swissmedic

Date: 6 July 2026
Swissmedic, Swiss Agency for Therapeutic Products

Swiss Public Assessment Report
Extension of therapeutic indication

MenQuadfi

International non-proprietary name: polysaccharida Neisseriae meningitidis (A, C, W-135, Y) conjugatum cum toxoidum tetani

Pharmaceutical form:	solution for injection
Dosage strength(s):	0.5 ml
Route(s) of administration:	intramuscular use
Marketing authorisation holder:	Sanofi-Aventis (Suisse) SA
Marketing authorisation no.:	68221
Decision and decision date:	extension of therapeutic indication approved on 17.02.2026

Note:

This assessment report is as adopted by Swissmedic with all information of a commercially confidential nature deleted.

SwissPARs are final documents that provide information on submissions at a particular point in time. They are not updated after publication.

Table of contents

1 Terms, Definitions, Abbreviations

ADA	Anti-drug antibody
ADME	Absorption, distribution, metabolism, elimination
AE	Adverse event
ALT	Alanine aminotransferase
API	Active pharmaceutical ingredient
AST	Aspartate aminotransferase
ATC	Anatomical Therapeutic Chemical Classification System
AUC	Area under the plasma concentration-time curve
$AUC_{0\text{-}24h}$	Area under the plasma concentration-time curve for the 24-hour dosing interval
CI	Confidence interval
C_{max}	Maximum observed plasma/serum concentration of drug
CYP	Cytochrome P450
DDI	Drug-drug interaction
EMA	European Medicines Agency
ERA	Environmental Risk Assessment
FDA	Food and Drug Administration (USA)
GI	Gastrointestinal
GLP	Good Laboratory Practice
HPLC	High-performance liquid chromatography
IC/EC_{50}	Half-maximal inhibitory/effective concentration
ICH	International Council for Harmonisation
Ig	Immunoglobulin
INN	International non-proprietary name
ITT	Intention-to-treat
LoQ	List of Questions
MAH	Marketing authorisation holder
Max	Maximum
Min	Minimum
MRHD	Maximum recommended human dose
N/A	Not applicable
NO(A)EL	No observed (adverse) effect level
PBPK	Physiology-based pharmacokinetics
PD	Pharmacodynamics
PIP	Paediatric investigation plan (EMA)
PK	Pharmacokinetics
PopPK	Population pharmacokinetics
PSP	Pediatric Study Plan (US FDA)
RMP	Risk Management Plan
SAE	Serious adverse event
SwissPAR	Swiss Public Assessment Report
TEAE	Treatment-emergent adverse event
TPA	Federal Act of 15 December 2000 on Medicinal Products and Medical Devices (SR 812.21)
TPO	Ordinance of 21 September 2018 on Therapeutic Products (SR 812.212.21)

2 Background information on the procedure

2.1 Applicant's request(s) and information regarding procedure

Extension(s) of the therapeutic indication(s)
The applicant requested the addition of a new therapeutic indication or modification of an approved one in accordance with Article 23 TPO.

Work-sharing procedure
The applicant requested a work-sharing procedure with Australia, Canada, Singapore and Switzerland.
The Access NAS (new active substance) work-sharing initiative is a collaboration between regulatory authorities – specifically Australia's Therapeutic Goods Administration (TGA), Health Canada (HC), Singapore's Health Sciences Authority (HSA), the UK Medicines & Healthcare products Regulatory Agency (MHRA) and Swissmedic – and the pharmaceutical industry.
The work-sharing initiative involves the coordinated assessment of NAS applications that have been filed in at least two jurisdictions.

2.2 Indication and dosage

2.2.1 Requested indication

MenQuadfi is indicated for the active immunisation of individuals from the age of 6 weeks and older against invasive meningococcal disease caused by Neisseria meningitidis of serogroups A, C, W, and Y.

2.2.2 Approved indication

MenQuadfi is indicated for the active immunisation of individuals from the age of 6 weeks and older against invasive meningococcal disease caused by Neisseria meningitidis of serogroups A, C, W, and Y.

2.2.3 Requested dosage

Summary of the requested standard dosage:

Primary Vaccination:

Infants from 6 weeks through 5 months of age	Infants from 6 months through 11 months of age	Individuals 12 months of age and older
4-dose series	2-dose series	
• 3 doses with a minimum interval of 2 months • 4th dose in the second year of life (from 12 to 18 months of age)	2 doses with a minimum interval of 2 months, with the 2nd dose administered in the second year of life	1 single dose

Booster Vaccination:

- A single dose (0.5 mL) of MenQuadfi may be used to boost individuals 12 months of age and older who have previously received a meningococcal conjugate vaccine containing the same serogroups (see “Clinical efficacy” section)
- There are no data available to indicate the need for or timing of a booster dose of MenQuadfi for individuals who have been primed with MenQuadfi.

Antibody persistence data following vaccination with MenQuadfi are available (see “Warnings and precautions” and “Pharmacodynamics" sections).
Other Paediatric Population:

- Data indicate that MenQuadfi can be given with the same posology to infants with a history of preterm birth (<37 weeks gestational age).
- The safety and immunogenicity of MenQuadfi in individuals under 6 weeks of age have not yet been established.

2.2.4 Approved dosage

(see appendix)

2.3 Regulatory history (milestones)

Application	25.03.2025
Formal objection	01.04.2025
Response to formal objection	06.04.2025
Formal control completed	23.04.2025
List of Questions (LoQ)	21.08.2025
Response to LoQ	20.10.2025
Preliminary decision	04.12.2025
Response to preliminary decision	21.12.2025
Final decision	17.02.2026
Decision	approval

3 Nonclinical aspects

The applicant did not submit new nonclinical studies to support the requested extension of the indication. This was considered acceptable. Based on the ERA, the extension of the indication will not be associated with a significant risk for the environment.
From the nonclinical point of view, there are no objections to approval of the proposed extension of indication.

4 Clinical aspects

Swissmedic has not assessed the primary data relating to clinical aspects submitted with this application and relies on the assessment of the foreign reference authority, Singapore's Health Sciences Authority (HSA) (see section 2.1 Applicant's request / Work-sharing procedure).

5 Risk management plan summary

The RMP summaries contain information on the medicinal products′ safety profiles and explain the measures that are taken to further investigate and monitor the risks, as well as to prevent or minimise them.
The RMP summaries are published separately on the Swissmedic website. It is the responsibility of the marketing authorisation holder to ensure that the content of the published RMP summaries is accurate and correct. As the RMPs are international documents, their summaries might differ from the content in the Information for healthcare professionals / product information approved and published in Switzerland, e.g. by mentioning risks that occur in populations or indications not included in the Swiss authorisations.

6 Appendix

Approved Information for healthcare professionals

Please be aware that the following version of the Information for healthcare professionals for MenQuadfi was approved with the submission described in the SwissPAR. This Information for healthcare professionals may have been updated since the SwissPAR was published.

Please note that the valid and relevant reference document for the effective and safe use of medicinal products in Switzerland is the Information for healthcare professionals currently authorised by Swissmedic (see www.swissmedicinfo.ch).

Note:
The following Information for healthcare professionals has been translated by the MAH. It is the responsibility of the authorisation holder to ensure the translation is correct. The only binding and legally valid text is the Information for healthcare professionals approved in one of the official Swiss languages.

▼ This medicinal product is subject to additional monitoring. This will allow quick identification of new safety information. Healthcare professionals are asked to report any suspected new or serious adverse reactions. See the "Undesirable effects" section for advice on the reporting of adverse reactions.

MenQuadfi®

Composition

Active substances

Neisseria meningitidis group A, C, W-135 and Y polysaccharides conjugated to tetanus toxoid carrier protein.

Excipients

Sodium chloride, Sodium acetate, Water for injections
This medicine contains 1.67 mg sodium per dose.

Pharmaceutical form and active substance quantity per unit

Ready to use solution for injection.
Clear colourless solution.

One dose (0.5mL) contains:

Neisseria meningitidis group A polysaccharide[1] 10 micrograms
Neisseria meningitidis group C polysaccharide[1] 10 micrograms
Neisseria meningitidis group W-135 polysaccharide[1] 10 micrograms
Neisseria meningitidis group Y polysaccharide[1] 10 micrograms
[1]Conjugated to tetanus toxoid carrier protein 55 micrograms.

Indications/Uses

MenQuadfi is indicated for the active immunisation of individuals from the age of 6 weeks and older against invasive meningococcal disease caused by *Neisseria meningitidis* of serogroups A, C, W, and Y.
This vaccine should be used in accordance with official vaccination recommendations.

Dosage/Administration

Primary Vaccination:

Infants from 6 weeks through 5 months of age	Infants from 6 months through 11 months of age	Individuals 12 months of age and older
4-dose series	2-dose series	

• 3 doses with a minimum interval of 2 months • 4th dose in the second year of life (from 12-18 months of age)	2 doses with a minimum interval of 2 months, with the 2nd dose administered in the second year of life	1 single dose

Booster Vaccination:

- A single dose (0.5 mL) of MenQuadfi (MenACWY) may be used to boost individuals 12 months of age and older who have previously received a meningococcal conjugate vaccine containing the same serogroups (see section “Clinical efficacy”)
- There are no data available to indicate the need for or timing of a booster dose of MenQuadfi for individuals who have been primed with MenQuadfi.

Antibody persistence data following vaccination with MenQuadfi are available (see section “Warnings and precautions” and “Pharmacodynamics").

Other Paediatric Population:

- Data indicate that MenQuadfi can be given with the same posology to infants with a history of preterm birth (<37 weeks gestational age).
- The safety and immunogenicity of MenQuadfi in individuals under 6 weeks of age have not yet been established.

Mode of administration

For intramuscular injection only. Depending on the recipient’s age and muscle mass, the injection should be carried out preferably into the upper arm (deltoid muscle) or the anterolateral thigh region.
To ensure traceability of biotechnological medicinal products, it is recommended that the trade name and batch number should be documented for each treatment.

Contraindications

Hypersensitivity to the active substances or to any of the excipients (including tetanus toxoid) or after previous administration of the vaccine or a vaccine containing the same components.

Warnings and precautions

MenQuadfi should not be administered subcutaneously, intravascularly or intradermally.
It is good clinical practice to precede vaccination by a review of the medical history (especially with regard to previous vaccination and possible occurrence of undesirable effects) and a clinical examination.
As with all injectable vaccines, appropriate medical treatment and supervision should always be readily available in case of an anaphylactic event following administration of the vaccine.

Vaccination should be postponed in individuals suffering from an acute severe febrile illness. However, the presence of a minor infection should not result in the deferral of vaccination.
Syncope (fainting) and other anxiety related reactions can occur following or even before any vaccination as a psychogenic response to the needle injection. Procedures should be in place to prevent falling and injury and to manage syncope.
Following vaccination with another conjugated quadrivalent meningococcal vaccine (ACWY-D)*, there was evidence of a potential increase in the risk of developing Guillain-Barré syndrome based on pharmacovigilance data. There are no data currently available to assess the potential risk following the use of MenQuadfi.
*Not approved in Switzerland.
MenQuadfi should be given with caution to individuals with thrombocytopenia or any coagulation disorder that would contraindicate intramuscular injection unless the potential benefit clearly outweighs the risk of administration.
MenQuadfi will only protect against *Neisseria meningitidis* groups A, C, W and Y. The vaccine will not protect against any other *Neisseria meningitidis* groups.
As with any vaccine, vaccination with MenQuadfi may not protect all vaccine recipients.
A decrease in serum bactericidal antibody titers against serogroup A when using human complement in the assay (hSBA) has been reported for MenQuadfi and other quadrivalent meningococcal vaccines. The clinical relevance of this observation is unknown.
Lower hSBA geometric mean titers (GMTs) against the serogroup A have been observed after a single dose of MenQuadfi was administered to toddlers previously primed with serogroup C meningococcal conjugate vaccine (MenC-CRM) during infancy. Nevertheless, seroprotection rates were comparable among treatment groups of MenC-primed toddlers (see section “Clinical efficacy”). The clinical relevance of this observation is unknown. This aspect might be considered for individuals at high risk for MenA infection who received MenC-CRM vaccine in their first year of life.
It is possible that in individuals receiving immunosuppressive treatment or suffering from immunodeficiency, an adequate immune response may not be elicited. Individuals with familial complement deficiencies (for example, C5 or C3 deficiencies) as well as individuals receiving treatments that inhibit terminal complement activation are at increased risk of invasive disease caused by *Neisseria meningitidis* groups A, C, W and Y, even if they develop antibodies following vaccination with MenQuadfi. There are no data available on the use in immunocompromised patients.
Vaccination with MenQuadfi does not substitute for routine tetanus vaccination.
Co-administration of MenQuadfi with a tetanus toxoid-containing vaccine does not impair the response to tetanus toxoid or impact the safety.
This medicine contains less than 1 mmol sodium (23 mg) per dose, that is to say essentially ‘sodium-free’.

Interactions

Injection sites on separate limbs and separate syringes must be used in the case of concomitant administration with other medicinal products.

For ages 6 weeks through 23 months, MenQuadfi was evaluated in a clinical trial along with the measles-mumps-rubella (MMR) vaccine + varicella (V) vaccine, combined diphtheria, tetanus and acellular pertussis (DTaP) vaccines, including combination DTap vaccines with hepatitis B (HBV), inactivated poliovirus (IPV) or Haemophilus influenzae type b (Hib) such as DTaP-IPV-HB-Hib or DTaP-IPV/Hib vaccine (Hib conjugated to tetanus toxoid), 13-valent pneumococcal polysaccharides conjugate vaccines (PCV-13) and pentavalent rotavirus vaccine (see section “Undesirable effects”). Lower hSBA GMTs on day 30 post-dose for serogroup A have been observed when MenQuadfi was administered concomitantly with PCV-13. The clinical relevance of this observation is unknown. As a precaution in children initiating MenQuadfi vaccination at 12-23 months of age and who are at high risk for serogroup A disease, consideration might be given for administration of MenQuadfi and PCV-13 vaccines separately.

For ages 10–17 years, MenQuadfi was evaluated in a clinical trial along with diphtheria, tetanus and pertussis (acellular, component) vaccine (adsorbed, reduced antigen(s) content) (Tdap) or Tdap and inactivated poliovirus vaccine (Tdap-IPV), and 4-valent human papillomavirus vaccines (recombinant, adsorbed) (4vHPV) or 9-valent HPV vaccine (9vHPV). However, the antibody responses to some of the antigens affected by the co-administration.

In children and adolescents (10–17 years of age), who had not received meningococcal vaccination, the immune response to MenQuadfi as well as to the diphtheria, tetanus or HPV vaccine components was not adversely impacted by the concomitant administration.

Meningococcal vaccine naïve children and adolescents aged 10–17 years had no inferior response to PT and lower antibody responses to FHA, PRN and FIM when MenQuadfi was administered concomitantly with Tdap and 4vHPV vaccine compared to co-administration with 4vHPV vaccine alone (immune response assessed after the full series of HPV was completed).

Similar results have been reported with other quadrivalent meningococcal conjugate vaccines. Since there is no established correlate of protection for pertussis, the clinical relevance of this observation is unknown.

The co-administration of MenQuadfi with Tdap-IPV and 9vHPV in children and adolescents aged 10-17 years resulted in lower GMTs and seroresponse rates for serogroup A, lower GMTs for serogroup W, lower responses to inactivated polio types 1 and 3, diphtheria, and anti-HPV types 6 and 58 (immune response assessed after the first dose of 9vHPV) compared to when MenQuadfi was given sequentially with Tdap-IPV and 9vHPV. The clinical implication of the observed reduced titre responses is unclear. Consideration might be given for sequential administration of MenQuadfi with Tdap-IPV and 9vHPV (see section “Undesirable Effects”).

There was no suggestion of interference in MenQuadfi hSBA immune response rates when the vaccine was co-administered with a meningococcal serogroup B vaccine. The impact of MenQuadfi on immune response to meningococcal serogroup B vaccine has not been evaluated in clinical trials (see section “Undesirable effects”).
Concomitant administration of MenQuadfi with other vaccines than those previously mentioned has not been studied.

Pregnancy, lactation

Pregnancy

There are no clinical data on the use of MenQuadfi in pregnant women. Animal studies do not indicate direct or indirect harmful effects with respect to reproductive toxicity (see section “Preclinical data”). MenQuadfi should be used during pregnancy only if the potential benefits to the mother outweigh the potential risks, including those to the foetus.

Lactation

It is unknown whether MenQuadfi is excreted in human milk. MenQuadfi should be used during breast-feeding only if the potential benefits to the mother outweigh the potential risks, including those to the breastfed child.

Fertility

A developmental and reproductive toxicity study was performed in female rabbits. There were no effects on mating performances or female fertility. No study was conducted on male fertility (see section “Preclinical data”).

Effects on ability to drive and use machines

MenQuadfi has no or negligible influence on the ability to drive and use machines.
However, some of the effects mentioned under section “Undesirable effects” may temporarily affect the ability to drive or use machines.

Undesirable effects

Summary of the safety profile

The safety of MenQuadfi presented in the tables below is based on three clinical datasets:

- For children, adolescents, adults, and older adults, a pooled analysis of data from 4919 individuals who received a single dose of MenQuadfi either as a primary dose (N = 4517) or a booster dose (N = 402). Participants aged 2 years and older were monitored for 6 months post-vaccination. This included 498 children aged 2 to 9 years, 2289 children and adolescents aged 10 to 17 years, 1684 adults aged 18 to 55 years, 199 older adults aged 56 through 64 years, and 249 elderly aged 65 years and older. Of these, 392 adolescents received MenQuadfi co-administered with Tdap and 4vHPV.

- A pooled analysis of 1389 toddlers aged 12 through 23 months of age who received a single dose of MenQuadfi. Of these, 589 toddlers received MenQuadfi co-administered with MMR+V (N = 189), DTaP-IPV-HB-Hib (N = 200) or PCV-13 (N = 200). Participants 12 to 23 months of age were monitored for 30 days post-vaccination.
- A pooled analysis of data from 6060 infants initiating vaccination from 6 weeks of age to less than 12 months of age who received at least one dose of a primary series consisting of one, two or three primary doses of MenQuadfi and 5373 toddlers who received a booster dose from 12 months of age. MenQuadfi was co-administered with routine paediatric vaccines. The routine paediatric vaccines include DTaP-IPV/Hib or DTaP-IPV-HepB or DTaP-IPV-HepB-Hib or DTPa-HepB-IPV/Hib, Hib vaccine, PCV-13 or PCV-10, pentavalent rotavirus vaccine, HepB, MMR, Varicella or HepA.

The most common occurring adverse reactions within 7 days of vaccination of MenQuadfi in children 2 years and older were injection site pain (38.7 %) and myalgia (30.5 %). For infants and toddlers from 6 weeks of age to less than 23 months of age, the most common adverse reactions were irritability (74.6%) and abnormal crying (66.2%). These adverse reactions were mostly mild or moderate in intensity.
The incidence of adverse reactions after a booster dose of MenQuadfi in participants from 12 months of age and older were comparable to those seen in participants who received a primary dose of MenQuadfi.
When MenQuadfi was co-administered with routine paediatric and adolescent vaccines, the safety profiles of the vaccines were comparable to those observed when the vaccines were not administered with MenQuadfi, except:

- Overall, rates of adverse reactions were higher in toddlers aged 12 through 23 months of age who received PCV-13 given concomitantly with MenQuadfi (36.5 %) than in toddlers who received PCV-13 alone (17.2 %).
- The rates of injection site reaction pain at the 9vHPV injection site were higher when given concomitantly with Tdap-IPV and MenQuadfi (83.6%) compared to when Tdap-IPV and 9vHPV were given without MenQuadfi (67.3%).
- Higher rates of solicited injection site and systemic reactions were observed in participants who received MenQuadfi concomitantly with meningococcal serogroup B vaccine (MenB) compared to when MenQuadfi was given alone.

Tabulated list of adverse reactions

The following adverse reactions, as listed below, have been identified (1) clinical studies conducted with MenQuadfi when the vaccine was given alone to participants 2 years of age and older and (2) post marketing surveillance. The safety profile observed in infants and toddlers aged 6 weeks through 23 months is presented in the section “Paediatric population from 6 weeks through 23 months of age”.

The adverse reactions should be arranged according to MedDRA system organ classes and the conventional frequencies as follows: "very common" (≥ 1/10), "common" (≥ 1/100, < 1/10), "uncommon" (≥ 1/1,000, < 1/100), "rare" (≥ 1/10,000, < 1/ 1,000), “very rare” (<1/10’000), “not known” (frequency cannot be estimated from the available data)

Table 1: Adverse reactions following administration of MenQuadfi from clinical trials and post marketing surveillance in individuals 2 years of age and above

System organ class	Frequency	Adverse reactions
Blood and lymphatic system disorders	Rare	Lymphadenopathy
Immune system disorders	Not known	Hypersensitivity including Anaphylaxis*
Nervous system disorders	Very common	Headache (26.5 %)
	Uncommon	Dizziness
	Not known	Convulsions with or without fever*
Gastrointestinal disorders	Uncommon	Vomiting, nausea
	Rare	Diarrhoea, stomach pain
Skin and subcutaneous tissue disorders	Rare	Urticaria, pruritus, rash
Musculoskeletal and connective tissue disorders	Very common	Myalgia (30.5 %)
	Rare	Pain in extremity
General disorders and administration site conditions	Very common	Malaise (21.7 %), Injection site pain (38.7 %)
	Common	Fever, Injection site reactions (swelling, erythema)
	Uncommon	Fatigue, Injection site reactions (pruritus, warmth, bruising, rash)
	Rare	Chills, axillary pain, Injection site induration

*Adverse reactions from spontaneous reporting

The safety profile of MenQuadfi in children and adolescents 2 to 17 years of age was generally comparable to that in adults. Injection site erythema and swelling at the injection site of MenQuadfi were reported more frequently in children 2 to 9 years of age (very common) than in the older age groups.

Injection site reactions within 7 days were more commonly observed after booster vaccination in children 4 to 5 years of age (MET62) who were previously vaccinated 3 years earlier in MET54 (NCT03205358). The most common injection site reactions after MenQuadfi booster dose were pain (61.9 % in individuals primed with MenQuadfi vs. 71.4 % in individuals primed with MenACWY-TT), erythema (52.4 % vs. 55.1 %) and swelling (38.1 % vs. 38.8 %). These adverse reactions were mild or moderate in intensity.

Paediatric population from 6 weeks through 23 months of age

When co-administered with routine paediatric vaccines, the safety profile of MenQuadfi when administered in the second year of life as a 4th dose in a 4-dose series or a 2nd dose in a 2-dose series was similar to its safety profile in infants from 6 weeks to less than 12 months of age and when MenQuadfi was administered as a single primary dose in individuals 12 through 23 months of age. The following additional reactions, as listed below in Table 2, have been reported following administration of MenQuadfi in infants and toddlers.

Table 2: Adverse reactions following administration of MenQuadfi from clinical trials and post-marketing surveillance in individuals 6 weeks through 23 months of age

System Organ Class	Frequency	Adverse reactions
Infections and infestations	Uncommon	Nasopharyngitis
	Rare	Upper respiratory tract infection
Immune system disorder	Very rare	Anaphylactic reaction*
	Not known	Hypersensitivity*
Metabolism and nutrition disorders	Very common	Appetite lost (45.5%)
Psychiatric disorders	Very common	Irritability (74.6%)
	Uncommon	Insomnia
Nervous system disorders	Very common	Drowsiness (63%)
	Rare	Febrile convulsions*, seizures*
Gastrointestinal disorders	Very common	Vomiting** (24.5%)
	Common	Diarrhoea***
Skin and subcutaneous tissue disorder	Uncommon	Urticaria***, Rash
	Rare	Petechiae
General disorders and administration site conditions	Very common	Fever** (32.2%), abnormal crying (66.2%)
		At the injection site: tenderness /pain (64.6%), erythema (39.1%), swelling (25.5%)
	Common	At the injection site: bruising**
	Uncommon	At the injection site: haemorrhage, induration, warmth

* Adverse reactions identified post-marketing

**Less frequent in toddlers 12 months through 23 months

***Less frequent in infants aged 6 weeks < 12 months of age

Preterm infants

The safety of MenQuadfi was evaluated in 237 infants with a history of preterm birth (31 to < 37 weeks of gestational age) and no differences in adverse reactions following MenQuadfi were found between these infants and those who were born full term.

Older population (> 55 years of age)

Overall, the same injection site and systemic adverse reactions but at lower frequencies were observed within seven days of vaccination with a single dose of MenQuadfi in older adults (56 years of age and older) than in younger adults (18 to 55 years old). Only injection site pruritus has been reported more frequently in older adults. These adverse reactions mostly were mild or moderate in intensity.
Reporting suspected adverse reactions after authorisation of the medicinal product is very important. It allows continued monitoring of the benefit/risk balance of the medicinal product. Healthcare professionals are asked to report any suspected adverse reactions online via the ElViS portal (Electronic Vigilance System). You can obtain information about this at www.swissmedic.ch.

Overdose

Overdose with MenQuadfi is unlikely due to its presentation as a single dose vial. In the event of overdose, monitoring of vital functions and possible symptomatic treatment is recommended.

Properties/Effects

ATC code

J07AH08

Mechanism of action

Anti-capsular meningococcal antibodies protect against meningococcal diseases via complement mediated bactericidal activity.
MenQuadfi induces the production of bactericidal antibodies specific to the capsular polysaccharides of *Neisseria meningitidis* serogroups A, C, W and Y.

Pharmacodynamics

Pharmacotherapeutic group: meningococcal vaccines

Clinical efficacy

Immunogenicity

The immunogenicity of MenQuadfi in infants initiating vaccination from 6 weeks to less than 12 months of age was assessed in two pivotal studies where MenQuadfi was given as a 4-dose or 2-dose series. The immunogenicity of MenQuadfi has been evaluated in toddlers, children and adolescents, adults and older adults when given as a primary vaccination dose (or series) and a booster vaccination. In addition, clinical data on the persistence of antibody response from at least 3 years and up to 7 years after primary vaccination with MenQuadfi are available.
Primary immunogenicity analyses were conducted by measuring serum bactericidal activity (SBA) using human serum as the source of exogenous complement (hSBA). Rabbit complement (rSBA)

data are available in subsets in all age groups and generally follows the trends observed with human complement (hSBA) data. In addition, primary immunogenicity analyses were conducted by measuring both hSBA and rSBA for serogroup C in MEQ00065.

Immunogenicity in infants initiating vaccination from 6 weeks through 6 months of age

MET42 compared the immunogenicity of a 4-dose series (given at 2, 4 and 6 and 12-18 months of age) of MenQuadfi to that of MenACWY-CRM 30 days after the third and fourth vaccination. The percentage of individuals with hSBA titres ≥ 1:8 (seroprotection rate), hSBA seroresponse rate, and GMTs are presented in Table 3.

Immune non-inferiority, based on seroresponse rates, after the fourth dose was demonstrated for MenQuadfi as compared to MenACWY-CRM for all four serogroups.

Immune non-inferiority, based on seroprotection rates, after the third dose was demonstrated for MenQuadfi as compared to MenACWY-CRM for all four serogroups.

Table 3: Comparison of bactericidal antibody responses to MenQuadfi and MenACWY-CRM 30 days after vaccination with routine infant vaccines at 2, 4, 6 and 12-18 months (study MET42)*

	Post 3rd Dose		Pre 4th dose		Post 4th dose	
Endpoint	MenQuadfi (95% CI)	MenACWY-CRM (95% CI)	MenQuadfi (95% CI)	MenACWY-CRM (95% CI)	MenQuadfi (95% CI)	MenACWY-CRM (95% CI)
A	N=682-852	N=322-409	N=607	N=282	N=501-642	N=223-296
% ≥1:8 (Seroprotection)‡	77.9 (75.0; 80.7)	67.7 (63.0; 72.2)	62.8 (58.8; 66.6)	46.5 (40.5; 52.5)	87.7 (84.9; 90.1)	88.2 (83.9; 91.6)
% Seroresponse†‡	64.4 (60.6; 68.0)	50.6 (45.0; 56.2)	-	-	79.4 (75.6; 82.9)	77.6 (71.5; 82.9)
hSBA GMT	25 (23; 28)	15 (13; 18)	11 (10; 12)	7 (6; 8)	67 (58; 78)	57 (47; 70)
C	N=691-835	N=338-421	N=612	N=284	N=530-655	N=238-300
% ≥1:8 (Seroprotection)‡	99.0 (98.1; 99.6)	91.2 (88.1; 93.7)	93.1 (90.8; 95.0)	30.6 (25.3; 36.4)	99.4 (98.4; 99.8)	93.3 (89.9; 95.9)
% Seroresponse†‡	96.4 (94.7; 97.6)	82.8 (78.4; 86.7)	-	-	97.0 (95.1; 98.3)	88.2 (83.4; 92.0)
hSBA GMT	391 (356; 428)	53 (46; 61)	61 (54; 69)	4 (4; 5)	678 (606; 758)	91 (76; 109)
W	N=739-883	N=369-438	N=619	N=288	N=540-651	N=250-305
% ≥1:8 (Seroprotection)‡	98.6 (97.6; 99.3)	92.9 (90.1; 95.1)	97.1 (95.4; 98.3)	61.5 (55.6; 67.1)	99.4 (98.4; 99.8)	99.0 (97.2; 99.8)

% Seroresponse†‡	92.8 (90.7; 94.6)	85.6 (81.6; 89.1)	-	-	97.6 (95.9; 98.7)	96.4 (93.3; 98.3)
hSBA GMT	98 (91; 106)	49 (43; 55)	58 (53; 64)	9 (8; 10)	387 (352; 426)	175 (149; 206)
Y	N=701-861	N=347-423	N=611	N=287	N=523-651	N=233-295
% ≥1:8 (Seroprotection)‡	98.3 (97.1; 99.0)	91.7 (88.7; 94.2)	96.2 (94.4; 97.6)	67.9 (62.2; 73.3)	99.1 (98.0; 99.7)	98.6 (96.6; 99.6)
% Seroresponse†‡	88.7 (86.2; 91.0)	81.8 (77.4; 85.8)	-	-	96.4 (94.4; 97.8)	92.3 (88.1; 95.4)
hSBA GMT	88 (81; 96)	41 (36; 46)	44 (40; 48)	10 (9; 11)	296 (268; 327)	186 (158; 219)

* Clinical trial identifier NCT03537508

N: number of individuals in per-protocol analysis set with valid serology results.

‡Non-inferiority criterion met (lower limit of the 2-sided 95% CI is > -10%)

† Seroresponse rate (primary endpoint) for each serogroup: the proportion of individuals with an hSBA pre-vaccination titre <1:8 who achieved a post-vaccination titre ≥ 1:16, or pre-vaccination titre ≥ 1:8 who achieved a post-vaccination titre at least 4-fold greater than the pre-vaccination titre.

95% CI of the single proportion calculated from the exact binomial method

Preterm infants

When MenQuadfi was given as a 4-dose series, the immune responses in infants with a history of preterm birth (<37 weeks gestational age) (N=61-71) were comparable to those infants who were born full term.

Immunogenicity in infants initiating vaccination from 6 months to less than 12 months of age

MET61 compared the immunogenicity of a 2-dose series (given at 6-7 and 12-13 months of age) of MenQuadfi to that of MenACWY-CRM 30 days after each vaccination. The percentage of individuals with hSBA titres ≥ 1:8 (seroprotection rate), hSBA seroresponse rate, and GMTs are presented in Table 4.

Immune non-inferiority, based on seroresponse and seroprotection rates after the booster dose, was demonstrated for MenQuadfi as compared to MenACWY-CRM for all four serogroups.

Table 4: Comparison of bactericidal antibody responses to MenQuadfi and MenACWY-CRM 30 days after vaccination with routine infant vaccines at 6-7 and 12-13 months (study MET61)*

	Post 1st Dose		Pre 2nd dose		Post 2nd dose	
Endpoint	MenQuadfi (95% CI)	Menveo (95% CI)	MenQuadfi (95% CI)	Menveo (95% CI)	MenQuadfi (95% CI)	Menveo (95% CI)

A	N=108-130	N=111-132	N=103	N=91	N=141-170	N=123-158
% ≥1:8 (Seroprotection)‡	54.6 (45.7; 63.4)	37.9 (29.6; 46.7)	77.7 (68.4; 85.3)	73.6 (63.3; 82.3)	95.3 (90.9; 97.9)	93.0 (87.9; 96.5)
% Seroresponse†‡	30.6 (22.1; 40.2)	15.3 (9.2; 23.4)	-	-	89.4 (83.1; 93.9)	82.9 (75.1; 89.1)
hSBA GMT	8 (7; 10)	5 (4; 7)	20 (15; 27)	15 (11; 20)	184 (143; 237)	119 (90.6; 157)
C	N=104-127	N=107-133	N=118	N=118	N=134-162	N=126-160
% ≥1:8 (Seroprotection)‡	96.9 (92.1; 99.1)	90.2 (83.9; 94.7)	98.1 (93.2; 99.8)	69.1 (58.8; 78.3)	100 (97.7; 100)	98.1 (94.6; 99.6)
% Seroresponse†‡	92.3 (85.4; 96.6)	81.3 (72.6; 88.2)	-	-	99.3 (95.9; 100)	97.6 (93.2; 99.5)
hSBA GMT	167 (129; 217)	41 (33; 52)	150 (117; 193)	13 (10; 17)	1473 (1236; 1756)	319 (263; 388)
W	N=108-134	N=112-134	N=120	N=117	N=143-171	N=127-159
% ≥1:8 (Seroprotection)‡	38.1 (29.8; 46.8)	28.4 (20.9; 36.8)	96.2 (90.6; 99.0)	50.5 (40.0; 61.1)	100 (97.9; 100)	95.6 (91.1; 98.2)
% Seroresponse†‡	18.5 (11.7; 27.1)	8.0 (3.7; 14.7)	-	-	99.3 (96.1; 100)	92.9 (86.9; 96.7)
hSBA GMT	6 (4; 7)	4 (3; 5)	47 (36; 61)	6 (5; 8)	442 (367; 533)	106 (83; 135)
Y	N=102-125	N=106-128	N=120	N=116	N=140-170	N=128-160
% ≥1:8 (Seroprotection)‡	60.8 (51.7; 69.4)	26.6 (19.1; 35.1)	96.2 (90.6; 99.0)	54.8 (44.2; 65.2)	100 (97.9; 100)	97.5 (93.7; 99.3)
% Seroresponse†‡	30.4 (21.7; 40.3)	7.5 (3.3;14.32)	-	-	98.6 (94.9; 99.8)	97.7 (93.3; 99.5)
hSBA GMT	8 (7; 11)	4 (3; 5)	46 (36; 59)	7 (5; 8)	423 (358; 499)	133 (107; 166)

*Clinical trial identifier NCT03691610

N: number of individuals in per-protocol analysis set with valid serology results.

‡Non-inferiority criterion met (lower limit of the 2-sided 95% CI is > -10%)

†Seroresponse rate (primary endpoint) for each serogroup: the proportion of inividuals with an hSBA pre-vaccination titre <1:8 who achieved a post-vaccination titre ≥ 1:16, or pre-vaccination titre ≥ 1:8 who achieved a post-vaccination titre at least 4-fold greater than the pre-vaccination titre.

95% CI of the single proportion calculated from the exact binomial method

Immunogenicity in toddlers 12 to 23 months of age

Immunogenicity in toddlers 12 to 23 months of age was evaluated in three clinical studies (MET51 [NCT02955797], MET57 [NCT03205371] and MEQ00065 [NCT03890367]).

Table 5: Comparison of bactericidal antibody responses to MenQuadfi and MenACWY-TT vaccine 30 days after vaccination of meningococcal vaccine naïve individuals only or combined (naïve + MenC primed) individuals 12 to 23 months of age (Study MET51)

Endpoint by Serogroup	*MenQuadfi (95 % CI) Naive*	*MenACWY-TT (95 % CI) Naive*	*MenQuadfi (95 % CI) Combined (Naive + MenC Primed)*	*MenACWY-TT (95 % CI) Combined (Naive + MenC Primed)*
A	*N = 293*	*N = 295*	*N = 490*	*N = 393-394*
% ≥ 1 : 8 (Seroprotection)**	90.8 (86.9; 93.8)	89.5 (85.4; 92.7)	90.4 (87.4; 92.9)	91.6 (88.4; 94.2)
% Seroresponse*	76.8 (71.5; 81.5)	72.5 (67.1; 77.6)	76.5 (72.5; 80.2)	77.1 (72.6; 81.2)
hSBA GMT	28.7 (25.2; 32.6)	28.0 (24.4; 32.1)	29.9 (26.9; 33.2)	34.5 (30.5; 39.0)
C	*N = 293*	*N = 295*	*N = 489*	*N = 393–394*
% ≥ 1 : 8 (Seroprotection)**	99.3 (97.6; 99.9)	81.4 (76.4; 85.6)	99.2 (97.9; 99.8)	85.5 (81.7; 88.9)
% Seroresponse*	98.3 (96.1; 99.4)	71.5 (66.0; 76.6)	97.1 (95.2; 98.4)	77.4 (72.9; 81.4)
hSBA GMT	436 (380; 500)	26.4 (22.5; 31.0)	880 (748; 1,035)	77.1 (60.7; 98.0)
W	*N = 293*	*N = 296*	*N = 489*	*N = 393–394*
% ≥ 1 : 8 (Seroprotection)**	83.6 (78.9; 87.7)	83.4 (78.7; 87.5)	84.9 (81.4; 87.9)	84.0 (80.0; 87.5)
% Seroresponse*	67.6 (61.9; 72.9)	66.6 (60.9; 71.9)	70.8 (66.5; 74.8)	68.4 (63.6; 73.0)
hSBA GMT	22.0 (18.9; 25.5)	16.4 (14.4; 18.6)	24.4 (21.8; 27.5)	17.7 (15.8; 19.8)
Y	*N = 293*	*N = 296*	*N = 488–490*	*N = 394–395*
% ≥ 1 : 8 (Seroprotection)**	93.2 (89.7; 95.8)	91.6 (87.8; 94.5)	94.3 (91.8; 96.2)	91.6 (88.5; 94.2)
% Seroresponse*	81.9 (77.0; 86.1)	79.1 (74.0; 83.5)	84.8 (81.3; 87.9)	78.9 (74.6; 82.9)
hSBA GMT	38.0 (33.0; 43.9)	32.2 (28.0; 37.0)	41.7 (37.5; 46.5)	31.9 (28.4; 36.0)

N: number of individuals in per-protocol analysis dataset with valid serology results. The number of individuals varies depending on the timepoints and serogroup.

95 % CI of the single proportion calculated from the exact binomial method.

* The response of individuals with an hSBA titer < 1 : 8 at baseline who then achieved an hSBA titer ≥ 1 : 16 or the response of individuals with an hSBA titer ≥ 1 : 8 at baseline who then achieved a ≥ 4-fold increase in hSBA titer.
** Non-inferiority criterion met.

Response in toddlers previously vaccinated with MenC conjugate vaccines in their first year of life

The majority of monovalent meningococcal C conjugate vaccine primed toddlers (12 through 23 months of age) in study MET51 had hSBA titers ≥ 1 : 8: in the MenQuadfi group (N = 198) ≥ 86.7 % and in MenACWY-TT group (N = 99) ≥ 85.7 %, each at day 30 after receiving MenQuadfi or MenACWY-TT. These toddlers had received during their infancy either MenC-TT or MenC-CRM vaccines. The post vaccination seroprotection rates were comparable between MenQuadfi and MenACWY-TT for all serogroups regardless of the priming background.
In MenC-CRM primed toddlers, the GMTs for serogroup A were lower in the MenQuadfi group (N = 49) than in the MenACWY-TT group (N = 25) (12.0 [95% CI 8.23; 17.5] vs. 42.2 [95% CI 25.9; 68.8]). After administration of MenQuadfi, seroprotection rates (hSBA titers ≥ 1 : 8) for MenC-CRM-primed toddlers trended lower for serogroups A and W compared with those in the MenACWY-TT group (A: 68.8 % [95% CI 53.7; 81.3] vs. 96.0 % [95% CI 79.6; 99.9]; W: 68.1 % [95% CI 52.9; 80.9] vs. 79.2 % [95% CI 57.8; 92.9]). Serogroup Y rates trended higher than those in the MenACWY-TT group (95.8 % [95% CI 85.7; 99.5] vs. 80.0 % [95% CI 59.3; 93.2]). Serogroup C seroprotection rates were comparable in both groups (95.7 % [95% CI 85.5; 99.5] vs. 92.0 % [95% CI 74.0; 99.0]). The clinical relevance of these results is unknown. This aspect could be considered in individuals at high risk for MenA infection who received the MenC-CRM vaccine in their first year of life.

Table 6: Comparison of bactericidal antibody responses to MenQuadfi and MenACWY-TT vaccine 30 days after vaccination of meningococcal primed toddlers 12 to 23 months of age – by type of MenC priming (MET51)

	MenQuadfi		*MenACWY-TT*	
Endpoint by serogroup	*MenC-TT primed (95 % CI)*	*MenC-CRM primed (95 % CI)*	*MenC-TT primed (95 % CI)*	*MenC-CRM primed (95 % CI)*
A	*N = 149*	*N = 48*	*N = 73–74*	*N = 25*
% ≥ 1 : 8 (Seroprotection)	96.6 (92.3; 98.9)	68.8 (53.7; 81.3)	98.6 (92.7; 100.0)	96.0 (79.6; 99.9)
*% seroresponse**	84.6 (77.7; 90.0)	50.0 (35.2; 64.8)	93.2 (84.7; 97.7)	84.0 (63.9; 95.5)
hSBA GMT	43.5 (36.2; 52.2)	12.0 (8.23; 17.5)	73.7 (56.9; 95.3)	42.2 (25.9; 68.8)
C	*N = 149*	*N = 47*	*N = 73–74*	*N = 25*
% ≥ 1 : 8 (Seroprotection)	100.0 (97.6; 100.0)	95.7 (85.5; 99.5)	100.0 (95.1; 100.0)	92.0 (74.0; 99.0)
*% seroresponse**	96.6 (92.3; 98.9)	91.5 (79.6; 97.6)	95.9 (88.5; 99.1)	92.0 (74.0; 99.0)
hSBA GMT	6,026 (4,915; 7,389)	157 (94.9; 261)	3,945 (2,891; 5,385)	211 (98.7; 451)
W	*N = 149*	*N = 47*	*N = 73–74*	*N = 24*
% ≥ 1 : 8 (Seroprotection)	92.6 (87.2; 96.3)	68.1 (52.9; 80.9)	87.8 (78.2; 94.3)	79.2 (57.8; 92.9)
*% seroresponse**	85.2 (78.5; 90.5)	44.7 (30.2; 59.9)	78.1 (66.9; 86.9)	62.5 (40.6; 81.2)
hSBA GMT	37.1 (30.7; 44.9)	12.6 (8.30; 19.2)	24.6 (19.0; 31.9)	16.5 (9.64; 28.1)
Y	*N = 148–149*	*N = 47-48*	*N = 73–74*	*N = 25*
% ≥ 1 : 8 (Seroprotection)	96.0 (91.4; 98.5)	95.8 (85.7; 99.5)	95.9 (88.6; 99.2)	80.0 (59.3; 93.2)
*% seroresponse**	91.9 (86.3; 95.7)	80.9 (66.7; 90.9)	82.2 (71.5; 90.2)	68.0 (46.5; 85.1)
hSBA GMT	53.9 (44.8; 64.8)	33.4 (23.2; 48.2)	32.9 (26.0; 41.6)	27.1 (14.3; 51.5)

N: number of individuals in per protocol analysis set with valid serology results. The number of individuals varies depending on the timepoints and serogroup.

95 % CI of the single proportion calculated from the exact binomial method
* Vaccine seroresponse: titer is < 1 : 8 at baseline with post-vaccination titer ≥ 1 : 16 or titer is ≥ 1 : 8 at baseline with a ≥ 4-fold increase at post vaccination.

MET57 was conducted in meningococcal vaccine naïve toddlers 12 to 23 months of age to assess the immunogenicity of concomitant administration of MenQuadfi with paediatric vaccines (MMR+V, DTaP-IPV-HB-Hib or PCV-13). Overall, MenQuadfi elicited a robust immune response with high showed post-vaccination hSBA seroprotection rates for all serogroups (between 88.9 % and 100 %).
Serum antibody response and seroprotection rates for serogroup A were comparable when MenQuadfi was co-administered with PCV-13 and administered alone (56.1 % [95 % CI 48.9; 63.2] and 83.7 % [95 % CI 77.7; 88.6] vs. 71.9 % [95 % CI 61.8; 80.6] and 90.6 % [95 % CI 82.9; 95.6]). There were differences in hSBA-GMTs for serogroup A when MenQuadfi was co-administered with PCV-13 (N = 196) compared with MenQuadfi alone (N = 96) (24.6 [95 % CI 20.2; 30.1] and 49.0 [95 % CI 36.8; 65.3]). The clinical relevance of this observation is unknown, but this observation could be considered in persons at high risk for MenA infection, and consequently, vaccination with MenQuadfi and PCV-13 could be administered separately.
MEQ00065 study was conducted in meningococcal vaccine naïve toddlers 12 through 23 months of age to assess the immunogenicity of serogroup C using hSBA and rSBA assays following administration of a single dose of MenQuadfi compared to MenACWY-TT or to MenC-TT.

Table 7: Comparison of hSBA and rSBA bactericidal antibody responses for serogroup C to MenQuadfi, MenACWY-TT and MenC-TT vaccines 30 days after vaccination of meningococcal vaccine naïve toddlers 12 through 23 months of age (MEQ00065)

Endpoints	*MenQuadfi (95% CI)*	*MenACWY-TT (95% CI)*	*MenC-TT (95% CI)*	*MenQuadfi (95% CI)*	*MenACWY-TT (95% CI)*	*MenC-TT (95% CI)*
	hSBA			*rSBA*		
	N=214	*N=211*	*N= 216*	*N=213*	*N=210*	*N= 215*
% ≥1:8 (Seroprotection)	99.5[#] [§] (97.4; 100)	89.1 (84.1; 93.0)	99.5 (97.4; 100)	100[¶] (98.3; 100)	94.8 (90.8; 97.4)	100 (98.3; 100)
% Seroresponse	99.5 (97.4; 100)	83.4 (77.7; 88.2)	99.1 (96.7; 99.9)	99.5 (97.4; 100)	92.9 (88.5; 95.9)	99.5 (97.4; 100)
GMTs	515[$] (450; 591)	31,6 (26.5; 37.6)	227 (198; 260)	2143[¥] (1870; 2456)	315 (252; 395)	1624 (1425; 1850)

[§] non inferiority of MenQuadfi demonstrated versus MenC-TT (hSBA seroprotection rates).*
[¶] non inferiority of MenQuadfi demonstrated versus MenACWY-TT and MenC-TT (rSBA seroprotection rates).*
[#] statistical superiority of MenQuadfi demonstrated versus MenACWY-TT (hSBA seroprotection rates).**

[$] statistical superiority of MenQuadfi demonstrated versus MenACWY-TT and MenC-TT (hSBA GMTs).***

[¥] statistical superiority of MenQuadfi demonstrated versus MenACWY-TT and MenC-TT (rSBA GMTs).***

N = number of individuals in the per-protocol analysis set with valid serology results.

95% CI of the single proportion calculated from the exact binomial method.

* Non-inferiority is demonstrated as the lower limit of the 97.5% CI of the difference is greater than -10%.

** Superiority is demonstrated as lower limit of the 97.5% CI of the difference is greater than 0%.

*** Superiority is demonstrated as the lower limit of the two-sided 97.5% CI of the ratio of GMTs between groups is > 1.

Immunogenicity in children 2 to 9 years of age

Immunogenicity in children 2 to 9 years of age was evaluated in study MET35 (NCT03077438) (stratified by ages 2 to 5 and 6 to 9 years) by comparing seroresponses following administration of either MenQuadfi or MenACWY-CRM.

Overall, for children 2 to 9 years of age, immune non-inferiority, based on hSBA seroresponse, was demonstrated for MenQuadfi as compared to MenACWY-CRM for all four serogroups (see table 8).

Table 8: Comparison of bactericidal antibody responses to MenQuadfi and MenACWY-CRM 30 days after vaccination in meningococcal vaccine naïve individuals 2 to 5 years and 6 to 9 years of age (MET35)*

	2–5 years		*6–9 years*	
Endpoint by Serogroup	*MenQuadfi (95 % CI)*	*MenACWY-CRM (95 % CI)*	*MenQuadfi (95 % CI)*	*MenACWY-CRM (95 % CI)*
A	*N = 227–228*	*N = 221*	*N = 228*	*N = 237*
% ≥ 1 : 8 (Seroprotection)	84.6 (79.3; 89.1)	76.5 (70.3; 81.9)	88.2 (83.2; 92.0)	81.9 (76.3; 86.5)
*% Seroresponse**	52.4 (45.7; 59.1)	44.8 (38.1; 51.6)	58.3 (51.6; 64.8)	50.6 (44.1; 57.2)
hSBA GMT	21.6 (18.2; 25.5)	18.9 (15.5; 23.0)	28.4 (23.9; 33.8)	26.8 (22.0; 32.6)
C	*N = 229*	*N = 222–223*	*N = 229*	*N = 236*
% ≥ 1 : 8 (Seroprotection)	97.4 (94.4; 99.0)	64.6 (57.9; 70.8)	98.3 (95.6; 99.5)	69.5 (63.2; 75.3)
*% Seroresponse**	94.3 (90.5; 96.9)	43.2 (36.6; 50.0)	96.1 (92.7; 98.2)	52.1 (45.5; 58.6)
hSBA GMT	208 (175; 246)	11.9 (9.79; 14.6)	272 (224; 330)	23.7 (18.2; 31.0)
W	*N = 229*	*N = 222*	*N = 229*	*N = 237*
% ≥ 1 : 8 (Seroprotection)	90.8 (86.3; 94.2)	80.6 (74.8; 85.6)	98.7 (96.2; 99.7)	91.6 (87.3; 94.8)
*% Seroresponse**	73.8 (67.6; 79.4)	61.3 (54.5; 67.7)	83.8 (78.4; 88.4)	66.7 (60.3; 72.6)
hSBA GMT	28.8 (24.6; 33.7)	20.1 (16.7; 24.2)	48.9 (42.5; 56.3)	33.6 (28.2; 40.1)
Y	*N = 229*	*N = 222*	*N = 229*	*N = 237*
% ≥ 1 : 8 (Seroprotection)	97.8 (95.0; 99.3)	86.9 (81.8; 91.1)	99.1 (96.9; 99.9)	94.5 (90.8; 97.0)

*% Seroresponse**	88.2 (83.3; 92.1)	77.0 (70.9; 82.4)	94.8 (91.0; 97.3)	81.4 (75.9; 86.2)
hSBA GMT	49.8 (43.0; 57.6)	36.1 (29.2; 44.7)	95.1 (80.2; 113)	51.8 (42.5; 63.2)

N: number of individuals in per-protocol analysis set with valid serology results. The number of individuals varies depending on the timepoints and serogroup.

95 % CI of the single proportion calculated from the exact binomial method.

* The response of individuals with an hSBA titer < 1 : 8 at baseline who then achieved an hSBA titer ≥ 1 : 16 or the response of individuals with an hSBA titer ≥ 1 : 8 at baseline who then achieved a ≥ 4-fold increase in hSBA titer.

Immunogenicity in children and adolescents 10 though 17 years of age

MET50 (NCT02199691) was conducted in meningococcal vaccine naïve individuals, and the immune response was evaluated following administration of either MenQuadfi alone, MenACWY-CRM alone, MenQuadfi co-administered with Tdap and 4vHPV, or Tdap and 4vHPV alone.

MET43 (NCT02842853) included an evaluation of the immunogenicity of MenQuadfi compared to MenACWY-DT in children and adolescents (10 through 17 years of age).

Table 9: Comparison of bactericidal antibody responses to MenQuadfi and MenACWY-CRM or MenACWY-DT 30 days after vaccination in meningococcal vaccine naïve individuals 10 to 17 years of age (MET50 and MET43)

	MET50		*MET43*	
Endpoint by Serogroup	*MenQuadfi*	*MenACWY-CRM*	*MenQuadfi*	*MenACWY-DT*
A	*N = 463*	*N = 464*	*N = 1097*	*N = 300*
% ≥ 1:8 (Seroprotection)	93.5 (90.9; 95.6)	82.8 (79.0; 86.1)	96.2 (94.9; 97.2)	89.0 (84.9; 92.3)
% Seroresponse[*#]	75.6 (71.4; 79.4)	66.4 (61.9; 70.7)	74.0 (71.3; 76.6)	55.3 (49.5; 61.0)
hSBA GMT	44.1 (39.2; 49.6)	35.2 (30.3; 41.0)	78 (71.4; 85.2)	44.2 (36.4; 53.7)
C	*N = 462*	*N = 463*	*N = 1097-1098*	*N = 300*
% ≥ 1:8 (Seroprotection)	98.5 (96.9; 99.4)	76.0 (71.9; 79.8)	98.5 (97.5; 99.1)	74.7 (69.3; 79.5)
% Seroresponse[*#]	97.2 (95.2; 98.5)	72.6 (68.3; 76.6)	95.6 (94.2; 96.8)	53.3 (47.5; 59.1)
hSBA GMT	387 (329; 456)	51.4 (41.2; 64.2)	504 (456; 558)	44.1 (33.7; 57.8)
W	*N = 463*	*N = 464*	*N = 1097*	*N = 300*
% ≥ 1:8 (Seroprotection)	99.1 (97.8; 99.8)	90.7 (87.7; 93.2)	98.3 (97.3; 99.0)	93.7 (90.3; 96.1)
% Seroresponse[*#]	86.2 (82.7; 89.2)	66.6 (62.1; 70.9)	84.5 (82.2; 86.6)	72.0 (66.6; 77.0)
hSBA GMT	86.9 (77.8; 97.0)	36.0 (31.5; 41.0)	97.2 (88.3; 107)	59.2 (49.1; 71.3)
Y	*N = 463*	*N = 464*	*N = 1097*	*N = 300*
% ≥ 1:8 (Seroprotection)	97.2 (95.2; 98.5)	83.2 (79.5; 86.5)	99.1 (98.3; 99.6)	94.3 (91.1; 96.7)
% Seroresponse[*#]	97.0 (95.0; 98.3)	80.8 (76.9; 84.3)	95.6 (94.2; 96.8)	85.7 (81.2; 89.4)
hSBA GMT	75.7 (66.2; 86.5)	27.6 (23.8; 32.1)	208 (189; 228)	80.3 (65.6; 98.2)

N: number of individuals in the per-protocol analysis set with valid serology results.
95% CI of the single proportion calculated from the exact binomial method.
** Post-vaccination hSBA titres ≥1:8 for individuals with pre-vaccination hSBA titres < 1:8 or at least a 4-fold increase in hSBA titres from pre to post-vaccination for individuals with pre-vaccination hSBA titres ≥1:8.
[#] Non-inferiority criterion met.

MEQ00071 (NCT04490018) was conducted in children and adolescents who were either meningococcal vaccine naïve or had been primed with MenC vaccines before two years of age to evaluate the immune response of MenQuadfi alone, MenACWY TT alone, or MenQuadfi co-administrated with Tdap-IPV and 9vHPV.

Table 10: Comparison of bactericidal antibody responses to MenQuadfi and MenACWY-TT 30 days after vaccination in meningococcal vaccine naïve and MenC primed children and adolescents 10 through 17 years of age (MEQ00071)

Endpoint by Serogroup	*MenQuadfi (95% CI)*	*MenACWY-TT (95% CI)*
A	*N=158-159*	*N=159-160*
% ≥1:8 (Seroprotection)**	97.5 (93.7; 99.3)	92.5 (87.3; 96.1)
% Seroresponse	88.0 (81.9; 92.6)	75.5 (68.0; 81.9)
hSBA GMT	78.2 (64.6; 94.7)	56.0 (44.0; 71.2)
C	*N=158-159*	*N=160-161*
% ≥1:8 (Seroprotection)**	100 (97.7; 100)	95.0 (90.4; 97.8)
% Seroresponse	99.4 (96.5; 100)	88.8 (82.8; 93.2)
hSBA GMT	2294 (1675; 3142)	619 (411; 931)
W	*N=159*	*N=159*
% ≥1:8 (Seroprotection)**	100 (97.7; 100)	98.8 (95.6; 99.8)
% Seroresponse	93.1 (88.0; 96.5)	81.4 (74.5; 87.1)
hSBA GMT	134 (109; 164)	64.6 (52.5; 79.4)
Y	*N=158*	*N=160*
% ≥1:8 (Seroprotection)**	99.4 (96.5; 100)	98.1 (94.6; 99.6)
% Seroresponse	98.7 (95.5; 99.8)	88.1 (82.1; 92.7)
hSBA GMT	169 (141; 202)	84.8 (68.3; 105)

N: number of individuals in the per-protocol analysis set with valid serology results. The number of individuals varies depending on the timepoints and serogroup.
95% CI of the single proportion calculated from the exact binomial method.
** Non-inferiority criterion met.

In an exploratory analysis in a non-random subset of individuals (N=60), the immune response and protection rates were measured 6 and 30 days following co-administration of MenQuadfi with Tdap-

IPV and 9vHPV. The proportion of individuals with seroprotection for serogroup A did not increase within 6 days, whereas most of the individuals had seroprotection against serogroups C, W and Y (>94%). After 30 days, protection rates in this subset were comparable to the full study population reported in table 10.

Response in individuals according to MenC vaccination status

The post vaccination seroresponse and hSBA GMTs against serogroup C were higher in meningococcal vaccine naïve individuals who received MenQuadfi than those who received MenACWY TT, with seroprotection rates also trending higher. No differences in antibody response were observed in MenC primed individuals between groups.

Immunogenicity in adults 18 to 55 years of age

MET43 also evaluated the immunogenicity of MenQuadfi compared to MenACWY-DT in adults aged 18 through 55 years of age.

Table 11: Comparison of bactericidal antibody responses to MenQuadfi and MenACWY-DT 30 days after vaccination in meningococcal vaccine naïve adults 18 to 55 years of age (MET43)

Endpoint by Serogroup	*MenQuadfi (95 % CI)*	*MenACWY-DT (95 % CI)*
A	*N = 1,406-1,408*	*N = 293*
% ≥ 1 : 8 (Seroprotection)	93.5 (92.1; 94.8)	88.1 (83.8; 91.5)
% Seroresponse**	73.5 (71.2; 75.8)	53.9 (48.0; 59.7)
hSBA GMT	106 (97.2; 117)	52.3 (42.8; 63.9)
C	*N = 1,406-1,408*	*N = 293*
% ≥ 1 : 8 (Seroprotection)	93.5 (92.0; 94.7)	77.8 (72.6; 82.4)
% Seroresponse**	83.4 (81.4; 85.3)	42.3 (36.6; 48.2)
hSBA GMT	234 (210; 261)	37.5 (29.0; 48.5)
W	*N = 1,408-1,410*	*N = 293*
% ≥ 1 : 8 (Seroprotection)	94.5 (93.2; 95.7)	80.2 (75.2; 84.6)
% Seroresponse**	77.0 (74.7; 79.2)	50.2 (44.3; 56.0)
hSBA GMT	75.6 (68.7; 83.2)	33.2 (26.3; 42.0)
Y	*N = 1,408-1,410*	*N = 293*

Endpoint by Serogroup	*MenQuadfi (95 % CI)*	*MenACWY-DT (95 % CI)*
% ≥ 1 : 8 (Seroprotection)	98.6 (97.8; 99.1)	81.2 (76.3; 85.5)
% Seroresponse**	88.1 (86.3; 89.8)	60.8 (54.9; 66.4)
hSBA GMT	219 (200; 239)	54.6 (42.3; 70.5)

N: number of individuals in per-protocol analysis set with valid serology results. The number of individuals varies depending on the timepoints and serogroup.
95 % CI of the single proportion calculated from the exact binomial method.
** The response of individuals with an hSBA titer < 1 : 8 at baseline who then achieved an hSBA titer ≥ 1 : 16 or the response of individuals with an hSBA titer ≥ 1 : 8 at baseline who then achieved a ≥ 4-fold increase in hSBA titer. Non-inferiority criterion met.

Immunogenicity in adults 56 years of age and older

Immunogenicity in adults ≥ 56 years of age was assessed in study MET49 (NCT02842866) comparing MenQuadfi to MenACWY polysaccharide vaccine.
In study MET49, the overall mean age of individuals vaccinated with MenQuadfi was 66.9 years. The age range of individuals was 56 to 96 years of age.

Table 12: Comparison of bactericidal antibody responses to MenQuadfi and MenACWY polysaccharide in meningococcal vaccine naïve adults 56 years of age and older 30 days after vaccination (MET49)

Serogroup Endpoint	*MenQuadfi (95 % CI)*	*MenACWY polysaccharide (95 % CI)*
A	*N = 433*	*N = 431*
% ≥ 1 : 8 (Seroprotection)	89.4 (86.1; 92.1)	84.2 (80.4; 87.5)
% Seroresponse**	58.2 (53.4; 62.9)	42.5 (37.7; 47.3)
hSBA GMT	55.1 (46.8; 65.0)	31.4 (26.9; 36.7)
C	*N = 433*	*N = 431*
% ≥ 1 : 8 (Seroprotection)	90.1 (86.9; 92.7)	71.0 (66.5; 75.2)
% Seroresponse**	77.1 (72.9; 81.0)	49.7 (44.8; 54.5)
hSBA GMT	101 (83.8; 123)	24.7 (20.7; 29.5)
W	*N = 433*	*N = 431*

Serogroup Endpoint	*MenQuadfi (95 % CI)*	*MenACWY polysaccharide (95 % CI)*
% ≥ 1 : 8 (Seroprotection)	77.4 (73.1; 81.2)	63.1 (58.4; 67.7)
% Seroresponse**	62.6 (57.8; 67.2)	44.8 (40.0; 49.6)
hSBA GMT	28.1 (23.7; 33.3)	15.5 (13.0; 18.4)
Y	*N = 433*	*N = 431*
% ≥ 1 : 8 (Seroprotection)	91.7 (88.7; 94.1)	67.7 (63.1; 72.1)
% Seroresponse**	74.4 (70.0; 78.4)	43.4 (38.7; 48.2)
hSBA GMT	69.1 (58.7; 81.4)	21.0 (17.4; 25.3)

N: number of individuals in per-protocol analysis set with valid serology results.

95 % CI of the single proportion calculated from the exact binomial method.

** The response of individulas with an hSBA titer < 1 : 8 at baseline who then achieved an hSBA titer ≥ 1 : 16 or the response of individuals with an hSBA titer ≥ 1 : 8 at baseline who then achieved a ≥ 4-fold increase in hSBA titer. Non-inferiority criterion met.

Persistence of immune response and MenQuadfi booster response in children 4 through 5 years of age

MET62 (NCT03476135) evaluated the antibody persistence of a primary dose and the antibody response of a booster dose of MenQuadfi in children of 4 through 5 years of age who had received a single dose of MenQuadfi or MenACWY-TT three years before as part of the phase II study MET54 when they were 12 through 23 months old. (Phase 2, Study Comparing the Safety and Immunogenicity of MenQuadfi with MenACWY-TT in toddlers [12 to 23 months]) (see table 13).

Table 13: Comparison of bactericidal antibody response 30 days after booster vaccination, and persistence in children (4 through 5 years) primed with MenQuadfi or MenACWY-TT 3 years before in study MET54 – (MET62 [NCT03476135])*

Endpoint by Serogroup	*MenQuadfi Booster in MenQuadfi primed (95% CI)*			*MenQuadfi Booster in MenACWY-TT primed (95% CI)*			*MenQuadfi Booster in MenQuadfi primed + MenACWY-TT primed (95% CI)*		
	Persistence[#] N=42		*Booster[$] N=40*	*Persistence[#] N=49*		*Booster[$] N=44*	*Persistence[#] N=91*		*Booster[$] N=84*
	D30 - Post primary dose	*3Y Post-primary dose (D0 - Pre-*		*D30 - Post primary dose*	*3Y Post-primary dose (D0 - Pre-booster dose)*		*D30 - Post primary dose*	*3Y Post-primary dose (D0 - Pre-*	

		booster dose)						*booster dose)*	
A									
% ≥1:8 (Seroprotection)	97.6 (87.4; 99.9)	66.7 (50.5; 80.4)	100 (91.2; 100)	89.8 (77.8; 96.6)	83.7 (70.3; 92.7)	100 (92.0; 100)	93.4 (86.2; 97.5)	75.8 (65.7; 84.2)	100 (95.7; 100)
% Seroresponse	-	-	100 (91.2; 100)	-	-	95.5 (84.5; 99.4)	-	-	97.6 (91.7; 99.7)
hSBA GMT	83.3 (63.9; 109)	11.9 (8.11; 17.4)	763 (521; 1117)	49.6 (32.1; 76.7)	14.7 (10.7; 20.2)	659 (427; 1017)	63.0 (48.3; 82.2)	13.3 (10.5; 17.0)	706 (531; 940)
C									
% ≥1:8 (Seroprotection)	100 (91.6; 100)	100 (91.6; 100)	100 (91.2; 100)	87.8 (75.2; 95.4)	57.1 (42.2; 71.2)	100 (92.0; 100)	93.4 (86.2; 97.5)	76.9 (66.9; 85.1)	100 (95.7; 100)
% Seroresponse	-	-	95.0 (83.1; 99.4)	-	-	100 (92.0; 100)	-	-	97.6 (91.7; 99.7)
hSBA GMT	594 (445; 793)	103 (71.7; 149)	5894 (4325; 8031)	29.4 (20.1; 43.1)	11.6 (7.28; 18.3)	1592 (1165; 2174)	118 (79.3; 175)	31.8 (21.9; 46.1)	2969 (2293; 3844)
W									
% ≥1:8 (Seroprotection)	100 (91.6; 100)	97.6 (87.4; 99.9)	97.5 (86.8; 99.9)	95.9 (86.0; 99.5)	83.7 (70.3; 92.7)	100 (92.0; 100)	97.8 (92.3; 99.7)	90.1 (82.1; 95.4)	98.8 (93.5; 100)
% Seroresponse	-	-	97.5 (86.8; 99.9)	-	-	100 (92.0; 100)	-	-	98.8 (93.5; 100)
hSBA GMT	71.8 (53.3; 96.7)	50.0 (35.9; 69.5)	2656 (1601; 4406)	40.1 (30.6; 52.6)	21.2 (14.6; 30.9)	3444 (2387; 4970)	52.5 (42.7; 64.5)	31.5 (24.2; 41.0)	3043 (2248; 4120)
Y									
% ≥1:8 (Seroprotection)	100 (91.6; 100)	97.6 (87.4; 99.9)	100 (91.2; 100)	100 (92.7; 100)	89.8 (77.8; 96.6)	100 (92.0; 100)	100 (96.0; 100)	93.4 (86.2; 97.5)	100 (95.7; 100)
% Seroresponse	-	-	100 (91.2; 100)	-	-	100 (92.0; 100)	-	-	100 (95.7; 100)
hSBA GMT	105 (73.9; 149)	32.5 (24.8; 42.7)	2013 (1451; 2792)	75.8 (54.2; 106)	18.2 (13.8; 24.0)	2806 (2066; 3813)	88.1 (69.3; 112)	23.8 (19.4; 29.1)	2396 (1919; 2991)

* Clinical trial MET54 was conducted in toddlers 12-23 months old.

$ N calculated using per protocol analysis set (PPAS) with valid serology results; booster dose = D30 MET62.

[#] N calculated using full analysis set for persistence (FASP) with valid serology results; D30 post-primary dose = D30 MET54, 3Y Post-primary (D0 pre-booster dose) = D0 MET62.
Vaccine seroresponse: titre is <1:8 at baseline with post-vaccination titre ≥1:16 or titre is ≥1:8 at baseline with a ≥4-fold increase at post-vaccination.
95% CI of the single proportion calculated from the exact binomial method.

Persistence of immune response and MenQuadfi booster response in children 6 through 7 years of age

MEQ00073 (NCT04936685) evaluated the antibody persistence of a primary dose, immunogenicity and safety of a booster dose of MenQuadfi in children 6 through 7 years of age who had previously received a primary dose of MenQuadfi 5 years earlier as part of study MET51 when they were 12 through 23 months of age (see *Table* 14).
For all serogroups, the 5Y post-primary (pre-booster) GMTs were higher than the pre-primary GMTs, indicative of persistence of immune response.

Table 14: Comparison of bactericidal antibody response 30 days after booster vaccination with MenQuadfi, and persistence in children (6 through 7 years) primed with MenQuadfi 5 years before in study MET51[*] – (MEQ00073)

	MenQuadfi booster vaccination in individuals primed with MenQuadfi (95% CI)		
	Persistence[#]		*Booster[$]*
Endpoint by Serogroup	*D30 – Post-primary dose N=208*	*5Y Post-primary dose (D0 – Pre-booster dose) N=208*	*N=88*
A			
% ≥1:8 (Seroprotection)	90.4 (85.5; 94.0)	76.0 (69.6; 81.6)	98.9 (93.8; 100)
% Seroresponse	-	-	93.2 (85.7; 97.5)
hSBA GMT	28.9 (24.5; 34.0)	14.5 (12.0; 17.5)	1143 (820; 1594)
C			
% ≥1:8 (Seroprotection)	99.5 (97.4; 100)	85.1 (79.5; 89.6)	97.7 (92.0; 99.7)
% Seroresponse	-	-	97.7 (92.0; 99.7)
hSBA GMT	1315 (1002; 1724)	37.6 (29.8; 47.4)	8933 (6252; 12764)
W			
% ≥1:8 (Seroprotection)	83.7 (77.9; 88.4)	84.6 (79.0; 89.2)	100 (95.9; 100)
% Seroresponse	-	-	98.9 (93.8; 100)
hSBA GMT	25.7 (21.3; 31.0)	30.7 (24.9; 37.9)	8656 (6393; 11721)
Y			
% ≥1:8 (Seroprotection)	92.3 (87.8; 95.5)	68.8 (62.0; 75.0)	100 (95.9; 100)
% Seroresponse	-	-	98.9 (93.8; 100)

hSBA GMT	41.6 (35.0; 49.6)	12.7 (10.5; 15.4)	3727 (2908; 4776)

*Clinical trial MET51 was conducted in toddlers 12-23 months old.

[#] N calculated using full analysis set for persistence (FASP) with valid serology results; D30 post-primary dose = D30 MET51, 5Y Post-primary dose (D0 pre-booster dose) = D0 MEQ00073.

[$] N calculated using per protocol analysis set (PPAS1) with valid serology results; Booster = D30 MEQ00073 5 years after primary vaccination in MET51.

Vaccine seroresponse: titre is <1:8 at baseline with post-vaccination titre ≥1:16 or titre is ≥1:8 at baseline with a ≥4-fold increase at post-vaccination.

95% CI of the single proportion calculated from the exact binomial method.

Response in individuals according to MenC vaccination status before priming with MenQuadfi in MET51

The antibody responses against serogroup C following administration of a booster dose of MenQuadfi were comparable regardless of MenC vaccination status during their first year of life before priming with MenQuadfi 5 years earlier in MET51.

Persistence of immune response and MenQuadfi booster response in adolescents and adults 13 through 26 years of age

MET59 (NCT04084769) evaluated the antibody persistence of primary dose, immunogenicity and safety of a booster dose of MenQuadfi in adolescents and adults 13 through 26 years of age who had received a single dose of MenQuadfi in study MET50 or MET43 or MenACWY-CRM in study MET50 or outside of clinical trials 3-6 years prior. The antibody persistence prior to the MenQuadfi booster dose and the booster immune response were assessed according to the vaccine (MenQuadfi or MenACWY-CRM) individuals had received 3-6 years previously (see Table 15).

For all serogroups, the 3–6-year post-primary dose (D0 pre-booster GMTs were higher than the pre-primary dose GMT.

Table 15: Presentation of bactericidal antibody response 30 days after booster vaccination, and persistence in adolescents and adults (13 through 26 years) primed with MenQuadfi or MenACWY-CRM 3-6 years before in study MET50, MET43** or outside of clinical trials – (MET59)*

Endpoint by Serogroup	*MenQuadfi Booster in MenQuadfi primed (95% CI)*			*MenQuadfi Booster in MenACWY-CRM primed (95% CI)*		
	Persistence[^]		*Booster[$]*	*Persistence[^]*		*Booster[$]*
	D30 – Post primary dos	*3-6Y Post-primary dose (D0 – Pre-booster dose)*	*D30 – Post booster dose*	*3-6Y Post-primary dose (D30 Post primary dose)*	*D0-Pre-booster dose*	*D30 – Post booster dose*
A	*N = 376*	*N = 379–380*	*N = 174*	*N = 132–133*	*N = 140*	*N = 176*

% ≥1:8 (Seroprotection)	94,7 (91,9; 96,7)	72,8 (68,0; 77,2)	99,4 (96,8; 100)	81,2 (73,5; 87,5)	71,4 (63,2; 78,7)	99,4 (96,9; 100)
% Seroresponse	-	-	94,8 (90,4; 97,6)	-	-	93,2 (88,4; 96,4)
hSBA GMT	45,2 (39,9; 51,1)	12,5 (11,1; 14,1)	502 (388; 649)	32,8 (25,0; 43,1)	11,6 (9,41; 14,3)	399 (318; 502)
C	*N = 376*	*N = 379–380*	*N = 174*	*N = 132–133*	*N = 140*	*N = 176*
% ≥1:8 (Seroprotection)	98,1 (96,2; 99,2)	86,3 (82,4; 89,6)	100 (97,9; 100)	74,2 (65,9; 81,5)	49,3 (40,7; 57,9)	100 (97,9; 100)
% Seroresponse% Seroresponse	-	-	97,1 (93,4; 99,1)	-	-	98,9 (96,0; 99,9)
hSBA GMT	417 (348; 500)	37,5 (31,6; 44,5)	3708 (3146; 4369)	49,7 (32,4; 76,4)	11,0 (8,09; 14,9)	2533 (2076; 3091)
W	*N = 376*	*N = 379–380*	*N = 174*	*N = 132–133*	*N = 140*	*N = 176*
% ≥1:8 (Seroprotection)	100 (99,0; 100)	88,9 (85,3; 91,9)	100 (97,9; 100)	93,2 (87,5; 96,9)	76,4 (68,5; 83,2)	100 (97,9; 100)
% Seroresponse	-	-	97,7 (94,2; 99,4)	-	-	98,9 (96,0; 99,9)
hSBA GMT	82,7 (73,6; 92,9)	28,8 (25,1; 33,0)	2290 (1934; 2711)	45,1 (34,3; 59,4)	14,9 (11,9; 18,6)	2574 (2178; 3041)
Y	*N = 376*	*N = 379–380*	*N = 174*	*N = 132–133*	*N = 140*	*N = 176*
% ≥1:8 (Seroprotection)	97,9 (95,9; 99,1)	81,8 (77,5; 85,5)	100 (97,9; 100)	88,7 (82,1; 93,5)	52,1 (43,5; 60,7)	100 (97,9; 100)
% Seroresponse	-	-	98,9 (95,9; 99,9)	-	-	100 (97,9; 100)
hSBA GMT	91,0 (78,6; 105)	21,8 (18,8; 25,1)	2308 (1925; 2767)	36,1 (27,2; 47,8)	8,49 (6,50; 11,1)	3036 (2547; 3620)

*MET50 – The study was conducted in adolescents (10-17 years of age).

**MET43 – The study was conducted in children, adolescents and adults (10-55 years of age)

[$]N calculated using per protocol analysis set (PPAS 1 and 2) with valid serology results; post-booster dose = D06 or D30 of MET59

^N calculated using full analysis set for persistence (FASP) with valid serology results. The number of individuals varies depending on the timepoints and serogroup; post-primary dose = D30 MET50 or MET43, 3-6Y Post-primary dose (pre-booster dose) = D0 MET59.

Vaccine seroresponse: titre is <1:8 at baseline with post-vaccination titre ≥1:16 or titre is ≥1:8 at baseline with a ≥4-fold increase at post-vaccination.

95% CI of the single proportion calculated from the exact binomial method.

Persistence of immune response and MenQuadfi booster response in adults 59 years of age and older

MEQ00066 (NCT04142242) evaluated the antibody persistence of primary dose, immunogenicity, and safety of a booster dose of MenQuadfi in adults ≥59 years of age who had received a single dose of MenQuadfi or MenACWY-PS ≥3 years previously in study MET49 or MET44.

3 year persistence

The antibody persistence prior to the MenQuadfi booster dose and the booster immune response were assessed according to the vaccine (MenQuadfi or MenACWY-PS) adults had received 3 years (3Y) previously in MET49 (Table 16).

For both primed groups, the 3-year (3Y) post-primary dose (pre-booster) GMTs were higher than the pre-primary dose for serogroups C, W and Y and were comparable for serogroup A.

Table 16: Presentation of bactericidal antibody response 30 days after booster vaccination, and persistence in adults (≥59 years) primed with MenQuadfi or MenACWY-PS 3 years before in study MET49 – (MEQ00066)

Endpoint by Serogroup	*MenQuadfi Booster in MenQuadfi primed (95% CI)*			*MenQuadfi Booster in MenACWY-PS primed (95% CI)*		
	*Persistence^*		*Booster$*	*Persistence^*		*Booster$*
	D30 - Post primary dose	*3Y Post-primary dose (D0 - Pre-booster dose)*	*D30 - Post booster dose*	*D30 Post primary dose*	*3Y Post-primary dose (D0-Pre-booster dose)*	*D30 - Post booster dose*
A	*N = 212*	*N = 214*	*N = 145*	*N = 168*	*N = 169*	*N = 129–130*
% ≥1:8 (Seroprotection)	89.6 (84.7; 93.4)	65.0 (58.2; 71.3)	93.8 (88.5; 97.1)	85.7 (79.5; 90.6)	65.7 (58.0; 72.8)	87.7 (80.8; 92.8)
% Seroresponse	-	-	79.3 (7.8; 85.6)	-	-	60.8 (51.8; 69.2)
hSBA GMT	48.9 (39.0; 61.5)	12.2 (10.2; 14.6)	162 (121; 216)	37.7 (29.3; 48.7)	11.6 (9.53; 14.1)	56.6 (41.5; 77.2)
C	*N = 212*	*N = 214*	*N = 145*	*N = 168*	*N = 169*	*N = 129–130*
% ≥1:8 (Seroprotection)	88.2 (83.1; 92.2)	73.4 (66.9; 79.2)	99.3 (96.2; 100)	71.4 (64.0; 78.1)	47.9 (40.2; 55.7)	85.3 (78.0; 90.9)
% Seroresponse	-	-	93.1 (87.7; 96.6)	-	-	55.0 (46.0; 63.8)
hSBA GMT	84.8 (64.0; 112)	17.7 (14.3; 21.9)	638 (496; 820)	26.7 (19.8; 36.0)	8.47 (6.76; 10.6)	56.0 (39.7; 78.9)
W	*N = 212*	*N = 214*	*N = 145*	*N = 168*	*N = 169*	*N = 129–130*
% ≥1:8 (Seroprotection)	78.8 (72.6; 84.1)	66.8 (60.1; 73.1)	98.6 (95.1; 99.8)	60.1 (52.3; 67.6)	39.6 (32.2; 47.4)	80.8 (72.9; 87.2)
% Seroresponse	-	-	90.3 (84.3; 94.6)	-	-	49.2 (40.4; 58.1)

hSBA GMT	28.0 (22.2; 35.3)	14.2 (11.6; 17.4)	419 (317; 553)	14.7 (11.0; 19.8)	6.54 (5.28; 8.11)	31.0 (22.6; 42.6)
Y	*N = 212*	*N = 214*	*N = 145*	*N = 168*	*N = 169*	*N = 129–130*
% ≥1:8 (Seroprotection)	92.5 (88.0; 95.6)	68.2 (61.5; 74.4)	100 (97.5; 100)	65.5 (57.8; 72.6)	40.8 (33.3; 48.6)	81.5 (73.8; 87.8)
% Seroresponse	-	-	92.4 (86.8; 96.2)	-	-	49.2 (40.4; 58.1)
hSBA GMT	65.3 (51.8; 82.2)	15.3 (12.3; 19.1)	566 (433; 740	19.6 (14.4; 26.7)	7.49 (5.72; 9.82)	40.5 (29.0; 56.4)

^N calculated using full analysis set for persistence (FASP) with valid serology results; Post primary dose = D30 of MET49, Pre-booster dose = D0 of MEQ00066

[$]N calculated using per protocol analysis Set 2 and 1 (PPAS2 and PPAS1) with valid serology results. The number of individuals varies depending on the timepoints and serogroup; Post booster dose = D06 or D30 of MEQ00066

Vaccine seroresponse - titer is < 1:8 at baseline with post-vaccination titer ≥ 1:16 or titer is ≥ 1:8 at baseline with a ≥ 4-fold increase at post-vaccination.

95% CI of the single proportion calculated using the exact binomial method.

5 years persistence

A subset of adults (N=52) who were assessed for antibody persistence at 3 years and did not receive the booster dose were re-assessed for antibody persistence at 5 years at which time they received a booster dose of MenQuadfi. In MenQuadfi-primed individuals, hSBA GMTs for serogroups C, W and Y five years post-primary dose trended higher than the pre-priming GMTs (and were comparable for serogroup A). Following the MenQuadfi booster dose seroprotection rates were 100% for serogroups A, C, and Y, and 95.0% for serogroups W in individuals primed with MenQuadfi and 87.5%, 62.5%, 87% and 68.8% for serogroups A, C, W and Y, respectively, for individuals primed with MenACWY-PS. Additionally, hSBA GMTs were higher and seroresponse rates were higher or trended higher for all serogroups in individuals primed with MenQuadfi compared to those primed with MenACWY-PS.

6-7 year persistence

Antibody persistence 6-7 years after primary vaccination of adults in study MET44 (NCT01732627) with either MenQuadfi or MenACWY-PS has been evaluated (Table 17).

The 6-7 year post-primary GMTs were higher than the pre-primary GMTs for serogroup C, W, and Y in MenQuadfi-primed adults and were comparable for serogroup A.

Table 17: Presentation of bactericidal antibody persistence in adults (≥59 years) primed with MenQuadfi or MenACWY-PS 6-7 years before in MET44 (MEQ00066)

	MenQuadfi primed (95% CI)	*MenACWY-PS primed (95% CI)*

Endpoint by Serogroup	*D30 - Post primary dose$*	*6-7Y Post-primary #*	*D30 - Post primary dose$*	*6-7Y Post-primary #*
A	*N = 58*	*N = 59*	*N = 26*	*N = 26*
% ≥1:8 (Seroprotection)	91,4 (81,0; 97,1)	55,9 (42,4; 68,8)	76,9 (56,4; 91,0)	50,0 (29,9; 70,1)
GMT	48,0 (30,6; 75,4)	9,00 (6,44; 12,6)	27,3 (13,8; 54)	9,64 (5,18; 17,9)
C	*N = 58*	*N = 59*	*N = 26*	*N = 26*
% ≥1:8 (Seroprotection)	74,1 (61,0; 84,7)	59,3 (45,7; 71,9)	76,9 (56,4; 91,0)	42,3 (23,4; 63,1)
GMT	52,2 (27,4; 99,7)	11,9 (7,67; 18,5)	23,9 (11,9; 48,1)	7,58 (4,11; 14,0)
W	*N = 58*	*N = 59*	*N = 26*	*N = 26*
% ≥1:8 (Seroprotection)	75,9 (62,8; 86,1)	66,1 (52,6; 77,9)	73,1 (52,2; 88,4)	38,5 (20,2; 59,4)
GMT	31,2 (18,8; 52,0)	11,9 (7,97; 17,8)	18,8 (10,1; 34,9)	4,95 (3,39; 7,22)
Y	*N = 58*	*N = 59*	*N = 26*	*N = 26*
% ≥1:8 (Seroprotection)	81,0 (68,6; 90,1)	59,3 (45,7; 71,9)	73,1 (52,2; 88,4)	46,2 (26,6; 66,6)
GMT	45,8 (26,9; 78,0)	11,2 (7,24; 17,5)	25,9 (12,4; 53,8)	7,19 (4,09; 12,6)

N: number of individuals in full analysis set for persistence (FAS3P) with valid serology results.

$ Post primary dose = D30 of MET44

Pre-booster dose = D0 of MEQ00066

95% CI of the single proportion calculated from the exact binomial method.

Booster response in adolescents and adults at least 15 years of age primed with other MenACWY vaccines

MET56 (NCT02752906) compared the immunogenicity of a booster dose of MenQuadfi with a booster dose of MenACWY-DT in individuals aged 15 years or older and primed with a quadrivalent meningococcal conjugate vaccine (MenACWY-CRM [11.3 %] or MenACWY-DT [86.3 %]) 4 to 10 years previously.

At baseline, hSBA seroprotection rates and GMTs were comparable for serogroups A, C, W and Y.

Table 18: Comparison of bactericidal antibody responses to MenQuadfi and MenACWY-DT 30 days after booster vaccination in individuals at least 15 years of age primed with MenACWY-CRM or MenACWY-DT 4 to 10 years earlier (MET56)

Serogroup Endpoint	*MenQuadfi (95 % CI)*	*MenACWY-DT (95 % CI)*
A	*N = 384*	*N = 389*
% ≥ 1 : 8 (Seroprotection)	100.0 (99.0; 100.0)	99.0 (97.4; 99.7)
% Seroresponse**	92.2 (89.0; 94.7)	87.1 (83.4; 90.3)

Serogroup Endpoint	*MenQuadfi (95 % CI)*	*MenACWY-DT (95 % CI)*
hSBA GMT	497 (436; 568)	296 (256; 343)
C	*N = 384*	*N = 389*
% ≥ 1 : 8 (Seroprotection)	99.5 (98.1; 99.9)	99.0 (97.4; 99.7)
% Seroresponse**	97.1 (94.9; 98.6)	91.8 (88.6; 94.3)
hSBA GMT	2,618 (2,227; 3,078)	599 (504; 711)
W	*N = 384*	*N = 389*
% ≥ 1 : 8 (Seroprotection)	100.0 (99.0; 100.0)	99.7 (98.6; 100.0)
% Seroresponse**	98.2 (96.3; 99.3)	90.7 (87.4; 93.4)
hSBA GMT	1,747 (1,508; 2,025)	723 (614; 853)
Y	*N = 384*	*N = 389*
% ≥ 1 : 8 (Seroprotection)	99.7 (98.6; 100.0)	99.5 (98.2; 99.9)
% Seroresponse**	97.4 (95.3; 98.7)	95.6 (93.1; 97.4)
hSBA GMT	2,070 (1,807; 2,371)	811 (699; 941)

N: number of individuals in per-protocol analysis set with valid serology results.

95 % CI of the single proportion calculated from the exact binomial method.

** The response of individuals with an hSBA titer < 1 : 8 at baseline who then achieved an hSBA titer ≥ 1 : 16 or the response of individuals with an hSBA titer ≥ 1 : 8 at baseline who then achieved a ≥ 4-fold increase in hSBA titer. Non-inferiority criterion met.

Pharmacokinetics

An investigation of pharmacokinetic properties is not required for vaccines.

Preclinical data

Non-clinical safety data revealed no special risks for humans based on a repeat-dose toxicity and local tolerance study in rats and a developmental and reproductive toxicity study in rabbits. MenQuadfi administered to female rabbits at a full human dose showed no effects on mating performance, female fertility, no teratogenic potential, and no effect on pre-or post-natal development.

Other information

Incompatibilities

In the absence of compatibility studies, this medicinal product must not be mixed with other medicinal products.

Shelf life

Do not use this medicine after the expiry date ("EXP") stated on the pack.

Special precautions for storage

Store in the refrigerator (2-8 °C). Do not freeze. Store in the original packaging. Keep out of reach of children.
Stability data indicate that the vaccine components are stable at temperatures up to 25°C for 72 hours. At the end of this period, MenQuadfi should be used or discarded. These data are intended to guide healthcare professionals in case of temporary temperature excursion only.

Instructions for handling

The vaccine should be inspected visually for any particulate matter and/or variation of physical aspect (or discoloration) prior to administration. In the event of either being observed, discard the vaccine.

Preparation

Remove the flip off seal and using a suitable syringe and needle, withdraw 0.5 mL of solution ensuring no air bubbles are present before injection.

Authorisation number

68221 (Swissmedic)

Packs

Solution in a Type I borosilicate clear glass vial with a 13 mm chlorobutyl stopper and a flip off seal. Pack of 1 dose (0.5 mL) vial. [B]

Marketing authorisation holder

sanofi-aventis (suisse) sa, 1214 Vernier

Date of revision of the text

December 2025