IFA
Institut für Arbeitsschutz der
Deutschen Gesetzlichen Unfallversicherung

BG RCI
Berufsgenossenschaft
Rohstoffe und chemische Industrie

Bundesministerium
für Arbeit und Soziales

Enterobacter cloacae subsp. cloacae

General information | Occupational and health protection | Morphology and physiology | Occurrence/natural habitat | Pathogenicity/pathogenic properties | Disease | Epidemiology | Resistance/Tenacity | Legal basics | References

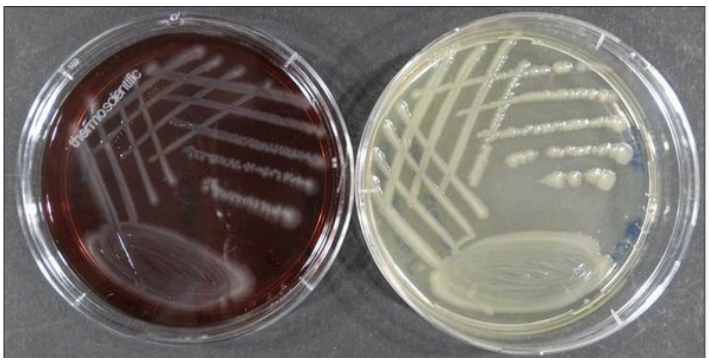
GENERAL INFORMATION

Enterobacter cloacae subsp. cloacae
Enterobacter cloacae

For further information on the current nomenclature of the species see
List of Prokaryotic Names with Standing in Nomenclature

Enterobacter cloacae (Hormaeche and Edwards 1960) is the type species of the genus *Enterobacter* and belongs to the family *Enterobacteriaceae*. Following Hoffmann and Roggenkamp's population genetic study in 2003, phylogenetic investigation of a large number of diverse but phenotypically and genotypically similar strains of the species resulted in the subdivision of the "*Enterobacter cloacae* complex" into the species *Enterobacter asburiae, Enterobacter carcinogenus, Enterobacter cloacae, Enterobacter hormaechei, Enterobacter kobei, Enterobacter nimipressuralis* and *Enterobacter mori*. In 2005, the species *E. cloacae* was subdivided into the subspecies *Enterobacter cloacae* subsp. *cloacae* and *Enterobacter cloacae* subsp. *dissolvens*, although a genome-based study from 2020 has suggested that *E. cloacae* subsp. *dissolvens* represents a separate species.

Document Number:	822243
Processing status:	This information was compiled on 08.06.2022.
Category:	Bacteria
Strain type:	ATCC 13047; CCUG 28448; CCUG 29301; CCUG 6323; CIP 60.85; DSM 30054; HAMBI 1295; HAMBI 96; IFO 13535; JCM 1232; LMG 2783; NBRC 13535; NCTC 10005 Further information: BacDive - The Bacterial Diversity Metadatabase (DSMZ)
Risk group:	**2** Biological agents that can cause human disease and might be a hazard to employees; they are unlikely to spread to the comunity; there is usually effective prophylaxis or treatment available.
References:	Note ht: Pathogenic for humans and vertebrates, but normally no transmission between the two host groups.
Consultant / Reference laboratory:	The German National Reference Centre (NRZ) for Surveillance of Nosocomial Infections at the Institute of Hygiene and Environmental Medicine Director: Prof. Dr med. Petra Gastmeier, Charité-Universitätsmedizin Berlin Joint institution of the Free University of Berlin and the Humboldt University Berlin Hindenburgdamm 27 12203 Berlin Tel.: +49 (0)30/450 577 612 Fax: +49 (0)30/450 577 920 E-mail: nrz@charite.de Homepage: https://www.nrz-hygiene.de/nrz/vorstellung/ Additional institution: German National Reference Centre for Gram-negative Hospital Pathogens Gram-negative hospital pathogens: among others *Enterobacteriaceae, P. aeruginosa* and *A. baumannii* Ruhr University Bochum Department of Medical Microbiology Contact: Prof. Dr Sören Gatermann Universitätsstr. 150 44801 Bochum Tel.: +49(0) 234 32-27467 (Prof. Gatermann) +49(0) 234 32-26938 (Dr rer. nat. Niels Pfennigwerth) +49(0) 234 32-27888 (Dr Anders) +49(0) 234 32-26938 (Dr Korte-Berwanger) Fax: +49 (0)234 32-14197 E-mail: nrz@rub.de Homepage: http://memiserf.medmikro.ruhr-uni-bochum.de/nrz/



Colonies of *Enterobacter cloacae* subsp. *cloacae*, strain DSM 30054T after cultivation on sheep's blood agar (left) and on TSA (right) after 48 h incubation at 37 °C.

Medical significance

E. cloacae subsp. *cloacae* belongs to a group of pathogens referred to as nosocomial (colloquially known as "hospital germs"). They are frequently facultative pathogenic constituents of the normal bacterial flora of the skin, nasopharynx or intestine and, for the most part, only develop pathogenicity in immunodeficient patients or after invasive medical intervention. Only in recent years have *Enterobacter* species, particularly *E. hormaechei* and *E. cloacae*, been identified as significant causes of nosocomial infections. There have been isolated major outbreaks of infections in neonatal intensive care units. Catheter-associated urinary tract infections and respiratory tract infections in intensive care units are of particular medical importance. In such cases, multiple antibiotic resistances can make it difficult to treat the disease. The primary risk factors for infection are prolonged stays in the intensive care unit of a hospital, in particular when invasive medical procedures are performed, e.g. insertion of catheters. *Enterobacter* species are members of the "ESKAPE" group (*Enterococcus faecium, Staphylococcus aureus, Klebsiella pneumoniae, Acinetobacter baumannii, Pseudomonas aeruginosa* and *Enterobacter* spp.), which are the primary causative agents of antibiotic-resistant nosocomial infections. For details on resistances, please refer to the relevant sections.
Epidemiological studies suggest that *E. cloacae* subsp. *cloacae* colonisations/infections are caused by a number of known "multilocus" sequence types, which have not been linked to a specific geographical origin. Clinically relevant isolates have been derived from different sources.
It can be assumed that approx. 10 - 25 % of patients colonised with multidrug-resistant *Enterobacter* spp. have acquired the infection during a stay in hospital.
Under § 23 of the German Infection Protection Act (IfSG), hospital managers must record and evaluate the occurrence of pathogens with specific resistances and multi-resistances. From this collected data, preventive measures must be deduced and communicated to hospital staff. As a result, hospitals are legally obliged to monitor for pathogens with particular resistances and to act appropriately in line with their findings. This is supported by the German Nosocomial Infection Surveillance System (KISS), which provides an overview of the medical relevance of various nosocomial pathogens). The hospitals participating in the system provide data on the pathogens identified, these include the pathogen groups 3MRGN and 4MRGN (multidrug-resistant Gram-negative bacteria). *E. cloacae* subsp. *cloacae* are of particular importance in invasively ventilated patients, patients with urinary catheters and in neonatal wards. Blood poisoning (sepsis) can be caused by central venous catheters.
Reference: 10474 10488 25407

Transmission routes

Admission over the respiratory tract.
Microbial contaminated aerosols (bioaerosols) are inhalable due to their size and can thus get in the lung.
Admission over the mouth.
The transmission takes place due to contaminated water.
A transmission takes place by touching the mouth with dirty hands or gloves or smoking without prior thorough cleaning of the hands (smear infection).
Special hazard exists in the case of contact with infected people and animals or their excretion.
Admission through the skin or the mucous membranes.
Injuries, dry and chapped skin as well as existing skin alterations such as eczema allow the penetration into the body.
Transmission via penetration in the deep tissues (muscle, subcutaneous fatty tissue) in the case of injury e.g. due to stab and cutting injuries with contaminated equipment.
Transmission of *E. cloacae* subsp. *cloacae* mainly occurs via direct or indirect contact with contaminated persons, materials or objects (smear/contact infection). Transmission can occur, for example, via contamination on the hands of nursing staff due to poor hygiene or via cross-contamination via objects such as endoscopes, stethoscopes, respiratory equipment and dialysis equipment. In addition, direct transmission can occur via contaminated fluids, e.g. isotonic saline solution.
Reference: 10474 25407
For further information on transmission routes see chapter EPIDEMIOLOGY.

OCCUPATIONAL SAFETY AND HEALTH

Sector | Activity | Protective measures | Inactivation/Decontamination | Immediate measures/First aid | Occupational health care

SECTORS

- Health and welfare services
- Laboratories
- Care services

Reference: 99999

ACTIVITIES

Nursing and caring activities in the above-mentioned facilities, in particular care of patients infected with *Enterobacter cloacae* subsp. *cloacae*, care of immunodeficient patients, patients on long-term ventilation, intensive-care patients and premature infants.
Reference: 10474 10488 25407

PROTECTIVE MEASURES

General protective measures

Since infections are caused by contact, strict adherence to hygiene regulations (especially hand-disinfection plans) must be ensured. At a minimum, gowns and gloves must be worn as protection. Care must be taken to change gloves.

The following protective measures apply to specific activities in laboratories, the husbandry of laboratory animals and biotechnological activities. For further information see TRBA 100, TRBA 120, TRBA 500.

Technical measures

Where tasks intentionally involve biomaterials, their identity must be verified and documented routinely.
Areas in which the biomaterial is processed must be isolated from other areas and labelled with the 'Biohazard' warning symbol and protection level **2**.
The doors of the area within which the protection level applies must open in the direction of the escape route and be equipped with an inspection window.
Where a health hazard posed by bioaerosols cannot be eliminated, the relevant activities must be performed in a microbiological safety cabinet (MSC). For detailed information on activities in MSCs, see leaflet B 011 of the BG RCI (German Social Accident Insurance Institution for the raw materials and chemical industry).
Wash basins, disinfectant dispensers, disposable towels and hand detergents must be available.
Water faucets and disinfectant dispensers must be operable without the use of the hands.
Laboratories must offer suitable eyewash facilities.
All surfaces and areas that could come into contact with biological agents must be easy to clean, liquid-tight and resistant to detergents and disinfectants. A seamless wall-floor joint must be effected.
Windows and doors must be kept closed while work is in progress.
Work areas are to be maintained in a clean and tidy state. Only tools and devices that are actually needed may remain on the benches.
Pipettors must be provided and used. Mouth pipetting is not permitted.
If the use of pointed or sharp instruments cannot be avoided, they must be disposed of in suitable containers after use.
The release of biological agents must be minimised during the opening of technical equipment.
Catch basins must be in place to ensure that open sample containers are prevented from turning over during work operations.
The biomaterial must not be stored under conditions that favour its reproduction.
Clearly labelled, closed, rigid, liquid-tight and unbreakable vessels that can be disinfected from the outside must be provided and used for the in-house transport of biological agents.
Transport of biological agents outside the plant is subject to the regulations governing hazardous goods (class 6.2).
Suitable containers must be available for the collection of waste that constitutes biological agents.

Organisational measures

The number of staff must be limited to the actual requirements, and access to the area in which the protection level applies must be restricted to authorized persons.
An instruction manual must be prepared. Prior to beginning their activity and subsequently at least once a year, verbal and work-related instruction must be provided to staff members to familiarise them with the hazards and protective measures as laid down in the instruction manual. DGUV Informative Publication 213-016 (BGI/GUV-I 853) contains a prototype instruction manual on 'activities involving biological agents of Risk Group 2' in accordance with the German Ordinance on Biological Substances.
The instruction process must also include advice in occupational medicine and safety.
Restrictions of employment for expectant and nursing mothers must be observed in accordance with the German Maternity Protection Act.
Injuries must be reported immediately to the person in charge.

Personal protection - body protection

Suitable protective clothing must be worn (at least lab coats).
Durind the processing of infectious tissues, the protective clothing must be complemented by disposable aprons.
Remove protective clothing when leaving the area in which the protection level applies.
Keep protective clothing separate from normal clothing.

Personal protection - hand protection

Depending on the results of the risk assessment, the use of protective gloves may be mandatory for certain activities.
The skin protection plan must be observed.

Personal protection – eye and face protection

Depending on the results of the risk assessment, protective goggles or face protection may be necessary.

Personal protection - respiratory protection

Depending on the results of the risk assessment, a respiratory protection device may be necessary.
Respiratory protection equipment must be worn for only a limited period of time. This period must be defined in the risk assessment.

Occupational hygiene

The consumption and storage of food and alcohol/tobacco in the protection level area is forbidden.
The wearing of jewellery, watches and rings on the hands and the forearms is not permitted. Fingernails are to be kept short.
Following completion of work and prior to leaving the work area, hands are to be disinfected, washed and remoisturised according to the skin protection plan.
Skin protection and skin care agents must be made available in contamination-proof containers.
Contaminated protective clothing and shoes are to be collected safely and decontaminated, cleaned and disposed of centrally.
Work clothing must not be cleaned at home.
The cleaning regulations for employees, equipment and workplaces must be defined in a hygiene plan.
Insects and pests in the working area must be regularly controlled.

Vaccination
No vaccine is available.

Reference: 00001 99999

INACTIVATION / DECONTAMINATION

Disinfection measures must be carried out by proven means and procedures. For detailed information see the following lists: DVG - Animal Husbandry (German Association for Veterinary Medicine, Accommodation and Husbandry of Animals), DVG - Food Area, VAH and RKI.
Officially ordered disinfection measures (decontamination) required by the authorities may be carried out only with disinfection agents included in the RKI list.
Furthermore, the Industrie Association Hyhiene and Surface Protection (HO) supplies lists of statements of companies on the efficacy of different products. The information in this register is based on statments of the respective companies.
A suitable autoclave must be available in the same building.
Externally contaminated test vessels must be disinfected before opening.
Work areas and working equipment must be decontaminated before the performance of maintenance measures. For further information see TRBA 100 ('Technical Rules for Biological Agents').
Contaminated solid wastes, liquid cultures and suspensions containing pathogens are to be collected in appropriate containers and deactivated.

Reference: 00001

IMMEDIATE MEASURES / FIRST AID / POST-EXPOSURE PROPHYLAXIS

Accidental release measures
In the event that material containing pathogens (e.g. material from infected cell cultures) is spilled or blown over, the contaminated area should be covered with paper towels while wearing protective clothing and carefully soaked with disinfectant. Once the paper towels have been removed (discard in a sealable container intended for infectious material), surface disinfection must be performed as per the hygiene plan – ensure sufficient application time (at least 30 minutes). If pathogenic material has been ingested consult the accident insurance consultant or the company physician.

First aid: eyes and mucous membranes
Beyond general first aid measures, special measures are usually not necessary.

First aid: skin
Beyond general first aid measures, special measures are usually not necessary.

First aid: respiratory tract
Beyond general first aid measures, special measures are usually not necessary.

First aid: swallowing
Rinse mouth thoroughly with water, spit out – do not swallow, consult the accident insurance consultant or company physician.

Information for physicians
Enterobacter cloacae subsp. *cloacae* is highly unlikely to be pathogenic in healthy individuals. Despite this, healthy individuals can also be colonised with *Enterobacter cloacae* subsp. *cloacae*. For this reason, consideration should also be given to the staff in clarifying and interrupting chains of infection of multidrug-resistant strains.
Enterobacter cloacae subsp. *cloacae* strains are both naturally resistant to ampicillin and carbenicillin and can express extended-spectrum beta-lactamases (ESBLs), affording them resistance to penicillins and cephalosporins. Please refer to the "Resistances" section for further details. A number of pathogenicity factors have been identified as haemolytic and leukotoxic membrane cytotoxins. However, the German Commission for Hospital Hygiene and Infection Prevention (KRINKO) does not explicitly recommend screening of staff, but instead suggests that patients from whom a multidrug-resistant strain of *Enterobacter cloacae* subsp. *cloacae* has been isolated should be cared for by specially selected staff.
Identification of multidrug-resistant strains of *Enterobacter cloacae* subsp. *cloacae* that are resistant to carbapenems (infection or colonisation) must be notified to the hospital's competent public health authority.

Reference: 10474 10488 25407 99999

OCCUPATIONAL HEALTH CARE according to ArbMedVV

Optional health care:
In the case of tasks specifically involving contact and tasks involving incidental contact with biological agents classed as Risk Group 2 under the Biological Agents Ordinance (Biostoffverordnung, BioStoffV) or which involve a comparable risk, the employer must offer an optional health care. This does not apply when on account of the risk assessment and on account of the protective measures taken it can be assumed that there is no risk of infection.
An optional health care must also be offered if as a result of the exposure to biological agents
- a serious infectious illness is to be expected and post-exposure prophylatic measures are possible, or
- an infection has resulted.

MORPHOLOGY AND PHYSIOLOGY

MORPHOLOGY

Enterobacter cloacae subsp. *cloacae* bacteria are Gram-negative, rod-shaped and have a diameter of up to 1 µm and a length of up to 3 µm. Some strains form an acidic polysaccharide capsule that surrounds the bacterial cell, which in unstained preparations has the appearance of a colourless halo. *Enterobacter cloacae* subsp. *cloacae* forms fimbriae and adhesins, allowing it to colonise mucous membranes.

Reference: 10474

PHYSIOLOGY

Enterobacter cloacae subsp. *cloacae* can proliferate both under aerobic and anaerobic conditions. The bacteria are esculin negative, do not synthesise indole from tryptophan, are arginine dihydrolase (ADH) positive and lysine decarboxylase (LDC) negative and can synthesise acid from sorbitol, sucrose and melibiose. Some strains exhibit slimy growth on solid culture media due to capsule formation. In the process of conjugation, *Enterobacter cloacae* subsp. *cloacae* can both acquire and transmit plasmids to and from other enterobacteria, thereby contributing to the spread of antibiotic resistance.

Reference: 10474

INFORMATION ON MOLECULAR BIOLOGY

Genome

A large number of genome sequences of *Enterobacter cloacae* subsp. *cloacae* strains have now been published. The size of the genome varies.
The DSM 30054T type strain possesses one chromosome and 2 plasmids with a total genome length of 5,602,610 bp. The GenBank accession no. is GCA_013376815.1

Comments

From a clinical-epidemiological point of view, detection of extended-spectrum beta-lactamases (ESBLs) by molecular biological means is important. Please refer to the “Resistances” section for further details.

Reference: 10471 10472 10473 10474 10476 10478 10480 10481 10485 10488 10500 25407

OCCURRENCE / NATURAL HABITAT

FREE-LIVING / HOST BOUND

This biological agent is free-living.
This biological agent is host-dependent parasitical.
This biological agent is host dependent-commensalic.

Reference: 99999

HOSTS

Humans, animals, plants, environment.

Reference: 99999

VECTORS

Humans, animals, plants, environment.

Reference: 99999

GEOGRAPHIC DISTRIBUTION

The pathogen is distributed worldwide.

Reference: 99999

PATHOGENICITY / PATHOGENIC PROPERTIES

CHARACTERISTIC OF PATHOGENICITY

Facultative human-pathogenic (it does not necessarily cause diseases in humans).
Facultative animal-pathogenic (it does not necessarily cause diseases in animals).

Reference: 99999

MINIMUM INFECTIOUS DOSE (MID)

Unknown.

Reference: 99999

CARCINOGENICITY / MUTAGENICITY / REPRODUCTIVE TOXICITY

Unknown.

Reference: 99999

ALLERGENICITY / SENSITISING EFFECT

An allergic / sensitising potential is not known.

No allergenic or sensitising effects are known.

Reference: 99999

TOXIGENICITY / TOXIN FORMATION

A number of pathogenicity factors have been identified as haemolytic and leukotoxic membrane cytotoxins.

Reference: 10474

DISEASE

DESCRIPTION

Enterobacter cloacae subsp. *cloacae* can in predisposed individuals cause various infections of the respiratory and urinary tracts as well as sepsis. In addition, the bacteria can also infect wounds.
Reference: 10473 10474 10475 10480 10483 25339 25666

ZOONOSIS

Zoonosis (transmission between animals and humans): Yes

Even though *Enterobacter cloacae* subsp. *cloacae* can be transmitted from animals to humans, as yet no reported infection has been considered to be zoonotic.
Reference: 10474

INFECTIOUS STAGES

The progress of infections depends on their location and specific stages do not exist.
Reference: 99999

INCUBATION PERIOD

Incubation periods vary, depending on the predisposing pre-existing disease.
Reference: 99999

SYMPTOMS AND COURSE OF DISEASE

Vary depending on the type of infection and the condition of the infected individual(s).
Reference: 99999

LETHALITY

Unknown.
Reference: 99999

THERAPY

Antibiotic therapy should only be prescribed after a conclusive antibiogram of the pathogen has been obtained.
Reference: 10474 10488 25407

PROPHYLAXIS

Generally not required.
Reference: 99999

EPIDEMIOLOGY

TRANSMISSION ROUTES / PORTALS OF ENTRY

Transmission takes place percutaneously (through the skin).
Transmission takes place via inhalation (by breathe).
Transmission takes place orally (by ingestion).

Transmission of *E. cloacae* subsp. *cloacae* mainly occurs via direct or indirect contact with contaminated persons, materials or objects (smear/contact infection). Transmission can occur, for example, via contamination on the hands of nursing staff due to poor hygiene or via cross-contamination via objects such as endoscopes, stethoscopes, respiratory equipment and dialysis equipment. In addition, direct transmission can occur via contaminated fluids, e.g. isotonic saline solution.
Reference: 10474 25407

PATHOGEN RESERVOIR

E. cloacae subsp. *cloacae* is also found in healthy humans and animals, on plants and in the environment.
Reference: 10474 25407

INCIDENCE

Unknown.
Reference: 99999

RESISTANCE / TENACITY

SPORULATION

Does not form spores.

Reference: 99999

CONIDIA FORMATION

Does not form conidia.

Reference: 99999

RESISTANCES

E. cloacae subsp. *cloacae* is naturally resistant to ampicillin, amoxicillin-clavulanic acid, cephalothin and cefoxitin. Ureidopenicillins and carboxypenicillins are effective in approximately fifty percent of strains. Chromosomally encoded AmpC cephalosporinase can give rise to resistance to a wide range of beta-lactam antibiotics, in particular third generation cephalosporins (with the exception of cefepines). Numerous strains expressing ESBLs (extended-spectrum ß-lactamases) have been isolated since 1989. Subsequently, a large number of ESBLs, including the established types TEM, SHV and CTX-M have been identified in *E. cloacae* subsp. *cloacae*. Along with *Escherichia coli* and *Klebsiella pneumoniae*, one of the most frequently detected members of the *Enterobacteriaceae* that are resistant to third-generation cephalosporins is *E. cloacae* subsp. *cloacae*. In addition, isolates with potent carbapenemases have been found. Strains possessing IMP, NDM, GIM or KPC enzymes have been most commonly identified in Asia. Lee et al. reported that 0.4 % of *E. cloacae* strains were found to be resistant to imipenem . 0 - 51 % of strains have been found to be resistant to aminoglycosides, 0 - 34 % to amikacin, while ciprofloaxin has been found to be effective in 64 - 100 % of strains. In a study from China, plasmids carrying genes for aminoglycoside resistance were found in 77 % of *E. cloacae* strains. *E. cloacae* subsp. *cloacae*, together with *E. coli* and *K. pneumoniae*, is one of the species in which resistance to quinolones attributed to plasmid-encoded QnrA protein production has been identified. Such determining factors of fluoroquinolone resistance have been identified in more than 60 % of *E. cloacae* strains.

Reference: 10471 10473 10474 10476 10478 10480 10481 10485 10487 10488 10489 10491

LEGAL PRINCIPLES / REGULATIONS

LAWS AND ORDINANCES

Ordinance on Safety and Health Protection at Workplaces Involving Biological Agents
(Biological Agents Ordinance - BioStoffV)

Law for the regulation of genetic engineering (Genetic Engineering Act -GenTG) and associated regulations (only in German).

Public notice of the list risk-rated donor organisms and recipient organisms for genetic engineering of 5. July 2013

Law on the prevention and control of infectious diseases in humans (Infection Protection Act -IfSG) (only in German)

Ordinance on Occupational Health Care (ArbMedVV)

Law for the protection of working mothers (MuSchG)
(only in German)

Animal health law (TierGesG) and associated regulations (only in German)

Regulation to protect against hazardous substances (Hazardous Substance Ordinance -GefStoffV) (only in German)

TECHNICAL RULES AND OTHER REGULATIONS

TRBA 100
Protective measures for activities involving biological agents in laboratories

TRBA 250
Biological agents in health care and welfare facilities

TRBA 400
Guideline for risk assessment and for the instruction of employees in relation to activities with biological agents

TRBA 450
Criteria for the classification of biological agents

TRBA 466
Classification of prokaryotes (bacteria and archaea) into risk groups (only in German)

TRBA 468
List of cell lines and activities with cell cultures (only in German)

TRBA 500
Basic measures to be taken for activities involving biological agents

REFERENCES

Quelle: 00001
Informationen aus den Technischen Regeln für Biologische Arbeitsstoffe, insbesondere aus:
Information from the technical rules for biological substances, in particular from:
- TRBA 100
Schutzmaßnahmen für Tätigkeiten mit biologischen Arbeitsstoffen in Laboratorien; Ausgabe: Oktober 2013, zuletzt geändert 2018
Protective measures for activities involving biological agents in laboratories; Edition: October 2013, last amended 2018
- TRBA 120
Versuchstierhaltung; Ausgabe: Juli 2012, zuletzt geändert 2017
Experimental animal husbandry; Edition July 2012, last amended 2017
- TRBA 500
Grundlegende Maßnahmen bei Tätigkeiten mit biologischen Arbeitsstoffen; Ausgabe: April 2012
Basic measures to be taken for activities involving biological agents; Edition April 2012

Quelle: 01466
TRBA 466
Einstufung von Prokaryonten (Bacteria und Archaea) in Risikogruppen; August 2015, zuletzt geändert August 2019

Classification of prokaryotes (bacteria and archaea) in risk groups; August 2015, last amended August 2019

Quelle: 02014
Verordnung zur arbeitsmedizinischen Vorsorge (ArbMedVV)
Ordinance on Occupational Health Care (ArbMedVV)

Quelle: 10471
Arpin C, Labia R, Dubois V, Noury P, Souquet M, Quentin C. 2002. TEM-80, a novel inhibitor-resistant -lactamase in a clinical isolate of *Enterobacter cloacae*. Antimicrob Agents Chemother 46:1183 - 1189. https://doi.org/10.1128/AAC.46.5.1183-1189.2002.

Quelle: 10472
Corkill JE, Anson JJ, Hart CA. 2005. High prevalence of the plasmidmediated quinolone resistance determinant*qnrA* in multidrugresistant *Enterobacteriaceae* from the blood cultures in Liverpool, UK. J Antimicrob Chemother 56:1115–1117. https://doi.org/10.1093/jac/dki388.

Quelle: 10473
Dai W, Sun S, Yang P, Huang S, Zhang X, Zhang L. 2013. Characterization of carbapenemases, extended spectrum _-lactamases and molecular epidemiology of carbapenem-non-susceptible Enterobacter cloacae in a Chinese hospital in Chongqing. Infect Genet Evol 14:1–7. https://doi.org/10.1016/j.meegid.2012.10.010.

Quelle: 10474
Davin-Regli A, Lavigne J-P, Pagès J-M. 2019. *Enterobacter* spp.: update on taxonomy, clinical aspects, and emerging antimicrobial resistance. Clin Microbiol Rev 32:e00002-19. https://doi.org/10.1128/CMR.00002-19.

Quelle: 10475
Galani I, Souli M, Chryssouli Z, Orlandou K, Giamarellou H. 2005. Characterization of a new integron containing, bla (VIM-1) and aac(6')-IIc in an *Enterobacter cloacae* clinical isolate from Greece. J Antimicrob Chemother 55:634–638. https://doi.org/10.1093/jac/dki073.

Quelle: 10476
Hamprecht A, Poirel L, Gottig S, Seifert H, Kaase M, Nordmann P. 2013. Detection of the carbapenemase GIM-1 in*Enterobacter cloacae* in Germany. J Antimicrob Chemother 68:558 –561. https://doi.org/10.1093/jac/dks447.

Quelle: 10477
Hoffmann H, Roggenkamp A. 2003. Population genetics of the Nomenspecies *Enterobacter cloacae*. Appl Environ Microbiol 69:5306 –5318. https://doi.org/10.1128/AEM.69.9.5306-5318.2003

Quelle: 10478
Huang S, Dai W, Sun S, Zhang X, Zhang L. 2012. Prevalence of plasmidmediated quinolone resistance and aminoglycoside resistance determinants among carbapeneme non-susceptible *Enterobacter cloacae*. PLoS One 7:e47636. https://doi.org/10.1371/journal.pone.0047636.

Quelle: 10480
Jin C, Zhang J, Wang Q, Chen H, Wang X, Zhang Y, Wang H. 2018. Molecular characterization of carbapenem-resistant*Enterobacter cloacae* in 11 Chinese cities. Front Microbiol 9:1597. https://doi.org/10.3389/fmicb.2018.01597.

Quelle: 10481
Kanamori H, Yano H, Hirakata Y, Hirotani A, Arai K, Endo S, Ichimura S, Ogawa M, Shimojima M, Aoyagi T, Hatta M, Yamada M, Gu Y, Tokuda K, Kunishima H, Kitagawa M, Kaku M. 2012. Molecular characteristics of extended-spectrum _-lactamases and *qnr* determinants in *Enterobacter* species from Japan. PLoS One 7:e37967. https://doi.org/10.1371/journal.pone.0037967.

Quelle: 10483
Moradigaravand D, Reuter S, Martin V, Peacock SJ, Parkhill J. 2016. The dissemination of multidrug-resistant*Enterobacter cloacae* throughout the UK and Ireland. Nat Microbiol 1:16173. https://doi.org/10.1038/nmicrobiol.2016.173.

Quelle: 10485
Pitout JDD, Moland ES, Sanders CC, Thomson KS, Fitzsimmons SR. 1997. -Lactamases and detection of _-lactam resistance in*Enterobacter* spp. Antimicrob Agents Chemother 41:35–39. https://doi.org/10.1128/AAC.41.1.35.

Quelle: 10487
Raimondi A, Traverso A, Nikaido H. 1991. Imipenem- and meropenemresistant mutants of *Enterobacter cloacae* and *Proteus rettgeri* lack porins. Antimicrob Agents Chemother 35:1174 –1180. https://doi.org/10.1128/aac.35.6.1174.

Quelle: 10488
Robert-Koch Institut (Hrsg) 2021. Infektionsepidemiologisches Jahrbuch meldepflichtiger Krankheiten für 2020. https://www.rki.de/DE/Content/Infekt/Jahrbuch/Jahrbuch_2020.html;jsessionid=EB811AB5DB50AC582173B2218FBDF115.internet091?nn=2374622

Quelle: 10489
Szabo D, Melan MAA, Hujer AM, Bonomo RA, Hujer KM, Bethel CR, Kristof K, Paterson DL. 2005. Molecular analysis of the simultaneous production of two SHV-type extended-spectrum beta-lactamases in a clinical isolate of *Enterobacter cloacae* by using single-nucleotide polymorphism genotyping. Antimicrob Agents Chemother 49:4716–4720. https://doi.org/10.1128/AAC.49.11.4716-4720.2005

Quelle: 10490
Wu W, Feng Y, Zong Z. 2020. Precise species identification for Enterobacter: a genome sequence-based study with reporting of two novel species, Enterobacter quasiroggenkampii sp. nov. and Enterobacter quasimori sp. nov. mSystems 5:e00527-20. https://doi.org/10.1128/mSystems.00527-20.

Quelle: 10491
Zaher A, Cimolai N. 1998. ERIC-PCR typing profiles of *Enterobacter cloacae* are stable after development of advanced cephalosporin resistance. Int J Antimicrobial Agents 9:165–167. https://doi.org/10.1016/S0924-8579(97)00046-0

Quelle: 10500
National Library of Medicine, National Center for Biotechnology Information, Assembly
https://www.ncbi.nlm.nih.gov/assembly/GCA_013376815#/def

Quelle: 25339
Sanders Jr, W E, Sanders, C C *Enterobacter* spp.: pathogens poised to flourish at the turn of the century. Clin Microbiol Rev. 1997 Apr;10(2):220-41.

Quelle: 25407
Suerbaum, C., Hornef, M., Karch, H. Enterobakterien. pp. 299-335. In: Medizinische Mikrobiologie und Infektiologie (Suerbaum, S., Burchard, G.-D., Kaufmann, S.H.E, Schulz. T.F.) Springer Verlag, 9. Auflage 2020

Quelle: 25666
De Champs C, Sauvant MP, Chanal C, Sirot D, Gazuy N, Malhuret R, Baguet JC, Sirot J. 1989. Prospective survey of colonization and infection caused by expanded spectrum-beta-lactamase-producing members of the family *Enterobacteriaceae* in an intensive care unit. J Antimicrob Chemother 27:2887–2890.

Quelle: 25667
Hoffmann H, Stindl S, Ludwig W, Stumpf A, Mehlen A, Heesemann J, Monget D, Schleifer KH, Roggenkamp A. 2005. Reassignment of *enterobacter dissolvens* to *Enterobacter cloacae* as *E. cloacae* subspecies *dissolvens* comb. nov. and emended description of *Enterobacter asburiae* and *Enterobacter kobei*. Syst Appl Microbiol 28:196-205.

Quelle: 25668
Hormaeche E, Edwards PR. 1960. A proposed genus *Enterobacter*. International Bulletin of Bacteriological Nomenclature and Taxonomy 10:71-74

Quelle: 99999
Angabe des Bearbeiters
Indication of the author

General information | Occupational and health protection | Morphology and physiology | Occurrence/natural habitat | Pathogenicity/pathogenic properties | Disease | Epidemiology | Resistance/Tenacity | Legal basics | References