Transport and storage conditions for bacteriological analyses

- The sample site should be located as closely as possible to the site of the infection.
- Contamination of the sample material with bacteria from the local flora and the environment must be avoided because the presence of local flora can lead to difficulties with interpretation.
- Avoid contact between the sample material and antiseptics and disinfectants.
- Collect adequate sample volumes to avoid false negative results.
- The time of collection should be prior to the start of antimicrobial therapy to avoid false negative results; life-saving therapy does have priority, however, and should not be prevented.
- Label samples and accompanying document exactly: Surname, first name, date of birth, address or ward of the patient, requested test, localisation of the infection (wound swab is too general), suspected diagnosis (e.g., animal bite), information from the patient's medical history (e.g., travel history), previous or ongoing antibiotic therapy, immune statue (neutropenia), date, time of the collection of the test material, telephone number that can be used to communicate the results if necessary.
- Send all samples immediately to the laboratory (optimally within 2 h, not longer than 24 h), but if this is not possible, ensure that the samples are stored properly in the interim.
- All materials must be considered in principle as being infectious; they must be sent in sterile, tightly sealed and leak-proof containers; if a pathogen with a high infection potential is suspected (Brucella spp., fungi originating from outside Europe) the laboratory must be informed because of the risk of laboratory infection (pay regard to personal protection! DIN 55515).
- When shipping by mail, the appropriate guidelines for the packaging must be considered.

Transport and storage conditions for bacteriological analyses

Specimens	Shipping, transport medium	Temperature	Method of choice
Blood for blood cultures	Direct inoculation	RT	Culture, (PCR)
Catheter tips	In sterile container	4°C	Culture
CSF	Native, prepare culture ≤2 h	RT	Culture, PCR
Lower respiratory tract			
Sputum for bacteria	Native	RT	Culture, (PCR)
Sputum for mycobacteria	Native	4°C	Culture, PCR
Bronchial or tracheal secretion / BAL	Native	RT	Culture, PCR
Throat rinsing solution	Native	RT	Culture, PCR
Tracheal aspirates	Anaerobic TM	RT	Culture
Upper respiratory tract [1]			
Sinus aspirates	Anaerobic TM	RT	Culture
Nasopharyngeal material	Aerobic TM	RT	Culture, PCR
Inner ear swab	Aerobic TM	RT	Culture
Swabs with otitis externa	Aerobic TM	4°C	Culture

Transport and storage conditions for bacteriological analyses

Specimens	Shipping, transport medium	Temperature	Method of choice
Eyes			
Conjunctival swabs	Aerobic TM	RT	Culture
Aqueous humour	Direct inoculation	RT	Culture
Urogenital tract			
Urine	Native	4°C	Culture
Dialysate	Native	4°C	Culture
Material from the genital tract	Aerobic TM	RT	Culture
Intraoperative material			
Intraoperative materials	Anaerobic TM	RT	Culture
Gastrointestinal tract			
Stool to verify presence of:			
Salmonella spp., Shigella spp., Campylobacter, Yersinia spp. and other bacteria	Native	RT	Culture

Transport and storage conditions for bacteriological analyses

Specimens	Shipping, transport medium	Temperature	Method of choice
Sterile compartments			
Synovial fluid [2]	Native	RT	Culture, PCR
Puncture specimens [2]	Anaerobic TM	RT	Culture, PCR
Biopsy specimens	Aerobic TM	RT	Culture
Tissue	Anaerobic TM	RT	Culture
Suspected infections with specific pathogens			
Verification of Bordetella spp.	Aerobic TM	RT	PCR
Verification of Corynebacterium diphtheriae	Aerobic TM	RT	Culture
Verification of Neisseria spp.	Aerobic special TM	RT	Culture
Verification of actinomycetes	Anaerobic TM	RT	Culture
Verification of anaerobes	Anaerobic TM	RT	Culture

BAL = bronchoalveolar lavage, RT = room temperature, TM = transport medium

[1] For longer transport (≥12 h or overnight) specimens should be stored at 4°C to prevent any aetiologically significant flora being overgrown by bacteria from the normal flora. However, there is the risk that sensitive bacteria die as a result.
[2] For longer transport, it is recommended to inoculate into blood culture flasks.

Collection, transport and storage of materials for verifying the presence of mycobacteria

Type of material	Collection	Comments
Bronchoalveolar lavage, bronchial fluid	Collect at least 10–30 mL in a sterile container	The bronchoscope must not be contaminated with tap water because tap water may contain nontuberculous mycobacteria.
Sputum Bronchial secretion	Morning sputum, 5–10 mL in a sterile, wide-mouthed single-use container on three consecutive days 2–5 mL	Personnel or parents must be taught precisely how to collect the sputum specimens. Saliva or nasal mucous are unsuitable. Before the sputum production, the patient should rinse his or her mouth with water. For induced sputum, sterile hypertonic NaCl solution should be used. These samples must be labelled as 'induced'.
Gastric juice (in children)	20–30 mL in sterile container. Gastric juice should be collected in the mornings immediately after waking so that the sputum swallowed during sleep is included.	The sample must be collected before the first ingestion of liquids or food. Sterile NaCl solution is used. The liquid must be placed in a container with a neutralising quantity of 100 mg sodium carbonate or 1 mL trisodium phosphate (request from laboratory) so that the mycobacteria survive.
Urine	Collect as much as possible (at least 30 mL) of the first morning urine, mid-stream, bladder puncture or catheter urine in a sterile container	Collect on 3 consecutive days. Urine samples collected at times other than after night's sleep are not optimal.

Collection, transport and storage of materials for verifying the presence of mycobacteria

Type of material	Collection	Comments
CSF, other puncture specimens	Collect at least 5 mL in a sterile tube; an additional 5 mL for PCR	As much CSF should be sent to the laboratory as possible. The minimum quantity of 5 mL must be complied with to avoid a false negative result!
Pleural puncture specimen	10–30 mL	
Tissue, biopsy specimens	If possible, provide 1 g in a sterile container without fixative or preservative	Give preference to caseating parts, do not place in NaCl solution!
Blood	5-10 mL tubes with sodium polyanethole sulfonate or isolator tubes should be used. The blood can be placed directly into a container with a growth medium suitable for this purpose.	Heparinised blood or citrate blood are also acceptable. EDTA blood is unsuitable because EDTA strongly inhibits the growth of mycobacteria.

Query Localisation	Pathogen and Verification of pathogen	Material and Material collection	Sample container and sample quantity
Urinary tract infections, cystitis, pyelonephritis	Cultural Aerobic and facultative anaerobic Gram-positive and Gram-negative uropathogenic bacteria, fungi. On request also obligate anaerobes, Mycoplasma spp., Ureaplasma spp. and trichomonads	Mid-stream urine: (morning urine if possible). After cleaning the urethral opening, allow first portion to pass, collect 10–20 mL from the stream in a sterile container. If using dipslides, hold the agar medium in the stream (do not allow any urine to enter the container). Catheter urine: Discard first portion! Indwelling catheter: Collection by puncture at a well disinfected site in the upper catheter section using a sterile cannula. Do not collect from the collection bag! Bladder puncture specimen: Ensure most rapid transport possible to the laboratory for urine specimens. Waiting times between collection and transport should be bridged by storing in the refrigerator.	About 10–20 mL urine in sterile urine containers with dipslide if necessary (remove protective film!). For urine samples without any stabiliser, transport to the laboratory should not exceed 2–4 hours.

Query Localisation	Pathogen and Verification of pathogen	Material and Material collection	Sample container and sample quantity
Lower airways	Microscopic and cultural aerobic and if applicable anaerobic pathogenic bacteria, yeasts and hyphomycetes, Legionella spp., Mycoplasma spp., Pneumocystis carinii (direct IFT).	Sputum, bronchial or tracheal secretion, bronchial lavage. Rinse mouth repeatedly beforehand if possible with fresh tap water (remove any dental prostheses).	Sputum tube
Upper respiratory tract: Tonsil, throat and tongue swab	Microscopic and cultural aerobic pathogenic bacteria, fungi.	Swab	Sterile cotton swab in transport medium
Whooping cough (Bordetella pertussi)	PCR	Throat swab	Sterile cotton swab in transport medium
Auditory canal swab, tympanic and sinus secretions	Microscopic and cultural, aerobic and anaerobic pathogenic bacteria, yeasts and hyphomycetes.	Swab	Normal or thin sterile cotton swab in transport medium

Query Localisation	Pathogen and Verification of pathogen	Material and Material collection	Sample container and sample quantity
Meningitis	Microscopic and cultural aerobic and anaerobic pathogenic bacteria, fungi.	CSF	At least 2 mL CSF in sterile sample tube, storage at room temperature. For storage > 2 h, place an additional CSF sample in an aerobic blood culture flask, storage at room temperature.
Eye, conjunctival diseases	Microscopic and cultural aerobic and if applicable anaerobic pathogenic bacteria, fungi. Chlamydia trachomatis: PCR. Herpes simplex virus: PCR Adenoviruses: PCR	Tears, pus	Sterile cotton swab **in** transport medium. Sterile cotton swab **without** transport medium
Wound infections	Microscopic and cultural aerobic and anaerobic pathogenic bacteria, fungi.	No swabs if possible. Better: Wound secretion, pus fluid, tissue samples or fibrin coatings.	Port-A-Cul tubes or Amies transport medium

Query Localisation	Pathogen and Verification of pathogen	Material and Material collection	Sample container and sample quantity
Infections of the urogenital area	Microscopic and cultural aerobic and if applicable anaerobic pathogenic bacteria, Gardnerella, Neisseria gonorrhoeae, yeasts, Chlamydia spp., Myocplasma spp., Ureaplasma spp.	Secretion, pus, vaginal discharge Gonococcal antigen detection: After telephone consultation with the laboratory. Request specific swab kit!	Normal or thin sterile cotton swab in transport medium. For gonococcal culture, request transport medium with charcoal. For additional analysis of Mycoplasma spp., send a second swab; Chlamydia spp. either in a special transport medium (EIA) or on special slides (IFT).
Joint puncture specimen	Microscopic and cultural aerobic and anaerobic pathogenic bacteria, fungi.	Puncture specimen	Sterile sample tube, for storage > 6 h also on transport medium; if necessary additional inoculation of an aerobic blood culture flask.

Query Localisation	Pathogen and Verification of pathogen	Material and Material collection	Sample container and sample quantity
Blood culture: sepsis, bacteraemia, endocarditis	Cultural aerobic and anaerobic pathogenic bacteria, fungi	Venous blood, arterial blood	Fill blood culture flasks after labelling, store at room temperature or at 37°C until transport to the laboratory. (Do not store in the refrigerator!) It is essential that the time of blood collection is noted on the blood culture flask or the accompanying documentation.
Venous catheter infection	Cultural aerobic and anaerobic pathogenic bacteria, fungi	Venous catheter tips and blood culture	Sterile sample tube, if necessary Port-A-Cul or Amies transport medium
Gastrointestinal infection	Cultural Salmonella spp., Shigella spp., Yersinia spp., Campylobacter, enteropathogenic E. coli, EHEC, Staphylococcus aureus, fungi, Clostridium difficile toxin A and B, adenovirus, rotavirus, norovirus and astrovirus	Stool sample, possible repeat analyses on three consecutive days. Short-term sample storage in the refrigerator (4–8°C).	Stool tube with spatula to collect 1–3 cherry-pip-sized samples

Query Localisation	Pathogen and Verification of pathogen	Material and Material collection	Sample container and sample quantity
Intestinal parasites	Worm identification. Direct microscopic verification and after MIF concentration. Worm eggs, amoebic cysts, amoebic antigen (EIA), Cryptosporidium spp. (EIA), Gardia cysts (EIA) and microsporidia	Worm or worm parts. For optimal diagnosis of Oxyuris eggs: Adhere anal film in the morning paraanally, remove and adhere to the slide. Stool samples: <For multiple requests, e.g., for pathogen, parasites and antigen.	Special tubes Stool tube with spatula 1–2 cherry-pip-sized stool samples Essential to send in one pea-sized sample each.
Bile Duodenal juice	Microscopic and cultural aerobic and anaerobic pathogenic bacteria, Gardia.	Gall bladder puncture specimen Duodenal probe	Sterile sample container, if necessary Port-A-Cul or Amies transport medium.
Bordetella pertussis (whooping cough)	PCR	Throat swab	Sterile swab without transport medium
Mycobacteria Tbc	Microscopic and cultural typical and atypical mycobacteria	Sputum, bronchial secretion, gastric juice, morning urine (3x each), pus, CSF and other puncture specimens, menstrual blood, stool, tissue	Sterile sample containers
Dermatophytes	Microscopic and cultural Trichophytes, microsporidia, epidermophytes	Skin flakes, hair, nail clippings, nails	Sterile sample containers

Query Localisation	Pathogen and Verification of pathogen	Material and Material collection	Sample container and sample quantity
Moulds	Microscopic and cultural	Sputum, bronchial secretion, ear, nasal or sinus swab, skin flakes	Sterile sample containers, Amies transport tubes
Yeasts	Microscopic and cultural	Sputum, bronchial secretion, tracheal secretion, throat, nasal, ear, tongue, vaginal, urethral swab, urine, stool, pus	Sterile sample containers or Amies transport medium
Dimorphic fungi	Cultural Blastomyces, coccidioides, histoplasma	Sputum, bronchial secretion, tracheal secretion, skin material, pus	Sterile sample containers or Amies transport medium
Parasites			
Acanthamoeba	Microscopic	CSF, conjunctival swab	Sterile sample container
Schistosomiasis	Schistosoma haematobium	Urine collected between 12–14 hours after	10–20 ml urine container
	Schistosoma mansoni / japonicum	physical exercise. Stool	Stool tube with spatula
Entamoeba histolytica	Cyst detection after MIF – concentration or ELISA	Stool	Stool tube with spatula 1–2 cherry-pip-sized samples

Query Localisation	Pathogen and Verification of pathogen	Material and Material collection	Sample container and sample quantity
Cryptosporidia spp.	ELISA	Stool	Stool tubes (about 2 g or cherry-pip-sized stool sample)
Gardia	ELISA	Stool	Stool tubes (about 2 g or cherry-pip-sized stool sample)
Leishmania spp.	Microscopic in blood, biopsy (bone marrow, spleen, lymph nodes)	EDTA blood or biopsy specimen	EDTA tubes or sterile sample container
Microsporidia	Microscopic	Stool	Stool tubes (about 2 g or cherry-pip-sized stool sample)
Pneumocystis carinii	Microscopic (IFT)	Bronchial lavage if applicable provoked sputum	Suitable sample container, sputum tube
Worm eggs	Microscopic after MIF concentration	Stool	Stool tubes (about 2 g or cherry-pip-sized stool sample)
Worms	Macroscopic	Worm or proglottids	Suitable container