IFA
Institut für Arbeitsschutz der
Deutschen Gesetzlichen Unfallversicherung

BG RCI
Berufsgenossenschaft
Rohstoffe und chemische Industrie

Bundesministerium
für Arbeit und Soziales

# Pseudomonas aeruginosa



## GENERAL INFORMATION

**Pseudomonas aeruginosa**

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

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**Category:** Bacteria

**Strain type:** *Pseudomonas aeruginosa*: DSM-50071
Specification in other collections: ATCC 10145, ICPB 2523, NCIB 8295, NCTC 10332, NRRL B-771, WDCM 00024

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.

Note T:
Toxin production: prokaryotes capable of forming exotoxins. The "T" tag lays no claim to completeness, however, i.e. exotoxin-forming strains may also arise in types of prokaryote without this tag. The "T" tag adopted over from Annex III of Directive 2000/54/EC.

**Consultant / Reference laboratory:**

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*Pseudomonas aeruginosa* cultured (right and left) on sheep's blood agar in comparison with *Escherichia coli* (centre). Broadly tapering colonies, blue discolouration due to pyocyanin and the metallic shine on the colony surface (left) are typical for *Pseudomonas aeruginosa*. There is also an intensive odour of fruit ester or flowers of the lime tree. Photo: PD Dr. Jürgen Rödel, Institute of Medical Microbiology [Institut für Medizinische Mikrobiologie], University Hospital Jena [Universitätsklinikum Jena].

## Medical significance

*Pseudomonas aeruginosa* belongs to the so-called "nonfermenters" and is widespread in the environment, especially in water or humid areas. The bacteria are routinely found in biofilms in wastewater pipes; sometimes they are also found in water pipes.
*Pseudomonas aeruginosa* possesses pronounced environmental resistance and is also resistant to various disinfectants. The bacterium may also exhibit resistance to various antibiotics.
*Pseudomonas aeruginosa* is an opportunistic pathogenic bacterium which may cause severe infections of various organ systems in persons with impaired immunity, diabetes mellitus, or burns or in patients on ventilators. In patients with cystic fibrosis (mucoviscidosis), alginate-forming strains colonise and infect the lungs and limit the life expectancy of these patients.
Strains of Pseudomonas aeruginosa with specific resistances to antibiotics or disinfectants are among the feared causative agents of hospital-acquired infections, particularly in intensive care wards.

Reference: 99999

## Transmission routes

*Pseudomonas aeruginosa* occurs ubiquitously in the environment, in soil, water bodies and on plants, especially in humid environments, in domestic and hospital settings also in toilets, showers, washbasins, flower vases, etc. Transmission occurs mainly through contact with contaminated media/objects. Transmission occurs mainly through contact with contaminated media/objects. Person-to-person transmission plays a role in hospitals and nursing homes. *P. aeruginosa* is one of the most frequent pathogens of nosocomial infections worldwide (especially pneumonia as well as wound and urinary tract infections).

Reference: 25321

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

- Medical services
- Veterinary medicine
- Services for medical devices
- Laboratories

Reference: 99999

### ACTIVITIES

- Care of patients in intensive care wards
- Handling examination material (specimens) from patients
- Repair of medical device (particularly ventilators)
- Handling cultures of Pseudomonas aeruginosa

Reference: 99999

### PROTECTIVE MEASURES

**General protective measures**

Inform medical staff about how to deal with patients who have contracted a hospital-acquired infection. Hand disinfection before and after each contact with a patient. Disposable gloves and final disinfection of non-gloved hands are recommended for contact with excreta from germ carriers. Strict hand hygiene in slaughterhouses. Similarly, if there is a risk of aerosol formation in poultry and other slaughterhouses, mouth/nose protection should be worn.
If there is a risk of aerosol formation when handling infected patients or when handling excreta from these persons, a simple mouth-nose protection is recommended.
Due to the lack of vaccination possibilities, effective protective measures are currently mainly based on personal, but also organisational protective and hygiene measures. The respective necessary (also personal) protective measures are to be determined and taken on the basis of the risk assessment (see below).
In the clinical area (but also in working areas of food production and processing), it is important to "eliminate" possible sources (washbasins, shower cabins, etc.) as potential sources by thorough cleaning and disinfection measures.

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.
Regular hand disinfection, even after removing any protective gloves which were worn, is recommended to avoid infection via skin microlesions.

### 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

A vaccine against infections by Pseudomonas aeruginosa is not available.

Reference: 00001 25321 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 (IHO) 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.
Provision of disinfectants which are suitable for inactivating *Pseudomonas aeruginosa*.
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.
*Pseudomonas aeruginosa* is sensitive to most approved disinfectants. Corresponding declarations must be observed.
The disinfectant solutions must be produced fresh every day if they are not already supplied in a ready-to-use form, since *Pseudomonas aeruginosa* can reproduce in diluted disinfectants and may be distributed over objects or surfaces (among other things) via the contaminated disinfectants.
Approved sterilisation methods are sufficient for inactivation.

Reference: 00001

## IMMEDIATE MEASURES / FIRST AID / POST-EXPOSURE PROPHYLAXIS

### Accidental release measures

No measures are necessary.

### First aid: eyes and mucous membranes

Eye shower, eye-wash bottle.

### First aid: skin

Skin disinfection with an approved disinfectant.

**First aid: respiratory tract**

If persons have inhaled an aerosol that contains the bacteria, prevention with antibiotics can be considered, depending on the affected person's state of health (check for diabetes mellitus, immune suppression, etc.).
*Pseudomonas aeruginosa* is not pathogenic for immunocompetent persons.

**First aid: swallowing**

No measures are necessary.

**Information for physicians**

Immunocompetent persons are usually not at risk from *Pseudomonas aeruginosa*, but can be possible carriers in the hospital if hygiene behaviour is faulty.
People with pre-existing conditions such as diabetes mellitus, immunosuppressive therapy, artificial respiration, burn disease, surgery or catheters may be at risk from *Pseudomonas aeruginosa*.
*P. aeruginosa* strains are often resistant to many antibiotics through natural resistance mechanisms but also through the accumulation of resistance genes and also pass on these resistance genes to other strains within the genus but also to other bacteria.
The therapy of an infection caused by *P. aeruginosa* must always be guided by an antibiogram. Since *P. aeruginoas* strains cause hospital infections, primary isolates should always be kept for molecular biological-epidemiological investigations in order to detect or exclude the spread of such strains in the hospital.

Reference: 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

*Pseudomonas aeruginosa* is a Gram-negative rod-shaped bacterium which is 0.5 to 1 µm wide and 1 to 1.3 µm long, with one polar flagellum. It forms no spores.

Reference: 99999

### PHYSIOLOGY

*Pseudomonas aeruginosa* is one of the nonfermenters. It produces and secretes various polysaccharides, rhamnolipids, proteinases and lipases. Some strains produce a polysaccharide alginate as a mucous capsule.
Most strains of *Pseudomonas aeruginosa* produce a blue-green pigment called pyocyanin.
*Pseudomonas aeruginosa* forms fimbria which serve for adherence to cell surfaces or in biofilms.
*Pseudomonas aeruginosa* is capable of survival for long periods in the environment in water, on plants and in foods. Some strains of *Pseudomonas aeruginosa* are capable of reproducing in ready-to-use disinfectant solutions.
*Pseudomonas aeruginosa* can be cultivated on most nutrient media under aerobic conditions.

Reference: 99999

### INFORMATION ON MOLECULAR BIOLOGY

**Genome**
The 18 strains fully sequenced to date have a chromosome with a size of 6.2 to 6.8 mbp and no plasmids.

**Comments**
The genome, which is very large for bacteria, indicates a high degree of adaptability to various hosts or environmental conditions.

Reference: 20586

## OCCURRENCE / NATURAL HABITAT

### FREE-LIVING / HOST BOUND

This biological agent is free-living.

*Pseudomonas aeruginosa* is found free-living in the environment, in soil, water and on plants.
Reference: 99999

### HOSTS

Very broad host spectrum.
Reference: 99999

### VECTORS

There are no specific vectors.
*Pseudomonas aeruginosa* can be found in the intestines or on the mucous membranes of humans and animals as a commensal (colonising) agent.
Hospital personnel may be involved in the spread of hospital strains without becoming ill themselves.
Reference: 99999

### GEOGRAPHIC DISTRIBUTION

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)

No information available. A high infective dose is probable.
The infective dose depends on the severity of the prior illness or the vulnerability of the affected person.
Reference: 99999

### CARCINOGENICITY / MUTAGENICITY / REPRODUCTIVE TOXICITY

Reference: 99999

### ALLERGENICITY / SENSITISING EFFECT

An allergic / sensitising potential is not known.

Reference: 99999

### TOXIGENICITY / TOXIN FORMATION

*Pseudomonas aeruginosa* produces exotoxin A, which inhibits protein synthesis in infected tissues. Aside from this, toxic properties are ascribed to the pigment pyocyanin, which is secreted by *Pseudomonas aeruginosa*.
As a Gram-negative rod-shaped bacterium, *Pseudomonas aeruginosa* contains endotoxin (LPS).
Reference: 20587

## DISEASE

### DESCRIPTION

*Pseudomonas aeruginosa* is the most common causative agent of acute pneumonia in patients on ventilators. Aside from this, *Pseudomonas aeruginosa* is a common causative agent of other hospital-acquired infections, such as urinary tract infections.
The septic conditions which develop within this context are very feared due to their high fatality rates.
Outside hospitals, *Pseudomonas aeruginosa* may cause chronic middle ear inflammation if the eardrum was previously damaged.
"Hot foot syndrome", in which *Pseudomonas aeruginosa* penetrates the soaked skin of the foot and triggers acute inflammation, is occasionally observed among swimmers at poorly maintained swimming pool facilities.
Patients with mucoviscidosis (cystic fibrosis), who are generally infected by alginate-forming strains of *Pseudomonas aeruginosa* and develop chronic obstructive lung disease, are particularly susceptible to *Pseudomonas aeruginosa*. Getting this infection under control is decisive for the life expectancy of these patients.
Reference: 99999

### ZOONOSIS

Zoonosis (transmission between animals and humans): Yes

Reference: 99999

### INFECTIOUS STAGES

The bacteria are always infectious.
Reference: 99999

### INCUBATION PERIOD

Hours to several days, depending on where the infection is localised.
Reference: 99999

### PATENCY

During the entire period of the infection.
Reference: 99999

### SYMPTOMS AND COURSE OF DISEASE

*Pseudomonas aeruginosa* is the causative agent of blue-green pus in wound infections.
The symptoms of infections with *Pseudomonas aeruginosa* decisively depend on the previous damage or previous illnesses in the affected person.
Symptoms range from acute inflammation (e.g. hot foot syndrome) to chronic disease with pus discharge (e.g. chronic otitis) to sepsis after pneumonia.
The course of the disease is also determined by the infective strain's resistance to antibiotics. Besides the sensitive strains from the environment, there are also multiresistant isolates from hospitals against which none of the available antibiotics are effective.

Reference: 99999

### LETHALITY

The fatality rate of sepsis triggered by *Pseudomonas aeruginosa* is above 70%, but is also significantly determined by the patient's prior illnesses.
Reference: 99999

### THERAPY

*Pseudomonas aeruginosa* is naturally resistant to penicillin, macrolide antibiotics, folic acid antagonists and most aminoglycoside antibiotics. Specialised antibiotics to treat infections by *Pseudomonas aeruginosa* include ceftazidime, tobramycin, imipenem or meropenem and colistin. Antibiotic treatment of infections caused by *Pseudomonas aeruginosa* must always be based on resistance testing of the strain!
Reference: 03043

### PROPHYLAXIS

Stringent hygiene when handling ventilators and catheters. Consistent hand hygiene must be practiced in hospitals.
A vaccine is not available!
Reference: 99999

## EPIDEMIOLOGY

### TRANSMISSION ROUTES / PORTALS OF ENTRY

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

Reference: 99999

### PATHOGEN RESERVOIR

Soil, water, wastewater pipes and infected persons.
Reference: 99999

### INCIDENCE

No information is available.
Reference: 99999

## RESISTANCE / TENACITY

### SPORULATION

Does not form spores.

Reference: 99999

### CONIDIA FORMATION

Does not form conidia.

Reference: 99999

### RESISTANCES

*Pseudomonas aeruginosa* is naturally resistant to penicillin, macrolide antibiotics, folic acid antagonists and most aminoglycoside antibiotics. *Pseudomonas aeruginosa* is also resistant to various disinfectants in their diluted form.
*Pseudomonas aeruginosa* possesses a high degree of environmental resistance.

Reference: 99999

## 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)

Law for the protection of the cultivated plants (Plant Protection Act -PflSchG) and associated regulations (only in German)

Rules for transportation of dangerous goods:
- European Convention on the carriage of dangerous goods by road (ADR)
- Order concerning the International Carriage of Dangerous Goods by Rail (RID)
- International Air Transport Association (IATA), dangerous goods regulation, 54th edition 2013
- the law on the transport of dangerous goods (Gefahrgutbeförderungsgesetz". -GGBefG)
- Regulation on the national and international transport of dangerous goods by road, rail and inland waterway services (Dangerous Goods Regulations, road, rail and inland waterways - GGVSEB)
- Regulation on the International Maritime Dangerous Goods (Dangerous Goods Regulations lake - GGVSee)
- Regulation on the order of advisor and the training of the persons in businesses and enterprises (Dangerous Goods Advisor Ordinance - GBV) (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 213
Waste collection: Protective measures (only in German)

TRBA 214
Plants for the treatment and recovery of waste (only in German)

TRBA 220
Safety and health for activities involving biological agents in sewage plants

TRBA 230
Protective measures for activities involving biological agents in agriculture and forestry and comparable activities

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 500
Basic measures to be taken for activities involving biological agents

## LINKS

**Public Health Agency of Canada (PHAC)**
Information provided by the Public Health Agency of Canada for this pathogen

**Centers for Disease Control and Prevention (CDC)**
Information provided by the Centers for Disease Control and Prevention for this pathogen

**German Federal Institute for Occupational Safety and Health (BAuA)**
Epidemiology of work-related infectious diseases (only in German)

## REFERENCES

General information | Occupational and health protection | Morphology and physiology | Occurrence/natural habitat | Pathogenicity/pathogenic properties | Disease | Epidemiology | Resistance/Tenacity | Legal basics | Links | 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, geändert 2014
Protective measures for activities involving biological agents in laboratories; Edition: October 2013, amended 2014
- TRBA 120
Versuchstierhaltung; Ausgabe: Juli 2012, geändert 2017
Experimental animal husbandry; Edition July 2012, 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; Ausgabe: August 2015, zuletzt geändert: GMBl. Nr. 25-31 vom 14. August 2019, S. 478
Classification of prokaryotes (bacteria and archaea) in risk groups; Edition August 2015, last amended August 2019

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

Quelle: 03043
Stille, W. et al. Antibiotika-Therapie, 11. Auflage, Schattauer, Stuttgat, New York 2005

Quelle: 20586
Stewart L, Ford A, Sangal V, Jeukens J, Boyle B, Kukavica-Ibrulj I, Caim S, Crossman L, Hoskisson PA, Levesque R, Tucker NP.: Draft genomes of 12 host-adapted and environmental isolates of Pseudomonas aeruginosa and their positions in the core genome phylogeny. Pathog Dis. 2014 Jun;71(1):20-5

Quelle: 20587
Pereira SG, Rosa AC, Ferreira AS, Moreira LM, Proença DN, Morais PV, Cardoso O.: Virulence factors and infection ability of Pseudomonas aeruginosa isolates from a hydropathic facility and respiratory infections. J Appl Microbiol. 2014 May;116(5):1359-68

Quelle: 25321
Steinmetz, I. Nichtfermentierende Bakterien (Nonfermenter), Pseudomonas, Burkholderia, Stenotrophomonas, Acinetobacter. pp. 346-356,498. In: Medizinische Mikrobiologie und Infektiologie (Suerbaum, S., Burchard, G.-D., Kaufmann, S.H.E, Schulz. T.F.) Springer Verlag, 9. Auflage 2020

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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 | Links | References