operating Guidelines. Product accountability will be verified throughout the study period.

### **6.3.5 Recall of Products**

If the Sponsor makes a decision to launch a retrieval procedure, the Investigator(s) will be informed of what needs to be done.

## **6.4 Blinding and Code-breaking Procedures**

Given that the meningococcal vaccines (investigational and control) used in this study have different appearances, preparation methods, and vaccination schedules, the study has a modified double blind design for each group at enrollment, i.e., modified double-blind between Group 1 and Group 2, and between Group 3 and Group 4, and thus, with the exception of the personnel administering the vaccine, everyone involved in study (participants, care provider, investigator, safety outcomes assessor, Sponsor) is blinded to avoid any bias.

The code may be broken in the event of an AE only when the identification of the vaccine received could influence the treatment of the subject. Code-breaking should be limited to the subject(s) experiencing the AE.



The blind can be broken by the Investigator or a delegate through the IRT system, as explained in the code-breaking procedures described in the Operating Guidelines. Once the emergency has been addressed by the site, the Investigator or a delegate must notify the Sanofi Pasteur RMO if a subject's code was broken. All contact attempts with the Sponsor prior to unblinding are to be documented in the source documents, and the code breaking CRF is to be completed.

A request for the code to be broken may also be made:

- by the GPV Department through an internal system for reporting to Health authorities in the case of an SAE as described in ICH E2A.<sup>a</sup> In this case, the code will be broken only for the subject(s) in question. The information resulting from code-breaking (i.e., the subject's vaccine or group assignment) will not be communicated to either the Investigator or the immediate team working on the study, except for the GPV representative.

The IEC / IRB must be notified of the code-breaking. All documentation pertaining to the event must be retained in the site's study records and in the Sanofi Pasteur files. Any intentional or unintentional code-breaking must be reported, documented, and explained, and the name of the person who requested it must be provided to the Sponsor.

## 6.5 Randomization and Allocation Procedures

On the day of enrollment, subjects who meet the inclusion/exclusion criteria and whose parent / guardian signs the ICF will be randomly assigned to either Groups 1, 2 or Groups 3, 4 in a 1:1 ratio depending on the age at recruitment. Approximately 870 healthy infants 6 to 7 months of age will be randomized 1:1 to either Group 1 or Group 2, and 200 healthy toddlers 17 to 19 months of age will be randomized 1:1 to either Group 3 or Group 4.

Site staff will connect to the IRT system, enter the identification and security information, and confirm a minimal amount of data in response to IRT system prompts. The IRT system will then provide the group assignment and have the site staff confirm it. The full detailed procedures for group allocation are described in the Operating Guidelines. If the subject is not eligible to participate in the study, then the information will only be recorded on the subject recruitment log.

Subject numbers that are assigned by the IRT system will consist of a 12-digit string (a 3-digit country identifier, a 4-digit study center identifier, and a 5-digit subject identifier). For example, Subject 840000100005 is the fifth subject enrolled in Center Number 1 in the US (840 being the US country code).

Subject numbers should not be reassigned for any reason. The randomization codes will be kept securely in the IRT system.

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<sup>a</sup> All unexpected and related SAEs submitted to European Union competent authorities must be unblinded.

## 6.6 Treatment Compliance

The following measures will ensure that the vaccine doses administered comply with those planned, and that any non-compliance is documented so that it can be accounted for in the data analyses:

- All vaccinations will be administered by qualified study personnel
- The person in charge of product management at the site will maintain accountability records of product delivery to the study site, product inventory at the site, dose(s) given to each subject, and the disposal of unused or wasted doses

## 6.7 Concomitant Medications and Other Therapies

At the time of enrollment, ongoing medications including, but not limited to, other therapies (e.g., blood products), should be recorded in the source documents. All new medications prescribed for new medical conditions / AEs during study participation should also be recorded in the source documents.

Documentation in the CRB of concomitant medication(s) will be limited to specific categories of medication(s) (Categories 1, 2, and 3 as detailed below). Those will include Category 1, 2, and 3 medications ongoing at the time of inclusion in the study, or started at any time during the subject's participation in the trial. For category 3 medication, the period of reporting in CRB will be restricted to only 3 days (72 hours) prior to each blood sampling time point.

### Collection Period in Source Documents

Reportable medications (Category 1, 2, and 3) will be collected in the source documents from the day of first vaccination to the end of the trial.<sup>a</sup>

### Categories of Reportable Medications and Reporting Period

Reportable medications include medications that impact or may impact the consistency of the safety information collected after any vaccination and/or the immune response to vaccination.

Category 1: Reportable medications with potential impact on the evaluation of the safety of the study vaccines. For example, antipyretics, analgesics, non-steroidal anti-inflammatory drugs (NSAIDs), systemic corticosteroids (therapy duration less than 2 weeks), and other immune modulators. Category 1 medications do not define the Per-Protocol Analysis Set (PPAS).

*Note: Topical steroids (inhaled, otic, ophthalmic, nasal etc.) should not be captured or reported.*

Category 1 medications will be reported in the CRB from the day of first vaccination to the end of the solicited and unsolicited follow-up period after each vaccination. These medications will also be collected in the CRB for the 30-day period prior to the subsequent doses of the vaccine,

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<sup>a</sup> Subject's parents will be required to document all medications received in the Diary Cards. The sites will focus on only recording the medications belonging to the 3 categories in the other source documents.

wherever applicable (second, third, fourth, etc., in case of a multi-dose schedule with more than a 30-day interval between doses).

- Category 2: Reportable medications with potential impact on immune response of the study vaccines and used to define the PPAS. For example:
  - Flu vaccines administered within 14 days pre or post each trial vaccination, including the day of the study vaccination visit
  - Any vaccine other than study vaccines (vaccines non-described in the Protocol) within the 28 days (4 weeks) preceding or after the trial vaccination, including the day of the study vaccination visit.
  - Immune globulins, blood or blood-derived products: used in the 3 months preceding the first blood draw and up to the last blood draw
  - Immunosuppressive therapy such as immune-suppressors, immune-modulators with immunosuppressive properties, long-term systemic corticosteroids therapy (prednisone or equivalent for more than 2 consecutive weeks) within past 3 months, anti-cancer chemotherapy, anti-proliferative drugs such as DNA synthesis inhibitors, or radiation therapy: used in the 6 months preceding the first trial vaccination, and up to the last blood draw.

Category 2 medications will be reported in the CRB according to the collection period detailed above up to the last blood draw.

- Category 3: Antibiotics that the subject received within 72 hours preceding each visit for blood draw related to IMP assessment (meningococcal vaccines) and used to define the PPAS. Category 3 medications will be reported in the CRB for the period of 3 days (72 hours) before each blood draw.

*Note: Topical antibiotics (inhaled, otic, ophthalmic, nasal, etc.) should not be captured or reported.*

The information reported in the CRB for each reported medication will be limited to:

- Trade name
- Rationale for the origin of prescription: Whether it was a prophylactic<sup>a</sup> medication? Prophylactic medications will be recorded in the Action Taken section of the AE collection tables.
- Medication category (1, 2, or 3)
- Start and stop dates

Dosage and administration route, homeopathic medication, will not be recorded.

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<sup>a</sup> Medication(s) prescribed for preventing AE occurrence (e.g. paracetamol to reduce the risk of fever)

If the subject has received medications other than those listed in Categories 1, 2, and 3, the detailed information will be collected in the source documents only.

Medications given to treat an AE will be captured in the “Action Taken” section of the AE CRB only. No details will be recorded in the concomitant medication CRB unless the medication(s) received belongs to one of the prelisted categories.

## 7 Management of Samples

Blood samples for the assessment of antibody responses will be collected at Visits 1, 2, 3 and 4 as follows:

Group 1 and Group 2:

- A blood sample before the first study vaccination at Visit 1 (all subjects)
- A blood sample 30 days after administration of the first dose of MenACYW conjugate vaccine or MENVEO<sup>®</sup> at Visit 2 (only from approximately the first 50% of the subjects in Group 1 and Group 2)
- A blood sample before the 12-month vaccination at Visit 3 (only from the remaining 50% of subjects in Group 1 and Group 2, who did not have a blood draw at Visit 2)
- A blood sample 30 days after administration of the second dose of MenACYW conjugate vaccine or MENVEO<sup>®</sup> at Visit 4 (all subjects)

Group 3 and Group 4:

- A blood sample before the first study vaccination at Visit 1
- A blood sample 30 days after administration of the second dose of MenACYW conjugate vaccine or Menactra<sup>®</sup> at Visit 3

See the Table of Study Procedures and [Section 5.1.3](#) for details of the sampling schedule.

### 7.1 Sample Collection

At Visits that include a blood draw, 3 mL of blood will be collected in tubes provided by or recommended by the Sponsor. Immediately prior to the blood draw, the staff member performing the procedure will verify the subject’s identity; will write the assigned subject’s number on the pre-printed label that contains that subject’s number and the sampling stage; and will attach the label to the tube. If vaccination and blood sample collection occur at the same visit and vaccine is given only in one of the arms, blood is to be taken from the limb opposite to the one that will be used for vaccination.

### ***Optional blood collection for routine screening tests (not part of study)***

The American Academy of Pediatrics (AAP) recommends blood lead screening as part of routine health supervision for children at 9 to 12 months of age and, if possible, again at 24 months of age. Further, the AAP recommends universal screening for anemia at approximately 12 months of age with determination of hemoglobin concentration and an assessment of risk factors associated with iron deficiency and iron deficient anemia (53). Children enrolled in this study will undergo routine screening outside of the study. Collection of blood for lead and anemia screening could be done at the same time as blood is drawn for the study immunologic assessment via the same venipuncture. This collection should be done in sample tubes which are not part of the study, and as per standard of care. The results of these tests will not be part of the study report. Blood collection for these screening tests could be done at any visit in the 2nd year of life, once for complete blood count (1 mL) and twice for lead blood levels (2 mL for each test).

## **7.2 Sample Preparation**

Detailed instructions on how to prepare blood samples for assessment of immune response are contained in the Operating Guidelines provided to the site. An overview of the procedures is provided here.

Following the blood draw, the tubes are to be left undisturbed, positioned vertically and not shaken, for a minimum of 1 hour and a maximum of 24 hours to allow the blood to clot. Samples can be stored at room temperature for up to 2 hours; beyond 2 hours, they must be refrigerated at a temperature of +2°C to +8°C after the period of clotting at room temperature and must be centrifuged within a maximum of 24 hours.

The samples are then centrifuged, and the serum is transferred to the appropriate number of aliquoting tubes. These tubes are pre-labeled with adhesive labels that identify the study code, the subject's number and the sampling stage or visit number.

The subject's number and the date of sampling, the number of aliquots obtained, the date and time of preparation, and the subject's consent for future use of his / her samples are to be specified on a sample identification list and recorded in the source document. Space is provided on this list for comments on the quality of samples.

## **7.3 Sample Storage and Shipment**

During storage, serum tubes are to be kept in a freezer whose temperature is set and maintained at -20°C or below. The temperature will be monitored and documented on the appropriate form during the entire study. If it rises above -10°C for any period of time, the Clinical Logistics Coordinator must be notified. See the Operating Guidelines for further details.

Shipments to the laboratories will be made only after appropriate monitoring, and following notification of the Clinical Logistics Coordinator. Sera will be shipped frozen, using dry ice to maintain them in a frozen state, in the packaging container provided by the carrier. Again, temperatures will be monitored. Shipments must be compliant with the United Nations (UN)

Class 6.2 specifications and the International Air Transport Association (IATA) 602 packaging instructions.

Samples will be shipped to R&D Global Operations at Sanofi Pasteur. The address is provided in the Operating Guidelines.

#### **7.4 Future Use of Stored Serum Samples for Research**

Any unused part of the serum samples will be securely stored at the Sanofi Pasteur R&D Global Operations for up to 25 years after the last license approval in the relevant market areas has been obtained for the vaccine being tested.

Subjects' parents / guardians will be asked to indicate in the ICF whether they will permit the future use of any unused stored serum samples for other tests. If they refuse permission, the samples will not be used for any testing other than that directly related to this study. If they agree to this use, they will not be paid for giving permission. Anonymity of samples will be ensured. The aim of any possible future research is unknown today, and may not be related to this particular study. It may be to improve the knowledge of vaccines or infectious diseases, or to improve existing tests or develop new tests to assess vaccines. Human genetic tests will never be performed on these samples without specific individual informed consent.

### **8 Clinical Supplies**

Sanofi Pasteur will supply the study sites with protocols, ICFs, CRBs, SAE reporting forms, diary cards, memory aids, and other study documents, as well as with the following study materials: all study vaccines, blood collection tubes, cryotubes, cryotube storage boxes, cryotube labels, temperature recorders, shipping containers, rulers, and digital thermometers.

The means for performing Electronic Data Capture (EDC) will be defined by Sanofi Pasteur. If a computer is provided by Sanofi Pasteur, it will be retrieved at the end of the study.

The Investigator will supply all vaccination supplies, phlebotomy, and centrifugation equipment, including biohazard and / or safety supplies. The biohazard and safety supplies include needles and syringes, examination gloves, laboratory coats, sharps disposal containers, and absorbent countertop paper. The site will ensure that all biohazard wastes are autoclaved and disposed of in accordance with local practices. The Investigator will also supply appropriate space in a temperature-monitored refrigerator for the storage of the products and for the blood samples, and appropriate space in a temperature-monitored freezer for serum aliquots.

In the event that additional supplies are required, study staff must contact Sanofi Pasteur, indicating the quantity required. Contact information is provided in the Operating Guidelines.

They must allow approximately 1 week for an order to be filled and to have the supplies sent to their site.

## 9 Endpoints and Assessment Methods

### 9.1 Primary Endpoints and Assessment Methods

#### 9.1.1 Safety

There are no primary objectives for safety.

#### 9.1.2 Immunogenicity

##### 9.1.2.1 Immunogenicity Endpoint

The primary endpoint for the evaluation of immunogenicity is:

Meningococcal serogroups A, C, Y, and W antibody titers measured by hSBA, before the first study vaccination (Visit 1) and 30 days after the second dose of MenACYW conjugate vaccine or MENVEO® (Group 1 vs Group 2)

##### 9.1.2.2 Immunogenicity Assessment Methods

The hSBA testing will be performed at GCI, Swiftwater, PA or at a qualified contract laboratory for GCI.

The assay method to be used is summarized below. Laboratory technicians conducting the immunogenicity assays will be blinded to the group to which each subject is assigned.

#### *Antibodies to meningococcal antigens (hSBA Method)*

Functional meningococcal antibody activity against serogroups A, C, Y, and W will be measured in hSBA. Two-fold dilutions of test sera are prepared in sterile 96-well microtiter plates. Serogroup-specific meningococcal bacteria along with human complement are added to the serum dilutions and allowed to incubate. After this incubation period, an agar overlay medium is added to the serum/complement/bacteria mixture, allowed to harden, and then incubated overnight at 37°C with 5% carbon dioxide (CO<sub>2</sub>). Bacterial colonies present in the wells are then counted. The endpoint titer is determined by the reciprocal serum dilution yielding  $\geq 50\%$  killing as compared to the mean of the complement control wells. The lower limit of quantitation (LLOQ) of the hSBA assay is a titer of 1:4.

#### 9.1.3 Efficacy

No clinical efficacy data will be obtained in the study.

### 9.2 Secondary Endpoints and Assessment Methods

#### 9.2.1 Safety

There are no secondary objectives for safety.

## 9.2.2 Immunogenicity

### 9.2.2.1 Immunogenicity Endpoints

The following serological endpoints will be assessed.

- 1) Meningococcal serogroups A, C, Y, and W antibody titers  $\geq 1:8$  measured by hSBA 30 days after the second dose of MenACYW conjugate vaccine or MENVEO® (Group 1 vs Group 2)
- 2) 30 days after the second vaccination at 12 to 13 months of age with MenACYW conjugate vaccine or MENVEO® (Group 1 and Group 2):
  - hSBA meningococcal serogroups A, C, Y, and W antibody titers
  - Geometric mean titers (GMTs) with 95% CI
  - Titer distribution and reverse cumulative distribution curves (RCDCs)
  - Percentage of subjects with titer  $\geq 4$ -fold rise from pre-vaccination to post-vaccination and 95% CI
- 3) 30 days after the first vaccination at 6 to 7 months of age with MenACYW conjugate vaccine or MENVEO® (Group 1 and Group 2):
  - hSBA meningococcal serogroups A, C, Y, and W antibody titers
  - GMTs with 95% CI
  - Titer distribution and RCDCs
  - Percentage of subjects with titer  $\geq 4$ -fold rise from pre-vaccination to post-vaccination and 95% CI
  - Percentage of subjects with hSBA vaccine seroresponse and 95% CI
- 4) 6 months after the first vaccination at 6 to 7 months of age with MenACYW conjugate vaccine or MENVEO® (Group 1 and Group 2):
  - hSBA meningococcal serogroups A, C, Y, and W antibody titers
  - GMTs with 95% CI
  - Titer distribution and RCDCs
  - Percentage of subjects with titer  $\geq 4$ -fold rise from pre-vaccination to post-vaccination and 95% CI
  - Percentage of subjects with hSBA vaccine seroresponse and 95% CI



- 5) 30 days after the second vaccination at 20 to 23 months of age with MenACYW conjugate vaccine or Menactra<sup>®</sup> (Group 3 and Group 4):
- hSBA meningococcal serogroups A, C, Y, and W antibody titers
  - GMTs with 95% CI
  - Titer distribution and RCDCs
  - Percentage of subjects with titer  $\geq$  4-fold rise from pre-vaccination to post-vaccination and 95% CI
  - Percentage of subjects with hSBA vaccine seroresponse and 95% CI

#### 9.2.2.2 Immunogenicity Assessment Methods

The immunogenicity assessment methods for the secondary endpoints are the same as those presented in [Section 9.1.2.2](#).

#### 9.2.3 Efficacy

No clinical efficacy data will be obtained in the study.

### 9.3 Observational Endpoints and Assessment Methods

#### 9.3.1 Immunogenicity

There are no observational objectives for immunogenicity in this study.

#### 9.3.2 Safety

##### 9.3.2.1 Safety Definitions

The following definitions are taken from the ICH E2A Guideline for Clinical Safety Data Management: Definitions and Standards for Expedited Reporting.

##### *Adverse Event (AE):*

An AE is any untoward medical occurrence in a patient or in a clinical investigation subject administered a medicinal product and which does not necessarily have a causal relationship with this treatment. An AE can therefore be any unfavorable and unintended sign (including an abnormal laboratory finding, for example), symptom or disease temporally associated with the use of a medicinal product, whether or not considered related to the medicinal product.

Therefore an AE may be:

- A new illness

- The worsening of a pre-existing condition
- An effect of the vaccination, including the comparator
- A combination of the above

All AEs include serious and non-serious AEs.

Surgical procedures are not AEs; they are the actions taken to treat a medical condition. It is the condition leading to the action taken that is the AE (if it occurs during the study period).

Pre-existing medical conditions are not to be reported as AEs. However, if a pre-existing medical condition worsens following study interventions in frequency or intensity, or if according to the Investigator there is a change in its clinical significance, this change should be reported as an AE (exacerbation). This applies equally to recurring episodes of pre-existing conditions (e.g., asthma) if the frequency or intensity increases post-vaccination.

***Serious Adverse Event (SAE):***

*Serious* and *severe* are not synonymous. The term *severe* is often used to describe the intensity of a specific event as corresponding to Grade 3. This is not the same as *serious* which is based on subject / event outcome or action criteria usually associated with events that pose a threat to a subject's life or functioning. Seriousness, not severity, serves as a guide for defining regulatory reporting obligations.

An SAE is any untoward medical occurrence that at any dose

- Results in death
- Is life-threatening<sup>a</sup>
- Requires inpatient hospitalization or prolongation of existing hospitalization<sup>b</sup>
- Results in persistent or significant disability / incapacity<sup>c</sup>
- Is a congenital anomaly / birth defect
- Is an important medical event (IME)

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<sup>a</sup> The term "life-threatening" refers to an event in which the subject was at risk of death at the time of the event; it does not refer to an event which hypothetically might have caused death if it were more severe.

<sup>b</sup> All medical events leading to hospitalizations will be recorded and reported as SAEs, with the exception of: hospitalization planned before inclusion into the study or outpatient treatment with no hospitalization.

<sup>c</sup> "Persistent or significant disability or incapacity" means that there is a substantial disruption of a person's ability to carry out normal life functions.

Medical and scientific judgment should be exercised in deciding whether expedited reporting is appropriate in other situations, such as IMEs that may not be immediately life-threatening or result in death or hospitalization but may jeopardize the health of the subject or may require intervention to prevent one of the other outcomes listed in the definition above. These IMEs should also usually be considered serious. Examples of such events include allergic bronchospasm requiring intensive treatment in an emergency room or at home, blood dyscrasias or convulsions that do not result in inpatient hospitalization, or the development of drug dependency or drug abuse, new-onset diabetes, or autoimmune disease.

***Adverse Reaction:***

All noxious and unintended responses to a medicinal product related to any dose should be considered adverse reactions (AR).

(The phrase “responses to a medicinal product” means that a causal relationship between a medicinal product and an AE is at least a reasonable possibility)

The following additional definitions are used by Sanofi Pasteur:

***Immediate Event/Reaction:***

Immediate events are recorded to capture medically relevant unsolicited systemic AEs (including those related to the product administered) that occur within the first 30 minutes after vaccination.

***Solicited Reaction:***

A solicited reaction is an “expected” adverse reaction (sign or symptom) observed and reported under the conditions (nature and onset) prelisted in the protocol and CRB (e.g., injection site tenderness or irritability occurring between D0 and D07 after vaccination).

By definition, solicited reactions are to be considered as being related to the product administered.

For injectable vaccines, solicited reactions can either be solicited injection site reactions or solicited systemic reactions.

The assessment of these reactions by the investigator is mandatory.

***Unsolicited AE / AR:***

An unsolicited AE is an observed AE that does not fulfill the conditions prelisted in the CRB in terms of diagnosis and/or onset window post-vaccination. For example, if vomiting between D0 and D07 is a solicited reaction (i.e., prelisted in the protocol and CRB), then a vomiting starting on D07 is a solicited reaction, whereas vomiting starting on D08 post-vaccination is an unsolicited AE. Unsolicited AEs includes both serious (SAEs) and non-serious unsolicited AEs.

***Injection Site Reaction:***

An injection site reaction is an AR at and around the injection site. Injection site reactions are commonly inflammatory reactions. They are considered to be related to the product administered.

***Systemic AE:***

Systemic AEs are all AEs that are not injection or administration site reactions. They therefore, include systemic manifestations such as vomiting, fever, as well as localized or topical manifestations that are not associated with the vaccination or administration site (e.g., erythema that is localized but that is not occurring at the injection site).

***Adverse Event of Special Interest (AESI):***

An AESI is an event for which ongoing monitoring and rapid communication by the Investigator to the Sponsor must be done. Such an event might warrant further investigation in order to characterize and understand it. Depending on the nature of the event, rapid communication by the study Sponsor to other parties (e.g., regulators) might also be warranted.

***Medically-Attended Adverse Event (MAAE)***

An MAAE is defined, for the purpose of this study, as a new onset of a condition that prompts the subject or subject's parent/guardian to seek unplanned medical advice at a health care provider's office or Emergency Department. This definition excludes pre-planned medical office visits for routine pediatric check-ups or follow-up visits of chronic conditions with an onset prior to entry in the study. Health care provider contact made over the phone or by email will be considered a physician office visit for the purpose of MAAE collection. The outcome of the health care provider contact (whether it results in a prescription or not) will not be considered as a basis for reporting the event as an MAAE and all contacts should be reported. Sufficient data should be collected for the event to allow an assessment of the causality and diagnosis, if possible.

**9.3.2.2 Safety Endpoints**

The following endpoints will be used for all subjects:

- Occurrence, nature (Medical Dictionary for Regulatory Activities [MedDRA] preferred term), duration, intensity, relationship to vaccination, and whether the event led to early termination from the study, of any unsolicited systemic AEs reported within 30 minutes after each vaccination.
- Occurrence, time of onset, number of days of occurrence, intensity, action taken, and whether the reaction led to early termination from the study, of solicited (prelisted in the subject's diary card and CRB) injection site reactions occurring up to D07 after each vaccination.
- Occurrence, time of onset, number of days of occurrence, intensity, action taken, and whether the reaction led to early termination from the study, of solicited (prelisted in the subject's diary card and CRB) systemic reactions occurring up to D07 after each vaccination.

- Occurrence, nature (MedDRA preferred term), time of onset, duration, intensity, action taken, relationship to vaccination, and whether the event led to early termination from the study, of unsolicited AEs up to D30 after each vaccination.
- Occurrence, nature (MedDRA preferred term), time of onset, duration, seriousness criteria, relationship to vaccination, outcome, and whether the event led to early termination from the study, of SAEs (including AESIs) throughout the trial from Visit 1 up to the 6 month follow-up contact after the last vaccination.
- Occurrence, nature (MedDRA preferred term), time of onset, duration, intensity, action taken, relationship to vaccination, and whether the event led to early termination from the study for MAAEs throughout the trial from Visit 1 up to the 6 month follow-up contact after the last vaccination.

### 9.3.2.3 Safety Assessment Methods

At each visit, the Investigator or a delegate will perform a physical examination on the basis of relevant medical history according to the Investigator's clinical judgement and will ask the parent / guardian about any solicited reactions and unsolicited AEs recorded in the diary card, as well as about any other AEs that may have occurred since the previous visit. All relevant data will be transcribed into the CRB according to the instructions provided by the Sponsor.

#### 9.3.2.3.1 Immediate Post-vaccination Observation Period

Subjects will be kept under observation for 30 minutes after each vaccination to ensure their safety. The post-vaccination observation should be documented in the source document. Any AE that occurs during this period will be noted on the source document and recorded in the CRB, as follows:

- Unsolicited systemic AEs will be recorded as immediate AEs in the CRB (presence marked as “yes” and details collected).
- Solicited and unsolicited injection site reactions and solicited systemic reactions will be recorded in the CRB in the same way as any reactions starting on the day of vaccination.
- SAEs will be recorded in the CRB and reported to the Sponsor in the same way as any other SAEs, according to the procedures described in [Section 10](#).

#### 9.3.2.3.2 Reactogenicity (Solicited Reactions from Day 0 to Day 07 after Each Vaccination)

After each vaccination, parents / guardians will be provided with a diary card, a digital thermometer, and a flexible ruler, and will be instructed how to use them. The following items will be recorded by the subject's parent / guardian in the diary card on the day of vaccination and for the next 7 days (i.e., D0 to D07) until resolution:

- Daily temperature, with the route by which it was taken

- Daily measurement or intensity grade of all other solicited injection site and systemic reactions
- Action taken for each event (e.g., medication)

The action(s) taken by the parent or guardian to treat and/or manage any **solicited reactions** will be classified in the CRB using the following list (all applicable items should be checked):

- None
- Medication
- Health care provider contact
- Hospitalized
- Discontinuation of study vaccination

Parents / guardians will be contacted by telephone 8 days after each vaccination to remind them to record all safety information in the diary card.

If the timing of the telephone call should fall on a weekend or a holiday, the call should be made on the next business day. If contact is not made on the designated day, study staff will continue calling until contact is made. Every telephone attempt and its outcome will be documented in the source document.

Table 9.1 and Table 9.2 present, respectively, the injection site reactions and systemic reactions that are prelisted in the diary cards and CRB, together with the intensity scales.

**Table 9.1: Solicited injection site reactions: terminology, definitions, and intensity scales**

CRB term (MedDRA lowest level term [LLT])	Injection site tenderness	Injection site erythema	Injection site swelling
MedDRA preferred term	Injection site pain	Injection site erythema	Injection site swelling
Diary card term	Tenderness	Redness	Swelling
Definition	Pain when the injection site is touched or injected limb mobilized	Presence of a redness including the approximate point of needle entry	Swelling at or near the injection site Swelling or edema is caused by a fluid infiltration in tissue or cavity and, depending on the space available for the fluid to disperse, swelling may be either soft (typically) or firm (less typical) to touch and thus can be best described by looking at the size of the swelling
Intensity scale*	<p>Grade 1: Minor reaction when injection site is touched</p> <p>Grade 2: Cries or protests when injection site is touched</p> <p>Grade 3: Cries when injected limb is mobilized, or the movement of the injected limb is reduced</p>	<p>Grade 1: &gt; 0 to &lt; 25 mm</p> <p>Grade 2: <math>\geq 25</math> to &lt; 50 mm</p> <p>Grade 3: <math>\geq 50</math> mm</p>	<p>Grade 1: &gt; 0 to &lt; 25 mm</p> <p>Grade 2: <math>\geq 25</math> to &lt; 50 mm</p> <p>Grade 3: <math>\geq 50</math> mm</p>

\* For the subjective reaction of tenderness, parents /guardians will record the intensity level (Grade 1, 2, or 3) in the diary card. For the measurable reactions of redness and swelling, they will record just the size of the reaction, and the classification as Grade 1, 2, or 3 will be assigned at the time of the statistical analysis. Since all subjects will be vaccinated before the second birthday, the same intensity scales will be used for all subjects.

**Table 9.2: Solicited systemic reactions: terminology, definitions, and intensity scales\***

CRB term (MedDRA LLT)	Fever	Vomiting	Crying Abnormal	Drowsiness	Appetite Lost	Irritability
MedDRA preferred term	Pyrexia	Vomiting	Crying	Somnolence	Decreased appetite	Irritability
Diary card term	Temperature	Vomiting	Abnormal crying	Drowsiness	Loss of appetite	Irritability
Definition	Elevation of temperature to $\geq 38.0^{\circ}\text{C}$ ( $\geq 100.4^{\circ}\text{F}$ )	Vomiting does not include spitting up	Inconsolable crying without a determined reason	Reduced interest in surroundings, or increased sleeping	See intensity scale	An excessive response to stimuli: increased fussiness, whining, and fretfulness despite attempts to comfort the infant and despite caregiver responses that would normally be soothing
Intensity scale†	<p>Grade 1: <math>\geq 38.0^{\circ}\text{C}</math> to <math>\leq 38.5^{\circ}\text{C}</math> <b>or</b> <math>\geq 100.4^{\circ}\text{F}</math> to <math>\leq 101.3^{\circ}\text{F}</math></p> <p>Grade 2: <math>&gt; 38.5^{\circ}\text{C}</math> to <math>\leq 39.5^{\circ}\text{C}</math> <b>or</b> <math>&gt; 101.3^{\circ}\text{F}</math> to <math>\leq 103.1^{\circ}\text{F}</math></p> <p>Grade 3: <math>&gt; 39.5^{\circ}\text{C}</math> <b>or</b> <math>&gt; 103.1^{\circ}\text{F}</math></p>	<p>Grade 1: 1 episode per 24 hours</p> <p>Grade 2: 2–5 episodes per 24 hours</p> <p>Grade 3: <math>\geq 6</math> episodes per 24 hours or requiring parenteral hydration</p>	<p>Grade 1: <math>&lt; 1</math> hour</p> <p>Grade 2: 1–3 hours</p> <p>Grade 3: <math>&gt; 3</math> hours</p>	<p>Grade 1: Sleepier than usual or less interested in surroundings</p> <p>Grade 2: Not interested in surroundings or did not wake up for a feed / meal</p> <p>Grade 3: Sleeping most of the time or difficult to wake up</p>	<p>Grade 1: Eating less than normal</p> <p>Grade 2: Missed 1 or 2 feeds / meals completely</p> <p>Grade 3: Refuses <math>\geq 3</math> feeds / meals or refuses most feeds / meals</p>	<p>Grade 1: Easily consolable</p> <p>Grade 2: Requiring increased attention</p> <p>Grade 3: Inconsolable</p>

\*Since all subjects will be vaccinated before the second birthday, the same intensity scales will be used for all subjects.

†For all reactions but fever, parents / guardians will record the intensity level (Grade 1, 2, or 3) in the diary card. For fever, they will record the body temperature, and the classification as Grade 1, 2, or 3 will be assigned at the time of the statistical analysis based on the unit used to measure the temperature and the intensity scale.



***Important notes for the accurate assessment of temperature:***

Parents / guardians are to measure body temperature once per day, preferably always at the same time. The optimal time for measurement is the evening, when body temperature is the highest. Temperature is also to be measured at the time of any apparent fever. The observed daily temperature and the route of measurement are to be recorded in the diary card, and the highest temperature will be recorded by the site in the CRB. The preferred route for this study is rectal. Pre-vaccination temperature is also systematically collected by the investigator on the source document. Tympanic thermometers must not be used.

**9.3.2.3.3 Unsolicited Adverse Events**

In addition to recording solicited reactions, parents / guardians will be instructed to record any other medical events that may occur during the 30-day period after each vaccination. Space will be provided in the diary card for this purpose.

Information on SAEs will be collected and assessed throughout the study, from Visit 1 until 6 months after the last vaccinations. Any SAE occurring at any time during the study will be reported by the Investigator in the CRB according to the completion instructions provided by the Sponsor; this includes checking the “Serious” box on the AE CRF and completing the appropriate Safety Complementary Information CRF. All information concerning the SAE is to be reported either as part of the initial reporting or during follow-up reporting if relevant information became available later (e.g., outcome, medical history, results of investigations, copy of hospitalization reports. In case a subject experiences febrile convulsion (neurological event associating fever and seizure), the assessment will be performed according to the “Guideline for definition and collection of cases of febrile convulsion”, and this event will be considered an SAE. See [Section 10](#) for further details on SAE reporting.

For each unsolicited AE (whether serious or non-serious), the following information is to be recorded:

- Start and stop dates<sup>a</sup>
- Intensity of the event:

For measurable unsolicited AEs that are part of the list of solicited reactions, the size of the AE as well as the temperature for fever will be collected and analyzed based on the corresponding scale used for solicited reactions (see [Table 9.1](#) and [Table 9.2](#)).

All other unsolicited AEs will be classified according to the following intensity scale:

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<sup>a</sup> The stop date of all related AEs will be actively solicited. For other events, the investigator will provide the stop date when it becomes available. AEs for which no stop date was obtained during the course of the study will be considered as ongoing at the end of the study.

- Grade 1: A type of adverse event that is usually transient and may require only minimal treatment or therapeutic intervention. The event does not generally interfere with usual activities of daily living.
- Grade 2: A type of adverse event that is usually alleviated with additional therapeutic intervention. The event interferes with usual activities of daily living, causing discomfort but poses no significant or permanent risk of harm to the research participant.
- Grade 3: A type of adverse event that interrupts usual activities of daily living, or significantly affects clinical status, or may require intensive therapeutic intervention.
- Whether the AE was related to the investigational product (for unsolicited systemic AEs)

The Investigator will assess the causal relationship between the AE and the investigational product as either “Not related” or “Related,” as described in [Section 9.3.2.3.6](#).

- Action taken for each AE (e.g., medication)

The action(s) taken by the parent or guardian to treat and/or manage any unsolicited AEs will be classified in the CRB using the following list (all applicable items should be checked):

- None
  - Medication
  - Health care provider contact
  - Hospitalized
  - Discontinuation of study vaccination
  - Whether the AE was serious
- For each SAE, the investigator will complete all seriousness criteria that apply (outcome, elapsed time, and relationship to study procedures)
- Whether the AE caused study discontinuation

#### 9.3.2.3.4 Adverse Events of Special Interest

An AESI is defined as an event for which ongoing monitoring and rapid communication by the Investigator to the Sponsor must be done. The following AEs will be captured as AESIs throughout the study:

- Generalized seizures (febrile and non-febrile) [\(54\)](#) [\(55\)](#)
- Kawasaki disease [\(55\)](#) [\(56\)](#) [\(57\)](#)
- Guillain-Barré syndrome [\(56\)](#)
- Idiopathic thrombocytopenic purpura (ITP) [\(57\)](#) [\(58\)](#)

These events have been listed as AESIs based on the feedback received from the European Union regulators.

No safety concerns relating to these AESIs have been identified with the use of MenACYW conjugate vaccine in the completed clinical trials. Because of their medical importance and to ensure expedited communication to the Sponsor, these AESIs are to be considered and collected as SAEs and reported to the Sponsor according to the procedure described in [Section 10](#). Further instructions on the data collection for these events and the relevant definitions will be provided in the Operating Guidelines.

#### 9.3.2.3.5 Medically-Attended Adverse Events

MAAE information will be collected throughout the study. MAAEs will be recorded as unsolicited AEs for up to D30 after each vaccination and as MAAEs until the next study visit on the appropriate diary cards. MAAEs that occur from D31 after the last vaccination visit until the 6-month follow up phone call will be recorded in the appropriate memory aid. An MAAE that occurs within the study period but meets the definition of an SAE should be reported only on the SAE Reporting Form but not on the MAAE page of the CRB. The Investigator will assess the causal relationship between the MAAE and the investigational or study product as either “Not related” or “Related”, as described in [Section 9.3.2.3.6](#).

#### 9.3.2.3.6 Assessment of Causality

The Investigator will assess the *causal relationship* between each unsolicited systemic AE and the investigational product administered as either *not related* or *related*, based on the following definitions:

- Not related – The AE is clearly / most probably caused by other etiologies such as an underlying condition, therapeutic intervention, or concomitant therapy; or the delay between vaccination and the onset of the AE is incompatible with a causal relationship; or the AE started before the first vaccination (screening phase, if applicable)
- Related – There is a “reasonable possibility” that the AE was caused by the product administered, meaning that there is evidence or arguments to suggest a causal relationship

Note: By convention, all AEs reported at the injection site (whether solicited or unsolicited) and all solicited systemic AEs are considered to be related to the administered product and therefore are referred to as reactions and do not require the Investigator’s opinion on relatedness.

Adverse events likely to be related to the product, whether serious or not, that persist at the end of the study will be followed up by the Investigator until their complete disappearance or the stabilization of the subject’s condition. The Investigator will inform the Sponsor of the date of final disappearance of the event or the date of “chronicity” establishment.

### 9.3.3 Efficacy

There are no objectives for efficacy in this study.

## 10 Reporting of Serious Adverse Events

To comply with current regulations on SAE reporting to health authorities, the Investigator must document all SAEs regardless of causal relationship, and notify the Sponsor and the Clinical Research Associate (CRA) within the notification timelines stated in the following sections. The Investigator will give access and provide the Sponsor and the CRA with all necessary information to allow the Sponsor to conduct a detailed analysis of the safety of the investigational product(s). It is the responsibility of the Investigator to request all necessary documentation (e.g., medical records, discharge summary) in order to provide comprehensive safety information. All relevant information must then be transcribed onto the AE CRF and the appropriate Safety Complementary Information CRFs.

### 10.1 Initial Reporting by the Investigator

Serious adverse events occurring during a subject's participation in the study or experiment must be reported within 24 hours to the Sponsor's GPV Department and to the CRA. Every SAE must be reported, even if the Investigator considers that it is not related to the vaccine. The investigator (licensed physician [M.D. or D.O.]) must validate the information entered on the AE CRF by completing the investigator validation form.

The Investigator must indicate on the AE CRF that the event was serious and must complete the relevant SAE section of this form as well as the appropriate Safety Complementary Information CRFs. An e-mail alert will automatically be sent by the EDC system to the GPV mailbox, the CRA and the RMO with relevant SAE information details.

If the EDC system is unavailable, the site must notify the Sponsor, using the paper version of the CRB, as described in the operating guidelines:

The Investigator must complete the paper copies of the AE CRF and of the appropriate Safety Complementary Information CRFs and send them to the Sponsor by one of the following means:

- By fax, to the following number: 570-957-2782
- In PDF format to the following e-mail address, using a method of transmission that includes password protection: [PV.outsourcing@sanofi.com](mailto:PV.outsourcing@sanofi.com)
- By express mail, to the following address:

Sanofi Pasteur Inc.  
Reception and Triage – Case Management  
Global Pharmacovigilance  
Mail Drop: 45D38  
Discovery Drive  
Swiftwater, PA 18370

When the EDC system becomes available, the Investigator must transcribe the information from the paper forms into the EDC system.

If there is need for urgent consultation, the Investigator is to contact the study RMO, [REDACTED], MD. If the RMO cannot be reached, the Investigator may contact the Call Center as described in [Section 5.3](#).

## **10.2 Follow-up Reporting by the Investigator**

The AE CRF completed initially must be updated within 24 hours after the Investigator has become aware of any new relevant information concerning the SAE (e.g., outcome, precise description of medical history, results of the investigation). All relevant information must be included directly in the AE CRF and the appropriate Safety Complementary Information CRFs. An e-mail alert will be sent automatically to the GPV Department and to the CRA. Copies of documents (e.g., medical records, discharge summary, autopsy) may be requested by the GPV Department.

The anonymity of the subject must always be respected when forwarding this information.

## **10.3 Reporting of SAEs Occurring After a Subject Has Completed the Study**

Any SAE that occurs after a subject has completed the study but that is likely to be related to the investigational product(s), other products (e.g., a benefit vaccine), or to the experiment must also be reported as soon as possible. In such a case, the reporting procedure to be followed is identical to that described in [Section 10.1](#).

## **10.4 Assessment of Causality**

The causal relationship between the SAE and the investigational product administered will be evaluated by the Investigator as described in [Section 9.3.2.3.6](#).

Following this, the Sponsor's Pharmacovigilance (PV) Global Safety Officer will also assess the causal relationship to the product, based on the available information and current medical knowledge.

The causal relationship to study procedures will be also assessed in the CRB.

The decision to modify or discontinue the study may be made after mutual agreement between the Sponsor and the Investigator(s).

## **10.5 Reporting SAEs to Health Authorities and IECs / IRBs**

The Sponsor will inform the relevant health authorities of any reportable SAEs according to the local regulatory requirements. Reporting to the health authorities will be according to the Sponsor's standard operating procedures.

The Sponsor's RMO, [REDACTED], MD will notify the Investigators in writing of the occurrence of any reportable SAEs. The Investigators / Sponsor will be responsible for informing the IECs or IRBs that reviewed the study protocol.

## 11 Data Collection and Management

### 11.1 Data Collection and CRB Completion

Individual diary cards, specifically designed for this study by the Sponsor and provided to the study sites, will be given to study participants' parent / guardian for the recording of daily safety information as described in [Section 9.3.2.3](#). These diary cards will include prelisted terms and intensity scales (see [Table 9.1](#) and [Table 9.2](#)) as well as areas for free text to capture additional safety information or other relevant details. Parents or guardians will also be provided with rulers for measuring the size of injection site reactions, and with standard digital thermometers for measuring daily temperatures. To ensure consistency of reporting, the study sites will instruct parents / guardians on how to correctly use these tools.

The 6-month follow-up will be done by interviewing subjects' parents / guardians over the telephone using a questionnaire to capture MAAEs, SAEs and AESIs, if applicable. A memory aid may be provided to the subjects' parents / guardians at the preceding study visit to help them record information on events occurring between this visit and the 6-month follow-up.

Relevant information will be transcribed into the AE CRF. Any SAEs captured during this 6-month follow-up period will be reported and followed-up as per the normal process for reporting SAEs.

At specified intervals, the Investigator or an authorized designee will interview the parents / guardians to collect the information recorded in the diary card, and will attempt to clarify anything that is incomplete or unclear. All clinical study information gathered by the study site will be reported electronically by the Investigator or authorized designee using a web-based CRB. (Any information that was not documented in the diary card will first be captured in the source document and then reported electronically.) The CRB has been designed specifically for this study under the responsibility of the Sponsor, using a validated Electronic Records / Electronic Signature-compliant platform (21 CFR Part 11).

To ensure the correct and consistent completion of the CRBs, the Sponsor or authorized representative will provide all necessary tools, instructions, and training to all site staff involved in data entry prior to study start. Additional instructional documents such as training manuals and completion instructions will be provided to assist with data entry during the course of the study.

Upon completion of training, each user requiring access to the EDC system will be issued a unique username and password. In the event of a change in study personnel, each newly assigned individual will receive a unique username and password; the username and password of a previous user may not be reissued. If any study personnel leave the study, the Investigator is responsible for informing the Sponsor immediately so that their access is deactivated. An audit trail will be initiated in the EDC system at the time of the first data entry to track all modifications and ensure database integrity.

The Investigator is responsible for the timeliness, completeness, and accuracy of the information in the CRBs; must provide explanations for all missing information; and must sign the CRB using an e-signature.

## **11.2 Data Management**

### ***Management of SAE Data***

During the study, SAE data (reported on the AE and Safety Complementary Information CRFs) will be integrated into the Sponsor's centralized GPV database upon receipt of these forms and after a duplicate check. Each case will be assigned a case identification number. Each case will be assessed by the case management platform or its delegate before being reported to the relevant authorities as necessary. The assessment of related cases will be done in collaboration with the PV Global Safety Officer and the RMO. Follow-up information concerning a completed case will be entered into the GPV database, and a new version of the case will be created.

The information from the GPV database cases will be reconciled with that in the clinical database.

### ***Management of Clinical and Laboratory Data***

Clinical data, defined as all data reported in the CRB, and laboratory data will be handled by the Sponsor's Clinical Data Management (CDM) platform or authorized representative.

During the study, clinical data reported in the CRBs will be integrated into the clinical database under the responsibility of the Sanofi Pasteur CDM platform. Data monitoring at the sites and quality control in the form of computerized logic and / or consistency checks will be systematically applied to detect errors or omissions. In addition, data reviews may be performed several times by the Sponsor's staff in the course of the study. Any questions pertaining to the reported clinical data will be submitted to the investigator for resolution using the EDC system. Each step of this process will be monitored through the implementation of individual passwords to maintain appropriate database access and to ensure database integrity.

The validation of the immunogenicity data will be performed at the laboratory level following the laboratory's procedures. Information from the laboratory will be checked for consistency before integration into the clinical Datawarehouse.

After integration of all corrections in the complete set of data, and after the SAE information available from CDM and the GPV Department has been reconciled, the database will be released for statistical analysis.

## **11.3 Data Review**

A blind review of the data is anticipated through the data review process led by Data Management before database lock. The safety of the investigational product will be continuously monitored by the Sponsor. Periodic safety data review will be performed by the Sponsor's SMT.

## 12 Statistical Methods and Determination of Sample Size

### 12.1 Statistical Methods

Clinical data will be analyzed under the responsibility of the Biostatistics Platform of the Sponsor.

A statistical analysis plan (SAP) will be written and peer reviewed before any analyses. In accordance with the protocol, the SAP will describe all analyses to be performed under the responsibility of the Sponsor and all the conventions to be taken.

Multiplicity adjustment is not required. Testing of the secondary hypotheses is dependent on successful rejection of the primary hypotheses. Within primary and secondary hypotheses, the intersection-union testing procedure (58) is being applied.

#### 12.1.1 Sensitivity analysis due to COVID-19 pandemic

The impact of COVID-19 pandemic situation on study conduct will be summarized through impact on visit procedures, study completion and major/critical protocol deviations due to COVID-19. The subjects impacted by COVID-19 pandemic situation will be defined as the subjects with at least one major/critical protocol deviation due to COVID-19 or who did not complete the study due to COVID-19. If more than 10% of subjects are impacted as per this definition, baseline and demographic characteristics and the main immunogenicity and safety endpoints will also be summarized in the subset of subjects impacted / not-impacted to assess the potential impact of COVID-19 situation on study outcome.

#### 12.1.2 Hypotheses and Statistical Methods for Primary Objective

##### 12.1.2.1 Hypotheses

The primary objectives will be met if the following primary hypotheses are rejected:

- **Primary Hypothesis 1 (MenACYW vaccine seroresponse rate after 2nd dose):**

Thirty days after receiving MenACYW conjugate vaccine at 12 months of age, the hSBA vaccine seroresponse<sup>a</sup> rates against meningococcal serogroups A, C, Y, and W in Group 1 is non-inferior to the corresponding hSBA vaccine seroresponse rates against meningococcal serogroups A, C, Y, and W in Group 2.

Null hypothesis (H0):  $p(\text{men, G1}) - p(\text{men, G2}) \leq -10\%$

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<sup>a</sup> hSBA vaccine seroresponse for serogroups A, C, Y and W is defined as:

- For a subject with a pre-vaccination titer < 1:8, the post-vaccination titer must be  $\geq 1:16$
- For a subject with a pre-vaccination titer  $\geq 1:8$ , the post-vaccination titer must be  $\geq 4$ -fold greater than the pre-vaccination titer



Alternative hypothesis (H1):  $p(\text{men}, G1) - p(\text{men}, G2) > -10\%$

where  $p(\text{men}, G1)$  and  $p(\text{men}, G2)$  are the percentages of subjects who achieve hSBA vaccine seroresponse in Group 1 and Group 2, respectively. Each of the serogroups A, C, Y, and W will be tested separately. Assuming the difference between the 2 proportions is normally distributed, if the lower limit of the 2-sided 95% confidence interval (CI) of the difference between the 2 proportions is  $> -10\%$ , the inferiority assumption will be rejected.

For the non-inferiority hypotheses using the seroresponse rates, the CI of the difference in proportions is computed using the Wilson Score method without continuity correction.

### 12.1.3 Hypotheses and Statistical Methods for Secondary Objective 1

#### 12.1.3.1 Hypotheses

Thirty days after receiving MenACYW conjugate vaccine at 12 months of age, the percentage of subjects that achieve hSBA titers  $\geq 1:8$  for meningococcal serogroups A, C, Y, and W in Group 1 are non-inferior to the corresponding percentages in Group 2.

Null hypothesis (H0):  $p(\text{men}, G1) - p(\text{men}, G2) \leq -10\%$

Alternative hypothesis (H1):  $p(\text{men}, G1) - p(\text{men}, G2) > -10\%$

where  $p(\text{men}, G1)$  and  $p(\text{men}, G2)$  are the percentages of subjects who achieve hSBA  $\geq 1:8$  in Group 1 and Group 2 respectively. Each of the serogroups A, C, Y, and W will be tested separately. Assuming the difference between the 2 proportions is normally distributed, if the lower limit of the 2-sided 95% CI of the difference between the 2 proportions is  $> -10\%$ , the inferiority assumption will be rejected.

For the non-inferiority hypotheses using the seroprotection rates, the CI of the difference in proportions is computed using the Wilson Score method without continuity correction.

In general, categorical variables will be summarized and presented by frequency counts, proportion percentages and CIs. The 95% CIs of point estimates will be calculated using the normal approximation for quantitative data and the exact binomial distribution (Clopper-Pearson method) for proportions. For GMTs and GMCs, 95% CIs of point estimates will be calculated using normal approximation assuming they are log-normally distributed.

For secondary objectives 2, 3, 4, and 5, no hypothesis will be tested, and descriptive statistics will be used.

#### 12.1.4 Statistical Methods for Observational Objectives

No hypotheses will be tested. Descriptive statistics will be presented.

### *Safety*

Safety results will be described for subjects in all study groups. The main parameters for the safety endpoints will be described by 95% CIs (based on the Clopper-Pearson method).

## 12.2 Analysis Sets

Three analysis sets will be used: the Full Analysis Set (FAS), the Per-Protocol Analysis Set (PPAS), and the SafAS.

### 12.2.1 Full Analysis Set

There will be 2 FAS for this study.

FAS1 for infant vaccination:

- The FAS1 is defined as the subset of all randomized subjects who received at least 1 dose of the study vaccine in infancy (< 12 months of age) and have a valid post vaccination serology result in infancy. All subjects will be analyzed according to the treatment group to which they were randomized.

FAS2 for second year of life vaccination:

- The FAS2 is defined as the subset of all randomized subjects who received at least 1 dose of the study vaccine in the second year of life ( $\geq 12$  months of age) and have a valid post-vaccination serology result in the second year of life. All subjects will be analyzed according to the treatment group to which they were randomized.

Immunogenicity analyses will be performed on the FAS for exploratory purposes.

### 12.2.2 Safety Analysis Set

The SafAS is defined as those subjects who have received at least 1 dose of the study vaccine(s)<sup>a</sup>, and have any safety data available. All subjects will have their safety analyzed according to the vaccine they actually received.

Safety data recorded for a vaccine received out of the protocol design will be excluded from the analysis (and listed separately).

#### 12.2.2.1 Overall Safety Analysis Set for Any Dose

The overall SafAS is defined as those subjects who have received at least one dose of the study vaccines and have any safety data available. All subjects will have their safety analyzed according to the vaccine they actually received at the first dose.

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<sup>a</sup> for which safety data are scheduled to be collected

Safety data recorded for a vaccine received out of the protocol design will be excluded from the analysis (and listed separately).

#### **12.2.2.2 Safety Analysis Set for Vaccination at 6 Months of Age**

The SafAS 1 for vaccination at 6-7 months of age in Groups 1 and 2 is defined as those subjects who have received the study vaccine at Visit 1 (Groups 1 and 2) around 6-7 months of age and have any safety data available.

All subjects in Group 1 and Group 2 will have their safety analyzed after the Visit 1 dose according to the vaccines they actually received at Visit 1.

Safety data recorded for a vaccine received out of the protocol design at Visit 1 will be excluded from the analysis (and listed separately).

#### **12.2.2.3 Safety Analysis Set for Vaccination at 12 Months of Age**

The SafAS 2 for vaccination at 12-13 months of age in Groups 1 and 2 is defined as those subjects who have received the study vaccine at Visit 3 (Groups 1 and 2) around 12-13 months of age and have any safety data available.

All subjects in Group 1 and Group 2 will have their safety analyzed after the Visit 3 dose according to the vaccines they actually received at Visit 3.

Safety data recorded for a vaccine received out of the protocol design at Visit 3 will be excluded from the analysis (and listed separately).

#### **12.2.2.4 Safety Analysis Set for Vaccination at 17 Months of Age**

The SafAS 3 for vaccination at 17-19 months of age in Groups 3 and 4 is defined as those subjects who have received the study vaccine at Visit 1 (Groups 3 and 4) around 17-19 months of age and have any safety data available.

All subjects in Group 3 and Group 4 will have their safety analyzed after the Visit 1 dose according to the vaccines they actually received at Visit 1.

Safety data recorded for a vaccine received out of the protocol design at Visit 1 (Groups 3 and 4) will be excluded from the analysis (and listed separately).

#### **12.2.2.5 Safety Analysis Set for Vaccination at 20 Months of Age**

The SafAS 4 for vaccination at 20-23 months of age in Groups 3 and 4 is defined as those subjects who have received the study vaccine at Visit 2 (Groups 3 and 4) around 20-23 months of age and have any safety data available.

All subjects in Group 3 and Group 4 will have their safety analyzed after the Visit 2 dose according to the vaccines they actually received at Visit 2.

Safety data recorded for a vaccine received out of the protocol design at Visit 2 (Groups 3 and 4) will be excluded from the analysis (and listed separately).

### 12.2.3 Per-Protocol Analysis Set

Immunogenicity analyses will primarily be performed on PPAS. The PPAS is a subset of the FAS. There will be 2 PPAS corresponding to the 2 FASs.

- PPAS for infant vaccination (PPAS1)
- PPAS for second year of life vaccination (PPAS2)

#### 12.2.3.1 Per-Protocol Analysis Set 1 (PPAS1)

Serology obtained 30 days after the vaccination visit at 6 months of age for all antigens will be used for immunogenicity analyses of infant stage of study.

PPAS1 will be a subset of FAS1. The subjects presenting with at least one of the following relevant protocol deviations will be excluded from the PPAS1:

- Subject did not meet all protocol-specified inclusion criteria or met at least one of the protocol-specified exclusion criteria
- Subject did not complete the vaccination schedule
- Subject received a vaccine other than the one that he / she was randomized to receive
- Preparation and / or administration of vaccine was not done as per-protocol
- Subject did not receive vaccine in the proper time window
  - Group 1 and Group 2
    - Visit 1: 24 to 32 weeks of age
- Subject did not provide a post-dose serology sample in the proper time window or a post-dose serology sample was not drawn
  - Group 1 and Group 2
    - Blood Sampling 0002A: Visit 1 + 30 days ( $\pm 21$  days)
- Subject received a protocol-prohibited therapy / medication / vaccine (reportable concomitant medication of category 2 and / or category 3)
- Subject had other protocol violations that affected the subject's immune response, as determined by the clinical team before locking the database.

In addition to the reasons listed above, subjects will also be excluded from the PPAS1 if their serology sample did not produce a valid test result (i.e., results for all antigens are missing).

Vaccine correctness required by the PPAS1 includes not only the dose of MenACYW conjugate vaccine or MENVEO® but also the concomitant vaccines (DTaP, IPV, Hib, PCV13, Rotavirus, hepatitis B) as scheduled.

In the event of a local or national immunization program with a pandemic influenza or coronavirus vaccine, subjects who receive 1 or more doses of a pandemic influenza or coronavirus vaccine at any time during the study will not be withdrawn from the study.

#### **12.2.3.2 Per-Protocol Analysis Set 2 (PPAS2)**

During the second year of life, the immunogenicity analyses for various antigens will be performed on serology obtained 30 days after the given antigen administration if blood collection is planned at that time.

PPAS2 will be a subset of FAS2. The subjects presenting with at least one of the following relevant protocol deviations will be excluded from the PPAS2:

- Subject did not meet all protocol-specified inclusion criteria or met at least one of the protocol-specified exclusion criteria
- Subject did not complete the vaccination schedule including the infant and the second year of the study:
  - Group 1 and Group 2: Up to 12-13 month vaccinations, including the infant schedule
  - Group 3 and Group 4: Up to 23 month vaccinations
- Subject received a vaccine other than the one that he / she was randomized to receive
- Preparation and / or administration of vaccine was not done as per-protocol
- Subject did not receive vaccine in the proper time window
  - Group 1 and Group 2
    - Visit 3: 12 to 13 months of age
  - Group 3 and Group 4
    - Visit 1: 17 to 19 months of age
    - Visit 2: 20 to 23 months of age
- Subject did not provide a post-dose serology sample in the proper time window or a post-dose serology sample was not drawn

- Group 1 and Group 2
  - Blood Sampling 0003: Visit 4 (Visit 3 + 30 days [ $\pm 21$  days])
- Group 3 and Group 4
  - Blood Sampling 0002: Visit 3 (Visit 2 + 30 days [ $\pm 21$  days])
- Subject received a protocol-prohibited therapy / medication / vaccine (reportable concomitant medication of category 2 and / or category 3)
- Subject had other protocol violations that affected the subject's immune response, as determined by the clinical team before locking the database

In addition to the reasons listed above, subjects will also be excluded from the PPAS if their serology sample did not produce a valid test result (i.e., results for all antigens are missing).

Vaccine correctness required by the PPAS2 includes not only the 2 doses of MenACYW conjugate vaccine, MENVEO<sup>®</sup>, or Menactra<sup>®</sup> but also, for subjects in groups 1 and 2, the concomitant vaccines (MMR, Varicella) as scheduled in the second year of life.

In the event of a local or national immunization program with a pandemic influenza vaccine, subjects who receive 1 or more doses of a pandemic influenza vaccine at any time during the study will not be withdrawn from the study.

#### **12.2.4 Populations Used in Analyses**

The primary immunogenicity analyses will be performed on the PPAS, including the PPAS1 and PPAS2. Additional immunogenicity analyses will be performed on the FAS for exploratory purposes, including FAS1 and FAS2, according to randomization group. The safety analysis will be performed on the SafAS (SafAS, and SafAS1 through SafAS4).

### **12.3 Handling of Missing Data and Outliers**

#### **12.3.1 Safety**

No replacement will be done.

#### **12.3.2 Immunogenicity**

Missing data will not be imputed. No test or search for outliers will be performed.

### **12.4 Interim Analysis**

No interim analyses are planned.

## 12.5 Determination of Sample Size and Power Calculation

Approximately 870 subjects will be enrolled in Group 1 and Group 2. An estimated around 20% to 30% and not higher than 40% of non-evaluable subjects will result in at least 522 subjects in the Per-Protocol population available for immunogenicity analyses. Group 1 will have 435 enrolled subjects and 261 evaluable subjects. Group 2 will have 435 enrolled subjects and 261 evaluable subjects. In addition, 200 subjects will be enrolled in Group 3 and Group 4.

In case of unexpected situations or any study hold resulting in an unexpected number of unevaluable subjects, total sample size may be increased to replace withdrawn, or unevaluable subjects.

### For the Primary Objective:

*Thirty days after the month 12 vaccination (after the second dose vaccination)*

With at least 261 evaluable subjects in Group 1 and at least 261 evaluable subjects in Group 2, the study will have around 90.0% power by using Farrington and Manning's method to declare the non-inferiority of Group 1 vs Group 2.

**Table 12.1: Power estimates to reject primary null hypothesis**

Antigen	Endpoint	Estimated response (%)*	Non-inferiority margin	Power (%)
A	Seroresponse Rate	97.7	10%	100
C	Seroresponse Rate	97.8	10%	100
Y	Seroresponse Rate	93.3	10%	99.0
W	Seroresponse Rate	86.7	10%	91.0
<b>Overall</b>				90.0

Note: Evaluable subjects: Group 1 = 261 subjects; Group 2 = 261 subjects

\*Estimated responses are based on results observed in MET39

### For Secondary Objective 1:

*Thirty days after the month 12 vaccination (after the second dose vaccination)*

With 261 evaluable subjects in Group 1 and 261 evaluable subjects in Group 2, the study will have 100% power by using Farrington and Manning's method to declare the non-inferiority of Group 1 vs Group 2.

**Table 12.2: Power estimates to reject the secondary null hypothesis**

Antigen	Endpoint	Estimated response (%)*	Non-inferiority margin	Power (%)
A	% $\geq$ 1:8	>99.9	10%	100
C	% $\geq$ 1:8	>99.9	10%	100
Y	% $\geq$ 1:8	97.8	10%	100

W	% $\geq$ 1:8	97.8	10%	100
Overall				100

Note: Evaluable subjects: Group 1 = 261 subjects; Group 2 = 261 subjects

\*Estimated responses are based on results observed in MET39

## 13 Ethical and Legal Issues and Investigator / Sponsor Responsibilities

### 13.1 Ethical Conduct of the Study / Good Clinical Practice

The conduct of this study will be consistent with the standards established by the Declaration of Helsinki and compliant with the ICH guidelines for GCP as well as with all local and / or national regulations and directives.

### 13.2 Source Data and Source Documents

“Source data” are the data contained in source documents. Source documents are original documents or certified copies, and include, but are not limited to, diary cards, medical and hospital records, screening logs, informed consent / assent forms, telephone contact logs, and worksheets. The purpose of study source documents is to document the existence of subjects and to substantiate the integrity of the study data collected. Investigators must maintain source documents so that they are accurate, complete, legible, and up to date.

For missing or discrepant data on a diary card, the study coordinator will obtain verbal clarification from the subject, enter the response into the “investigator’s comment” page of the diary card, and transfer the information to the CRB.

The subject pre-screening log should list all individuals contacted by the Investigators to participate in the study, regardless of the outcome.

The Investigator must print<sup>a</sup> any electronic records on an ongoing basis, sign and date them immediately after creation, and keep the printouts on file as source documents that can be verified by the Sponsor or an inspector against the electronic records. Any subsequent changes of an electronic record require the record to be re-printed, dated (with an indication of the date of change), and signed. Such records must also be kept together with the original printed copy.

Good Documentation Practice should be followed by the Investigator and the site staff managing source documents.

### 13.3 Confidentiality of Data and Access to Subject Records

Prior to initiation of the study, the Investigator will sign a fully executed confidentiality agreement with Sanofi Pasteur.

<sup>a</sup> Unless the electronic medical records are managed by validated computerized systems that are compliant with US 21 CFR Part 11, in which case they are acceptable on their own.



Sanofi Pasteur personnel (or designates), the IECs / IRBs, and regulatory agencies, including the FDA, require direct access to all study records, and will treat these documents in a confidential manner.

In the event a subject's medical records are not at the investigational site, it is the responsibility of the investigator to obtain those records if needed.

### **13.4 Monitoring, Auditing, and Archiving**

#### **13.4.1 Monitoring**

Before the start of the study (i.e., before the inclusion of the first subject in the first center) the Investigators and the Sponsor's staff or a representative will meet at the site-initiation visit to discuss the study protocol and the detailed study procedures. Emphasis will be placed on inclusion and exclusion criteria, visit timing, safety procedures, informed consent procedures, SAE reporting procedures, CRB completion, and the handling of samples and products. The Sponsor's staff or a representative will ensure and document that all material to be used during the study has been received at the site; and that the study investigator team and local Sponsor/delegate staff have been properly informed about the study, GCP and regulatory requirements, and the Sponsor's procedures. The trial will follow a Risk Based Monitoring (RBM) strategy in which site generated data will be source reviewed and verified through a combination of on-site monitoring visits and centralized monitoring. Specific training sessions for the study investigator team and the CRAs on these topics may be performed as necessary, and should be documented.

The following instruction manuals will be provided: the CRB Completion Instructions for entering data into the CRB, and the Operating Guidelines for detailed study procedures such as the product management and sample-handling procedures.

After the start of the study, the Sponsor's staff or a representative will be in regular contact with the investigational team through telephone calls and regular follow-up visits. The Investigator or delegate must be available for these visits, and must allow the Sponsor/delegate staff direct access to subject medical files and CRBs. During these visits, the Sponsor/delegate staff will:

- Evaluate the quality of the study progress (adherence to protocol and any study-specific guidelines, quality of data collection and document completion, signature of consent forms, occurrence of SAEs, sample and product management, cold-chain monitoring, archiving)
- Source-verify completed CRBs and any corresponding answered queries.
- Determine the number of complete or ongoing issues identified at monitoring visits (e.g., protocol deviations, SAEs). Any identified problems will be discussed with the Investigator, and corrective or preventive actions will be determined, as appropriate.
- After all protocol procedures have been completed and the data have been entered into the CRB, the Investigator must still be available to answer any queries forwarded by the Sponsor. All data-related queries must be completed prior to database lock.

At the end of the study, a close-out visit will be performed to ensure that:

- The center has all the documents necessary for archiving.
- All samples have been shipped to the appropriate laboratories.
- All unused materials and products have been either destroyed or returned to the Sponsor.

#### **13.4.2 Audits and Inspections**

A quality assurance audit may be performed at any time by the Sponsor's Clinical Quality Assessment department (CQA) or by independent auditors to verify that the study has been conducted according to the protocol, GCP and ICH requirements, and other applicable regulations. An inspection may be conducted by regulatory authorities. The Investigator must allow direct access to study documents during these inspections and audits.

#### **13.4.3 Archiving**

The Investigator must keep all study documents after the completion or discontinuation of the study, whatever the nature of the investigational center (private practice, hospital, or institution), for as long as required by applicable laws and regulations. In the absence of any applicable laws or regulations, study documents will be kept at a minimum for the duration indicated on the Clinical Trial Agreement (CTA). In no event, should study personnel destroy or permit the destruction of any study documents upon less than 90 days advance written notification to the Sponsor. In addition, study documents should continue to be stored, at Sponsor's sole expense, in the event that the Sponsor requests in writing that such storage continues for a period of time that exceeds that required by any applicable law or regulation or the CTA. The Investigator will inform Sanofi Pasteur of any address change or if they will no longer be able to house the study documents.

Archived data may be held on electronic records, provided that a back-up exists and that a hard copy can be obtained if required. The protocol, documentation, approvals, and all other documents related to the study will be kept by the Sponsor in the Trial Master File (TMF). Data on AEs are included in the TMF. All data and documents will be made available if requested by relevant authorities.

### **13.5 Financial Contract and Insurance Coverage**

A Clinical Trial Agreement will be signed by all the parties involved in the study's performance, if relevant. The Sponsor has an insurance policy to cover any liabilities that may arise from use of the product and / or the study protocol.

### **13.6 Stipends for Participation**

The subject's parent / guardian may be provided with a stipend according to local practice to compensate for the time and travel required for study visits and procedures, if any.

### **13.7 Publication Policy**

Data derived from this study are the exclusive property of Sanofi Pasteur. Any publication or presentation related to the study must be submitted to Sanofi Pasteur for review before submission of the manuscript. After publication of the results of the study, any participating center may publish or otherwise use its own data provided that any publication of data from the study gives recognition to the study group. In addition, Sanofi Pasteur shall be offered an association with all such publications, it being understood that Sanofi Pasteur is entitled to refuse the association.

Sanofi Pasteur must have the opportunity to review all proposed abstracts, manuscripts, or presentations regarding this study at least 90 days prior to submission for publication / presentation. Any information identified by Sanofi Pasteur as confidential must be deleted prior to submission, it being understood that the results of this study are not to be considered confidential.

Sanofi Pasteur's review can be expedited to meet publication guidelines.

## 14 Reference List

- 1 Granoff DM, Harrison LH, Pelton S. Meningococcal vaccines. In: Plotkin SA, Orenstein WA, Offit PA, editors. *Vaccines*. 6th ed. Philadelphia (PA):Saunders (Elsevier);2013:388-418.
- 2 Borrow R, Alarcón P, Carlos J, et al. The Global Meningococcal Initiative: global epidemiology, the impact of vaccines on meningococcal disease and the importance of herd protection. *Expert Rev Vaccines*. 2017;16(4):313-28.
- 3 Harrison OB, Claus H, Jiang Y, et al. Description and nomenclature of *Neisseria meningitidis* capsule locus. *Emerg Infect Dis*. 2013;19(4):566-73.
- 4 Pollard AJ. Global epidemiology of meningococcal disease and vaccine efficacy. *Pediatr Infect Dis J*. 2004;23(12 Supp):S274-9.
- 5 Kvalsvig AJ, Unsworth DJ. The immunopathogenesis of meningococcal disease. *J Clin Pathol*. 2003;56(6):417-22.
- 6 Sidikou F, Djibo S, Taha MK, et al. Polymerase chain reaction assay and bacterial meningitis surveillance in remote areas, Niger. *Emerg Infect Dis*. 2003;9(11):1486-8.
- 7 World Health Organization. Meningococcal disease, serogroup W135 (update). *WER*. 2001;76(28):213-4.
- 8 Sáfadi MA, O’Ryan M, Valenzuela Bravo MT, et al. The current situation of meningococcal disease in Latin America and updated Global Meningococcal Initiative (GMI) recommendations. *Vaccine*. 2015;33(48):6529-36.
- 9 Ceyhan M, Yildirim I, Balmer P, et al. A prospective study of etiology of childhood acute bacterial meningitis, Turkey. *Emerg Infect Dis*. 2008;14(7):1089-96.
- 10 Kilic A, Urwin R, Li H, Saracli MA, Stratton CW, Tang YW. Clonal spread of serogroup W135 meningococcal disease in Turkey. *J Clin Microbiol*. 2006;44(1):222-4.
- 11 Shao Z, Zhou H, Gao Y, et al. *Neisseria meningitidis* serogroup W135, China. *Emerg Infect Dis*. 2010;16(2):348-9.
- 12 Zhou H, Liu W, Xu L, et al. Spread of *Neisseria meningitidis* serogroup W clone, China. *Emerg Infect Dis*. 2013;19(9):1496-9.
- 13 Efron AM, Sorhouet C, Salcedo C, Abad R, Regueira M, Vasquez JA. W135 invasive meningococcal strains spreading in South America: significant increase in incidence rate in Argentina. *J Clin Microbiol*. 2009;47(6):1979-80.
- 14 Weidlich L, Baethgen LF, Mayer LW, et al. High prevalence of *Neisseria meningitidis* hypervirulent lineages and emergence of W135:P1.5,2:ST-11 clone in southern Brazil. *J Infect*. 2008;57(4):324-31.
- 15 Barroso DE, Rebelo MC. Recognition of the epidemiological significance of *Neisseria meningitidis* capsular serogroup W135 in the Rio de Janeiro region, Brazil. *Mem Inst Oswaldo Cruz*. 2007;102(6):773-5.
- 16 Boisier P, Nicholas P, Djibo S, et al. Meningococcal meningitis: unprecedented incidence of serogroup X-related cases in 2006 in Niger. *Clin Infect Dis*. 2007;44(5):657-63.
- 17 Rosenstein NE, Perkins BA, Stephens DS, et al. The changing epidemiology of meningococcal disease in the United States, 1992-1996. *J Infect Dis*. 1999;180(6):1894-901.

- 18 Canadian Immunization Committee and Public Health Agency of Canada. Advice for consideration of quadrivalent (A, C, Y, W135) meningococcal conjugate vaccine, for use by provinces and territories. *CCDR*. 2010;36(S2):1-35.
- 19 Bröker M, Jacobsson S, Kuusi M, et al. Meningococcal serogroup Y emergence in Europe: update 2011. *Hum Vaccin Immunother*. 2012;8(12):1907-11.
- 20 Cohn AC, MacNeil JR, Harrison LH, et al. Changes in *Neisseria meningitidis* disease epidemiology in the United States, 1998-2007: implications for prevention of meningococcal disease. *Clin Infect Dis*. 2010;50(2):184-91.
- 21 National Foundation for Infectious Diseases. Addressing the challenges of serogroup B meningococcal disease outbreaks on campuses: A report by the National Foundation for Infectious Diseases. May 2014. Available online: <http://www.nfid.org/meningococcal-b>. Accessed 14 November 2017.
- 22 Centers for Disease Control and Prevention. Interim guidance for control of serogroup B meningococcal disease outbreaks in organizational settings. Available online: <http://www.cdc.gov/meningococcal/downloads/interim-guidance.pdf>. Accessed 14 November 2017.
- 23 European Centre for Disease Prevention and Control. Surveillance of invasive bacterial diseases in Europe 2008/2009. Stockholm: ECDC; 2011. Available at: [https://ecdc.europa.eu/sites/portal/files/media/en/publications/Publications/1107\\_SUR\\_IBD\\_2008-09.pdf](https://ecdc.europa.eu/sites/portal/files/media/en/publications/Publications/1107_SUR_IBD_2008-09.pdf). Accessed on 14 November 2017.
- 24 Public Health England. Increase in endemic meningococcal group W (MenW) ST-11 complex associated with severe invasive disease in England and Wales. Health Protection Weekly Report. Vol 8 No 41 Published on: 24 October 2014. Available online: [https://www.gov.uk/government/uploads/system/uploads/attachment\\_data/file/367588/hpr4114.pdf](https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/367588/hpr4114.pdf). Accessed 14 November 2017.
- 25 Ladhani S, Lucidarme J, Newbold LS, et al. Investigations into an increase in reported meningococcal serogroup Y disease in England and Wales in 2007-9. Presented at: The European Meningococcal Disease Society (EMGM). 11th EMGM Meeting, 18-20 May 2011. Ljubljana Slovenia. Poster 035:107.
- 26 Törös B, Thulin Hedberg S, Jacobsson S, Fredlund H, Olcén P, Mölling P. Surveillance of invasive *Neisseria meningitidis* with a serogroup Y update, Sweden 2010 to 2012. *Euro Surveill*. 2014;19(42):pii=20940.
- 27 Thulin Hedberg S, Törös B, Fredlund H, Olcén P, Mölling P. Genetic characterisation of the emerging invasive *Neisseria meningitidis* serogroup Y in Sweden, 2000 to 2010. *Euro Surveill*. 2011;16(23):pii=19885.
- 28 Caugant DA, Løvoll Ø, Blystad H. Meningococcal disease in Norway, 2009-2010: emergence of serogroup Y. Presented at: The European Meningococcal Disease Society (EMGM). 11th EMGM Meeting, 18-20 May 2011. Ljubljana Slovenia. Poster 040:117.
- 29 Vainio A, Toropainen M, Kuusi M, Virolainen A. Characteristics of invasive meningococcal serogroup Y isolates in Finland, 1995-2010. Presented at: The European Meningococcal Disease Society (EMGM). 11th EMGM Meeting, 18-20 May 2011. Ljubljana Slovenia. Poster 037:110.

- 30 Centers for Disease Control and Prevention. Active Bacterial Core surveillance (ABCs) Report: *Neisseria meningitidis*, 2013. Available online: <http://www.cdc.gov/abcs/reports-findings/survreports/mening13.html>. Accessed 14 November 2017.
- 31 Centers for Disease Control and Prevention. Meningococcal disease. In: Hamborsky J, Kroger A, Wolfe S, eds. *Epidemiology and Prevention of Vaccine-Preventable Diseases*. 13th ed. Washington D.C. Public Health Foundation, 2015:231-45.
- 32 Centers for Disease Control and Prevention. Update: Guillain-Barré syndrome among recipients of Menactra meningococcal conjugate vaccine--United States, June 2005-September 2006. *MMWR*. 2006; 55(41):1120-4.
- 33 Velentgas P, Amato AA, Bohn RL, et al. Risk of Guillain-Barré syndrome after meningococcal conjugate vaccination. *Pharmacoepidemiol Drug Saf*. 2012;21(12):1350-8.
- 34 Institute of Medicine. Diphtheria toxoid, tetanus toxoid, and acellular pertussis-containing vaccines. In: *Adverse effects of vaccines: evidence and causality*. Washington, DC: The National Academies Press;2012:557-8. <https://doi.org/10.17226/13164>.
- 35 Institute of Medicine. Diphtheria and tetanus toxoids. In: *Adverse events associated with childhood vaccines: evidence bearing on causality*. Washington, DC. The National Academies Press; 1994:67-117. <https://doi.org/10.17226/2138>.
- 36 Centers for Disease Control and Prevention. General recommendations on immunization: recommendations of the Advisory Committee on Immunization Practices (ACIP):*MMWR*. 2011;60(2):1-60.
- 37 Menveo [package insert]. GSK Vaccines, Srl, Bellaria-Rosia 53018, Sovicille (SI), Italy. Available at: [https://www.gsksource.com/pharma/content/dam/GlaxoSmithKline/US/en/Prescribing\\_Information/Menveo/pdf/MENVEO.PDF](https://www.gsksource.com/pharma/content/dam/GlaxoSmithKline/US/en/Prescribing_Information/Menveo/pdf/MENVEO.PDF). Accessed 16 November 2017.
- 38 Menactra®[package insert]: Sanofi Pasteur Inc., Swiftwater, PA, USA. Available at: <https://www.fda.gov/downloads/BiologicsBloodVaccines/Vaccines/ApprovedProducts/UCM131170.pdf>. Accessed on 16 November 2017.
- 39 Kroger AT, Duchin J, Vázquez M. General Best Practice Guidelines for Immunization. Best Practices Guidance of the Advisory Committee on Immunization Practices (ACIP). Available from [www.cdc.gov/vaccines/hcp/acip-recs/general-recs/downloads/general-recs.pdf](http://www.cdc.gov/vaccines/hcp/acip-recs/general-recs/downloads/general-recs.pdf). Accessed 3 May 2018.
- 40 Marin M, Güris Dalya, Chaves SS, et al, Recommendations of the Advisory Committee on Immunization Practices (ACIP), Division of Viral Diseases, National Center for Immunization and Respiratory Diseases, CDC. Available from <https://www.cdc.gov/mmwr/preview/mmwrhtml/rr5604a1.htm>. Accessed 3 May 2018.
- 41 Centers for Disease Control and Prevention *Epidemiology and Prevention of Vaccine-Preventable Diseases*, 13th Edition, April 2015. Available at <https://www.cdc.gov/vaccines/pubs/pinkbook/varicella.html>. Accessed 3 May 2018.
- 42 Pentacel [package insert]. Sanofi Pasteur Ltd, Toronto, Ontario, Canada. Available at: <https://www.fda.gov/downloads/biologicsbloodvaccines/vaccines/approvedproducts/ucm109810.pdf>. Accessed 16 November 2017.

- 43 Pediarix [package insert]. GlaxoSmithKline Biologicals, Rixensart, Belgium. Available at: <https://www.fda.gov/downloads/BiologicsBloodVaccines/Vaccines/ApprovedProducts/UCM241874.pdf> Accessed 16 November 2017.
- 44 ActHIB®[package insert]: Sanofi Pasteur Inc., Swiftwater, PA, USA. Available at <https://www.fda.gov/downloads/biologicsbloodvaccines/vaccines/approvedproducts/ucm109841.pdf>. Accessed 16 November 2017
- 45 Hiberix®[package insert]: GlaxoSmithKline Biologicals, Rixensart, Belgium. Available at <https://www.fda.gov/downloads/biologicsbloodvaccines/vaccines/approvedproducts/ucm179530.pdf>. Accessed 16 November 2017
- 46 PedvaxHIB®[package insert]: Merck &Co., Inc., West Point, PA, USA. Available at <https://www.fda.gov/downloads/BiologicsBloodVaccines/Vaccines/ApprovedProducts/UCM253652.pdf>. Accessed 16 November 2017.
- 47 Prevnar 13® [package insert]. Wyeth Pharmaceuticals, Inc., a subsidiary of Pfizer Inc, Philadelphia, PA, USA. Available at: <https://www.fda.gov/downloads/biologicsbloodvaccines/vaccines/approvedproducts/ucm201669.pdf>. Accessed on 16 November 2017.
- 48 RotaTeq® [package insert]. Merck Sharp & Dohme Corp., a subsidiary of Merck & Co., Inc., Whitehouse Station, NJ, USA. Available at: <https://www.fda.gov/downloads/biologicsbloodvaccines/vaccines/approvedproducts/ucm142288.pdf>. Accessed on 16 November 2017.
- 49 ENGERIX-B® [package insert]. GlaxoSmithKline Biologicals 441 Rixensart, Belgium. Available at: <https://www.fda.gov/downloads/biologicsbloodvaccines/vaccines/approvedproducts/ucm224503.pdf>. Accessed on 16 November 2017.
- 50 RecombivaxHB®[package insert]: Merck Sharp & Dohme Corp., a subsidiary of Merck & Co., Inc., Whitehouse Station, NJ, USA. Available at: <https://www.fda.gov/downloads/biologicsbloodvaccines/vaccines/approvedproducts/ucm110114.pdf> Accessed on 16 November 2017.
- 51 M-M-R® II [package insert]. Merck Sharp & Dohme Corp., a subsidiary of Merck & Co., Inc., Whitehouse Station, NJ, USA. Available at: <https://www.fda.gov/downloads/biologicsbloodvaccines/vaccines/approvedproducts/ucm123789.pdf>. Accessed on 16 November 2017.
- 52 VARIVAX® [package insert]. Merck Sharp & Dohme Corp., a subsidiary of Merck & Co., Inc., Whitehouse Station, NJ, USA. Available at: [https://www.merck.com/product/usa/pi\\_circulars/v/varivax/varivax\\_pi.pdf](https://www.merck.com/product/usa/pi_circulars/v/varivax/varivax_pi.pdf). Accessed on 16 November 2017.
- 53 Lead Exposure in Children: Prevention, Detection, and Management. (2005). PEDIATRICS, 116(4), pp. 1036-1046
- 54 Bonhoeffer J, Menkes J, Gold MS, et al. Generalized convulsive seizure as an adverse event following immunization: case definition and guidelines for data collection, analysis, and presentation. Vaccine. 2004;22:557-62.

- 55 Marcy SM, Kohl KS, Dagan R, et al. Fever as an adverse event following immunization: case definition and guidelines of data collection, analysis and presentation. *Vaccine*. 2004; 22:551-556.
- 56 Newburger JW, Takahashi M, Gerber MA, et al. Diagnosis, treatment, and long-term management of Kawasaki disease: a statement for health professionals from the Committee on Rheumatic Fever, Endocarditis, and Kawasaki Disease, Council on Cardiovascular Disease in the Young, American Heart Association. *Pediatrics*. 2004;114(6):1708-33
- 57 Centers for Disease Control and Prevention. Kawasaki Syndrome Case Report 2003. Available online: [http://www.cdc.gov/kawasaki/pdf/ks\\_case\\_report-fillable.pdf](http://www.cdc.gov/kawasaki/pdf/ks_case_report-fillable.pdf). Accessed 17 November 2017
- 58 Chu YW, Korb J, Sakamoto M. Idiopathic thrombocytopenic purpura. *Pediatr Rev*. 2000;21(3):95-104



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