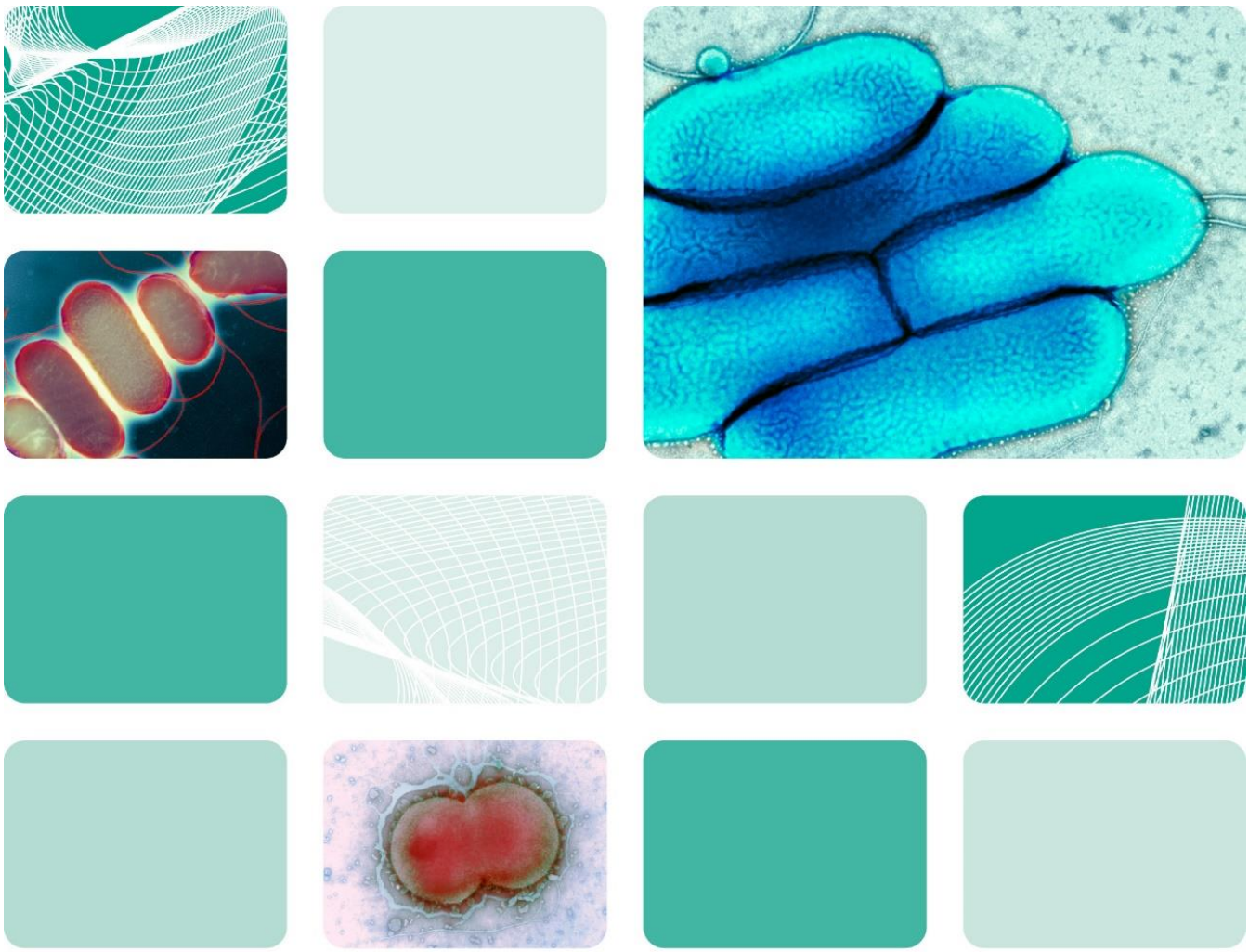
UK Health Security Agency

UK Standards for Microbiology Investigations

Screening for *Neisseria meningitidis*



Issued by the Standards Unit, UK Standards for Microbiology Investigations, UKHSA

Bacteriology | B 51 | Issue no: 2.1 | Issue date: 05.12.25 | Page: 1 of 18

Acknowledgments

UK Standards for Microbiology Investigations (UK SMIs) are developed under the auspices of UKHSA working in partnership with the partner organisations whose logos are displayed below and listed on the UK SMI website. UK SMIs are developed, reviewed and revised by various working groups which are overseen by a steering committee.

The contributions of many individuals in clinical, specialist and reference laboratories who have provided information and comments during the development of this document are acknowledged. We are grateful to the medical editors for editing the medical content.

UK SMIs are produced in association with:

Displayed logos correct as of December 2024

Contents

Amendment table

Each UK SMI document has an individual record of amendments. The amendments are listed on this page. The amendment history is available from standards@ukhsa.gov.uk.

Any alterations to this document should be controlled in accordance with the local document control process.

Amendment number/date	4/05.12.25
Issue number discarded	2
Insert issue number	2.1
Section(s) involved	**Amendment**
Whole document.	**This is an administrative point change.** **The content of this UK SMI document has not changed.** **The last scientific and clinical review was conducted on 12/03/2014.** Hyperlinks throughout document updated to Royal College of Pathologists website. Public Health England replaced with UK Health Security Agency throughout the document, including the updated Royal Coat of Arms. Partner organisation logos updated. Broken links to devolved administrations replaced. References to NICE accreditation removed. Scope and Purpose replaced with General and Scientific information to align with current UK SMI template.

Amendment No/Date.	3/12.03.14
Issue no. discarded.	1.2
Insert Issue no.	2
Section(s) involved	**Amendment**
Whole document.	Document has been transferred to a new template to reflect the Health Protection Agency's transition to PHE.

	Front page has been redesigned. Status page has been renamed as Scope and Purpose and updated as appropriate. Professional body logos have been reviewed and updated. Standard safety and notification references have been reviewed and updated. Name changed to 'Screening for *Neisseria meningitidis'* from 'Screening for meningococci'. Minor textual and formatting changes.
Scope.	Type of specimen - Naso and Pernasal swabs removed, Nasopharyngeal swabs added. Scope - expanded to include when to screen for *Neisseria meningitidis*. Hyperlinks to other relevant SMI added.
Introduction.	Updated to include routes of transmission and risk factors, PHE and NICE guidelines, and information regarding serogroups. Updated carriage, spectrum of disease and epidemiology sections.
Safety considerations.	Restructured and reworded in line with new template. Safety consideration statements regarding *N. meningitidis* updated; processing of samples can be carried out at containment level 2. Standard safety references have been reviewed and updated.
Referral to Reference Laboratories.	Text updated, links for Scotland and Ireland added.
Notification to PHE or equivalent in the devolved administrations.	Reference updated, reference to Northern Ireland added.
Appendix 1.	Addition of Appendix 1 – Flowchart.
References.	References reviewed and updated.

1 General information

View general information related to UK SMIs.

2 Scientific information

View scientific information related to UK SMIs.

3 Scope of document

Type of Specimen

Oropharyngeal swabs, nasopharyngeal swabs

Scope

This UK SMI describes the investigation of swabs for the presence of *Neisseria meningitidis.*

Screening for *Neisseria meningitidis* (the meningococcus) should be performed when investigating a suspected case of meningococcal disease, for screening contacts of a case, and in outbreak situations to determine the extent of carriage and/or the need for prophylaxis.

UK SMI B 5 - Investigation of samples from paranasal sinuses, UK SMI B 9 - Investigation of throat specimens and UK SMI ID 6 - Identification of *Neisseria* species are recommended for additional background information.

This UK SMI should be used in conjunction with other UK SMIs.

4 Introduction

Neisseria meningitidis forms part of the normal nasopharyngeal flora. Person to person transmission is the only known route of acquisition and usually occurs via aerosol droplets or secretions from the upper respiratory tract of an asymptomatic carrier or a close contact with invasive meningococcal disease[3]. The majority of cases (97%) of meningococcal disease which occur in the UK are sporadic, close contacts of a case are however recognised to be at an increased risk of infection[4]. To prevent onward transmission of virulent meningococci, prophylaxis (antibiotic chemoprophylaxis and vaccination if appropriate) is recommended for such contacts. The aim is to eliminate carriage of the virulent organism from the case's immediate social network. UKHSA recommends that nasopharyngeal swabs should be collected from all suspected cases, and the request form should specify that *N. meningitidis* is being sought[4-7]. NICE guidelines for the management of bacterial meningitis do not however recommend the use of throat swabs for the investigation of meningococcal disease in children under 16[8]. Management of outbreaks of meningococcal disease and prophylaxis is usually led by the consultant in communicable disease control (CCDC) or consultant in public health medicine (CPHM)[4].

Characterisation of the causative organism is an important consideration in outbreak management, as it determines whether cases may be related and whether vaccination of contacts may be necessary. The use of intravenous antibiotics in the community prior to hospital admission may decrease the yield of *N. meningitidis* from blood and CSF samples, nasopharyngeal swabs are less affected by prior antibiotic therapy and have been shown to yield *N. meningitidis* in 40-50% of clinical cases[4]. Confirmation of cases by non-culture (molecular) methods does not provide isolates for typing and determination of antimicrobial susceptibilities. Isolation of the organism from diagnostic or screening swabs from cases and close contacts may therefore be necessary for strain identification. Typing is important for outbreak investigations and surveillance, for the national serogroup C meningococcal vaccination programme and for detection of vaccine failures[9].

4.1 Carriage

N. meningitidis is carried on the posterior pharyngeal wall and can be detected from oropharyngeal or nasopharyngeal swabs[10]. Specimens for meningococcal screening are from two types of individuals: those infected and who may have been treated with antibiotics; and untreated asymptomatic contacts of the index case. Oropharyngeal swabs (sampling the posterior pharyngeal wall through the mouth) are ideal, but nasopharyngeal swabs (although they may be difficult to obtain) are also acceptable.

The carriage rate in the general population has been estimated to be around 10%[11]. This may be substantially higher in teenagers (25%) and young adults (32%), probably as a result of increased social activities leading to inhalation of infected respiratory secretions and by direct contact (kissing)[3,11]. Carriage rates may also be higher in close contacts of a case, in closed or semi-closed communities such as military establishments and university students, during mass public gatherings (eg the Hajj pilgrimage) and particularly during outbreaks[12]. The risk of carriage also increases with damage to the nasopharyngeal mucosa from smoking (and passive smoking) and from co-infection with influenza and *Mycoplasma* species[11]. Chemoprophylaxis should be offered to close contacts of a case who have had prolonged close contact (eg those in a household setting), and to those who have had transient close contact but who have been exposed to large droplets or secretions from the respiratory tract at the time of case admission to hospital[4]. Where there is more than one case the decision on when to extend prophylaxis will be taken by the CCDC.

4.2 Spectrum of disease

Infection with *N. meningitidis* produces a wide spectrum of disease manifestations ranging from a mild illness with transient fever and bacteraemia to fulminant meningococcal sepsis characterised by a rapidly progressive, widespread purpuric skin rash, coagulation defects, septic shock and death within a few hours of onset of symptoms[11]. Other presentations include a predominantly meningitic illness which may or may not be accompanied by a purpuric rash, primary meningococcal arthritis, pneumonia, conjunctivitis and, more rarely sinusitis, endocarditis and necrotising fasciitis[13-15]. Occasionally a more chronic picture may be encountered in association with positive blood cultures often with cutaneous lesions and arthritis.

N. meningitidis may also be isolated from the lower genital tract or rectum in men and women during screening for gonorrhoea and may be implicated in genital tract infections[16,17]. Rare deficiencies of the later stages of the complement and properdin pathway (or treatments that inhibit the complement pathway) can predispose to

recurrent infections with uncommon *N. meningitidis* serogroups, non-groupable meningococci and *Neisseria*-related bacteria presenting as meningococcal disease[18]. Disseminated meningococcal infection, although rare, may also be found in patients who are infected with HIV[19].

4.3 Epidemiology

Meningococcal disease occurs worldwide. Thirteen serogroups have been identified (based on unique capsular polysaccharides), six of which cause the majority of infections (A, B, C, W135, X and Y)[20]. Serogroup B is the most prevalent serogroup in the UK followed by serogroup C[21,22]. Incidence of invasive serogroup Y in the UK has increased over recent years. Natural immunity in the population to group W135 and Y meningococci has been shown to be low across all age groups[23].

The incidence and case fatality are highest in infants less than one year of age in whom the signs of early infection may be more difficult to detect[8,21,22]. There is a second but lower peak of infection in the 15-24 year age group and a seasonal peak in the winter months[24].

5 Technical Information/Limitations

Limitations of UK SMIs

The recommendations made in UK SMIs are based on evidence (eg sensitivity and specificity) where available, expert opinion and pragmatism, with consideration also being given to available resources. Laboratories should take account of local requirements and undertake additional investigations where appropriate. Prior to use, laboratories should ensure that all commercial and in-house tests have been validated and are fit for purpose.

Selective Media in Screening Procedures

Selective media which does not support the growth of all circulating strains of organisms may be recommended based on the evidence available. A balance therefore must be sought between available evidence, and available resources required if more than one media plate is used.

Specimen Containers[1,2]

UK SMIs use the term “CE marked leak proof container” to describe containers bearing the CE marking used for the collection and transport of clinical specimens. The requirements for specimen containers are given in the EU in vitro Diagnostic Medical Devices Directive (98/79/EC Annex 1 B 2.1) which states: “The design must allow easy handling and, where necessary, reduce as far as possible contamination of, and leakage from, the device during use and, in the case of specimen receptacles, the risk of contamination of the specimen. The manufacturing processes must be appropriate for these purposes”.

6 Safety Considerations[1,2,25-39]

6.1 Specimen Collection, Transport and Storage[1,2,25-28]

Use aseptic technique.

Collect swabs into appropriate transport medium.

Transport swabs in transport medium in sealed plastic bags.

Compliance with postal, transport and storage regulations is essential.

6.2 Specimen Processing[1,2,25-39]

N. meningitidis is a Hazard Group 2 organism and the processing of diagnostic samples can be carried out at Containment Level 2.

Due to the severity of the disease and the risks associated with generating aerosols of the organism, any manipulation of suspected isolates of *N. meningitidis* should always be undertaken in a microbiological safety cabinet until *N. meningitidis* has been ruled out (as must any laboratory procedure giving rise to infectious aerosols)[31].

N. meningitidis can cause severe and sometimes fatal disease. Laboratory acquired infections have been reported[40,41]. The organism infects primarily by the respiratory route. An effective vaccine is available for some meningococcal groups.

Refer to current guidance on the safe handling of all organisms documented in this UK SMI.

The above guidance should be supplemented with local COSHH and risk assessments.

7 Specimen Collection

7.1 Type of Specimens

Oropharyngeal swabs, nasopharyngeal swabs

7.2 Optimal Time and Method of Collection[42]

For safety considerations refer to Section 6.1.

Unless otherwise stated, swabs for bacterial and fungal culture should then be placed in appropriate transport medium[43-47].

7.3 Adequate Quantity and Appropriate Number of Specimens[42]

N/A

8 Specimen Transport and Storage[1,2]

8.1 Optimal Transport and Storage Conditions

For safety considerations refer to Section 6.1.

Collect specimens before antimicrobial therapy where possible[42].

Specimens should be transported and processed as soon as possible[42].

Recovery of meningococci is compromised if culture is delayed[10].

If processing is delayed, refrigeration is preferable to storage at ambient temperature[42].

Direct plating when the swab is taken should be considered.

9 Specimen Processing/Procedure[1,2]

9.1 Test Selection

N/A

9.2 Appearance

N/A

9.3 Sample Preparation

N/A

9.4 Microscopy

N/A

9.5 Culture and Investigation

Inoculate each plate with swab. (UK SMI Q 5 - Inoculation of Culture Media for Bacteriology).

For the isolation of individual colonies, spread inoculum with a sterile loop.

9.5.1 Culture media, conditions and organisms

Clinical details/ conditions	Specimen	Standard media	Incubation			Cultures read	Target organism(s)
			Temp °C	Atmos	Time		
Screening for *N. meningitidis* case or contact	Swab	GC selective agar	35-37	5-10% CO2	40-48hr	daily	*N. meningitidis*

9.6 Identification

Refer to individual SMIs for organism identification.

9.6.1 Minimum level of identification in the laboratory

Neisseria species	species level UK SMI ID 6 - Identification of *Neisseria* species

Organisms may be further identified if this is clinically or epidemiologically indicated.

10 Antimicrobial Susceptibility Testing

Refer to British Society for Antimicrobial Chemotherapy (BSAC) and/or EUCAST guidelines.

11 Referral to Reference Laboratories

For information on the tests offered, turnaround times, transport procedure and the other requirements of the reference laboratory click here for user manuals and request forms.

Organisms with unusual or unexpected resistance and whenever there is a laboratory or clinical problem, or anomaly that requires elucidation should be sent to the appropriate reference laboratory.

Contact appropriate devolved nation reference laboratory for information on the tests available, turnaround times, transport procedure and any other requirements for sample submission:

England

Wales

Scotland

Northern Ireland

Refer *N. meningitidis* for confirmation of identification, typing and susceptibility testing.

12 Reporting Procedure

12.1 Microscopy

N/A

12.2 Culture

Negative

N. meningitidis not isolated.

Positive

N. meningitidis isolated and report serogroup if known or state “Further identification to follow”.

12.2.1 Culture reporting time

Clinically urgent culture results to be telephoned or sent electronically when available.

Interim/final written report, 16 – 72hr stating, if appropriate, that a further report will be issued.

12.3 Antimicrobial Susceptibility Testing

Report susceptibilities as clinically indicated. Prudent use of antimicrobials according to local and national protocols is recommended.

13 Notification to UKHSA[48,49] or Equivalent in the Devolved Administrations[50-53]

The Health Protection (Notification) regulations 2010 require diagnostic laboratories to notify UK Health Security Agency (UKHSA) when they identify the causative agents that are listed in Schedule 2 of the Regulations. Notifications must be provided in writing, on paper or electronically, within seven days. Urgent cases should be notified orally and as soon as possible, recommended within 24 hours. These should be followed up by written notification within seven days.

For the purposes of the Notification Regulations, the recipient of laboratory notifications is the local UKHSA Health Protection Team. If a case has already been notified by a registered medical practitioner, the diagnostic laboratory is still required to notify the case if they identify any evidence of an infection caused by a notifiable causative agent.

Notification under the Health Protection (Notification) Regulations 2010 does not replace voluntary reporting to UKHSA. The vast majority of NHS laboratories voluntarily report a wide range of laboratory diagnoses of causative agents to UKHSA and many UKHSA Health protection Teams have agreements with local laboratories for urgent reporting of some infections. This should continue.

Note: The Health Protection Legislation Guidance (2010) includes reporting of HIV & STIs, HCAIs and CJD under ‘Notification Duties of Registered Medical Practitioners’: it is not noted under ‘Notification Duties of Diagnostic Laboratories’.

England

Wales

Scotland

Northern Ireland

Note: In case of sending away to laboratories for processing, ensure that specimen is placed in appropriate package and transported accordingly.

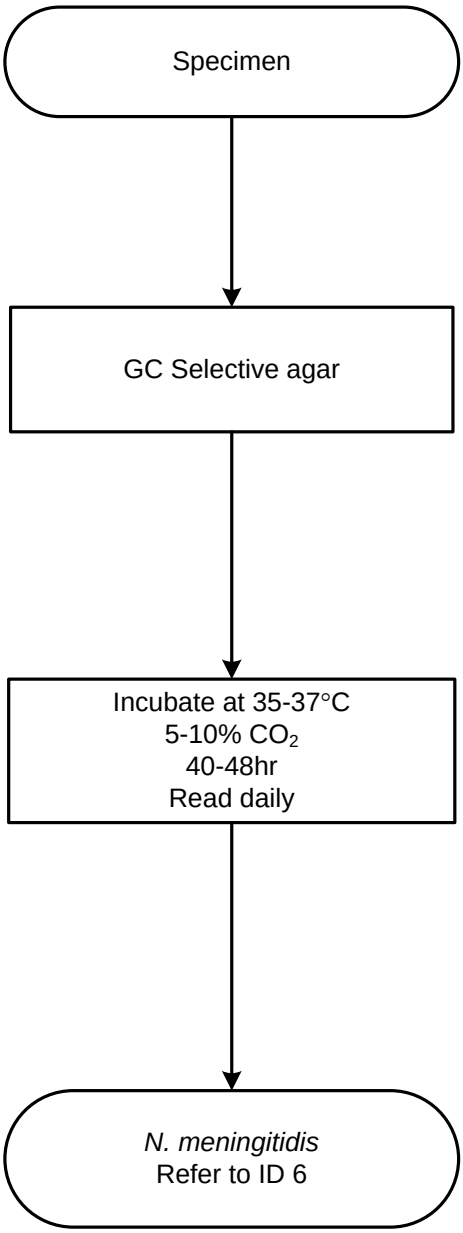
14 Public health responsibilities of diagnostic laboratories

Diagnostic laboratories have public health responsibility as part of their duties. Amongst these are additional local testing, or referral to further characterise the organism as required, primarily for public health purposes e.g. routine cryptosporidium detection; serotyping or microbial subtyping; and a duty to refer appropriate specimens and isolates of public health importance to a reference laboratory.

Diagnostic laboratory outputs inform public health intervention, and surveillance data is required to develop policy and guidance forming an essential component of healthcare. It is recognised that additional testing and referral of samples may entail some costs that has to be borne by the laboratory but in certain jurisdictions these costs are covered centrally.

Diagnostic laboratories should be mindful of the impact of laboratory investigations on public health and consider requests from the reference laboratories for specimen referral or enhanced information.

Algorithm: Screening for *Neisseria meningitidis*



References

An explanation of the reference assessment used is available in the scientific information section on the UK SMI website.

1. European Parliament. UK Standards for Microbiology Investigations (SMIs) use the term "CE marked leak proof container" to describe containers bearing the CE marking used for the collection and transport of clinical specimens. The requirements for specimen containers are given in the EU in vitro Diagnostic Medical Devices Directive (98/79/EC Annex 1 B 2.1) which states: "The design must allow easy handling and, where necessary, reduce as far as possible contamination of, and leakage from, the device during use and, in the case of specimen receptacles, the risk of contamination of the specimen. The manufacturing processes must be appropriate for these purposes".

2. Official Journal of the European Communities. Directive 98/79/EC of the European Parliament and of the Council of 27 October 1998 on *in vitro* diagnostic medical devices. 7-12-1998. p. 1-37.

3. Strunk JA, Rocchiccioli JT. Meningococcal meningitis: an emerging infectious disease. J Community Health Nurs 2010;27:51-8.

4. Health Protection Agency. Guidance for public health management of meningococcal disease in the UK. 2012.

5. Cartwright K, Reilly S, White D, Stuart J. Early treatment with parenteral penicillin in meningococcal disease. BMJ 1992;305:143-7.

6. Begg N, Cartwright KA, Cohen J, Kaczmarski EB, Innes JA, Leen CL, et al. Consensus statement on diagnosis, investigation, treatment and prevention of acute bacterial meningitis in immunocompetent adults. British Infection Society Working Party. J Infect 1999;39:1-15.

7. British Infection Association, Meningitis Research Foundation. Early Management of Suspected Bacterial Meningitis and Menigococcal Septicaemia in Immunocompetent Adults. 2013.

8. National Institute for Healthcare and Clinical Excellence. NICE Guideline 102 - Bacterial meningitis and meningococcal septicaemia. 2010.

9. Lucidarme J, Newbold LS, Findlow J, Gilchrist S, Gray SJ, Carr AD, et al. Molecular targets in meningococci: efficient routine characterization and optimal outbreak investigation in conjunction with routine surveillance of the meningococcal group B vaccine candidate, fHBP. Clin Vaccine Immunol 2011;18:194-202.

10. Roberts J, Greenwood B, Stuart J. Sampling methods to detect carriage of Neisseria meningitidis; literature review. Journal of Infection 2009;58:103-7.

11. Pace D, Pollard AJ. Meningococcal disease: Clinical presentation and sequelae. Vaccine 2012;30, Supplement 2:B3-B9.

12. Caugant DA. Genetics and evolution of Neisseria meningitidis: importance for the epidemiology of meningococcal disease. Infect Genet Evol 2008;8:558-65.

13. Lin VH, Parekh RS, McQuillan MA, Braun DK, Markovitz DM. Meningococcal endocarditis presenting as cellulitis. Clin Infect Dis 1995;21:1023-5.

14. Arias IM, Henning TD, Alba LM, Rubio S. A meningococcal endocarditis in a patient with Sweet's syndrome. International Journal of Cardiology 2007;117:e51-e52.

15. Orden B, Martinez R, Millan R, Belloso M, Perez N. Primary meningococcal conjunctivitis. Clin Microbiol Infect 2003;9:1245-7.

16. Lourenco MC, Reis RS, Andrade AC, Tuyama M, Barroso DE. Subclinical infection of the genital tract with Neisseria meningitidis. Braz J Infect Dis 2006;10:154-5.

17. Givan KF, Thomas BW, Johnston AG. Isolation of Neisseria meningitidis from the urethra, cervix, and anal canal: further observations. Br J Vener Dis 1977;53:109-12.

18. van Deuren M, Brandtzaeg P, van der Meer JW. Update on meningococcal disease with emphasis on pathogenesis and clinical management. Clin Microbiol Rev 2000;13:144-66, table.

19. Nitta AT, Douglas JM, Arakere G, Ebens JB. Disseminated meningococcal infection in HIV-seropositive patients. AIDS 1993;7:87-90.

20. Stephens DS, Greenwood B, Brandtzaeg P. Epidemic meningitis, meningococcaemia, and Neisseria meningitidis. Lancet 2007;369:2196-210.

21. Gray SJ, Trotter CL, Ramsay ME, Guiver M, Fox AJ, Borrow R, et al. Epidemiology of meningococcal disease in England and Wales 1993/94 to 2003/04: contribution and experiences of the Meningococcal Reference Unit. J Med Microbiol 2006;55:887-96.

22. Halperin SA, Bettinger JA, Greenwood B, Harrison LH, Jelfs J, Ladhani SN, et al. The changing and dynamic epidemiology of meningococcal disease. Vaccine 2012;30, Supplement 2:B26-B36.

23. Trotter CL, Findlow H, Borrow R. Seroprevalence of serum bactericidal antibodies against group W135 and Y meningococci in England in 2009. Clin Vaccine Immunol 2012;19:219-22.

24. European Centre for Disease Prevention and Control. Annual epidemiological report 2011. Reporting on 2009 surveillance data and 2010 epidemic intelligence data. 2011.

25. Health and Safety Executive. Safe use of pneumatic air tube transport systems for pathology specimens. 9/99.

26. Department for transport. Transport of Infectious Substances, 2011 Revision 5. 2011.

27. World Health Organization. Guidance on regulations for the Transport of Infectious Substances 2013-2014. 2012.

28. Home Office. Anti-terrorism, Crime and Security Act. 2001 (as amended).

29. Advisory Committee on Dangerous Pathogens. The Approved List of Biological Agents. Health and Safety Executive. 2013. p. 1-32

30. Advisory Committee on Dangerous Pathogens. Infections at work: Controlling the risks. Her Majesty's Stationery Office. 2003.

31. Advisory Committee on Dangerous Pathogens. Biological agents: Managing the risks in laboratories and healthcare premises. Health and Safety Executive. 2005.

32. Advisory Committee on Dangerous Pathogens. Biological Agents: Managing the Risks in Laboratories and Healthcare Premises. Appendix 1.2 Transport of Infectious Substances - Revision. Health and Safety Executive. 2008.

33. Centers for Disease Control and Prevention. Guidelines for Safe Work Practices in Human and Animal Medical Diagnostic Laboratories. MMWR Surveill Summ 2012;61:1-102.

34. Health and Safety Executive. Control of Substances Hazardous to Health Regulations. The Control of Substances Hazardous to Health Regulations 2002. 5th ed. HSE Books; 2002.

35. Health and Safety Executive. Five Steps to Risk Assessment: A Step by Step Guide to a Safer and Healthier Workplace. HSE Books. 2002.

36. Health and Safety Executive. A Guide to Risk Assessment Requirements: Common Provisions in Health and Safety Law. HSE Books. 2002.

37. Health Services Advisory Committee. Safe Working and the Prevention of Infection in Clinical Laboratories and Similar Facilities. HSE Books. 2003.

38. British Standards Institution (BSI). BS EN12469 - Biotechnology - performance criteria for microbiological safety cabinets. 2000.

39. British Standards Institution (BSI). BS 5726:2005 - Microbiological safety cabinets. Information to be supplied by the purchaser and to the vendor and to the installer, and siting and use of cabinets. Recommendations and guidance. 24-3-2005. p. 1-14

40. Sejvar JJ, Johnson D, Popovic T, Miller JM, Downes F, Somsel P, et al. Assessing the risk of laboratory-acquired meningococcal disease. J Clin Microbiol 2005;43:4811-4.

41. Bhatti AR, DiNinno VL, Ashton FE, White LA. A laboratory-acquired infection with Neisseria meningitidis. J Infect 1982;4:247-52.

42. Baron EJ, Miller JM, Weinstein MP, Richter SS, Gilligan PH, Thomson RB, Jr., et al. A Guide to Utilization of the Microbiology Laboratory for Diagnosis of Infectious Diseases: 2013 Recommendations by the Infectious Diseases Society of America (IDSA) and the American Society for Microbiology (ASM). Clin Infect Dis 2013;57:e22-e121.

43. Rishmawi N, Ghneim R, Kattan R, Ghneim R, Zoughbi M, Abu-Diab A, et al. Survival of fastidious and nonfastidious aerobic bacteria in three bacterial transport swab systems. J Clin Microbiol 2007;45:1278-83.

44. Barber S, Lawson PJ, Grove DI. Evaluation of bacteriological transport swabs. Pathology 1998;30:179-82.

45. Van Horn KG, Audette CD, Sebeck D, Tucker KA. Comparison of the Copan ESwab system with two Amies agar swab transport systems for maintenance of microorganism viability. J Clin Microbiol 2008;46:1655-8.

46. Nys S, Vijgen S, Magerman K, Cartuyvels R. Comparison of Copan eSwab with the Copan Venturi Transystem for the quantitative survival of *Escherichia coli, Streptococcus agalactiae* and *Candida albicans*. Eur J Clin Microbiol Infect Dis 2010;29:453-6.

47. Tano E, Melhus A. Evaluation of three swab transport systems for the maintenance of clinically important bacteria in simulated mono- and polymicrobial samples. APMIS 2011;119:198-203.

48. Public Health England. Laboratory Reporting to Public Health England: A Guide for Diagnostic Laboratories. 2013. p. 1-37.

49. Department of Health. Health Protection Legislation (England) Guidance. 2010. p. 1-112.

50. Scottish Government. Public Health (Scotland) Act. 2008 (as amended).

51. Scottish Government. Public Health etc. (Scotland) Act 2008. Implementation of Part 2: Notifiable Diseases, Organisms and Health Risk States. 2009.

52. The Welsh Assembly Government. Health Protection Legislation (Wales) Guidance. 2010.

53. Home Office. Public Health Act (Northern Ireland) 1967 Chapter 36. 1967 (as amended).