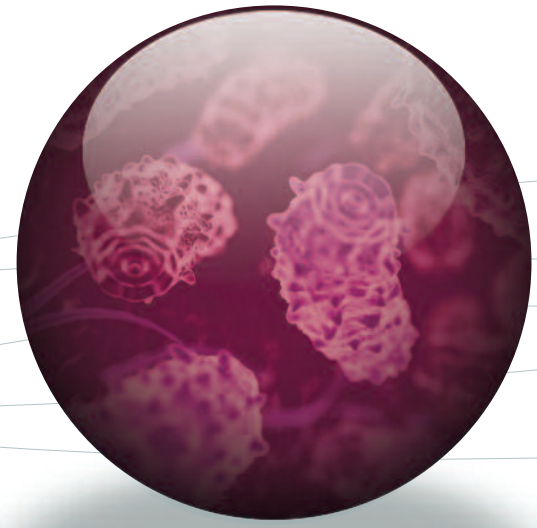
Microbiology catalogue



ATCC™

in partnership with

LGC Standards

Excellence through measurement

Contents

About ATCC

ATCC is an independent, private, nonprofit biological resource centre (BRC) and research organisation.

As a biological resource centre, ATCC authenticates microorganisms and cell lines and manages logistics of long-term preservation and distribution of cultures for the scientific community. ATCC supports the cultures it acquires and authenticates with expert technical support, intellectual property management and characterisation data.

As a research organisation, ATCC works to generate new knowledge and technology, as well as to continuously improve its function as a BRC. ATCC scientists develop new *in vitro* model systems, describe new species, search for new disease biomarkers and build bodies of characterisation data for valuable biological materials. In addition, they study improved methods for characterisation, long-term preservation and optimal authentication of biological materials.

Mission

ATCC is a global nonprofit bioresource centre and research organisation that provides biological products, technical services and educational programmes to private industry, government and academic organisations. The mission of ATCC is to acquire, authenticate, preserve, develop and distribute biological materials, information, technology, intellectual property and standards for the advancement and application of scientific knowledge.

Vision

The ATCC vision is to use its resources and experience as a BRC to become the world leader in standard biological reference materials management, intellectual property resource management and translational research as applied to biomaterial development, standardisation and certification.

Status

ATCC is a nonprofit 501(c)(3) organisation. The culture fees paid by purchasers support the functions of the mission.

About the ATCC / LGC Standards partnership

LGC Standards' partnership with ATCC facilitates the distribution of ATCC cultures and bioproducts to life science researchers throughout Europe and India. Our specific aims are to make access to the important resources of ATCC more easily accessible to the European scientific community through a local stock holding of more than 5,000 individual culture items supported by our local office network delivering the highest levels of customer service and technical support.

For materials which are part of the European stock holding, delivery times are typically 3-5 working days from order receipt, and we are able to assist with permit requirements as necessary for many of the "controlled" materials in the ATCC collection. For ATCC products which are not able to be included in the European stock, delivery times are typically 2-3 weeks.

ATCC Genuine Cultures®: Direct from the source

The ATCC Genuine Cultures emblem was designed to help scientists identify authentic ATCC microbial strains that come directly from ATCC. ATCC Genuine Cultures are backed by meticulous laboratory procedures and 80 years of experience and represent ATCC's high standards of quality for microbial strains:

- Full characterisation of each strain to establish identity
- Utilisation of a seed stock system to minimise subculturing
- Careful preservation and storage protocols to maintain the culture safely and effectively

As always, a customer who purchases a genuine ATCC culture from LGC Standards is receiving a culture that is a direct, minimal-passage descendant of the original material deposited with ATCC and has been cultured only by ATCC. These products are backed by our warranty and covered by our expert technical support.

Don't take chances on the quality of your cultures. Insist on products that meet ATCC's high standards of full characterisation and low passage number. ATCC Genuine Cultures are available in Europe only through LGC Standards.

ATCC®
Genuine Cultures

Quality control strains

Commercial firms specify ATCC® strains as controls for rapid identification, minimum inhibitory concentration of antibiotics and antibiotic susceptibility panels. Species and strains specified or recommended for use are listed in this brochure. Repeated subculturing can be detrimental to quality control strains.

Every passage carries the potential for contamination, genetic drift and mutation, taking your culture farther and farther from the original. Most professional organisations that draft standards require that cultures not be used beyond five passages from the original ATCC strain. ATCC defines the first passage to be the broth or agar culture prepared from the vial supplied by ATCC. Each subsequent transfer to a new broth or agar is counted as an additional passage.

Come to the source for ATCC Genuine Cultures® for your laboratory quality control protocols.

ATCC Genuine Cultures® are available throughout Europe exclusively from LGC Standards.

ATCC®
Genuine Cultures

Microbial applications directory

- Pharmaceutical applications
- Food microbiology
- Water microbiology

Pharmaceutical applications

Pharmaceutical companies are well versed in the important role of microbiological testing in its basic functions – product research and development, process validation, manufacturing and quality control.

ATCC cultures are cited in many international standards including most of the major pharmacopoeia, and in many laboratories. ATCC Genuine Cultures® have always been an integral part of pharmaceutical products performance testing, both as positive controls, negative controls and as identification standards.

QC testing guidelines recommend that a strain may not be used in testing which is more than 5 passages from the original reference strain – defined as the original strain and provided by a recognised culture collection such as ATCC. Organisms supplied for QC testing by ATCC are considered passage zero. LGC Standards is the only source for ATCC cultures in Europe. A key objective of the ATCC partnership is to make these important ATCC materials available to the pharmaceutical quality control community, efficiently and cost effectively, and to support laboratory quality programmes across the pharmaceutical industry. All ATCC cultures sold by LGC Standards are the original strain provided by ATCC. They are never regrown or repackaged and are fully supported by the ATCC comprehensive quality programme which utilises a polyphasic approach whenever possible to authenticate and identify all ATCC Genuine Cultures.

The following lists provide an easy to use reference for all ATCC microbial strains quoted in the USP and EP, including easy to use cross-referenced tables that list all of the microbial strains specified for each of the pharmacopoeial QC tests. If you are not able to find what you are looking for, please contact us.

With a full range of ATCC cultures, LGC Standards is uniquely positioned to meet all your biological standards needs.

Pharmaceutical application

	ATCC® No.
EP 6.5 2.6.1 Sterility	
Aspergillus brasiliensis (formerly *Aspergillus niger*)	16404™
Bacillus subtilis subsp. *spizizenii*	6633™
Candida albicans	10231™
Clostridium sporogenes	11437™
Clostridium sporogenes	19404™
Pseudomonas aeruginosa	9027™
Staphylococcus aureus subsp. *aureus*	6538™
EP 6.5 2.6.12 Microbial examination of non-sterile products: Microbial enumeration tests	
Aspergillus brasiliensis (formerly *Aspergillus niger*)	16404™
Bacillus subtilis subsp. *spizizenii*	6633™
Candida albicans	10231™
Pseudomonas aeruginosa	9027™
Staphylococcus aureus subsp. *aureus*	6538™
EP 6.5 2.6.13 Microbial examination of non-sterile products: Test for specified microorganisms	
Candida albicans	10231™
Clostridium sporogenes	11437™
Clostridium sporogenes	19404™
Escherichia coli	8739™
Pseudomonas aeruginosa	9027™
Salmonella enterica subsp. *enterica* serovar *Typhimurium*	14028™
Staphylococcus aureus subsp. *aureus*	6538™
EP 6.5 2.6.27 Microbiological control of cellular products	
Aspergillus brasiliensis (formerly *Aspergillus niger)*	16404™
Bacillus subtilis subsp. *spizizenii*	6633™
Bacteroides fragilis	25285™
Candida albicans	10231™
Clostridium sporogenes	11437™
Clostridium sporogenes	19404™
Propionibacterium acnes	11827™
Pseudomonas aeruginosa	9027™
Staphylococcus aureus subsp. *aureus*	6538™
Streptococcus pyogenes	19615™
Yersinia enterocolitica	9610™
EP 6.5 2.6.7 Mycoplasmas	
Acholeplasma laidlawii	23206™
Mycoplasma fermentans	19989™
Mycoplasma gallisepticum	19610™
Mycoplasma hyorhinis	17981™
Mycoplasma hyorhinis	29052™
Mycoplasma orale	23714™
Mycoplasma pneumoniae	15531™
Mycoplasma synoviae	25204™

A complete listing of ATCC Genuine Cultures® can be found at: **www.lgcstandards-atcc.org**

Pharmaceutical application

	ATCC® No.
EP 6.5 2.7.2 Microbiological assays of antibiotics	
Bacillus pumilus	14884™
Bacillus subtilis	11774™
Bacillus subtilis subsp. *spizizenii*	6633™
Bordetella bronchiseptica	4617™
Enterococcus hirae	10541™
Escherichia coli	10536™
Escherichia coli	9637™
Klebsiella pneumoniae subsp. *pneumoniae*	10031™
Kocuria rhizophila (formerly *Micrococcus luteus*)	9341™
Micrococcus luteus	10240™
Mycobacterium smegmatis	607™
Saccharomyces cerevisiae	9763™
Staphylococcus aureus subsp. *aureus*	9144™
Staphylococcus aureus subsp. *aureus*	6538P™
Staphylococcus epidermidis	12228™
EP 6.5 5.1.1 Methods of preparation of sterile products	
Brevundimonas diminuta (formerly *Pseudomonas sp.*)	19146™
EP 6.5 5.1.2 Biological indicators of sterilisation	
Bacillus atrophaeus (formerly *Bacillus subtilis* var. *niger*)	9372™
Bacillus pumilus (strain recommended by ATCC)	27142™
Geobacillus stearothermophilus (formerly *Bacillus stearothermophilus*)	7953™
EP 6.5 5.1.3 Efficacy of antimicrobial preservation	
Aspergillus brasiliensis (formerly *Aspergillus niger*)	16404™
Candida albicans	10231™
Escherichia coli	8739™
Pseudomonas aeruginosa	9027™
Staphylococcus aureus subsp. *aureus*	6538™
EP 6.5 Monographs – Penicillamine	
Kocuria rhizophila (formerly *Micrococcus luteus*)	9341™
EP 6.5 Monographs – Water for injections	
Bacillus subtilis subsp. *spizizenii*	6633™
Pseudomonas aeruginosa	9027™
EP 6.5 Monographs – Water, highly purified	
Bacillus subtilis subsp. *spizizenii*	6633™
Pseudomonas aeruginosa	9027™
EP 6.5 Monographs – Water, purified	
Bacillus subtilis subsp. *spizizenii*	6633™
Pseudomonas aeruginosa	9027™

A complete listing of ATCC Genuine Cultures® can be found at: **www.lgcstandards-atcc.org**

Pharmaceutical application

	ATCC® No.
USP32, Antimicrobial effectiveness testing <51>	
Aspergillus brasiliensis (formerly *Aspergillus niger*)	16404™
Candida albicans	10231™
Escherichia coli	8739™
Pseudomonas aeruginosa	9027™
Staphylococcus aureus subsp. *aureus*	6538™
USP32, Microbiological examination of nonsterile products: Microbial enumeration tests <61>	
Aspergillus brasiliensis (formerly *Aspergillus niger*)	16404™
Bacillus subtilis subsp. *spizizenii*	6633™
Candida albicans	10231™
Pseudomonas aeruginosa	9027™
Staphylococcus aureus subsp. *aureus*	6538™
USP32, Microbial examination of nonsterile products: Tests for specified microorganisms <62>	
Candida albicans	10231™
Clostridium sporogenes	11437™
Clostridium sporogenes	19404™
Escherichia coli	8739™
Pseudomonas aeruginosa	9027™
Salmonella enterica subsp. *enterica* serovar *Typhimurium*	14028™
Staphylococcus aureus subsp. *aureus*	6538™
USP32, Sterility tests <71>	
Aspergillus brasiliensis (formerly *Aspergillus niger*)	16404™
Bacillus subtilis subsp. *spizizenii*	6633™
Bacteroides vulgatus	8482™
Candida albicans	10231™
Clostridium sporogenes	11437™
Clostridium sporogenes	19404™
Kocuria rhizophila (formerly *Micrococcus luteus*)	9341™
Pseudomonas aeruginosa	9027™
Staphylococcus aureus subsp. *aureus*	6538™
USP32, Antibiotics – Microbial assays <81>	
Bacillus subtilis subsp. *spizizenii*	6633™
Bordetella bronchiseptica	4617™
Enterococcus hirae	10541™
Escherichia coli	10536™
Klebsiella pneumoniae subsp. *pneumoniae*	10031™
Kocuria rhizophila (formerly *Micrococcus luteus*)	9341™
Micrococcus luteus	10240™
Mycobacterium smegmatis	607™
Pseudomonas aeruginosa	25619™
Saccharomyces cerevisiae	2601™
Saccharomyces cerevisiae	9763™
Staphylococcus aureus subsp. *aureus*	29737™
Staphylococcus aureus subsp. *aureus*	9144™
Staphylococcus epidermidis	12228™
USP32, Biological indicators, <1035> (Official Monographs)	
Bacillus atrophaeus (formerly *Bacillus subtilis* var. *niger*)	9372™
Geobacillus stearothermophilus (formerly *Bacillus stearothermophilus*)	12980™
Geobacillus stearothermophilus (formerly *Bacillus stearothermophilus*)	7953™

A complete listing of ATCC Genuine Cultures® can be found at: **www.lgcstandards-atcc.org**

Pharmaceutical application

	ATCC® No.
USP32 Disinfectants and antiseptics <1072> (according to AOAC)	
Aspergillus brasiliensis (formerly *Aspergillus niger*)	16404™
Bacillus subtilis	19659™
Candida albicans	10231™
Candida albicans	2091™
Escherichia coli	11229™
Penicillium chrysogenum	11709™
Pseudomonas aeruginosa	15442™
Staphylococcus aureus subsp. *aureus*	6538™
USP32, Sterilization and sterility assurance of compendial articles <1211>	
Bacillus pumilus (strain recommended by ATCC)	27142™
USP32 Sterilization and sterility assurance of compendial articles <1211>	
Bacillus atrophaeus (formerly *Bacillus subtilis* var. *niger*) (strain recommended by ATCC)	9372™
Geobacillus stearothermophilus (formerly *Bacillus stearothermophilus*) (strain recommended by ATCC)	7953™
USP32 Sterilization and sterility assurance of compendial articles <1211>	
Brevundimonas diminuta (formerly *Pseudomonas* sp.)	19146™
Serratia marcescens	14756™
USP32 Microbial limit tests – Dietary supplements – Preparatory testing, growth promotion testing <2021>	
Aspergillus brasiliensis (formerly *Aspergillus niger*)	16404™
Bacillus subtilis subsp. *spizizenii*	6633™
Candida albicans	10231™
Escherichia coli	8739™
Salmonella enterica subsp. *enterica* serovar *Typhimurium*	13311™
Staphylococcus aureus subsp. *aureus*	6538™
USP32, Oil and water-soluble vitamins with mineral tablets (biotin, cyanocobalamin) (Official Monographs)	
Lactobacillus delbrueckii subsp. *lactis* (formerly *Lactobacillus leichmannii*)	7830™
Lactobacillus plantarum	8014™
USP32, Penicillamine (Official Monographs)	
Kocuria rhizophila (formerly *Micrococcus luteus*)	9341™
USP32, Penicillin G procaine and novobiocin sodium intramammary infusion (Official Monographs)	
Staphylococcus aureus subsp. *aureus*	12692™
USP32, Tetracycline hydrochloride and novobiocin sodium tablets (Official Monographs)	
Escherichia coli	10536™
Staphylococcus aureus subsp. *aureus*	29737™
USP32, Water-soluble vitamins capsules (dexpanthenol, panthenol) (Official Monographs)	
Pediococcus acidilactici	8042™

European Pharmacopoceia 6th Edition Supplement 6.5
U.S. Pharmacopoceia 32nd rev.; 2009

A complete listing of ATCC Genuine Cultures® can be found at: **www.lgcstandards-atcc.org**

Food microbiology

Top performing food processors realise the importance of effective microbiological testing. Safety, reputation and business performance depend on it. Microbial strains with confirmed identity, viability and purity, backed by meticulous laboratory procedures that minimise sub-culturing are important to product safety, and they are important to ATCC. Food processors look to ATCC to provide the top quality microbial strains needed to maintain outstanding quality control (QC) microbiology programs. Whether in quality control testing, process validation or research and development, microbial strains should be considered vital factors in generating valid, accurate results. To identify microbial strains that are handled, stored and tested with the unparalleled expertise that comes from over 80 years of experience, look for the ATCC symbols of quality.

Some standards organisations have recommended, and ATCC concurs, that strains being used in standard test methods should not be used beyond 5 passages from the original ATCC strain. ATCC defines the first passage as the first broth or agar culture started from the culture vial supplied by ATCC. Each subsequent transfer to new broth or agar is counted as an additional passage. Since 1925, ATCC has set the standard for authenticating and distributing biological materials for research and testing in food and other industries. The following lists summarise the cultures specified or recommended for use in standards (including specifications, assays, and other tests) written by government agencies and professional organisations. Most standards name specific strains, often by ATCC number. Species are listed here by the name currently used at ATCC. If the name used in the standard is different, it has most likely been reclassified based on recent molecular phylogeny and genotyping methods following the Rules of the Bacteriological Code and current taxonomic interpretation.

Food microbiology standards

International Organisation for Standardization (ISO)	ATCC® No.
ISO 6888-3:2003 – Microbiology of food and animal feeding stuffs - Horizontal method for the enumeration of coagulase – positive staphylococci (*Staphylococcus aureus* and other species) – Part 3: Detection and MPN technique for low numbers.	
Escherichia coli FDA strain Seattle 1946	25922™
Escherichia coli Crooks	8739™
Penicillium aurantiogriseum	8732™
Staphylococcus aureus subsp. *aureus* FDA 209	6538™
Staphylococcus aureus subsp. *aureus* Seattle 1945	25923™
ISO 11290-2:1998 – Microbiology of food and animal feeding stuffs – Horizontal method for the detection and enumeration of *Listeria monocytogenes* – Part 2: Enumeration method.	
Rhodococcus equi	6939™
Staphylococcus aureus subsp. *aureus* Seattle 1945	25923™
ISO 11133-2:2003 – Microbiology of food and animal feeding stuffs – Guidelines on preparation and production of culture media – Part 2: Practical guidelines on performance testing of culture media.	
Aspergillus brasiliensis WLRI 034(120)	16404™
Bacillus cereus FDA strain PCI 213	11778™
Bacillus subtillis subsp. *spizizenii* NRS 231	6633™
Candida albicans 3147	10231™
Citrobacter freundii LRA 117.03.76	43864™
Clostridium perfringens	13124™
Enterococcus faecalis	19433™
Enterococcus faecalis Portland	29212™
Escherichia coli FDA strain Seattle 1946	25922™
Escherichia coli Crooks	8739™
Escherichia coli	11775™
Lactobacillus sakei subsp. *sakei* T.S.	15521™
Lactococcus lactis subsp. *lactis*	19435™
Listeria monocytogenes Li 20	19111™
Listeria monocytogenes 1071/53	13932™
Pediococcus damnosus NCDO 1832	29358™
Penicillium aurantiogriseum IMI 19759	16025™
Proteus mirabilis CDC PR 14	29906™
Pseudomonas aeruginosa Boston 41501	27853™
Saccharomyces cerevisiae	9763™
Salmonella enterica subsp. *enterica* CDC K-1891	13076™
Salmonella enterica subsp. *enterica* CDC 6516-60	14028™
Staphylococcus aureus subsp. *aureus* FDA 209	6538™
Staphylococcus aureus subsp. *aureus* Seattle 1945	25923™
Staphylococcus epidermidis FDA strain PCI 1200	12228™
Yersinia enterocolitica 33114	9610™
Yersinia enterocolitica subsp. *enterocolitica* Billups-1803-68	23715™
ISO 21527-1 – Microbiology of food and animal feeding stuffs - Horizontal method for the enumeration of yeasts and moulds – Part 1: Colony count technique in products with water activity greater than 0,95.	
Saccharomyces cerevisiae	9763™
Candida albicans 3147	10231™
Aspergillus brasiliensis WLRI 034(120)	16404™
Mucor racemosus	42647™
Escherichia coli FDA Strain Seattle 1946	25922™
Bacillus subtilis subsp. *spizizenii* NRS 231	6633™

Food microbiology standards

International Organisation for Standardization (ISO)	ATCC® No.
ISO 21527-2 – Microbiology of food and animal feeding stuffs - Horizontal method for the enumeration of yeasts and moulds – Part 2: Colony count technique in products with water activity less than or equal to 0,95.	
Saccharomyces cerevisiae	9763™
Wallemia sebi	42694™
Aspergillus restrictus	42693™
Eurotium rubrum	42690™
Escherichia coli FDA Strain Seattle 1946	25922™
Bacillus subtilis subsp. *spizizenii* NRS 231	6633™

British Standards Institution (BSI)	ATCC® No.
BS EN 1104:2005 – Paper and board intended to come into contact with foodstuffs – Determination of the transfer of antimicrobial constituents.	
Aspergillus niger 4247	6275™
BS EN 13697:2001 – Chemical disinfectants and antiseptics – Quantitative non-porous surface test for the evaluation of bactericidal and/or fungicidal activity of chemical disinfectants used in food, industrial, domestic and institutional areas – Test method and requirements without mechanical action (phase 2/step 2).	
Aspergillus brasiliensis WLRI 034(120)	16404™
Candida albicans 3147	10231™
Enterococcus hirae FDA M19	10541™
Escherichia coli MacLeod	10536™
Pseudomonas aeruginosa PRD-10	15442™
Saccharomyces cerevisiae	9763™
Salmonella enterica subsp. *enterica*	13311™
Staphylococcus aureus subsp. *aureus* FDA 209	6538™
BS EN 13704:2002 – Chemical disinfectants – Quantitative suspension test for the evaluation of sporicidal activity of chemical disinfectants used in food, industrial, domestic and institutional areas – Test method and requirements (phase 2, step 1).	
Bacillus cereus Type Strain A, variant IV	12826™
Bacillus subtilis subsp. *spizizenii* NRS 231	6633™
BS EN 14131:2003 – Foodstuffs – Determination of folate by microbiological assay.	
Lactobacillus rhamnosus	7469™
BS EN 1650:1998 – Chemical disinfectants and antiseptics – Quantitative suspension test for the evaluation of fungicidal activity of chemical disinfectants and antiseptics used in food, industrial, domestic and institutional areas – Test method and requirements (phase 2, step 1).	
Aspergillus brasiliensis WLRI 034(120)	16404™
Candida albicans 3147	10231™
Saccharomyces cerevisiae	9763™
BS EN ISO 11290-1:1997 – Microbiology of food and animal feeding stuffs - Horizontal method for the detection and enumeration of *Listeria monocytogenes* - Part 1: Detection method, Annex B.	
Enterococcus faecalis Portland	29212™
Escherichia coli FDA strain Seattle 1946	25922™
Listeria innocua SLCC 3379	33090™
Listeria monocytogenes 1071/53	13932™
Listeria monocytogenes Li20	19111™
Rhodococcus equi	6939™
Staphylococcus aureus subsp. *aureus* Seattle 1945	25923™

Food microbiology standards

British Standards Institution (BSI)	ATCC® No.
BS EN ISO 11290-2:1998 – Microbiology of food and animal feeding stuffs – Horizontal method for the detection and enumeration of *Listeria monocytogenes* – Part 2: Enumeration method, Annex B.	
Rhodococcus equi	6939™
Staphylococcus aureus subsp. *aureus* Seattle 1945	25923™
BS EN ISO 21871:2006 – Microbiology of food and animal feeding stuffs.	
Bacillus cereus FDA strain PCI 213	11778™
Escherichia coli FDA strain Seattle 1946	25922™
Escherichia coli Crooks	8739™
BS EN ISO 6888-3:2003 – Microbiology of food and animal feeding stuffs – Horizontal method for the enumeration of coagulase-positive staphylococci (*Staphylococcus aureus* and other species) – Part 3: Detection and MPN technique for low numbers.	
Penicillium aurantiogriseum	8732™
Staphylococcus aureus subsp. *aureus* FDA 209	6538™
DD ENV 14166:2001 – Foodstuffs – Determination of vitamin B6 by microbiological assay.	
Saccharomyces cerevisiae 4228	9080™

Association of Official Analytical Chemists (AOAC)	ATCC® No.
AOAC 955.12 – Testing disinfectants against *Staphylococcus aureus*, phenol coefficient method.	
Staphylococcus aureus subsp. *aureus* FDA 209	6538™
AOAC 955.13 – Testing disinfectants against *Pseudomonas aeruginosa*, phenol coefficient method.	
Pseudomonas aeruginosa PRD-10	15442™
AOAC 955.14 – Testing disinfectants against *Salmonella choleraesuis*, use-dilution methods.	
Salmonella enterica subsp. *enterica* ETS 34	10708™
AOAC 955.15 – Testing disinfectants against *Staphylococcus aureus*, use-dilution methods.	
Staphylococcus aureus subsp. *aureus* FDA 209	6538™
AOAC 955.16 – Chlorine (available) in disinfectants, germicidal equivalent concentration.	
Staphylococcus aureus subsp. *aureus* FDA 209	6538™
AOAC 955.17 – Fungicidal activity of disinfectants.	
Trichophyton mentagrophytes 640	9533™
AOAC 957.23 – Antibiotics in feeds, microbiological methods.	
Bacillus cereus FDA strain PCI 213	11778™
Bacillus subtillis subsp. *spizizenii* NRS 231	6633™
Escherichia coli UC 527	29998™
Kocuria rhizophila FDA strain PCI 1001	9341™
Micrococcus luteus Mercedita	7468™
Micrococcus luteus 130.21	10240™
Saccharomyces cerevisiae	9763™
Staphylococcus epidermidis FDA strain PCI 1200	12228™
AOAC 960.09 – Germicidal and detergent sanitising action of disinfectants.	
Escherichia coli AMC 198	11229™
Staphylococcus aureus subsp. *aureus* FDA 209	6538™

Food microbiology standards

Association of Official Analytical Chemists (AOAC)	ATCC® No.
AOAC 960.46 – Vitamin assays, microbiological method.	
Lactobacillus delbrueckii subsp. *lactis* 313	7830™
Lactobacillus rhamnosus	7469™
AOAC 960.47 – Amino acids in vitamin preparations.	
Enterococcus hirae R	9790™
Lactobacillus plantarum 17-5	8014™
Pediococcus acidilactici	8042™
AOAC 960.67 – Hygromycin B in feeds, microbiological method.	
Bacillus subtillis subsp. *spizizenii* NRS 231	6633™
AOAC 961.02 – Germicidal spray products as disinfectants.	
Pseudomonas aeruginosa PRD-10	15442™
Salmonella enterica subsp. *enterica* ETS 34	10708™
Staphylococcus aureus subsp. *aureus* FDA 209	6538™
Trichophyton mentagrophytes 640	9533™
AOAC 961.15 – Vitamin B6 (pyridoxine, pyridoxal, pyridoxamine) in food extracts, microbiological method.	
Bacillus subtillis subsp. *spizizenii* NRS 231	6633™
AOAC 962.14 – Beta-lactam antibiotics in milk, qualitative field disk assay.	
Saccharomyces cerevisiae 4228	9080™
AOAC 964.02 – Testing disinfectants against *Pseudomonas aeruginosa*, use-dilution method.	
Pseudomonas aeruginosa PRD-10	15442™
AOAC 972.56 – Monensin in feeds, microbiological method.	
Bacillus subtillis subsp. *spizizenii* NRS 231	6633™
AOAC 975.56 – Virus in beef (ground), microbiological method.	
Cercopithecus aethiops Vero	CCL-81™
AOAC 976.37 – Monensin in feeds, turbidimetric method.	
Enterococcus hirae R	8043™
AOAC 977.37 – Chlortetracycline HCl in feeds, turbidimetric method.	
Staphylococcus aureus subsp. *aureus* 3R7089 strain Oxford	9144™
AOAC 979.14 – Beta-lactam antibiotics, qualitative disc method I.	
Geobacillus stearothermophilus NRS T15	10149™
AOAC 982.16 – Beta-lactam antibiotics in milk, quantitative disc method.	
Geobacillus stearothermophilus NRS T15	10149™
AOAC 982.17 – Beta-lactam antibiotics in milk, qualitative disc method II.	
Geobacillus stearothermophilus NRS T15	10149™
AOAC 982.36 – Invasiveness by *Escherichia coli* of mammalian cells, microbiological method.	
Homo sapiens (human) HeLa	CCL-2™
AOAC 982.43 – Bacitracin in premix feeds.	
Micrococcus luteus 130.21	10240™

Food microbiology standards

Association of Official Analytical Chemists (AOAC)	ATCC® No.
AOAC 984.34 – Detection of *Escherichia coli* producing heat labile enterotoxin, DNA colony hybridisation method.	
Escherichia coli H10407	35401™
Escherichia coli pBR313	37018™
AOAC 985.32 – Vitamin B6 in ready-to-feed milk based infant formula, microbiological method.	
Saccharomyces cerevisiae 4228	9080™
AOAC 986.23 – Vitamin B12 activity in milk based infant formula, turbidimetric method.	
Lactobacillus delbrueckii subsp. *lactis* 313	7830™
Weissella confusa 548-D	10881™
AOAC 991.38 – Salmonella in foods.	
Escherichia coli FDA strain Seattle 1946	25922™
AOAC 991.47 – Testing disinfectants against *Salmonella choleraesuis*, hard surface carrier test method.	
Salmonella enterica subsp. *enterica* ETS 34	10708™
AOAC 991.48 – Testing disinfectants against *Staphylococcus aureus*, hard surface carrier test method.	
Saccharomyces cerevisiae	9763™
Staphylococcus aureus subsp. *aureus* FDA 209	6538™
AOAC 991.49 – Testing disinfectants against *Pseudomonas aeruginosa*, hard surface carrier test method.	
Pseudomonas aeruginosa PRD-10	15442™
AOAC 992.05 – Folic acid (pteroylglutamic acid) in infant formula, microbiological methods.	
Lactobacillus rhamnosus	7469™
AOAC 992.18 – Listeria species – Biochemical identification method (MICRO-ID) Listeria.	
Lactococcus lactis subsp. *cremoris* NCDO 607	19257™
Listeria grayi V-1	25400™
Listeria monocytogenes Li 20	19111™
Listeria seeligeri CIP 100100	35967™
Streptococcus mitis	6249™
AOAC 992.19 – Listeria species – Biochemical identification method (Vitek GPI and GNI+).	
Acinetobacter baumannii 2208	19606™
Bordetella bronchiseptica 3127	10580™
Enterococcus durans 23C2	6056™
Enterococcus faecalis Portland	29212™
Klebsiella pneumoniae subsp. *pneumoniae*	13883™
Proteus mirabilis	7002™
Pseudomonas aeruginosa Boston 41501	27853™
Serratia odorifera 1073	33077™
Shigella sonnei	25931™
Staphylococcus xylosus KL 162	29971™
Streptococcus equi subsp. *equi* 2-1-23	9528™
Streptococcus gallolyticus 38	9809™
Streptococcus pneumoniae R36a rough phase	27336™
Streptococcus pyogenes Bruno	19615™

Food microbiology standards

Association of Official Analytical Chemists (AOAC)	ATCC® No.
AOAC 993.29 – Bacitracin-MD (BMD) in complete feed, microbiological plate assay method.	
Micrococcus luteus 130.21	10240™
AOAC 997.17 – Microbial ranking of porous packaging materials (Exposure Chamber Method).	
Bacillus atrophaeus NRS 1221A	9372™
AOAC 998.02 – Neomycin in feeds - stahl microbiological agar diffusion assay.	
Staphylococcus epidermidis FDA strain PCI 1200	12228™
AOAC 2004.04 – Identification of presumptive isolates of *Bacillus anthracis*.	
Bacillus cereus	14579™
AOAC 2004.05 – Total folates in cereals and cereal Foods.	
Lactobacillus rhamnosus	7469™
AOAC 2004.11 – Identification of *Bacillus anthracis* from culture - Gas chromatographic analysis of Fatty Acid Methyl Esters (FAMEs).	
Bacillus cereus	14679™

Bacteriological Analytical Manual, U.S. Food and Drug Administration (BAM)	ATCC® No.
BAM 10.F – Detection and enumeration of *Listeria monocytogenes* in foods, the CAMP Test.	
Rhodococcus equi	6939™
Staphylococcus aureus subsp. *aureus* Seattle 1945	25923™
Staphylococcus pseudintermedius	49444™
BAM 13b – Electrophoretic and immunoblot analysis of Staphylococcal Enterotoxins in food.	
Staphylococcus aureus subsp. *aureus* FDA 196E	13565™
BAM 20A – Inhibitory substances in milk.	
Geobacillus stearothermophilus NRS T15	10149™
Kocuria rhizophila FDA strain PCI 1001	9341™
BAM 24 – Identification of foodborne bacterial pathogens by gene probes: Enterotoxigenic *Escherichia coli*: heat stable Enterotoxin (Human), heat stable Enterotoxin (Porcine), and heat labile Enterotoxin.	
Escherichia coli FDA strain Seattle 1946	25922™
BAM 24 – Identification of foodborne bacterial pathogens by gene probes, *Listeria monocytogenes*: combination of invasion associated protein (iap) and Hemolysin (hly) Gene Probes – AD713.	
Listeria innocua SLCC 3379	33090™
BAM 24 – Identification of foodborne bacterial pathogens by gene probes, *Vibrio vulnificus* VV6.	
Vibrio vulnificus 324	27562™
BAM 24 – Identification of foodborne bacterial pathogens by gene probes, *Vibrio parahaemolyticus* tdh3.	
Vibrio parahaemolyticus EB 101	17802™
BAM 4.II.3 – Enumeration of *Escherichia coli* and the Coliform bacteria: LST-MUG method for detecting *Escherichia coli* in chilled or frozen foods exclusive of bivalve mollucan shellfish.	
Enterobacter aerogenes NCDC 819-56	13048™
Escherichia coli FDA strain Seattle 1946	25922™
BAM 5.D.7 – Salmonella: Isolation of Salmonella	
Salmonella enterica subsp. *diarizonae* 62	29934™

Food microbiology standards

Other important food microbiology organisms	ATCC® No.
Salmonella enterica subsp. *enterica*	BAA-215™
Salmonella enterica subsp. *diarizonae*	BAA-216™
Cronobacter muytjensii	51329™
Escherichia coli	11303™
Campylobacter coli	33559™
Enterococcus faecalis deposited as *Streptococcus faecalis*	7080™
Campylobacter lari	35221™
Campylobacter coli	43478™

AOAC International = Association of Official Analytical Chemists
ISO = International Organization for Standardization
DD = Draft for Development
BSI = British Standards Institution
BAM = Bacteriological Analytical Manual, U.S. Food and Drug Administration

A complete listing of ATCC Genuine Cultures® can be found at: **www.lgcstandards-atcc.org**

Food microbiology, Genomic DNA

ATCC® No.	Strain	Product related to standard/application
16404D-2	*Aspergillus brasiliensis* (formerly *Aspergillus niger*)	ISO 11133-2:2003; ISO 21527-1
6633D-5	*Bacillus subtilis* subsp. *spizizenii*	ISO 11133-2:2003; ISO 21527-1
33560D-5	*Campylobacter jejuni* subsp. *jejuni*	(ISO 10272)
10231D-5	*Candida albicans*, serotype A	ISO 11133-2:2003; ISO 21527-1
13124D-5	*Clostridium perfringens*	ISO 11133-2:2003
8739D-5	*Escherichia coli*	ISO 11133-2:2003, ISO 6888-3:2003, ISO 11290-1/2
25922D-5	*Escherichia coli*	ISO 11133-2:2003, ISO 6888-3:2003, ISO 11290-1/2; ISO 21527-1
9341D-5	*Kocuria rhizophila* (formerly *Micrococcus luteus*)	Antibacterial substances in animal feeding stuffs
19435D-5	*Lactococcus lactis* subsp. *lactis*	ISO 11133-2:2003
27853D-5	*Pseudomonas aeruginosa*	ISO 11133-2:2003
9763D-5	*Saccharomyces cerevisiae*	ISO 11133-2:2003
25923D-5	*Staphylococcus aureus* subsp. *aureus*	ISO 6888-3:2003, CAMP Listeria (FDA)
6538D-5	*Staphylococcus aureus* subsp. *aureus*	ISO 11133-2:2003
12228D-5	*Staphylococcus epidermidis*	ISO 11133-2:2003
23715D-5	*Yersinia enterocolitica* subsp. *enterocolitica*	ISO 11133-2:2003
9610D	*Yersinia enterocolitica* subsp. *enterocolitica*	ISO 11133-2:2003

A complete listing of ATCC Genuine Cultures® can be found at: **www.lgcstandards-atcc.org**

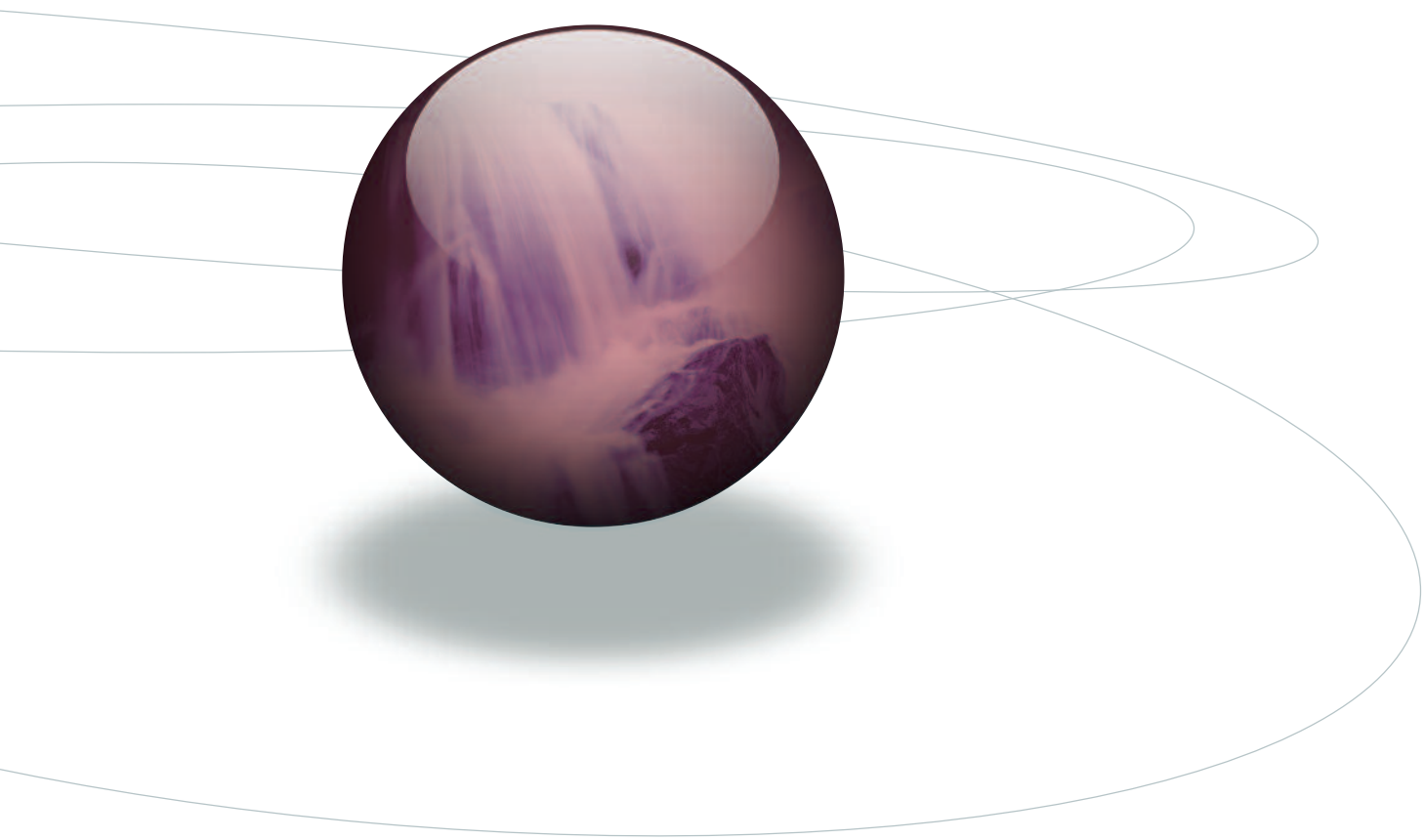
Water microbiology

Microbial analyses are a vital part of many companies' environmental laboratory testing programmes. The control strains used to support and measure the results of these analyses are an important laboratory tool. The analysis of water and environmental samples can have a number of different objectives including, regulatory compliance, resource allocation, safety as well as protection of the environment and your business.

ATCC cultures are specified by standard-setting organisations and regulatory bodies for use in their official assays and tests. Manufacturers of microbial identification systems also specify ATCC microorganisms for the quality testing of instrumentation, kits or reagents where the use of authenticated control cultures is an essential element to ensuring the quality and comparability of laboratory results. One of the primary objectives of the ATCC/LGC partnership is to help make the important resources of the ATCC collection available to European quality control analysts across a range of industries including environmental and water testing. The following lists describe a number of the key tests used in environmental and water sample analysis laboratories. All ATCC cultures sold by LGC standards are the original strain provided by ATCC. They are never regrown or repackaged and are fully supported by the ATCC comprehensive quality programme which utilises a polyphasic approach whenever possible to authenticate and identify all ATCC Genuine Cultures®.

The following lists are cross-referenced to provide an alphabetical listing of relevant microbial strains and a listing by test method with the recommended control strains from the ATCC. The catalogue tables provide an easy to use guide to accessing the right materials.

Used in conjunction with a comprehensive Proficiency Testing programme; the use of authenticated, highly characterised microbial controls such as those available from ATCC provides the most effective tools for the ongoing monitoring and improvement of analytical results.



Water microbiology

ATCC® No.	Strain	Standard/Application
9144™	*Staphylococcus aureus* subsp. *aureus*	AS/NZS 4276.16:1999, AS/NZS 4276.20:2003
10145™	*Pseudomonas aeruginosa*	IDEXX (Colilert, Colisure), AS 4276.4-1995, AS 4276.5-1995, AS 4276.10-1995, AS 4276.11-1995, AS 4276.12-1995, AS 4276.13-1995, AS/NZS 4276.16:1999, AS/NZS 4276.18:2001, EN ISO 16266:2008
10400™	*Aerococcus viridans*	IDEXX Enterolert-E
11775™	*Escherichia coli*	EPA 1103.1 (2005), EPA 1106.1 (2005), EPA 1600 (2006), EPA 1603 (2005), EPA 1680 (2005), AS 4276.6-1995, AS 4276.7-1995, AS 4276.12-1995, AS 4276.13-1995, AS/NZS 4276.16:1999, EN ISO 16266:2008
11778™	*Bacillus cereus*	EPA 1605 (2005)
13048™	*Enterobacter aerogenes*	EPA 1103.1 (2005), EPA 1603 (2005), EPA 1680 (2005), EPA 1681 (2005), AS 4276.4-1995, AS 4276.5-1995, AS 4276.6-1995, AS 4276.7-1995, AS 4276.10-1995, AS 4276.11-1995, AS/NZS 4276.18:2001
13124™	*Clostridium perfringens*	AS/NZS 4276.17.1:2000, AS/NZS 4276.17.2:2000, AS/NZS 4276.18:2001
14028™	*Salmonella enterica* subsp. *enterica* serovar *Typhimurium*	EPA 1682 (2005)
15597™	*Escherichia coli*	ISO 10705-1:1995, EPA 1601 (2001), EPA 1601 (2001)
15597-B1™	*Escherichia coli,* MS2	ISO 10705-1:1995, EPA 1601 (2001), EPA 1601 (2001)
19433™	*Enterococcus faecalis*	EPA 1103.1 (2005), EPA 1106.1 (2005), EPA 1600 (2006), EPA 1603 (2005), AS 4276.8-1995, AS 4276.9-1995
23631™	*Escherichia coli*	ISO 10705-1:1995
25922™	*Escherichia coli*	IDEXX (Colilert, Colisure), EPA 1605 (2005), EPA 1681 (2005), EPA 1682 (2005)
25923™	*Staphylococcus aureus* subsp. *aureus*	AS 4276.8-1995, AS 4276.9-1995
27853™	*Pseudomonas aeruginosa*	EPA 1605 (2005), EPA 1680 (2005)

Water microbiology

ATCC® No.	Strain	Standard/Application
31488™	*Klebsiella pneumoniae* subsp. *pneumoniae*	IDEXX (Colilert, Colisure)
35667™	*Enterococcus faecium*	IDEXX Enterolert-E
43862™	*Serratia marcescens*	IDEXX Enterolert-E
700078™	*Escherichia coli*	ISO 10705-2:2000
700609™	*Escherichia coli*	EPA 1601 (2001), EPA 1602 (2001)
700786™	*Bacteroides fragilis*	ISO 10705-4:2001
700786-B1™	*Bacteroides fragilis,* B56-3	ISO 10705-4:2001
700891™	*Escherichia coli*	EPA 1601 (2001), EPA 1601 (2001)
7966™	*Aeromonas hydrophila*	EPA 1605 (2005), AS/NZS 4276.18:2001
8043™	*Enterococcus hirae*	ISO 7899-1:1998

ISO = International Organization for Standardization
AS/NZS = Australian/New Zealand standards published by Standards Australia and Standards New Zealand
EPA = United States Environmental Protection Agency

A complete listing of ATCC Genuine Cultures® can be found at: **www.lgcstandards-atcc.org**

Catalogue listing

While this list of organisms represents some of the most important microbes used in industrial testing, it is only a small section of the ATCC® microbial collection.

The most complete listing can be found by visiting the LGC Standards ATCC website: **www.lgcstandards-atcc.org**

Still can't find what you are looking for? Contact your local LGC Standards office.

LGC Standards offices

France

Tel: +33 (0)3 88 04 82 82
Fax: +33 (0)3 88 04 82 90
fr@lgcstandards.com

Countries served: Belgium, France, Luxembourg, Monaco, Switzerland.

Germany

Tel: +49 (0)281 9887 230
Fax: +49 (0)281 9887 239
atcc.de@lgcstandards.com

Countries served: Austria, Croatia, Germany, Greece, Hungary, Kosovo, Moldova, Mongolia, Montenegro, Netherlands, Romania, Serbia, Slovenia, Turkey.

India

Tel: +91 80 6701 2000
Fax: +91 80 6701 2046
in@lgcpromochem.com

Italy

Tel: +39 02 24126 830
Fax: +39 02 24126 831
it@lgcstandards.com

Poland

Tel: +48 (0)22 751 31 40
Fax: +48 (0)22 751 58 45
pl@lgcstandards.com

Countries served: Armenia, Belarus, Bulgaria, Czech Republic, Lithuania, Macedonia, Poland, Russia, Slovakia, Ukraine.

Spain

Tel: +34 93 308 41 81
Fax: +34 93 307 36 12
es@lgcstandards.com

Countries served: Andorra, Portugal, Spain.

Sweden

Tel: +46 (0)33 20 90 60
Fax: +46 (0)33 20 90 79
atcc.se@lgcstandards.com

Countries served: Denmark, Estonia, Finland, Iceland, Latvia, Norway, Sweden.

United Kingdom

Tel: +44 (0)20 8943 8489
Fax: +44 (0)20 8943 8405
atcc@lgcstandards.com

Countries served: Albania, Bosnia Herzegovina, Channel Islands, Cyprus, Ireland, Liechtenstein, Malta, United Kingdom.

Catalogue

Organism	Designation	ATCC® No.
Acetobacter aceti	NCIB 8621	15973™
Acholeplasma laidlawii deposited as *Mycoplasma laidlawii*	PG8	23206™
Achromobacter xylosoxidans deposited as *Achromobacter xylosoxidans*	KM 543	27061™
Acinetobacter baumannii	Vitek #109234	BAA-747™
Acinetobacter baumannii deposited as *Bacterium anitratum*	2208	19606™
Acinetobacter baumannii deposited as *Moraxella glucidolytica* subsp. *nonliquefaciens*	5377	17978™
Acinetobacter baylyi deposited as *Acinetobacter calcoaceticus*	BD413	33305™
Acinetobacter calcoaceticus deposited as *Moraxella calcoacetica*	46	23055™
Acinetobacter haemolyticus deposited as *Herellea caseolytica*	57.073.192	19002™
Acinetobacter lwoffii	NCTC 5866	15309™
Acinetobacter lwoffii deposited as *Achromobacter lwoffi*	NCIB 9020	17925™
Acinetobacter sp. deposited as *Acinetobacter anitratus*	AmMS 203	49137™
Acinetobacter sp. deposited as *Acinetobacter anitratus*	AmMS 202	49139™
Acinetobacter sp. deposited as *Acinetobacter calcoaceticus*	AmMS 243	49466™
Actinobacillus pleuropneumoniae deposited as *Haemophilus parahaemolyticus*	4074	27088™
Actinobacillus pleuropneumoniae deposited as *Haemophilus parahaemolyticus*	S 1421	27090™
Actinomyces odontolyticus	CDC X363	17929™
Actinomyces viscosus	MG-1	43146™
Actinomyces viscosus deposited as *Odontomyces viscosus*	T-6	15987™
Aerococcus viridans	NCTC 8251	11563™
Aerococcus viridans	API 78-12-095	700406™
Aerococcus viridans deposited as *Gaffkya homari*	[ICPB 4308]	10400™
Aeromonas caviae deposited as *Aeromonas punctata* subsp. *caviae*	[NRRL B-968]	15468™
Aeromonas hydrophila	LRA 3300 776	35654™
Aeromonas hydrophila	AmMS 199	49140™
Aeromonas hydrophila	NCTC 7812	7965™
Aeromonas hydrophila deposited as *Proteus ichthyosmius*	[CDC 359-60, IAM 12460, NCIB 9240, NCMB 86, NCTC 8049, RH 250]	7966™
Aeromonas salmonicida subsp. *salmonicida*	NCMB 1102	33658™
Aggregatibacter aphrophilus deposited as *Haemophilus aphrophilus*	NCTC 5906	33389™
Alcaligenes faecalis subsp. *faecalis*	LRA 41 02 82	35655™
Alcaligenes faecalis subsp. *faecalis*	16, 104-1A	8750™
Alicyclobacillus acidocaldarius subsp. *acidocaldarius* deposited as *Bacillus acidocaldarius*	[HAMBI 2073, IFO 15652, JCM 5260, KCTC 1825, LMG 7119, NCCB 89167, NCIMB 11725, NRRL B-14509]	27009™
Alicyclobacillus acidoterrestris deposited as *Bacillus acidoterrestris*	GD3B	49025™
Alloiococcus otitis	NCFB 2890	51267™
Alternaria alternata deposited as *Alternaria tenuis*		6663™
Anabaena variabilis	[IUCC 1444, MSU A-37]	29413-U™
Aneurinibacillus aneurinolyticus deposited as *Bacillus thiaminolyticus*	[CIP 104323, JCM 9023, LMG 12387, Vitek #202274]	11376™
Aquaspirillum sp. deposited as *Spirillum* sp.	NOX	49643™
Arcanobacterium pyogenes deposited as *Actinomyces pyogenes*	LRA 212.10.89	49698™
Arcanobacterium pyogenes deposited as *Corynebacterium pyogenes*	NCTC 5224	19411™
Arthrobacter psychrolactophilus	B7	700733™
Aspergillus brasiliensis deposited as *Aspergillus niger*	WLRI 034(120)	16404™
Aspergillus brasiliensis deposited as *Aspergillus niger*	SN 26	9642™
Aspergillus brasiliensis deposited as *Aspergillus niger*	SN 26	9642-U™
Aspergillus flavus var. *flavus*	WB 1957	16883™
Aspergillus flavus	MCV-C#1	204304™
Aspergillus fumigatus deposited as *Aspergillus fumigatus*	FG 1432	MYA-3627™
Aspergillus niger 16404™ renamed (2008) as *Aspergillus brasiliensis*		16404™
Aspergillus niger		10535™
Aspergillus niger	WB 326	16888™
Aspergillus niger	4247	6275™
Aspergillus niger		64958™
Aspergillus oryzae deposited as *Aspergillus flavus*	NRRL 484	10124™
Aspergillus restrictus	FRR 2176	42693™
Aspergillus ustus	NRRL A-310	10760™
Bacillus atrophaeus deposited as *Bacillus subtilis*	NCTC 10073	51189™
Bacillus atrophaeus deposited as *Bacillus subtilis* var. *niger*	NRS 1221A	9372™
Bacillus cereus	NRRL B-569	10876™
Bacillus cereus	PCI 246	13061™
Bacillus cereus	[BCRC 10603, CCM 2010, CCUG 7414, CIP 66.24, DSM 31, HAMBI 1887, HAMBI 1905, IAM 12605, JCM 2152, LMG 6923, NBRC 15305, NCCB 75008, NCIMB 9373, NCTC 2599, NRRL B-3711, VKM B-504]	14579™
Bacillus cereus	ENSP6	33019™

Catalogue

Organism	Designation	ATCC® No.
Bacillus cereus deposited as *Bacillus agri*	AMC 800	2™
Bacillus cereus deposited as *Bacillus mycoides*	FDA strain PCI 213	11778™
Bacillus circulans		4513™
Bacillus circulans	7	4516™
Bacillus circulans deposited as *Bacillus fusiformis*	AMC 732	61™
Bacillus coagulans	NRS 609	7050™
Bacillus licheniformis	[ATCC 11560, Damodaron P-8, LMG 7560, NRS 1415]	12759™
Bacillus licheniformis	[46, NCIB 9375, NCTC 10341, NRS 1264]	14580™
Bacillus megaterium	[BCRC 10608, CCM 2007, CCUG 1817, CIP 66.20, DSM 32, HAMBI 2018, IAM 13418, JCM 2506, KCTC 3007, LMG 7127, NBRC 15308, NCCB 75016, NCIMB 9376, NCTC 10342, NRIC 1710, NRRL B-14308, VKM B-512]	14581™
Bacillus megaterium	4R6259	9885™
Bacillus pumilus	NCTC 8241	14884™
Bacillus pumilus	E601	27142™
Bacillus pumilus	GB34	700814™
Bacillus pumilus	200211	BAA-1434™
Bacillus subtilis	NCTC 8236	11774™
Bacillus subtilis	PRD 66	19659™
Bacillus subtilis	168	23857™
Bacillus subtilis	BD170	33608™
Bacillus subtilis subsp. *spizizenii* deposited as *Bacillus subtilis*	NRS 231	6633™
Bacillus subtilis subsp. *subtilis* deposited as *Bacillus subtilis*	Marburg strain	6051™
Bacillus subtilis subsp. *subtilis* deposited as *Bacillus subtilis*	Marburg strain	6051-U™
Bacillus thuringiensis deposited as *Bacillus cereus* subsp. *thuringiensis*	[CCUG 7429, CIP 53.137, DSM 2046, HAMBI 478, LMG 7138, NCAIM B.01292, NCCB 70008, NRRL HD-735, VKM B-1544]	10792™
Bacillus thuringiensis deposited as *Bacillus thuringiensis* subsp. *kurstaki*	NRRL B-3792	33679™
Bacteroides fragilis	VPI 2553	25285™
Bacteroides fragilis	RYC2056	700786™
Bacteroides fragilis ATCC 700786 bacteriophage	B56-3	700786-B1™
Bacteroides fragilis deposited as "*Sphaerophorus intermedius*"	[ICPB 3498, NCTC I0581]	23745™
Bacteroides ovatus	[NCTC 11153]	8483™
Bacteroides ovatus	Vitek 400963; NSB 24257	BAA-1296™
Bacteroides ovatus	Vitek 400956	BAA-1304™
Bacteroides thetaiotaomicron	WAL 2926	29741™
Bacteroides uniformis deposited as *Bacteroides thetaiotaomicron*		8492™
Bacteroides ureolyticus	NCTC 10941	33387™
Bacteroides vulgatus	WAL 1887	29327™
Bacteroides vulgatus	[NCTC 11154]	8482™
Bartonella henselae deposited as *Rochalimaea henselae*	Houston-1	49882™
Bifidobacterium breve	S1 (Variant a)	15700™
Bordetella bronchiseptica	3127	10580™
Bordetella bronchiseptica	NRRL B-140	4617™
Bordetella parapertussis deposited as *Acinetobacter parapertussis*	NCTC 5952	15311™
Bordetella pertussis	F	8467™
Bordetella pertussis	5	9340™
Bordetella pertussis	18323	9797™
Brevibacillus agri deposited as *Bacillus agri*	NRS 1219	51663™
Brevibacillus brevis deposited as *Bacillus brevis*	NRS 604	8246™
Brevibacillus laterosporus deposited as *Bacillus laterosporus*	AMC 797	64™
Brevundimonas diminuta deposited as *Pseudomonas diminuta*	DSM 7234	11568™
Brevundimonas diminuta deposited as *Pseudomonas* sp.	FDA strain PCI 818	19146™
Brochothrix thermosphacta deposited as *Microbacterium thermosphactum*	SW 26	11509™
Budvicia aquatica	85-01-010	51341™
Burkholderia cepacia deposited as *Pseudomonas cepacia*	UCB 717	25416™
Burkholderia cepacia deposited as *Pseudomonas kingii*	[NCDC 7119 (EO-1 group)]	25608™
Campylobacter coli	CIP 7080	33559™
Campylobacter coli	76-GA2	43478™
Campylobacter fetus subsp. *fetus* deposited as *Vibrio fetus*	NADL 1083-2255	25936™
Campylobacter jejuni subsp. *jejuni*	CIP 702	33560™
Campylobacter jejuni subsp. *jejuni*	Strain LRA 094.06.89	49943™
Campylobacter jejuni subsp. *jejuni*	Vitek 109169	BAA-1153™
Campylobacter jejuni subsp. *jejuni*	CJC-25	43430™
Campylobacter jejuni subsp. *jejuni* deposited as *Campylobacter fetus* subsp. *jejuni*	VPI H840	29428™
Campylobacter jejuni subsp. *jejuni* deposited as *Campylobacter fetus* subsp. *jejuni*	AS-83-79	33291™

Catalogue

Organism	Designation	ATCC® No.
Campylobacter jejuni subsp. *jejuni* deposited as *Campylobacter fetus* subsp. *jejuni*	AS-84-79	33292™
Campylobacter lari	NCTC 11352	35221™
Candida albicans	3147	10231™
Candida albicans	NIH 3172	14053™
Candida albicans	CBS 562	18804™
Candida albicans	Wasson	24433™
Candida albicans	H-29	26790™
Candida albicans	S-24	60193™
Candida albicans	FC18	62376™
Candida albicans	AmMS 225	66027™
Candida albicans	NCCLS 11	90028™
Candida albicans	NCCLS 67	90029™
Candida albicans deposited as *Candida stellatoidea*	[ATCC 42266, CBS 1905, CCRC 20518, CECT 1439, DBVPG 6157, IFO 1397, JCM 1543]	11006™
Candida albicans deposited as *Candida stellatoidea*	MCV52.10	36232™
Candida albicans deposited as *Endomyces albicans*	132	2091™
Candida catenulata	NRRL Y-1508	10565™
Candida geochares deposited as *Torulopsis geochares*	CBS 6870	36852™
Candida glabrata	LRA 85.10.75	64677™
Candida glabrata	303542	MYA-2950™
Candida glabrata deposited as *Torulopsis glabrata*	mutant TMAGR-23	15126™
Candida glabrata deposited as *Torulopsis glabrata*	CBS 138	2001™
Candida glabrata deposited as *Torulopsis glabrata*	AmMS 231	66032™
Candida glabrata deposited as *Torulopsis glabrata*	NCCLS 84	90030™
Candida guilliermondii deposited as *Monilia guilliermondii*	Yamadazyma guilliermondii (Wickerham) Billon-Grand, teleomorph	6260™
Candida kefyr	Vitek 302993	204093™
Candida kefyr	CBS 607	4135™
Candida kefyr deposited as *Candida pseudotropicalis*	AmMS 226	66028™
Candida kefyr deposited as *Torula cremoris*	[BI CZAS 652/6, CCY 29-8-9]	2512™
Candida krusei		14243™
Candida krusei	ST-112	34135™
Candida lusitaniae	IFO 1019	34449™
Candida lusitaniae	AmMS 233	66035™
Candida magnoliae	API 85 02 008	201379™
Candida membranaefaciens	API 85 03 203	201377™
Candida parapsilosis	CBS 604	22019™
Candida parapsilosis	ST-89	34136™
Candida parapsilosis	7312/52.493	90018™
Candida tropicalis	API 90 01 105	201380™
Candida tropicalis	FDA PCI M-59	13803™
Candida tropicalis	API 90 06 019	201381™
Candida tropicalis	AmMS 227	66029™
Candida tropicalis deposited as *Monilia murmannica*	[CBS 2317, CCRC 21436, NRRL Y-1378, NRRL Y-1767, VTT C-78087]	9968™
Candida tropicalis deposited as *Monilia tropicalis*	[1909, ATCC 4563, ATCC 7349, CBS 94, CCRC 20520, DSY 59, IFO 1070, IFO 1400, JCM 1541, NRRL Y-12699, NRRL Y-12968, NRRL Y-607]	750™
Candida utilis deposited as *Torulopsis utilis*	*Pichia jadinii* (Sartory et al.) Kurtzman, teleomorph	9950™
Capnocytophaga sputigena		33612™
Cedecea neteri	CDC 0621-75	33855™
Cellulosimicrobium cellulans deposited as *Oerskovia xanthineolytica*	LL G62	27402™
Chlamydophila pneumoniae deposited as *Chlamydia pneumoniae*	TWAR strain AR-39	53592™
Citrobacter braakii	CDC 80-58	51113™
Citrobacter braakii deposited as *Citrobacter freundii*	MMS 4477	43162™
Citrobacter freundii	LRA 117.03.76	43864™
Citrobacter freundii	[ATCC 13316, NCTC 9750]	8090™
Citrobacter koseri deposited as *Citrobacter diversus*	CDC 3613-63	27156™
Cladosporium cladosporioides deposited as *Cladosporium herbarum*	IMI 45534	16022™
Clostridium beijerinckii deposited as *Clostridium butyricum*	CP Hegarty	8260™
Clostridium bifermentans deposited as *Bacillus centrosporogenes*	76	638™
Clostridium difficile	VPI 10463	43255™
Clostridium difficile	1351	43593™
Clostridium difficile	VPI 11186	700057™
Clostridium difficile	90556-M6S	9689™
Clostridium difficile	630	BAA-1382™
Clostridium histolyticum	NCTC 503	19401™

Catalogue

Organism	Designation	ATCC® No.
Clostridium novyi	1323	7659™
Clostridium perfringens		13124™
Clostridium septicum	NCTC 547	12464™
Clostridium sordellii	211	9714™
Clostridium sporogenes		19404™
Clostridium sporogenes	L.S. McClung 2006	11437™
Clostridium sporogenes	388	3584™
Clostridium tetani	43415	10779™
Corynebacterium diphtheriae	48255	11913™
Corynebacterium diphtheriae	5159	13812™
Corynebacterium minutissimum	[IFO 15361, NCTC 10288]	23348™
Corynebacterium pseudodiphtheriticum	153	10700™
Corynebacterium pseudodiphtheriticum	39555	10701™
Corynebacterium renale	NCTC 7448	19412™
Corynebacterium striatum	NSB 23348	BAA-1293™
Corynebacterium striatum deposited as *Corynebacterium flavidum*	NCTC 764	6940™
Corynebacterium xerosis		373™
Cronobacter muytjensii deposited as *Enterobacter sakazakii*	83-07-023	51329™
Crypthecodinium cohnii	PGM-1	30772™
Cryptococcus albidus var. *albidus*	NRRL Y-1400	10666™
Cryptococcus albidus var. *albidus*	CR-180	34140™
Cryptococcus albidus	AmMS 228	66030™
Cryptococcus humicola deposited as *Candida humicola*	LRA 229.03.85	64676™
Cryptococcus humicola deposited as *Candida humicola*	NRRL Y-1266	9949™
Cryptococcus laurentii	CBS 139	18803™
Cryptococcus laurentii	AmMS 230	66036™
Cryptococcus laurentii	YBC 505	76483™
Cryptococcus luteolus	NRRL Y-986	10671™
Cryptococcus neoformans	3756	14116™
Cryptococcus neoformans	*Vitek 302898*	204092™
Cryptococcus neoformans	CBS 132	32045™
Cryptococcus neoformans	NIH 76	34877™
Cryptococcus neoformans	AmMS 229	66031™
Cryptococcus neoformans	YBC 81	76484™
Cryptococcus uniguttulatus	AmMS 234	66033™
Deinococcus radiodurans deposited as *Micrococcus radiodurans*	R1 (smooth)	13939™
Dekkera bruxellensish	KT412	200341™
Delftia acidovorans deposited as *Pseudomonas acidovorans*	LRA 16.01.76	43868™
Desulfovibrio vulgaris deposited as *Spirillum desulfuricans* previously named *Desulfovibrio desulfuricans* subsp. *desulfuricans*	C-6	7757™
Edwardsiella tarda	CDC 1483-59	15947™
Eggerthella lenta deposited as *Eubacterium lentum*	MSMC 77-67	43055™
Eikenella corrodens	Vitek #101889	BAA-1152™
Eikenella corrodens deposited as *Bacteroides corrodens*	333/54-55	23834™
Elizabethkingia meningoseptica deposited as *Flavobacterium meningosepticum*	14	13253™
Enterobacter aerogenes	413	35028™
Enterobacter aerogenes	203	35029™
Enterobacter aerogenes	AmMS 264	51697™
Enterobacter aerogenes deposited as *Aerobacter aerogenes*	NCDC 819-56	13048™
Enterobacter amnigenus deposited as *Enterobacter cloacae*	C3	51816™
Enterobacter cloacae subsp. *cloacae* subsp. *nov.* deposited as *Aerobacter cloacae*	NCDC 279-56	13047™
Enterobacter cloacae subsp. *cloacae* subsp. *nov.* deposited as *Aerobacter cloacae*	A-8	23355™
Enterobacter cloacae subsp. *cloacae* subsp. *nov.* deposited as *Enterobacter cloacae*	2581	35030™
Enterobacter cloacae subsp. *cloacae* subsp. *nov.* deposited as *Enterobacter cloacae*	AmMS 204	49141™
Enterobacter cloacae subsp. *cloacae* subsp. *nov.* deposited as *Enterobacter cloacae*	LBM 93.03.067	700323™
Enterobacter gergoviae	CDC 604-77	33028™
Enterobacter sakazakii (51329™) renamed *Cronobacter muytjensii*		51329™
Enterococcus avium deposited as *Streptococcus* sp.	NCTC 9938	14025™
Enterococcus casseliflavus	9199	700327™
Enterococcus casseliflavus deposited as *Streptococcus faecium* var. *casseliflavus*	20	25788™
Enterococcus durans	AmMS 254	49479™
Enterococcus durans	AmMS 206	49135™
Enterococcus durans deposited as *Streptococcus durans*	SD-A	11576™
Enterococcus durans deposited as *Streptococcus durans*	NCTC 8307	19432™
Enterococcus durans deposited as *Streptococcus durans*	23C2	6056™
Enterococcus faecalis	AmMS 161	49149™
Enterococcus faecalis	API 639	49452™
Enterococcus faecalis	UWH 1921	49532™
Enterococcus faecalis	UWH 1936	49533™
Enterococcus faecalis	AmMS 260	51188™

Catalogue

Organism	Designation	ATCC® No.
Enterococcus faecalis	NJ-3	51299™
Enterococcus faecalis	V583	700802™
Enterococcus faecalis deposited as *Streptococcus faecalis*	PCI 1325	14506™
Enterococcus faecalis deposited as *Streptococcus faecalis*	NCTC 775	19433™
Enterococcus faecalis deposited as *Streptococcus faecalis*	[Portland]	29212™
Enterococcus faecalis deposited as *Streptococcus faecalis*	CN 478	33186™
Enterococcus faecalis deposited as *Streptococcus faecalis*	110	7080™
Enterococcus faecium	MMC4	51559™
Enterococcus faecium	VRE	700221™
Enterococcus faecium deposited as *Streptococcus faecalis*	24	6057™
Enterococcus faecium deposited as *Streptococcus faecalis*	PRD	6569™
Enterococcus faecium deposited as *Streptococcus faecium*	X3	27270™
Enterococcus faecium deposited as *Streptococcus faecium*	LRA 55 03 77	35667™
Enterococcus faecium deposited as *Streptococcus* sp.	NCTC 7171	19434™
Enterococcus gallinarum	NCDO 2313	49573™
Enterococcus gallinarum	API 84-10-088	700425™
Enterococcus hirae deposited as *Streptococcus faecalis*	FDA M19	10541™
Enterococcus hirae deposited as *Streptococcus lactis*	R	8043™
Enterococcus raffinosus deposited as *Enterococcus avium*	AmMS 239	49464™
Enterococcus saccharolyticus deposited as *Streptococcus saccharolyticus*	NCDO 2594	43076™
Epidermophyton floccosum	ES 3115	52066™
Erysipelothrix rhusiopathiae deposited as *Erysipelothrix insidiosa*	NCTC 8163	19414™
Escherichia coli	C600	23724
Escherichia coli	HB101	33694
Escherichia coli	MacLeod	10536™
Escherichia coli	K-12	10798™
Escherichia coli		11105™
Escherichia coli	AMC 198	11229™
Escherichia coli	B	11303™
Escherichia coli	B	11303-U™
Escherichia coli	NCTC 9001	11775™
Escherichia coli	CDC 5624-50	12014™
Escherichia coli	W1485	12435™
Escherichia coli	C	13706™
Escherichia coli	W-mutant 99-1	13762™
Escherichia coli	NCIB 9270	14169™
Escherichia coli	W3100	14948™
Escherichia coli	FDA strain PCI 1657	15222™
Escherichia coli	ML308	15224™
Escherichia coli	C-3000	15597™
Escherichia coli		23631™
Escherichia coli	[EMG 2: K (lambda)]	23716™
Escherichia coli	[B, EMG 31]	23848™
Escherichia coli	K-12	25404™
Escherichia coli	FDA strain Seattle 1946	25922™
Escherichia coli	K-12 RV308	31608™
Escherichia coli	K380, 81E1301	33605™
Escherichia coli	1532	35218™
Escherichia coli	API 1157	35421™
Escherichia coli	NCTC 86 (original Escherich strain)	4157™
Escherichia coli	V1076	51446™
Escherichia coli	DUP-101	51739™
Escherichia coli	BDMS 605	51755™
Escherichia coli	DG1H9	51813™
Escherichia coli	27	53498™
Escherichia coli	C Na1(r)	700078™
Escherichia coli	CN13	700609™
Escherichia coli	HS(pFamp)R	700891™
Escherichia coli	MG1655	700926™
Escherichia coli	Crooks	8739™
Escherichia coli	[397E, CCM 2024, DSM 1116, IFO 13500, NCIB 8666, NRRL B-766, W]	9637™
Escherichia coli bacteriophage	T2	11303-B2™
Escherichia coli bacteriophage	T4	11303-B4™
Escherichia coli bacteriophage	phi X174	13706-B1™
Escherichia coli bacteriophage	MS2	15597-B1™
Escherichia coli bacteriophage	P1	25404-B1™
Eurotium rubrum	FRR 1968	42690™
Exiguobacterium aurantiacum deposited as *Corynebacterium* sp.	LRA 143.06.89	49676™
Finegoldia magna deposited as *Peptococcus magnus*	WAL2508	29328™

Catalogue

Organism	Designation	ATCC® No.
Flavobacterium sp.	HC6	51823™
Fluoribacter bozemanae deposited as *Legionella bozemanii*	WIGA	33217™
Fusarium solani	FIV/74	36031™
Fusobacterium necrophorum subsp. *necrophorum*	VPI 2891	25286™
Fusobacterium nucleatum subsp. *nucleatum Knorr*	VPI 4355	25586™
Fusobacterium nucleatum subsp. *polymorphum* deposited as *Fusobacterium polymorphum*	[NCTC 10562]	10953™
Fusobacterium varium		27725™
Gardnerella vaginalis	AmMS 117	49145™
Gardnerella vaginalis deposited as *Haemophilus vaginalis*	594	14018™
Gardnerella vaginalis deposited as *Haemophilus vaginalis*	317	14019™
Gemella morbillorum deposited as *Streptococcus morbillorum*	VPI 5424	27824™
Geobacillus stearothermophilus deposited as *Bacillus calidolactis*	NRS T15	10149™
Geobacillus stearothermophilus deposited as *Bacillus stearothermophilus*	NCA 1805	12978™
Geobacillus stearothermophilus deposited as *Bacillus stearothermophilus*	NCA 26	12980™
Geobacillus stearothermophilus deposited as *Bacillus stearothermophilus*		7953™
Geotrichum candidum		34614™
Geotrichum capitatum deposited as *Trichosporon capitatum*	NRRL Y-1487	10663™
Geotrichum capitatum deposited as *Trichosporon capitatum*	CBS 5882	28576™
Haemophilus actinomycetemcomitans deposited as *Actinobacillus actinomycetemcomitans*	CDC A1916	29523™
Haemophilus aphrophilus	NCTC 5886	19415™
Haemophilus haemolyticus	NCTC 10659	33390™
Haemophilus influenzae	AMC 36-A-1	10211™
Haemophilus influenzae	NCTC 4560	19418™
Haemophilus influenzae		33533™
Haemophilus influenzae	R387	33930™
Haemophilus influenzae	[CIP 103777]	35056™
Haemophilus influenzae	MMS 34D-F	43163™
Haemophilus influenzae	AmMS 120	49144™
Haemophilus influenzae	TD-4	49247™
Haemophilus influenzae	L-378	49766™
Haemophilus influenzae	NCTC 8143	33391™
Haemophilus influenzae	3591	43065™
Haemophilus influenzae	AMC 36-A-3	9006™
Haemophilus influenzae	AMC 36-A-5	9007™
Haemophilus parahaemolyticus deposited as *Haemophilus haemolyticus*	536	10014™
Haemophilus parainfluenzae	H30	51505™
Haemophilus parainfluenzae	429	7901™
Haemophilus paraphrophilus	AmMS 115	49146™
Haemophilus paraphrophilus	LRA 116.07.89	49917™
Haemophilus paraphrophilus	NCTC 10557	29241™
Haemophilus somnus	8917974	700025™
Hafnia alvei deposited as *Enterobacter* sp.	C2	51815™
Halobacterium salinarum	1	19700™
Helicobacter pylori deposited as *Campylobacter pyloridis*	NCTC 11637	43504™
Issatchenkia orientalis deposited as *Candida krusei*	[ATCC 749, CBS 573, CCRC 20514, IFO 1064, IFO 1395, JCM 1609, NRRL Y-413, NRRL Y-7179]	6258™
Kingella denitrificans	NCTC 10995	33394™
Klebsiella oxytoca	Pasco 201	43086™
Klebsiella oxytoca	MMS 4377	43165™
Klebsiella oxytoca	LRA 06.01.73	43863™
Klebsiella oxytoca	AmMS 101	49131™
Klebsiella oxytoca	C4	51817™
Klebsiella oxytoca	LBM 90.11.033	700324™
Klebsiella oxytoca deposited as *Aerobacter aerogenes*	NRRL B-199	8724™
Klebsiella oxytoca deposited as *Klebsiella pneumoniae*	479-2	13182™
Klebsiella pneumoniae	ART 2008133	BAA-1705™
Klebsiella pneumoniae	AIS 2007023	BAA-1706™
Klebsiella pneumoniae subsp. *pneumoniae*		10031™
Klebsiella pneumoniae subsp. *pneumoniae*	NCTC 9633	13883™
Klebsiella pneumoniae subsp. *pneumoniae*	S 389	27736™
Klebsiella pneumoniae subsp. *pneumoniae*	PS-53	31488™
Klebsiella pneumoniae subsp. *pneumoniae*	C122	33495™
Klebsiella pneumoniae subsp. *pneumoniae*	LRA 24 11 73	35657™
Klebsiella pneumoniae subsp. *pneumoniae*	[CIP 104034, NCDC 400-68]	9997™
Klebsiella pneumoniae subsp. *pneumoniae* deposited as *Aerobacter aerogenes*	[NCDC 379-68, NCIB 8152]	8308™
Klebsiella pneumoniae subsp. *pneumoniae* deposited as *Escherichia coli* var. *communior*	[CIP 104216, NCIB 10341]	4352™
Klebsiella pneumoniae subsp. *pneumoniae* deposited as *Klebsiella aerogenes*	NCTC 8172	13882™
Klebsiella pneumoniae subsp. *pneumoniae* deposited as *Klebsiella pneumoniae*	K6	700603™
Kloeckera apiculata var. *apis*	CBS 2591	32857™

Catalogue

Organism	Designation	ATCC® No.
Kocuria kristinae	Vitek #12917	BAA-752™
Kocuria rhizophila deposited as *Sarcina lutea*	FDA strain PCI 1001/E	15957™
Kocuria rhizophila deposited as *Sarcina lutea*		533™
Kocuria rhizophila deposited as *Sarcina lutea*	FDA strain PCI 1001/D	9341a™
Kocuria rhizophila deposited as *Sarcina lutea*	FDA strain PCI 1001	9341™
Kocuria rosea deposited as *Micrococcus rubens*	[CCM 679, IAM 1315, IFO 3768, NCIB 11696, NCTC 7523]	186™
Kocuria varians deposited as *Micrococcus varians*	D757	51820™
Lactobacillus acidophilus	Scav	4356™
Lactobacillus acidophilus deposited as *Bacillus acidophilus*	[43]	314™
Lactobacillus brevis	Bb14	14869™
Lactobacillus casei deposited as *Lactobacillus casei* subsp. *casei*		334™
Lactobacillus casei deposited as *Lactobacillus casei* subsp. *casei*	03	393™
Lactobacillus delbrueckii subsp. *bulgaricus* deposited as *Lactobacillus bulgaricus*	Lb14	11842™
Lactobacillus delbrueckii subsp. *lactis* deposited as *Lactobacillus leichmannii*	326	4797™
Lactobacillus delbrueckii subsp. *lactis* deposited as *Lactobacillus leichmannii*	313	7830™
Lactobacillus fermentum	36	9338™
Lactobacillus gasseri deposited as *Lactobacillus acidophilus*	1SL4	19992™
Lactobacillus paracasei subsp. *paracasei*	NCDO 206	BAA-52™
Lactobacillus plantarum	Lp 39	14917™
Lactobacillus plantarum deposited as *Lactobacillus arabinosus*	17-5	8014™
Lactobacillus rhamnosus deposited as *Lactobacillus acidophilus*	GG	53103™
Lactobacillus rhamnosus deposited as *Lactobacillus casei*	4R2127	9595™
Lactobacillus rhamnosus deposited as *Lactobacillus casei*	[BUCSAV 227, M. Rogosa, V300, M.E. Sharpe H2, NCDO 243, NCIB 6375, NCIB 8010, NCTC 6375, NRC 488, P.A. Hansen 300, R.P. Tittsler 300]	7469™
Lactobacillus sakei subsp. *sakei Katagiri* deposited as *Lactobacillus sakei*	T.S	15521™
Lactococcus lactis deposited as *Enterococcus faecium*	9155	49032™
Lactococcus lactis subsp. *cremoris* deposited as *Streptococcus cremoris*	NCDO 607	19257™
Lactococcus lactis subsp. *lactis* deposited as *Streptococcus lactis*	Berridge X 13	11454™
Lactococcus lactis subsp. *lactis* deposited as *Streptococcus* sp.	NCTC 6681	19435™
Leclercia adecarboxylata	LBM 84.05.644	700325™
Leclercia adecarboxylata deposited as *Escherichia adecarboxylata*	1783	23216™
Legionella longbeachae	Long Beach 4	33462™
Legionella pneumophila subsp. *pneumophila*	Philadelphia-1	33152™
Legionella pneumophila subsp. *pneumophila*	Bloomington-2	33155™
Legionella pneumophila subsp. *pneumophila* deposited as *Legionella pneumophila*	Knoxville-1	33153™
Leishmania braziliensis	MHOM/BR/75/M2903	50135™
Listeria grayi	API 88-05-013	700545™
Listeria grayi deposited as *Listeria murrayi*	F-9	25401™
Listeria innocua	SLCC 3379	33090™
Listeria innocua	DUP-104	51742™
Listeria ivanovii subsp. *ivanovii* deposited as *Listeria ivanovii*	BE3229	BAA-139™
Listeria ivanovii subsp. *ivanovii* deposited as *Listeria monocytogenes*	Li 1979	19119™
Listeria monocytogenes	1071/53	13932™
Listeria monocytogenes	53 XXIII	15313™
Listeria monocytogenes	Li 20	19111™
Listeria monocytogenes	Li 21	19112™
Listeria monocytogenes	Li 23	19114™
Listeria monocytogenes	Li 2	19115™
Listeria monocytogenes	Li 2109	19118™
Listeria monocytogenes	Gibson	7644™
Listeria monocytogenes	[API 87-10-028, NSB 22072]	BAA-751™
Listeria seeligeri	CIP 100100	35967™
Lysinibacillus sphaericus deposited as *Bacillus sphaericus*	25	4525™
Macrococcus caseolyticus deposited as *Staphylococcus cohnii*	LRA 041 575	35662™
Magnetospirillum sp.	AMB-1	700264™
Mannheimia haemolytica deposited as *Pasteurella haemolytica*	NCTC 9380	33396™
Methylobacterium mesophilicum deposited as *Pseudomonas mesophilica*	A47	29983™
Microbacterium esteraromaticum	MC3	51822™
Microbacterium testaceum deposited as *Brevibacterium testaceum*	Rp-3	15829™
Micrococcus luteus	AmMS 533	49732™
Micrococcus luteus deposited as *Micrococcus flavus*	130.21	10240™
Micrococcus luteus deposited as *Micrococcus lysodeikticus*	[ATCC 15307, CCM 169, CIP A-270, IAM 1056, IFO 333, NCIB 9278, NCTC 2665, NRRL B-287]	4698™
Micrococcus luteus deposited as *Sarcina subflava*	Mercedita	7468™
Micrococcus luteus; renamed *Kocuria rhizophila*	refer to strains 9341™, 9341a™, 15957™	
Micrococcus sp.	API 82-06-057	700405™

Catalogue

Organism	Designation	ATCC® No.
Micrococcus sp.	MC7	51819™
Microsporum canis	Vasquez	11621™
Microsporum canis	A 3697 (2)	36299™
Microsporum gypseum	VH/3032	24102™
Moraxella (Branhamella) catarrhalis deposited as *Branhamella catarrhalis*	Ne 11	25238™
Moraxella (Branhamella) catarrhalis deposited as *Branhamella catarrhalis*	N9	25240™
Moraxella (Branhamella) catarrhalis deposited as *Branhamella catarrhalis*	AmMS 116	49143™
Moraxella (Branhamella) catarrhalis deposited as *Neisseria catarrhalis*	NCTC 4103	23246™
Moraxella (Branhamella) catarrhalis deposited as *Neisseria catarrhalis*	20	8176™
Moraxella (Moraxella) nonliquefaciens deposited as *Moraxella nonliquefaciens*	A170	17953™
Moraxella (Moraxella) osloensis deposited as *Mima polymorpha*	CDC	10973™
Morganella morganii subsp. *morganii* deposited as *Proteus morganii*	M4	25829™
Morganella morganii subsp. *morganii* deposited as *Proteus morganii*	M11	25830™
Mucor racemosus Fresenius	NRRL 6341	42647™
Mycobacterium avium subsp. *avium*	1982	15769™
Mycobacterium avium subsp. *avium*	Vet. 1387	25291™
Mycobacterium fortuitum subsp. *fortuitum*	[TMC 1529]	6841™
Mycobacterium gordonae	[L. Wayne W-1609, P-15, TMC 1324]	14470™
Mycobacterium intracellulare	3600	13950™
Mycobacterium kansasii	G133 Bostrom	12478™
Mycobacterium peregrinum	MF1353	700686™
Mycobacterium phlei	Timoteo	11758™
Mycobacterium smegmatis	W-113	14468™
Mycobacterium smegmatis	NCTC 8159	19420™
Mycobacterium smegmatis		607™
Mycobacterium smegmatis	mc(2)155	700084™
Mycobacterium terrae	W-45	15755™
Mycobacterium tuberculosis	H37Ra	25177™
Mycoplasma arginini deposited as *Mycoplasma arginini*	G230	23838™
Mycoplasma fermentans deposited as *Mycoplasma fermentans*	PG18	19989™
Mycoplasma gallisepticum deposited as *Mycoplasma gallisepticum*	[NCTC 10115, PG 31, X95]	19610™
Mycoplasma genitalium	G37	33530™
Mycoplasma hyorhinis deposited as *Mycoplasma hominis*	[H27]	15488™
Mycoplasma hyorhinis deposited as *Mycoplasma hominis*	PG21	23114™
Mycoplasma hyorhinis deposited as *Mycoplasma hyorhinis*	BTS-7	17981™
Mycoplasma hyorhinis deposited as *Mycoplasma hyorhinis*	DBS 1050	29052™
Mycoplasma orale deposited as *Mycoplasma orale*	CH 19299	23714™
Mycoplasma pneumoniae deposited as *Mycoplasma pneumoniae*	FH strain of Eaton Agent	15531™
Mycoplasma synoviae	WVU 1853	25204™
Myroides odoratus deposited as *Flavobacterium odoratum*	[CCUG 7321, CIP 103105, DSM 2801, IFO 14945, JCM 7458, LMG 1233, NCTC 11036]	4651™
Neisseria gonorrhoeae	NCTC 8375	19424™
Neisseria gonorrhoeae		31426™
Neisseria gonorrhoeae	CDC Ng-116	43069™
Neisseria gonorrhoeae	CDC Ng-98	43070™
Neisseria gonorrhoeae	F-18	49226™
Neisseria gonorrhoeae	WHO V	49498™
Neisseria gonorrhoeae	NHI 1	49981™
Neisseria lactamica	NCDC A5906	23971™
Neisseria lactamica	NCDC A7515	23970™
Neisseria lactamica	AmMS 118	49142™
Neisseria meningitidis	M1027	13077™
Neisseria meningitidis	M2092	13090™
Neisseria meningitidis	M1628	13102™
Neisseria meningitidis	M-112	35561™
Neisseria mucosa	X71	19695™
Neisseria mucosa	AmMS 138	49233™
Neisseria perflava deposited as *Neisseria subflava*	28	14799™
Neisseria sicca	CN	29193™
Neisseria sicca	AMC 14-D-1	9913™
Nitrosomonas europaea	EL Schmidt	19718™
Nocardia brasiliensis	IMRU 845	19296™
Novosphingobium capsulatum deposited as *Flavobacterium capsulatum*	28	14666™
Ochrobactrum anthropi	Biolog 1185	49687™
Ochrobactrum anthropi	Vitek 109243	BAA-749™
Octosporomyces octosporus deposited as *Schizosaccharomyces octosporus*	CBS 371	4206™
Oligella ureolytica	CCUG 1465	43534™
Oligella ureolytica	CCUG 17791	43535™
Oligella urethralis deposited as *Mima polymorpha* var. *oxidans*	CDC 7603	17960™

Catalogue

Organism	Designation	ATCC® No.
Paecilomyces marquandii	NRRL 901	10525™
Paenibacillus gordonae deposited as *Bacillus gordonae*	Q1	29948™
Paenibacillus larvae subsp. *larvae* deposited as *Bacillus larvae*	846	9545™
Paenibacillus macerans deposited as *Bacillus macerans*	18	8509™
Paenibacillus polymyxa deposited as *Bacillus polymyxa*	LRA 88.01.80	43865™
Paenibacillus polymyxa deposited as *Bacillus polymyxa*	[Difco Labs. 8277, N.R. Smith NRS 279, Vitek #200115]	7070™
Paenibacillus polymyxa deposited as *Bacillus polymyxa*	[BUCSAV 162, CCM 1459, NCIB 8158, NCTC 10343, NRS 1105]	842™
Parabacteroides distasonis deposited as *Bacteroides distasonis*	[NCTC 11152]	8503™
Parabacteroides distasonis deposited as *Bacteroides distasonis*	Vitek 400127	BAA-1295™
Parvimonas micra formerly *Micromonas micros* and Peptostreptococcus micros deposited as *Peptostreptococcus micros*	VPI 5464	33270™
Pasteurella aerogenes	P-172-71	27883™
Pasteurella multocida subsp. *multocida*	P-931	12945™
Pasteurella multocida subsp. *multocida*	NCTC 10322	43137™
Pediococcus acidilactici deposited as *Leuconostoc mesenteroides*		8042™
Pediococcus damnosus	NCDO 1832	29358™
Penicillium aurantiogriseum deposited as *Penicillium cyclopium*	IMI 19759	16025™
Penicillium aurantiogriseum deposited as *Penicillium puberulum*	NRRL 1889	8732™
Penicillium chrysogenum	[CBS 277.47, IFO 4626, IMI 37767, PRL 1910, QM 943, Wis. Q-176]	10002™
Penicillium chrysogenum	NRRL 807	10106™
Penicillium chrysogenum	Wis. 49-133	11709™
Penicillium chrysogenum deposited as *Penicillium notatum*	NRRL 832	9179™
Penicillium chrysogenum var. *dipodomyis*	NRRL 13485	64185™
Penicillium variabile	NRRL 3765	32333™
Peptoniphilus asaccharolyticus deposited as *Peptococcus aerogenes*	UW 228	14963™
Peptoniphilus asaccharolyticus deposited as *Peptococcus asaccharolyticus*	WAL 3218	29743™
Peptostreptococcus anaerobius	VPI 4330	27337™
Pityrosporum ovale		12078™
Plesiomonas shigelloides	GNI 14	51903™
Plesiomonas shigelloides deposited as *Aeromonas shigelloides*	CDC 3085-55	14029™
Porphyromonas gingivalis deposited as *Bacteroides gingivalis*	2561	33277™
Porphyromonas gingivalis deposited as *Bacteroides gingivalis*	W50	53978™
Porphyromonas levii deposited as *Bacteroides melaninogenicus*	1	29147™
Prevotella loescheii deposited as *Bacteroides oratus*	8B	15930™
Prevotella melaninogenica deposited as *Bacteroides melaninogenicus* subsp. *melaninogenicus*	VPI 2381	25845™
Prevotella nigrescens deposited as *Bacteroides intermedius*	VPI 8944	33563™
Propionibacterium acnes deposited as *Corynebacterium acnes*	Gerath	11827™
Propionibacterium acnes deposited as *Corynebacterium acnes*	NCTC 737	6919™
Propionibacterium granulosum	VPI 0507	25564™
Proteus hauseri deposited as *Proteus vulgaris*	NCTC 4125 strain Lehmann	13315™
Proteus mirabilis	D1	12453™
Proteus mirabilis	FDA strain PCI 765	14153™
Proteus mirabilis	NCDC 2059-70	25933™
Proteus mirabilis	CDC 73-57740	29245™
Proteus mirabilis	CDC PR 14	29906™
Proteus mirabilis	571101	33583™
Proteus mirabilis	LRA 08 01 73	35659™
Proteus mirabilis	CDC S-17	43071™
Proteus mirabilis deposited as *Proteus ammoniae*		7002™
Proteus vulgaris		33420™
Proteus vulgaris	AmMS 105	49132™
Proteus vulgaris		6380™
Proteus vulgaris		8427™
Proteus vulgaris deposited as *Bacterium proteus*	NCTC 4636	6896™
Prototheca wickerhamii	NRRL YB-4330	16529™
Providencia alcalifaciens	GNI 3	51902™
Providencia alcalifaciens		9886™
Providencia rettgeri deposited as *Shigella rettgeri*	[ATCC 6907, IFO 13501, NCTC 1501]	9250™
Providencia stuartii	495	33672™
Providencia stuartii	AmMS 256	49809™
Pseudomonas aeruginosa	[CCEB 481, MDB strain BU 277, NCIB 8295, NCPPB 1965, NCTC 10332, NRRL B-771, R.Hugh 815]	10145™
Pseudomonas aeruginosa	[CCEB 481, MDB strain BU 277, NCIB 8295, NCPPB 1965, NCTC 10332, NRRL B-771, R.Hugh 815]	10145-U™

Catalogue

Organism	Designation	ATCC® No.
Pseudomonas aeruginosa	PRD-10	15442™
Pseudomonas aeruginosa	1C	15692™
Pseudomonas aeruginosa	NCTC 6750	19429™
Pseudomonas aeruginosa		25619™
Pseudomonas aeruginosa	NCTC 10662	25668™
Pseudomonas aeruginosa	Boston 41501	27853™
Pseudomonas aeruginosa	C118	35032™
Pseudomonas aeruginosa	API 1099	35422™
Pseudomonas aeruginosa	API 1143	35554™
Pseudomonas aeruginosa		9027™
Pseudomonas aeruginosa	GMC #6	BAA-427™
Pseudomonas fluorescens	NCTC 10038	13525™
Pseudomonas fluorescens	1	17386™
Pseudomonas fluorescens	P17	49642™
Pseudomonas fluorescens	AmMS 257	49838™
Pseudomonas putida	KT2440	47054™
Pseudomonas fluorescens	AmMS 106	49128™
Pseudomonas putida deposited as *Pseudomonas fluorescens*	[A.3.12, ATCC 23467, NCIB 9494, NCTC 10936, R.Y. Stanier 90]	12633™
Pseudomonas sp.	PS8	51821™
Pseudomonas stutzeri	221	17588™
Ralstonia pickettii deposited as *Pseudomonas cepacia*	AmMS 155	49129™
Raoultella terrigena deposited as *Klebsiella terrigena*	CUETM 77-176	33257™
Rhizobium rhizogenes deposited as *Agrobacterium rhizogenes*	[CIP 104786]	15834™
Rhizopus stolonifer	UNB-1	14037™
Rhizopus stolonifer deposited as *Rhizopus nigricans*	C-25A	6227a™
Rhizopus stolonifer deposited as *Rhizopus nigricans*	C-25B	6227b™
Rhodococcus equi deposited as *Corynebacterium equi*	NCTC 1621	6939™
Rhodotorula mucilaginosa var. *mucilaginosa*, deposited as *Rhodotorula rubra*	AmMS 232	66034™
Rhodotorula mucilaginosa var. *mucilaginosa*, deposited as *Rhodotorula rubra*	NRRL Y-1592	9449-U™
Saccharomyces cerevisiae deposited as *Saccharomyces carlsbergensis*	4228	9080™
Saccharomyces cerevisiae deposited as *Saccharomyces cerevisiae*	S288C	204508™
Saccharomyces cerevisiae deposited as *Saccharomyces cerevisiae*	NRRL Y-53	2601™
Saccharomyces cerevisiae deposited as *Saccharomyces cerevisiae*	[CBS 1368, CCRC 21727, DSM 2155, IFO 1346, NCYC 79, NRRL Y-977]	7754™
Saccharomyces cerevisiae deposited as *Saccharomyces cerevisiae*		9763™
Saccharomyces cerevisiae deposited as *Saccharomyces ellipsoideus*	[657, IFO 1661]	4098™
Saccharomyces cerevisiae deposited as *Saccharomyces sake*	B73.P	32701™
Salmonella bongori deposited as *Salmonella enterica* subsp. *bongori*	CIP 82.33	43975™
Salmonella enterica subsp. *arizonae* deposited as *Arizona arizonae*	NCTC 8297	13314™
Salmonella enterica subsp. *diarizonae*	0563-95	BAA-216™
Salmonella enterica subsp. *diarizonae* deposited as *Arizona hinshawii*	CDC 656/75	29226™
Salmonella enterica subsp. *enterica*	0267-95	BAA-215™
Salmonella enterica subsp. *enterica* serovar *Abaetetuba* deposited as *Salmonella* sp.		35640™
Salmonella enterica subsp. *enterica* serovar *Anatum* deposited as *Salmonella* sp.	5101	9270™
Salmonella enterica subsp. *enterica* serovar *Choleraesuis* deposited as *Salmonella choleraesuis*subsp. *choleraesuis* serovar *Choleraesuis*	ETS 34	10708™
Salmonella enterica subsp. *enterica* serovar *Choleraesuis* deposited as *Salmonella choleraesuis* subsp. *choleraesuis* serovar *Choleraesuis*	NCTC 5735	13312™
Salmonella enterica subsp. *enterica* serovar *Choleraesuis* deposited as *Salmonella choleraesuis* subsp. *choleraesuis* serovar *Choleraesuis*		7001™
Salmonella enterica subsp. *enterica* serovar *Choleraesuis* var. *Kunzendorf* deposited as *Salmonella choleraesuis* subsp. *Kunzendorf*	CDC (5210) (37)	12011™
Salmonella enterica subsp. *enterica* serovar *Enteritidis* deposited as *Salmonella enteritidis*	CDC K-1891	13076™
Salmonella enterica subsp. *enterica* serovar *Infantis* deposited as *Salmonella infantis*	DUP-103	51741™
Salmonella enterica subsp. *enterica* serovar *Paratyphi A* deposited as *Salmonella paratyphi-A*		9150™
Salmonella enterica subsp. *enterica* serovar *Pullorum* deposited as *Aeromonas* sp.	NRRL B-663	13036™
Salmonella enterica subsp. *enterica* serovar *Pullorum* deposited as *Salmonella* sp.	X-12	19945™
Salmonella enterica subsp. *enterica* serovar *Tallahassee* deposited as *Salmonella* sp.	CDC	12002™
Salmonella enterica subsp. *enterica* serovar *Typhimurium* bacteriophage	P22	19585-B1™
Salmonella enterica subsp. *enterica* serovar *Typhimurium* deposited as *Salmonella choleraesuis* subsp. *choleraesuis serotype Typhimurium*	U24	51812™
Salmonella enterica subsp. *enterica* serovar *Typhimurium* deposited as *Salmonella enterica* subsp. I *serotype Typhimurium*	0267-95	BAA-215™
Salmonella enterica subsp. *enterica* serovar *Typhimurium* deposited as *Salmonella typhimurium*	NCTC 74	13311™
Salmonella enterica subsp. *enterica* serovar *Typhimurium* deposited as *Salmonella typhimurium*	CDC 6516-60	14028™
Salmonella enterica subsp. *enterica* serovar *Typhimurium* deposited as *Salmonella typhimurium*	LT2	19585™

Catalogue

Organism	Designation	ATCC® No.
Salmonella enterica subsp. *enterica* serovar *Typhimurium* deposited as *Salmonella typhimurium*	met-A-15	25241™
Salmonella enterica subsp. *enterica* serovar *Typhimurium* deposited as *Salmonella typhimurium*	TA 1535	29629™
Salmonella enterica subsp. *enterica* serovar *Typhimurium* deposited as *Salmonella typhimurium*	TA 1537	29630™
Salmonella enterica subsp. *enterica serovar Typhimurium* deposited as *Salmonella typhimurium*	TA 1538	29631™
Salmonella enterica subsp. *enterica* serovar *Typhimurium* deposited as *Salmonella typhimurium*	Leu 130	49416™
Salmonella enterica subsp. *enterica* serovar *Vellore* deposited as *Salmonella* sp.	V1796	15611™
Salmonella enterica subsp. *enterica* serovar *Paratyphi B* deposited as *Salmonella schottmuelleri*		8759™
Schizochytrium sp.	S31	20888™
Scopulariopsis acremonium	UAMH 541	58636™
Serratia liquefaciens	CDC 1284-57	27592™
Serratia marcescens	BS 303	13880™
Serratia marcescens	NRRL B-1481	14041™
Serratia marcescens	PCI 1107	14756™
Serratia marcescens	LRA 13.05.73	43861™
Serratia marcescens	LRA 04.03.73	43862™
Serratia marcescens	NRS 116-175	8100™
Serratia odorifera	1073	33077™
Serratia rubidaea	E1344	33670™
Shewanella putrefaciens deposited as *Pseudomonas putrefaciens*	AmMS 201	49138™
Shewanella putrefaciens deposited as *Pseudomonas putrefaciens*	95	8071™
Shigella boydii deposited as *Shigella paradysenteriae*	AMC 43-G-58	9207™
Shigella flexneri	CDC 3591-52	12022™
Shigella flexneri deposited as *Shigella paradysenteriae*	AMC 43-G-68	9199™
Shigella sonnei	NCDC 1120-66	25931™
Shigella sonnei	WRAIR I virulent	29930™
Shigella sonnei	AMC 43-GG9	9290™
Sordaria fimicola	A-1, wild type g+	14517™
Sordaria fimicola	t, tan-spored	16096™
Sphingobacterium multivorum deposited as *Flavobacterium multivorum*	LRA 26 07 76	35656™
Sphingobacterium spiritivorum deposited as *Flavobacterium spiritivorum*	CDC E7288	33861™
Sphingomonas paucimobilis deposited as *Pseudomonas paucimobilis*	NCTC 11030	29837™
Sphingomonas trueperi deposited as *Pseudomonas azotocolligans*	DSM 7225	12417™
Spiroplasma citri	AZ-1729	33274™
Staphylococcus aureus	Vitek #8753	BAA-1026™
Staphylococcus aureus subsp. *aureus*	Wood 46	10832™
Staphylococcus aureus subsp. *aureus*	S13	11632™
Staphylococcus aureus subsp. *aureus*	NCTC 8530	12598™
Staphylococcus aureus subsp. *aureus*	NCTC 8532	12600™
Staphylococcus aureus subsp. *aureus*	NCTC 8532	12600-U™
Staphylococcus aureus subsp. *aureus*	Newman D2C	25904™
Staphylococcus aureus subsp. *aureus*	655	27660™
Staphylococcus aureus subsp. *aureus*	Wichita	29213™
Staphylococcus aureus subsp. *aureus*	FDA	29737™
Staphylococcus aureus subsp. *aureus*	I.J.7	31153™
Staphylococcus aureus subsp. *aureus*	328	33591™
Staphylococcus aureus subsp. *aureus*	1063	33592™
Staphylococcus aureus subsp. *aureus*	SS697	33862™
Staphylococcus aureus subsp. *aureus*	F-182	43300™
Staphylococcus aureus subsp. *aureus*	AmMS 241	49476™
Staphylococcus aureus subsp. *aureus*	V8	49775™
Staphylococcus aureus subsp. *aureus*	91089	51153™
Staphylococcus aureus subsp. *aureus*	DUP-102	51740™
Staphylococcus aureus subsp. *aureus*	FDA 209P	6538P™
Staphylococcus aureus subsp. *aureus*	FDA 209	6538™
Staphylococcus aureus subsp. *aureus*	3R7089 strain Oxford	9144™
Staphylococcus aureus subsp. *aureus* deposited as *Micrococcus pyogenes*	PCI 1209/N	12692™
Staphylococcus aureus subsp. *aureus* deposited as *Staphylococcus aureus*	Seattle 1945	25923™
Staphylococcus aureus subsp. *aureus* deposited as *Staphylococcus aureus*	Mu3	700698™
Staphylococcus aureus subsp. *aureus* deposited as *Staphylococcus aureus*	Mu50	700699™
Staphylococcus aureus subsp. *aureus* deposited as *Staphylococcus aureus*	UT 25	BAA-976™
Staphylococcus aureus subsp. *aureus* deposited as *Staphylococcus aureus*	UT 32	BAA-977™
Staphylococcus aureus subsp. *aureus* deposited as *Staphylococcus* sp.	FDA 196E	13565™
Staphylococcus capitis deposited as *Sarcina aurantiaca*	[NRRL B-2616]	146™
Staphylococcus capitis subsp. *capitis*	LRA 360 677	35661™

Catalogue

Organism	Designation	ATCC® No.
Staphylococcus epidermidis	FDA strain PCI 1200	12228™
Staphylococcus epidermidis	Fussel	14990™
Staphylococcus epidermidis	255-01B	29887™
Staphylococcus epidermidis	RP62A	35984™
Staphylococcus epidermidis	AmMS 205	49134™
Staphylococcus epidermidis	AmMS 242	49461™
Staphylococcus epidermidis	CCF 15990	51625™
Staphylococcus epidermidis	C078	700296™
Staphylococcus epidermidis deposited as *Staphylococcus saprophyticus*	MDB strain BS 747	13518™
Staphylococcus gallinarum	AP 91-07-073	700401™
Staphylococcus haemolyticus	SM 131	29970™
Staphylococcus hominis subsp. *hominis*	DM 122	27844™
Staphylococcus intermedius	H11/68	29663™
Staphylococcus lentus	API 86-01-034	700403™
Staphylococcus lugdunensis	LRA 260.05.79	49576™
Staphylococcus lugdunensis	6733	700328™
Staphylococcus pseudintermedius deposited as *Staphylococcus aureus*		49444™
Staphylococcus saprophyticus	NCTC 7292	15305™
Staphylococcus saprophyticus	API 1101	35552™
Staphylococcus saprophyticus	LRA 27.02.80	43867™
Staphylococcus saprophyticus	API 222	49453™
Staphylococcus saprophyticus	AmMS 143	49907™
Staphylococcus saprophyticus	Vitek #8935	BAA-750™
Staphylococcus sciuri subsp. *sciuri*	GH9	29060™
Staphylococcus sciuri subsp. *sciuri*	GV252	29061™
Staphylococcus simulans	KH 1	27851™
Staphylococcus sp. deposited as *Staphylococcus epidermidis*	AMC 263	155™
Staphylococcus sp. deposited as *Staphylococcus epidermidis*	AMC 263	155-U™
Staphylococcus warneri	API 379	49454™
Staphylococcus xylosus	SL 8	29967™
Staphylococcus xylosus	KL 162	29971™
Staphylococcus xylosus	9280	35033™
Staphylococcus xylosus	LRA 1641 575	35663™
Staphylococcus xylosus	AmMS 151	49148™
Staphylococcus xylosus	API 85-12-228	700404™
Stenotrophomonas maltophilia deposited as *Pseudomonas maltophilia*	810-2	13637™
Stenotrophomonas maltophilia deposited as *Pseudomonas maltophilia*	300	17666™
Stenotrophomonas maltophilia deposited as *Pseudomonas maltophilia*	AmMS 194	49130™
Stenotrophomonas maltophilia deposited as *Xanthomonas maltophilia*	89-02-019	51331™
Streptococcus agalactiae	NCTC 8181	13813™
Streptococcus agalactiae	NADC 44	27956™
Streptococcus agalactiae	2603 V/R	BAA-611™
Streptococcus agalactiae deposited as *Streptococcus* sp.	grouping strain O90R	12386™
Streptococcus agalactiae deposited as *Streptococcus* sp.	typing strain D136C(3)	12403™
Streptococcus anginosus deposited as *Streptococcus anginosus*	NCTC 10713	33397™
Streptococcus bovis	NCDO 597	33317™
Streptococcus bovis	9145	35034™
Streptococcus criceti deposited as *Streptococcus cricetus*	HS-6	19642™
Streptococcus dysgalactiae subsp. *equisimilis* deposited as *Streptococcus equisimilis*	LRA 06 11 76	35666™
Streptococcus dysgalactiae subsp. *equisimilis* deposited as *Streptococcus equisimilis*	1180	9542™
Streptococcus dysgalactiae subsp. *equisimilis* deposited as *Streptococcus* sp.	grouping strain C74	12388™
Streptococcus dysgalactiae subsp. *equisimilis* deposited as *Streptococcus* sp.	grouping strain D166B	12394™
Streptococcus equi subsp. *equi*	NCTC 9682	33398™
Streptococcus equi subsp. *equi*	2-1-23	9528™
Streptococcus equi subsp. *zooepidemicus*	NCDO 1358	43079™
Streptococcus equi subsp. *zooepidemicus*	API 77-01-036	700400™
Streptococcus gallolyticus deposited as *Streptococcus bovis*	AmMS 119	49147™
Streptococcus gallolyticus deposited as *Streptococcus bovis*	38	9809™
Streptococcus gallolyticus deposited as *Streptococcus bovis*	AmMS 236	49475™
Streptococcus mitis deposited as *Streptococcus viridans*		6249™
Streptococcus mutans	NCTC 10449	25175™
Streptococcus mutans	LRA 28 02 81	35668™
Streptococcus oralis deposited as *Streptococcus mitis*	M7A	9811™
Streptococcus parasanguinis deposited as *Streptococcus mitis*	[SS 895]	15909™
Streptococcus pasteurianus deposited as *Streptococcus bovis*	AmMS 207	49133™
Streptococcus pneumoniae	AmMS 208	49136™
Streptococcus pneumoniae	AmMS 149	49150™
Streptococcus pneumoniae	262	49619™
Streptococcus pneumoniae	CDC CS111	51916™
Streptococcus pneumoniae	Slovakia 14-10	700677™

Catalogue

Organism	Designation	ATCC® No.
Streptococcus pneumoniae	TIGR4	BAA-334™
Streptococcus pneumoniae deposited as *Diplococcus pneumoniae*	SVI	10015™
Streptococcus pneumoniae deposited as *Diplococcus pneumoniae*	R36a rough phase	27336™
Streptococcus pneumoniae deposited as *Diplococcus pneumoniae*		6301™
Streptococcus pneumoniae deposited as *Diplococcus pneumoniae*	[CIP 104225]	6303™
Streptococcus pneumoniae deposited as *Diplococcus pneumoniae*		6305™
Streptococcus pyogenes	typing strain T1	12344™
Streptococcus pyogenes	typing strain C203	12384™
Streptococcus pyogenes	C203 S	14289™
Streptococcus pyogenes	Bruno	19615™
Streptococcus pyogenes	QC A62	49399™
Streptococcus pyogenes	SF370; M1 GAS	700294™
Streptococcus salivarius	C699	13419™
Streptococcus sanguinis	SK36	BAA-1455™
Streptococcus sanguinis deposited as *Streptococcus sanguis*	DSS-10	10556™
Streptococcus sp.	grouping strain H60R	12392™
Streptococcus sp.	NCTC 4725	27284™
Streptococcus sp.	typing strain H36B	12401™
Streptococcus thermophilus	NCDO 573	19258™
Streptococcus uberis	API 78-11-025	700407™
Streptococcus uberis	[CIP 105801, NCDO 2055]	9927™
Streptococcus vestibularis	MM1	49124™
Streptomyces griseus subsp. *griseus*	4	10137™
Streptomyces somaliensis	IMRU 1274	33201™
Tannerella forsythensis deposited as *Bacteroides forsythus*	FDC 338	43037™
Thermoanaerobacterium thermosaccharolyticum	NCA 3814 (thermophilic anaerobe)	7956™
Treponema phagedenis deposited as *Treponema pallidum*	Kazan 8	27087™
Trichomonas vaginalis	C-1:NIH	30001™
Trichomonas vaginalis	123414	30184™
Trichophyton mentagrophytes deposited as *Trichophyton interdigitale*	640	9533™
Trichophyton rubrum	379	28188™
Trichophyton tonsurans		28942™
Trichosporon mucoides	API 85 02 177	201382™
Trichosporon mucoides	API 94 09 047	201383™
Trichosporon mucoides	Vitek 303483	204094™
Ureaplasma urealyticum deposited as *Ureaplasma urealyticum*		27619™
Ureaplasma urealyticum deposited as *Ureaplasma urealyticum*	7	27813™
Veillonella parvula	[ATCC 17742, Te 3]	10790™
Vibrio alginolyticus deposited as *Oceanomonas alginolytica*	XII-53	17749™
Vibrio fischeri deposited as *Achromobacter fischeri*	[NCMB 1281]	7744™
Vibrio harveyi	BB120	BAA-1116™
Vibrio natriegens deposited as *Pseudomonas natriegens*	[P. Baumann 111]	14048™
Vibrio parahaemolyticus	EB 101	17802™
Virgibacillus pantothenticus deposited as *Bacillus pantothenticus*	NRS 1321	14576™
Wallemia sebi	FRR 1471	42694™
Yarrowia lipolytica deposited as *Mycoderma lipolytica*	251	9773™
Yersinia enterocolitica subsp. *enterocolitica* deposited as *Bacterium enterocoliticum*	33114	9610™
Yersinia enterocolitica subsp. *enterocolitica* deposited as *Yersinia enterocolitica*	Billups-1803-68	23715™
Yersinia enterocolitica subsp. *enterocolitica* deposited as *Yersinia enterocolitica*	WA	27729™
Yersinia kristensenii	CDC 1459-81	33639™
Yersinia ruckeri	CDC 2396-61	29473™
Zalerion arboricola	MF5533	74030™
Zygosaccharomyces rouxii deposited as *Saccharomyces bisporus* var. *mellis*	NARD 3344	34890™
Zygosaccharomyces rouxii deposited as *Saccharomyces rouxii*	59-4	28253™

A complete listing of ATCC Genuine Cultures® can be found at: **www.lgcstandards-atcc.org**

Nucleic Acids prepared from ATCC Genuine Cultures®

For a complete listing see our online catalogue: www.lgcstandards-atcc.org

ATCC offers Nucleic Acids from well characterised and authenticated microbial strains, viruses and molecularly cloned viruses. Nucleic Acids from ATCC Genuine Cultures® fall into the following categories:

- Genomic DNA from microbial strains, namely bacteria, archaea, mycoplasma, protists, and fungi/yeast
- Viral DNA or RNA including viral genomic material, from infected cells or allantoic fluid
- Plasmid DNA from molecularly cloned viruses.

Nucleic Acids from ATCC Genuine Cultures can save you the time and expense of isolating DNA and RNA yourself.

Applications include:

- Construction of genomic libraries
- Southern hybridisation
- PCR
- Method development
- Positive controls for PCR/RT-PCR and other detection methods
- Identification and comparison at the genus, species, and strain levels.

This high quality DNA and RNA have been isolated under aseptic conditions to prevent cross-contamination. Batches are evaluated for integrity, purity and quality by several methods, including:

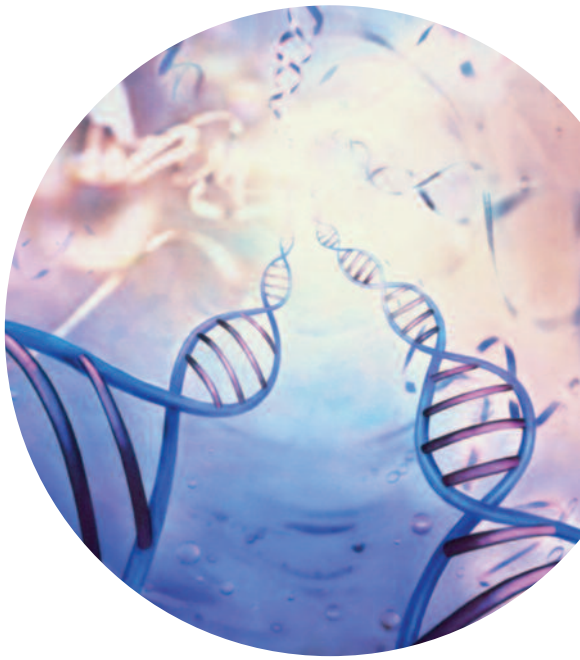
- Agarose gel electrophoresis
- Spectrophotometry
- Suitability for amplification by PCR
- Sequencing of the 16S ribosomal RNA gene (first ~ 500 base pairs) consistent with the sequence of the source organism for bacteria
- ITS sequencing consistent with the sequence of the source organism for fungi or yeast
- Sequence of PCR amplicon consistent with the sequence of the infecting agent for viruses.

Genomic DNA is available from bacteria and most yeasts in a 5 µg package size and from most filamentous fungi in a 2 µg package size. Most ATCC catalogue numbers have changed to add either '-5' or '-2' as a suffix. For example: ATCC catalogue number 10556D has been changed to 10556D-5 for the new 5 µg size. We've expanded our quality control testing for the new 5 µg and 2 µg sizes to include the determination of the total amount of nucleic acids by PicoGreen® measurement. Original packaging as indicated by a 'D' suffix was tested by an alternate method.

The package size of DNA and RNA prepared from Mycoplasma remains unchanged at either 10 ng or 50 ng.

The package size of viral DNA is 100 µl per vial, dilutable ten-fold or more for amplification. All viral nucleic acids have been tested to determine the total amount of the appropriate nucleic acid by PicoGreen® or RiboGreen® measurement, and have been tested for viral inactivation.

For more information, please refer to the individual product sheets.



Fully Sequenced Microbes

Bacteria and Archea

Name and strain	Culture ATCC® No.	Genomic DNA ATCC® No.	GenBank® No.
Acidithiobacillus ferrooxidans ATCC 23270™	23270™	23270D	CP001219
Acidithiobacillus ferrooxidans BNL-5-31	53993™	53993D-5	CP001132
Acidothermus cellulolyticus 11B	43068™	43068D-5	CP000481
Acidovorax sp. JS42	700441™		CP000539
Acinetobacter baumannii 5377	17978™	17978D-5	CP000521
Actinobacillus succinogenes 130Z	55618™	55618D-5	CP000746
Aeromonas hydrophila subsp. *hydrophila* RH 250	7966™	7966D-5	CP000462
Aeropyrum pernix K1	700893™		BA000002
Akkermansia muciniphila Muc	BAA-835™	BAA-835D-5	CP001071
Anabaena variabilis IUCC 1444	29413™	29413D-5	CP000117
Anaeromyxobacter dehalogenans 2CP-1	BAA-258™		CP001359
Anaeromyxobacter dehalogenans 2CP-C	BAA-259™	BAA-259D-5	CP000251
Archaeoglobus fulgidus VC16	49558™	49558D-5	AE000782
Arthrobacter aurescens TC1	BAA-1386™	BAA-1386D-5	CP000474
Arthrobacter chlorophenolicus A6	700700™	700700D-5	CP001341
Bacillus cereus ATCC 10987™	10987™	10987D-5	AE017194
Bacillus cereus ATCC 14579™	14579™	14579D-5	AE016877
Bacillus halodurans C-125	BAA-125™	BAA-125D-5	BA000004
Bacillus licheniformis 46	14580™	14580D-5	CP000002
Bacteroides fragilis EN-2	25285™	25285D	CR626927
Bacteroides thetaiotaomicron E50	29148™	29148D-5	AE015928
Bacteroides vulgatus ATCC 8482™	8482™	8482D-5	CP000139
Bartonella bacilliformis KC583	35685™	35685D-5	CP000524
Bartonella henselae Houston-1	49882™	49882D-5	BX897699
Bdellovibrio bacteriovorus HD100	15356™	1536D-5	BX842601
Beijerinckia indica subsp. *indica* 11	9039™	9039D-5	CP001016
Bifidobacterium adolescentis E194a	15703™	15703D	AP009256
Bifidobacterium infantis S12	15697™	15697D	CP001095
Bordetella bronchiseptica RB50	BAA-588™	BAA-588D-5	BX470250
Bordetella parapertussis 12822	BAA-587™	BAA-587D-5	BX470249
Bordetella pertussis Tohama I	BAA-589™	BAA-589D-5	BX470248
Borrelia burgdorferi B31	35210™	35210D-5	AE001115
Bradyrhizobium sp. BTAi1	BAA-1182™		CP000494
Brucella ovis 63/290	25840™	25840D-5	CP000709
Burkholderia ambifaria AMMD	BAA-244™	BAA-244D-5	CP000440
Burkholderia cepacia 249	17616™	17616D-5	CP000869
Burkholderia thailandensis E264	700388™	700388D-5	CP000086
Caldicellulosiruptor saccharolyticus Tp8T.6331	43494™	43494D-5	CP000679
Campylobacter concisus 13826	BAA-1457™	BAA-1457D-5	CP000792
Campylobacter hominis CH001A	BAA-381™	BAA-381D-5	CP000776
Campylobacter jejuni RM1221	BAA-1062™	BAA-1062D-5	CP000025
Campylobacter jejuni subsp. *doylei* 269.97	BAA-1458™	BAA-1458D-5	CP000768
Campylobacter jejuni subsp. *jejuni* NCTC 11168	700819™	700819D-5	AL111168
Campylobacter lari RM2100	BAA-1060™	BAA-1060D-5	CP000932
Caulobacter vibrioides CB 15	19089™	19089D-5	AE005673
Chlorobium tepidum TLS	49652™	49652D-5	AE006470
Chloroflexus aurantiacus J-10-fl	29366™	29366D-5	CP000909
Chloroflexus aurantiacus Y-400-fl	29364™		CP001364
Chloroherpeton thalassium GB-78	35110™		CP001100
Chromobacterium violaceum MK	12472™	12472D	AE016825
Chromohalobacter salexigens 1H11	BAA-138™	BAA-138D-5	CP000285
Citrobacter koseri 4225-83	BAA-895™	BAA-895D-5	CP000822
Clostridium acetobutylicum ATCC 824™	824™	824D-5	AE001437
Clostridium difficile 630	BAA-1382™	BAA-1382D-5	AM180355
Clostridium perfringens ATCC 13124™	13124™	13124D-5	CP000246
Clostridium phytofermentans ISDg	700394™	700394D-5	CP000885
Clostridium thermocellum 157	27405™	27405D-5	CP000568
Colwellia psychrerythraea 34H	BAA-681™	BAA-681D	CP000083
Corynebacterium diphtheriae ATCC 700971™	700971™	700971D-5	BX248353
Corynebacterium glutamicum 534	13032™	13032D-5	BA000036
Cupriavidus metallidurans CH34	43123™	43123D-5	CP000352
Cupriavidus necator H16	17699™	17699D-5	AM260479
Cyanothece sp. BH68	51142™	51142D-5	CP000806
Cyanothece sp. PCC 7425	29141™		CP001344
Cytophaga hutchinsonii ATCC 33406™	33406™	33406D-5	CP000383
Deinococcus radiodurans R1	BAA-816™	BAA-816D	AE000513
Desulfovibrio desulfuricans subsp. *desulfuricans* MB	27774™	27774D-5	CP001358
Desulfovibrio vulgaris subsp. *vulgaris* Hildenborough	29579™	29579D-5	AE017285
Dictyoglomus thermophilum H-6-12	35947™		CP001146
Ensifer meliloti Rm1021	51124™	51124D-5	AL591688

Fully Sequenced Microbes

Bacteria and Archea

Name and strain	Culture ATCC® No.	Genomic DNA ATCC® No.	GenBank® No.
Enterobacter sakazakii 2001-10-01	BAA-894™	BAA-894D-5	CP000783
Enterococcus faecalis V583	700802™	700802D-5	AE016830
Escherichia coli Crooks	8739™	8739D-5	CP000946
Escherichia coli K12-MG1655	700926™	700926D-5	U00096
Escherichia coli UPEC-CFT073	700928™	700928D-5	AE014075
Escherichia coli RIMD 0509952	BAA-460™	BAA-460D-5	BA000007
Escherichia fergusonii CDC 0568-73	35469™	35469D-5	CU928158
Finegoldia magna WAL2508	29328™	29328D-5	AP008971
Flavobacterium johnsoniae MYX.1.1.1	17061™	17061D-5	CP000685
Flavobacterium psychrophilum TG 02/86	49511™	49511D-5	AM398681
Francisella philomiragia O#319-036	25017™	25017D-5	CP000937
Fusobacterium nucleatum subsp. *nucleatum* 1612A	25586™	25586D-5	AE009951
Geobacter lovleyi SZ	BAA-1151™		CP001089
Geobacter metallireducens GS-15	53774™	53774D-5	CP000148
Geobacter sulfurreducens PCA	51573™	51573D-5	AE017180
Gloeobacter violaceus PCC 7421	29082™	29082D-5	BA000045
Gluconacetobacter diazotrophicus PAI 5	49037™	49037D-5	AM889285
Gluconobacter oxydans ATCC 621H™	621H™	621HD-5	CP000009
Granulobacter bethesdensis CGDNIH1	BAA-1260™	BAA-1260D-5	CP000394
Haemophilus ducreyi 35000HP	700724™	700724D-5	AE017143
Haemophilus influenzae KW20 Rd	51907™	51907D	L42023
Haloarcula marismortui ATCC 43049™	43049™	43049D-5	AY596297
Halobacterium salinarum NRC-1	700922™	700922D	AE004437
Halorubrum lacusprofundi ACAM34	49239™		CP001365
Helicobacter pylori 26695	700392™	700392D-5	AE000511
Helicobacter pylori J99	700824™	700824D-5	AE001439
Heliobacterium modesticaldum Ice1	51547™	51547D-5	CP000930
Herpetosiphan aurantiacus 114-95	23779™		CP000875
Hyphomonas neptunium 14-15	15444™	15444D-5	CP000158
Idiomarina loihiensis L2-TR	BAA-735™	BAA-735D-5	AE017340
Kineococcus radiotolerans SRS30216	BAA-149™	BAA-149D-5	CP000750
Klebsiella pneumoniae subsp. *pneumoniae* MGH 78578	700721™	700721D-5	CP000647
Kocuria rhizophila DC2201	9341™	9341D-5	AP009152
Lactobacillus brevis 118-8	367™	367D-5	CP000416
Lactobacillus casei ATCC 334™	334™	334D-5	CP000423
Lactobacillus delbrueckii subsp. *bulgaricus* Lb14	11842™	11842D-5	CR954253
Lactobacillus delbrueckii subsp. *bulgaricus* Lb-18	BAA-365™	BAA-365D	CP000412
Lactobacillus gasseri 63 AM	33323™	33323D-5	CP000413
Lactobacillus plantarum WCFS1	BAA-793™	BAA-793D	AL935263
Lactobacillus reuteri F275	23272™	23272D-5	CP000705
Legionella pneumophila subsp. *pneumophila* Philadelphia 1	33152™	33152D-5	AE017354
Leptospira interrogans serovar Copenhageni, Fiocruz L1-130	BAA-1198™	BAA-1198D-5	AE016823
Leuconostoc mesenteroides subsp. *mesenteroides* 37Y	8293™	8293D-5	CP000414
Listeria innocua CLIP 11262	BAA-680™	BAA-680D	AL592022
Listeria monocytogenes EGDe	BAA-679™	BAA-679D-5	AL591824
Listeria welshimeri serovar 6b, SLCC5334	35897™	35897D-5	AM263198
Magnetospirillum magneticum AMB-1	700264™	700264D-5	AP007255
Marinobacter aquaeolei VT8	700491™	700491D-5	CP000514
Mesoplasma florum L1	33453™	33453D-5	AE017263
Metallosphaera sedula TH2	51363™	51363D-5	CP000682
Methanobrevibacter smithii P5	35061™	35061D-5	CP000678
Methanocaldococcus jannaschii JAL-1	43067™	43067D-5	L77117
Methanococcus aeolicus Nankai-3	BAA-1280™	BAA-1280D-5	CP000743
Methanococcus maripaludis C5	BAA-1333™	BAA-1333D-5	CP000609
Methanococcus maripaludis C6	BAA-1332™	BAA-1332D-5	CP000867
Methanococcus maripaludis C7	BAA-1331™	BAA-1331D-5	CP000745
Methanococcus vannielii SB	35089™	35089D-5	CP000742
Methanocorpusculum labreanum Z	43576™	43576D-5	CP000559
Methanoculleus marisnigri JR1	35101™	35101D-5	CP000562
Methanosarcina acetivorans C2A	35395™	35395D-5	AE010299
Methanosarcina mazei Go1	BAA-159™	BAA-159D-5	AE008384
Methanospirillum hungatei JF-1	27890™	27890D-5	CP000254
Methanothermobacter thermautotrophicus delta H	29096™	29096D-5	AE000666
Methylibium petroleiphilum PM1	BAA-1232™	BAA-1232D-5	CP000555
Methylobacillus flagellatus KT	51484™	51484D	CP000284
Methylobacterium radiotolerans O-1	27329™	27329D-5	CP001001
Methylococcus capsulatus Bath	33009™	33009D-5	AE017282
Moorella thermoacetica ATCC 39073™	39073™	39073D-5	CP000232
Mycobacterium abscessus L948	19977™		CU458896
Mycobacterium avium subsp. *paratuberculosis* K-10	BAA-968™	BAA-968D-5	AE016958

Fully Sequenced Microbes

Bacteria and Archea

Name and strain	Culture ATCC® No.	Genomic DNA ATCC® No.	GenBank® No.
Mycobacterium bovis AF2122/97	BAA-935™		BX248333
Mycobacterium marinum M	BAA-535™	BAA-535D-5	CP000854
Mycobacterium smegmatis MC2 155	700084™	700084D-5	CP000480
Mycobacterium tuberculosis H37Ra	25177™	25177D-5	CP000611
Mycobacterium tuberculosis H37Rv	25618™		AL123456
Mycoplasma genitalium G-37	33530™	33530D	L43967
Mycoplasma hyopneumoniae J	25934™	25934D	AE017243
Mycoplasma mobile 163K	43663™	43663D	AE017308
Mycoplasma pneumoniae M129	29342™	29342D	U00089
Natronomonas pharaonis Gabara	35678™	35678D-5	CR936257
Nautilia profundicola AmH	BAA-1463™		CP001279
Neisseria gonorrhoeae FA 1090	700825™	700825D-5	AE004969
Neisseria meningitidis FAM18	700532™	700532D-5	AM421808
Neisseria meningitidis MC58	BAA-335™	BAA-335D-5	AE002098
Nitrobacter winogradskyi Nb-255	25391™		CP000115
Nitrosococcus oceani C-107	19707™	19707D-5	CP000127
Nitrosomonas europaea ATCC 19718™	19718™	19718D	AL954747
Nitrosospira multiformis C 71	25196™	25196D-5	CP000103
Nocardioides sp. JS614	BAA-499™	BAA-499D-5	CP000509
Nostoc punctiforme PCC 73102	29133™	29133D	CP001037
Nostoc sp. PCC 7120	27893™	27893D-5	BA000019
Novosphingobium aromaticivorans SMCC F199	700278™	700278D-5	CP000248
Ochrobactrum anthropi CL350/82	49188™	49188D-5	CP000758
Oenococcus oeni PSU-1	BAA-331™	BAA-331D-5	CP000411
Oligotropha carboxidovorans OM5	49405™		CP001196
Parabacteroides distasonis ATCC 8503™	8503™	8503D-5	CP000140
Pectobacterium atrosepticum SCRI 1043	BAA-672™	BAA-672D	BX950851
Pediococcus pentosaceus 183-1w	25745™	25745D-5	CP000422
Photobacterium profundum SS9	BAA-1253™	BAA-1253D-5	CR354531
Polaromonas naphthalenivorans CJ2	BAA-779™		CP000529
Polaromonas sp. JS666	BAA-500™	BAA-500D-5	CP000316
Porphyromonas gingivalis 2561	33277™	33277D-5	AP009380
Porphyromonas gingivalis W83	BAA-308™	BAA-308D-5	AE015924
Pseudoalteromonas atlantica T6c	BAA-1087™	BAA-1087D-5	CP000388
Pseudomonas fluorescens Pf-5	BAA-477™	BAA-477D-5	CP000076
Pseudomonas putida F1	700007™	700007D-5	CP000712
Pseudomonas putida KT2440	47054™	47054D-5	AE015451
Pseudomonas syringae pathovar *Phaseolicola*, 1448A	BAA-978™	BAA-978D	CP000058
Pseudomonas syringae pathovar *Tomato*, DC3000	BAA-871™	BAA-871D-5	AE016853
Psychrobacter cryohalolentis K5	BAA-1226™	BAA-1226D-5	CP000323
Pyrococcus furiosus Vc1	43587™	43587D-5	AE009950
Pyrococcus horikoshii OT3	700860™	700860D-5	BA000001
Ralstonia solanacearum GMI1000	BAA-1114™	BAA-1114D-5	AL646052
Renibacterium salmoninarum Lea-1-74	33209™	33209D-5	CP000910
Rhizobium etli CFN 42	51251™	51251D-5	CP000133
Rhizobium radiobacter C58	33970™	33970D	AE008688
Rhizobium radiobacter K84	49644™		CP000628
Rhizobium vitis S4	BAA-846™	BAA-846D	CP000633
Rhodobacter sphaeroides 2.4.1	BAA-808™	BAA-808D	CP000143
Rhodobacter sphaeroides ATH 2.4.9	17029™	17029D-5	CP000577
Rhodoferax ferrireducens T118	BAA-621™	BAA-621D-5	CP000267
Rhodopseudomonas palustris BisA53	BAA-1125™	BAA-1125D-5	CP000463
Rhodopseudomonas palustris BisB18	BAA-1124™	BAA-1124D-5	CP000301
Rhodopseudomonas palustris BisB5	BAA-1123™	BAA-1123D-5	CP000283
Rhodopseudomonas palustris CGA009	BAA-98™	BAA-98D-5	BX571963
Rhodopseudomonas palustris HaA2	BAA-1122™	BAA-1122D-5	CP000250
Rhodospirillum centenum SW	51521™		CP000613
Rhodospirillum rubrum ATCC 11170™	11170™	11170D-5	CP000230
Roseobacter denitrificans OCh 114	33942™	33942D-5	CP000362
Saccharophagus degradans 2-40	43961™	43961D-5	CP000282
Saccharopolyspora erythraea M5-12259	11635™	11635D-5	AM420293
Salinibacter ruber M31	BAA-605™	BAA-605D	CP000159
Salinispora tropica CNB-440	BAA-916™	BAA-916D-5	CP000667
Salmonella enterica subsp. *arizonae* RSK2980	BAA-731™	BAA-731D-5	CP000880
Salmonella enterica subsp. *enterica serovar Paratyphi A*, ATCC 9150™	9150™	9150D-5	CP000026
Salmonella enterica subsp. *enterica serovar Paratyphi B*, SPB7	BAA-1250™	BAA-1250D-5	CP000886
Salmonella enterica subsp. *enterica serovar Typhimurium*, LT2	700720™	700720D-5	AE006468
Shewanella amazonensis SB2B	700329™	700329D-5	CP000507
Shewanella baltica OS155	BAA-1091™	BAA-1091D-5	CP000563
Shewanella denitrificans OS217	BAA-1090™	BAA-1090D-5	CP000302

Fully Sequenced Microbes

Bacteria and Archea

Name and strain	Culture ATCC® No.	Genomic DNA ATCC® No.	GenBank® No.
Shewanella frigidimarina NCIMB 400	BAA-1089™	BAA-1089D-5	CP000447
Shewanella oneidensis MR-1	700550™	700550D	AE014299
Shewanella pealeana ANG-SQ1	700345™	700345D-5	CP000851
Shewanella putrefaciens CN-32	BAA-453™	BAA-453D-5	CP000681
Shewanella woodyi MS32	51908™	51908D-5	CP000961
Shigella flexneri 2457T	700930™	700930D-5	AE014073
Silicibacter pomeroyi DSS-3	700808™	700808D	CP000031
Staphylococcus aureus MW2 USA 400	BAA-1707™		BA000033
Staphylococcus aureus subsp. *aureus* Mu3	700698™	700698D-5	AP009324
Staphylococcus aureus subsp. *aureus* Mu50	700699™	700699D-5	BA000017
Staphylococcus aureus subsp. *aureus* USA 300, FPR3757	BAA-1556™	BAA-1556D-5	CP000255
Staphylococcus epidermidis FDA strain PCI 1200	12228™	12228D-5	AE015929
Staphylococcus epidermidis RP62A	35984™	35984D-5	CP000029
Staphylococcus saprophyticus S-41	15305™	15305D-5	AP008934
Staphylothermus marinus F1	43588™	43588D-5	CP000575
Streptococcus agalactiae 2603V/R	BAA-611™	BAA-611D-5	AE009948
Streptococcus agalactiae A909	BAA-1138™	BAA-1138D-5	CP000114
Streptococcus gordonii Challis, CH1	35105™	35105D-5	CP000725
Streptococcus mutans UA159	700610™	700610D-5	AE014133
Streptococcus pneumoniae Mu50	700669™	700669D-5	FM211187
Streptococcus pneumoniae R6	BAA-255™	BAA-255D-5	AE007317
Streptococcus pneumoniae TIGR4	BAA-334™	BAA-334D-5	AE005672
Streptococcus pyogenes M1 GAS, SF370	700294™	700294D-5	AE004092
Streptococcus pyogenes MGAS 8232	BAA-572™	BAA-572D-5	AE009949
Streptococcus pyogenes MGAS 315	BAA-595™	BAA-595D-5	AE014074
Streptococcus pyogenes MGAS 10394	BAA-946™	BAA-946D-5	CP000003
Streptococcus pyogenes MGAS 5005	BAA-947™	BAA-947D-5	CP000017
Streptococcus pyogenes MGAS 10270	BAA-1063™	BAA-1063D-5	CP000260
Streptococcus pyogenes MGAS 6180	BAA-1064™	BAA-1064D-5	CP000056
Streptococcus pyogenes MGAS 2096	BAA-1065™	BAA-1065D-5	CP000261
Streptococcus pyogenes MGAS 10750	BAA-1066™	BAA-1066D-5	CP000262
Streptococcus pyogenes MGAS 9429	BAA-1315™	BAA-1315D-5	CP000259
Streptococcus sanguinis SK36	BAA-1455™	BAA-1455D-5	CP000387
Streptococcus thermophilus LMD-9	BAA-491™	BAA-491D-5	CP000419
Streptococcus thermophilus LMG 18311	BAA-250™	BAA-250D-5	CP000023
Streptococcus uberis O14OJ	BAA-854™	BAA-854D-5	AM946015
Streptomyces avermitilis MA-4680	31267™	31267D-5	BA000030
Streptomyces violaceoruber M145	BAA-471™	BAA-471D-5	AL645882
Sulfolobus acidocaldarius 98-3	33909™	33909D-5	CP000077
Sulfolobus solfataricus P2	35092™	35092D-5	AE006641
Sulfurimonas denitrificans ATCC 33889™	33889™	33889D-5	CP000153
Synechococcus elongatus PCC 7942	33912™	33912D-5	CP000100
Synechococcus sp. PR-6	27264™	27264D-5	CP000951
Synechocystis sp. N-1	27184™	27184D-5	BA000022
Thermoanaerobacter pseudethanolicus 39E	33223™	33223D-5	CP000924
Thermoanaerobacter sp. X514	BAA-938™	BAA-938D-5	CP000923
Thermobifida fusca YX	BAA-629™	BAA-629D-5	CP000088
Thermodesulfovibrio yellowstonii YP87	51303™		CP001147
Thermomicrobium roseum P-2	27502™		CP001275
Thermoplasma acidophilum 122-1B2	25905™	25905D-5	AL139299
Thermoplasma volcanium GSS1	51530™	51530D-5	BA000011
Thermotoga lettingae TMO	BAA-301™	BAA-301D-5	CP000812
Thermotoga maritima MSB8	43589™	43589D-5	AE000512
Thermotoga neapolitana NS-E	49049™	49049D	CP000916
Thermotoga petrophila RKU-1	BAA-488™	BAA-488D-5	CP000702
Thermus thermophilus HB27	BAA-163™	BAA-163D-5	AE017221
Thermus thermophilus HB8	27634™	27634D-5	AP008226
Thiobacillus denitrificans T1	25259™	25259D-5	CP000116
Treponema denticola a	35405™	35405D-5	AE017226
Ureaplasma parvum ATCC 700970™	700970™		AF222894
Ureaplasma parvum serotype III, 27	27815™	27815D	CP000942
Ureaplasma urealyticum Western	33699™		CP001184
Verminephrobacter eiseniae EF01-2	BAA-1489™	BAA-1489D-5	CP000542
Vibrio fischeri ES114	700601™	700601D-5	CP000020
Vibrio harveyi BB120	BAA-1116™	BAA-1116D-5	CP000789
Wolinella succinogenes FDC 602W	29543™	29543D-5	BX571656
Xanthobacter autotrophicus Py2	BAA-1158™	BAA-1158D-5	CP000781
Xanthomonas campestris pathovar Campestris, ATCC 33913™	33913™	33913D-5	AE008922
Xylella fastidiosa Temecula	700964™	700964D-5	AE009442
Zymomonas mobilis ZM4	31821™	31821D-5	AE008692

Fully Sequenced Microbes

Eukaryotes

Name and strain - Fungi	Culture ATCC® No.	Genomic DNA ATCC® No.
Ashbya gossypii NRRL Y-1056	10895™	10895D-5
Candida glabrata CBS 138	2001™	2001D-5
Cryptococcus neoformans JEC21	MYA-565™	MYA-565D-5
Debaryomyces hansenii CBS 767	36239™	36239D-5
Kluyveromyces lactis 61	8585™	8585D-5
Kluyveromyces waltii UCD 72-13	56500™	56500D-5
Pichia stipitis CBS 6054	58785™	58785D-2
Saccharomyces cerevisiae S288C	204508™	204508D-5
Saccharomyces mikatae CBS 8839	MYA-4448™	MYA-4448D-5
Schizosaccharomyces pombe 972 h-	24843™	24843D-5
Schizosaccharomyces pombe 972H-	26189™	26189D-5
Vanderwaltozyma polyspora CBS 2163	22028™	22028D-5
Name and strain - Protozoa	**Culture ATCC® No.**	**Genomic DNA ATCC® No.**
Cryptosporidium parvum Iowa		PRA-67D
Entamoeba histolytica HM1:IMSS	30459™	

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Preparation of biological materials

How materials are processed in preparation for freezing can have an affect on the outcome of the preservation process. For non-replicable materials such as tissues, nucleic acids and proteins, the preparation process consists of ensuring that the materials are in the proper solution or freezing medium in order to maximize the intended use of the materials when recovered. However the stability and recoverability of living cells and organisms is affected by the growth conditions and pre-freezing processing. Several factors must be considered when preparing cells for cryopreservation. These include the type of cell, cell viability, growth conditions, physiological state of the cells, the number of cells, and how the cells are handled.

When preparing the initial seed stock of a new isolate or cell line, the culture should be examined for identity and contaminating microorganisms at a minimum. This examination should be repeated after preservation and each time a new lot of the culture is prepared.

Microorganisms

Microbial cells, particularly bacteria and yeast, grown under aerated conditions demonstrate a greater resistance to the detrimental effects of cooling and freezing than non-aerated cells.[1] T. Nei et.al.[2] have demonstrated that cell permeability is greater in aerated cultures, and that the aerated cells dehydrate faster during cooling than non-aerated cells. Microbial cells harvested from late log or early stationary cultures also demonstrate greater resistance to the freezing process than younger or older cells.[1]

Generally, the greater the number of cells present initially, the greater the recovery. For most bacteria and yeast, approximately 10^7/ml cells are required to ensure adequate recovery.[3] These can be conveniently harvested from agar slants or plates, or when greater quantities are required, grown in broth culture and harvested by centrifugation. In either case, cells are generally suspended in fresh growth medium containing the cryoprotective agent. Protists can also be concentrated by centrifugation, but are often suspended in the used medium and then diluted by adding an equal volume of fresh growth medium containing the cryoprotective agent.[3] Spore forming fungi require harvesting of spores and suspension of the spores in fresh growth medium containing the cryoprotective agent. When freezing fungal spores, care must be taken not to delay the freezing process too long to ensure that germination does not occur prior to freezing. For fungi that do not form spores, special procedures for harvesting mycelia prior to freezing must be utilised. For fungi with tough mycelia, the culture is harvested from agar growth by cutting and removing agar plugs containing the mycelia and placing the plugs into fresh growth medium containing the cryoprotective agent. Tough mycelia that do not adhere well to agar cultures are grown in broth culture and the mycelial mass is blended prior to freezing.[3]

The viability and an estimate of recovery should be determined both before and after freezing the culture. Viability is a measure of the culture's ability to grow and reproduce. For some material, such as protozoan cultures, this should include several passages to ensure stability. An estimate of the number of cells recovered can be made by several means including serial dilution, plate counts, or direct cell counting. A comparison of the counts prior to and after freezing gives an indication of the degree of recovery or the success of the preservation procedure.

Genetically modified materials

Genetically modified cells and organisms can be cryopreserved in a manner similar to the unmodified host cell.[4,5]

Inventory control

Appropriate record keeping is important in any laboratory and there are a number of methods available for keeping records on cryopreserved materials.[6] When establishing your own method, keep in mind that there is key information which will be important for future use: (a) the preservation methodology used; (b) the location and identification of the stored material; (c) preservation date; and (d) number of passages for replicable material. The item number should be linked to associated data for that material, and for some purposes each container may require a unique identifying code linked to specific information for that particular aliquot.

Identification begins with proper labeling of the storage container. The label information should include a name or identification code for the frozen material, as well as a lot number. The information on the label should be kept with the inventory records that include the location code for each vial. These records can be maintained as paper documents, or preferably as electronic files. Duplicate inventory records should be maintained in a location separate from working records. Locator codes should be specific enough to allow rapid and easy retrieval for a specific lot and should include freezer unit number, a code for a freezer section or inventory rack, a box or canister number, and possibly even a grid spot within the box or a cane number when canes are used. Detailed locator codes minimise hunting for material which risks warming the freezer unit, exposure of other materials to warmer temperatures, and prolonged exposure of laboratory personnel to extremely cold temperatures.

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Come directly to the source

Useful terms for ATCC Microbiology

Organisations and agencies such as AOAC, ASTM, FDA, CLSI (formerly NCCLS) and USP specify ATCC cultures in their standards and specifications, then describe the propagation and growth conditions to be used. As the collection responsible for these cultures, ATCC uses the following working definitions derived from the Bacteriological Code,[1] Brown and Gilbert's Microbiological Quality Assurance[2] and NCCLS (now CLSI) M22-A2.[3]

Authentication – the process of comparing the characteristics of a strain to the description of the species to determine or verify the strain's identity.

Characterisation – the process of subjecting a strain to a battery of morphological, physiological, molecular and/or other tests. The data derived can be used to describe the strain and objectively compare it to other strains.

Culture – a population of cells in a given place at a given time, e.g., in a test tube or on an agar plate.

Distribution stock – cultures derived from seed stock and intended for distribution. At least one vial of each batch of distribution stock is checked for purity and viability, then characterised and compared with the data for the seed stock.

Master culture – a culture derived directly from the reference culture (i.e., the vial obtained from ATCC or another recognised culture collection). The master culture can be stored as freeze-dried ampoules, low temperature suspensions, low temperature suspension on beads, or through suitably validated alternatives. The master culture serves as the in-house reference standard. The master culture is used to prepare stock cultures.

Passage – transfer of an inoculum of cells from an existing culture to fresh growth medium in another vessel. Each transfer (i.e., subculture) is counted as an additional passage. Some organisations have recommended, and ATCC concurs, that strains being used in standard test methods should not be used beyond five passages from the original ATCC vial. ATCC defines the first passage as the first broth or agar culture started from the culture vial supplied by ATCC. Actively growing cultures are subject to genetic drift, accidental loss, contamination at time of subculture, human error in transfer and labelling, and selection of mutant lines.

Pure culture – a culture of only one organism (i.e., not contaminated, not a mixed culture).

Quality control strain – a strain previously determined to meet the performance criteria of a particular test. Seed stocks are maintained at low passage numbers. Each passage is re-authenticated and characterised.

Seed stock – cultures stored under optimal conditions and used to prepare distribution stock. Ideally, seed stock is from very low-passage material. At ATCC, every effort is made to minimise the number of transfers. Contamination and genetic drift are minimised. One vial of seed stock is used to test for viability and purity, as well as to authenticate and characterise the strain.

Stock culture – a culture derived from a master culture or a reference culture and used as a reagent on a regular basis. Official standards and specifications mandate propagation procedures, growth conditions and limits on passage numbers for stock cultures used in individual tests.

Strain – cells descended from a single isolation in pure culture, usually from a single colony, though not necessarily from a single cell (i.e., not necessarily a clone).

Subculture – (see Passage)

Test organism – an organism used in a particular assay or other test.

References

1. International Code of Nomenclature of Bacteria. Washington DC: American Society for Microbiology, 1992.

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Reprinted from ATCC® Technical Bulletin no. 1.

Preservation and recovery of filamentous fungi

Preservation methods for filamentous fungi vary depending on the type and degree of sporulation. Spore forming strains (with the exception of zoosporic fungi) can usually be freeze dried successfully. Similar success with nonsporulating strains is far less likely. Both types can be frozen and stored for long periods in liquid nitrogen or liquid nitrogen vapour. All plasmid containing or mutant strains should be frozen directly from the original material if possible to prevent any alteration or loss of desired characteristics. The following overview discusses preservation methods used at ATCC and is presented for descriptive purposes only; it is not intended as a laboratory protocol. Anyone planning to preserve cultures by these methods is strongly advised to study detailed, published protocols before proceeding.

Freeze drying sporeformers; preparing the cultures

1. Grow fungi under conditions that will induce maximum sporulation so that sufficient spores will survive the freezing and drying process. Optimum media and growth conditions are listed in the strain descriptions in ATCC's online catalogue at **www.lgcstandards-atcc.org**. Literature cited there may also give further guidance on appropriate cultivation procedures.

2. Prepare a 20% solution of skim milk and autoclave at 116°C for 20 minutes in 10 ml tubes. One tube is usually more than enough for 10 freeze dried vials unless the culture is very mycelial. Store the milk at 2-8°C until needed so that it will be cold when used.

3. Prepare the spore suspension by slowly introducing about 2 ml of milk into the culture tube or plate while gently scraping the surface of the culture with a pipette. Take care to avoid raising a cloud of spores, especially with Aspergillus, Penicillium, and other fungi that produce large amounts of dry spores. For example, Neurospora spores are very difficult to contain; cultures for freeze drying are usually grown on agar in 250 ml Erlenmeyer flasks.

4. Transfer the suspension back into the tube containing the remainder of the skim milk and mix thoroughly. If more than one plate or tube is used, repeat the procedure for each and pool the suspensions into one tube. A concentration of at least 106 spores per ml of milk is needed.

5. Dispense 0.2 ml of the suspension into each vial for freeze drying. Many spores will begin to germinate when suspended in liquid, so timing is critical when filling vials. Spores should not be in the skim milk for more than two hours before being processed. Refrigerate filled vials while waiting for further processing.

Freeze drying methods

Although the process is somewhat labour intensive, freeze drying spore forming fungi greatly facilitates their distribution and storage. The following four methods are described in detail in Simione and Brown (1991).

1. Component freeze dryer. Samples are freeze dried in cotton plugged glass inner vials which are then sealed inside glass outer ampoules under vacuum. The components of the system (vacuum pump and condenser) are assembled on a bench top.

2. Commercial freeze dryer. Samples are prepared in glass vials in ampoules (as in no.1 above), and then freeze dried in a commercial freeze dryer.

3. Serum vial. Samples are processed in glass serum vials sealed with rubbers stoppers and metal caps. A commercial freeze dryer is used.

4. Manifold. Samples are processed in bulb shaped or tubular glass ampoules attached with latex tubing to a manifold. (This method is not used at ATCC, but is relatively inexpensive and uses equipment that a lab may already own.)

Recovery

1. If the culture to be recovered was obtained directly from ATCC, check it thoroughly upon receipt. If it is found to be unsatisfactory in any respect, notify ATCC so that the strain in question can be investigated.

2. Open the ampoule as directed and, using sterile distilled water and a sterile pipette, transfer the contents of the preparation to approximately 5 ml of sterile distilled water in a test tube.

3. Allow the contents to rehydrate for at least one hour (two hours is better, and overnight is not too long) before transfer of a few drops to broth or agar. Use the media and growth conditions specified in the strain descriptions when first subculturing to ensure optimal recovery.

4. Incubate at the appropriate temperature. The remainder of the suspension may be stored for a few days if refrigerated, allowing for another recovery attempt if the first should fail. Given proper treatment and conditions, most cultures will grow in a few days. However, some may exhibit a prolonged lag period and should be given twice the normal incubation time before being discarded as nonviable.

5. For special media, growth conditions, and tips on maintenance, carefully read the literature cited in the strain descriptions. This is especially important for producers of secondary metabolites and quality control strains.

Freezing filamentous fungi; preparing the culture

Grow sporulating strains on solid media as for freeze-drying; grow nonsporulating strains on either solid or liquid medium. If the mycelium is easily broken, grow the culture on agar in test tubes, scrape with a pipette, and suspend the fragments in sterile 10% glycerol. Dispense 0.5 ml into each plastic vial. If the mycelium is sticky, will not break up, or grows embedded in the agar, grow the culture on agar in plates, cut out plugs containing new growth (hyphal tips) with a sterile cork borer, and place three or four plugs into each plastic freezing vial with approximately 0.4 ml of 10% glycerol. If the mycelium does not break up or does not adhere to the agar well enough to cut with a cork borer, grow the culture in liquid medium in flasks and use a blender to prepare the culture for freezing.

1. Before blending a culture, sterilise the blender jar and lid by wrapping them separately in foil and autoclaving at 121°C for 15 minutes. Unwrap the jar and check the bolt to ensure that it is tight.

2. Pour the contents of the flask (growing culture and liquid medium) down the side of the blender jar, being careful to minimise splatter. Replace the lid and set the blender jar firmly on its base.

3. Blend on medium or high for 2 or 3 seconds. Observe the appearance of the contents directly or draw up some of the suspension into a wide mouthed pipette to ensure that small segments of mycelia are homogeneously suspended throughout the medium. If the culture is especially tough and does not blend well, blend for 2 or 3 seconds longer.

4. Pour the contents back into the flask, again being careful to minimise splatter. Incubate slow growing strains for several days before freezing to allow for healing. Fast-growing strains can be frozen one day after blending.

5. Add a portion of this suspension to an equal amount of sterile 20% glycerol, for a final concentration of 10% glycerol. Mix well and dispense approximately 0.5 ml into each freezing vial.

Warning: Pathogens should be handled under a hood and should not be blended. Histoplasma, Paracoccidioides, and Blastomyces should be frozen in the yeast phase and Coccidioides in the young mycelial stage to avoid contamination from airborne spores and to minimise exposure of laboratory personnel.

Freezing methods

To ensure long-term viability of fungal cultures, ATCC recommends freezing and storage at liquid nitrogen temperatures. Storage in the liquid itself is not always convenient or safe. Storage in liquid nitrogen vapour is a more practical alternative. It is critical, however, to constantly monitor the liquid level of the liquid nitrogen freezer to ensure that material is maintained below –130°C. Storage at warmer temperatures can compromise the stability of many strains.

1. Select a container appropriate for the material to be preserved. Plastic screw-capped vials with internal tube threads (1.0 to 2.0 ml) are appropriate for most fungi. They are sterilised by the manufacturer and, when properly handled, remain sterile throughout labelling and dispensing.

2. Label each vial clearly and accurately. Whatever labelling method is chosen, labels must be able to withstand subsequent freezing and thawing procedures.

3. Prepare the cultures for freezing as described above. Seal the plastic vials as tightly as possible with the screw cap.

4. Load the vials onto aluminium canes and record the location of each culture.

5. Cool the chamber of a controlled-rate cooling apparatus to 4°C and place the canes into the unit. Insert the thermocouple probe into one sample containing only sterile medium. Prior to starting the cooling program, allow the material to cool to within 2°C of the chamber temperature.

6. Cool the material at a rate of 1°C per minute to –40°C, then cool 10°C per minute to –90°C.

7. When the program is complete, transfer the canes to boxes in the vapour phase of a liquid nitrogen unit for storage. If the unit is more than a few feet from the programmable freezer, transport the canes in an insulated container with liquid nitrogen. Be careful not to store the vials directly in liquid nitrogen. See notes under "Safety" below. Liquid nitrogen has a temperature of –196°C. The vapour will have a temperature gradient which is near –196°C at the level of the liquid and which gradually becomes warmer near the top of the freezer. For best long-term storage, keep frozen materials below –130°C. To ensure that materials are stored at proper temperatures, liquid nitrogen freezers must first be validated by placing a thermometer at the top of the unit and adding liquid nitrogen until a working temperature of at least –130°C is maintained at the top of the freezer. This level is then continuously monitored and an alarm system activated if the levels fluctuate above or below predetermined limits. Occasionally, strains may require special handling. If a strain does not survive freezing in glycerol, try 5% DMSO. Some cultures, such as some Agaricus strains, may be grown on sterile seeds, grains or pollen, and may be frozen without a cryoprotectant.

Recovery

Thaw frozen cultures quickly in a 37°C water bath, transfer immediately to appropriate growth media, and incubate at an appropriate temperature. Given proper treatment and conditions, most cultures will grow in a few days. However, some may exhibit a prolonged lag period and should be given twice the normal incubation time before being discarded as non-viable. For special media, growth conditions, and tips on maintenance, carefully read the literature cited in the strain descriptions. This is especially important for transformation hosts, genetic mutants, producers of secondary metabolites, and quality control strains.

Safety

Safety precautions must be considered when preserving living cells and microorganisms by freeze drying, freezing, and storing at cryogenic temperatures.

Cryogenic storage

Because of its extremely cold temperature, liquid nitrogen can be hazardous if improperly

used. When handling liquid nitrogen, take precautions to protect your face and exposed skin from exposure to the liquid. Wear protective clothing, including a laboratory coat, gloves designed for handling material at cryogenic temperatures, and a face shield. To reduce your exposure to cryogenic temperatures, design inventory systems for storing frozen specimens that allow for easy retrieval and that minimise the time required to look for specimens. Prolonged exposure to cryogenic temperatures can lead to a loss of sensation in the hands that can only be recovered after warming. This loss of sensation can lead to a false sense of security regarding damage to tissues by the low temperatures. When the temperature in a liquid nitrogen unit becomes tolerable and working in the unit is no longer uncomfortable, the operator has reached a point where damage from the cryogenic temperatures is likely. When liquid nitrogen issued in confined and inadequately ventilated areas, the nitrogen can quickly displace the room air. Liquid nitrogen freezers should be located in well-ventilated areas, and special precautions should be taken during fill operations. In facilities with several liquid nitrogen freezers, an oxygen monitor should be installed to warn occupants of any deterioration in the air quality due to the nitrogen gas. Plastic screw-capped vials can present a hazard if stored directly in liquid nitrogen. Vials with an inadequate seal between the cap and the vial can fill with liquid nitrogen. Upon retrieval to warmer temperatures the vials may explode violently or may spray liquid, potentially disseminating the contents of the vial. Likewise when opening plastic vials after thawing some dissemination of the contents may occur. Material in plastic ampoules is therefore stored in the vapour above the liquid nitrogen.

Freeze drying

When freeze drying microorganisms in vials or ampoules without cotton plugs or other bacteriological filters, the microorganisms can be carried from the container and contaminate the freeze drying system. Microbial contamination can be found on the outside of the vial or ampoule, and on parts of the freeze drying system such as the condenser. A system should be designed to monitor the contamination level, and decontamination procedures should be implemented if necessary. Take care to properly treat freeze dried cultures prior to disposal. To autoclave freeze dried cultures, open the vial or ampoule to allow penetration of the steam. An alternative to autoclaving is to heat the preparations in a hot air oven at 180°C for four hours.

Culture handling

When opening frozen or freeze dried cultures take care to prevent dispersion of the ampoule contents. Open these preparations in a biological safety cabinet if possible, and perform all work with hazardous cultures in a biological safety cabinet. There are varying degrees of pathogenicity among microorganisms. All laboratory personnel should be aware of the hazards posed by the cultures they are handling. Detailed discussions of laboratory safety procedures are provided in the U.S. Dept. of Health and Human Services / CDC publication Biosafety in Microbiological and Biomedical Laboratories, 5th ed. Washington D.C. U.S. Government Printing Office; 2007. This publication is available in its entirety on the CDC Office of Health and Safety website at **www.cdc.gov/od/ohs**.

Cultivation and preservation literature

For any strain listed in ATCC's electronic catalogue, note the recommended media and incubation conditions. The literature cited here is useful for general knowledge on the cultivation and preservation of a wide variety of fungi.

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Reprinted from ATCC® Technical Bulletin no. 2

Authentication of prokaryotes at ATCC

ATCC's goal is to fully characterise every prokaryote that is accepted into the collection. Considering the diversity of organisms housed at ATCC it is a constant challenge to streamline the authentication process so that microbes can be characterised with the greatest efficiency. By utilising several diverse identification strategies at the phenotypic and genotypic levels ATCC has developed protocols that ensure thorough characterisation of every strain.

Quality control (QC) begins when a new strain arrives at ATCC and continues through each step of the manufacturing process (Figure 1). Testing protocols and results become part of the laboratory record of the strain. This technical bulletin provides an overview of prokaryotic characterisation at ATCC.

Basic testing

The first step is to check the growth, purity, and cell and colony morphologies of each culture that arrives at ATCC for deposit. Cultures then undergo biochemical testing if appropriate. For many of the more common bacteria, ATCC has developed a standard set of growth and biochemical methods based on the phenotypic traits of these organisms. These biochemical tests, which include the use of API strips (bioMérieux, Inc.) and other commercial rapid tests, have been developed for different bacterial groups and are summarised in Table 1. ATCC has refined this schema over the years to minimise the number of tests yet still provide robust identification. Even with these refinements there are 23 different characterisation schemes encompassing nearly 350 individual tests that are performed on a routine basis on newly deposited organisms.

The biochemical tests are instrumental for authenticating many important phenotypic properties of ATCC microbes. They are time consuming, however, and the repertoire

of biochemical tests is very limited for some groups, such as extremophiles and fastidious organisms like mycobacteria or actinomycetes. Therefore whenever possible we take a polyphasic approach to authentication that elucidates both phenotypic and genotypic traits.

Automated phenotypic testing

In the last few years instrumentation has been developed that allows standardised testing of phenotypic and genotypic traits across a wide range of organisms. ATCC is constantly evaluating and utilising these methods to balance selectivity, throughput, cost, and effort to ensure the best quality for our authentication procedures.

Phenotypic methods currently used at ATCC include fatty acid methyl ester analysis (FAME), the Biolog system, and matrix-assisted laser desorption ionisation time-of-flight mass spectrometry (MALDI-TOF-MS or MALDI). FAME analysis provides a fatty acid profile using a standardised procedure for deriving the methyl esters of bacterial fatty acids and then analysing the products on a gas chromatograph. The resulting chromatogram provides a quantitative profile of an organism's fatty acids that can be used for identification[1]. ATCC uses a commercial FAME system produced by MIDI (Newark, Delaware). The MIDI system includes databases to which new organisms can be compared to obtain presumptive identification.

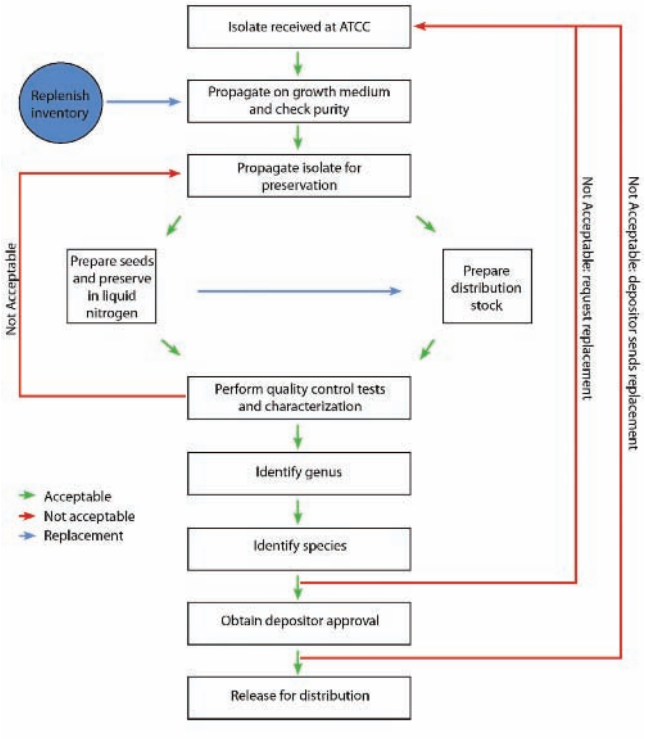

Figure 1. Processing of new accessions at ATCC.

FAME analysis is useful in this respect, since there is a correspondence between phylogenetic groups of organisms and the dominant fatty acids in their cell membranes. FAME analysis has limitations, however it does not work with archaea, which do not have conventional fatty acids in their cells walls. It is also quite sensitive to both the growth medium and incubation time and temperature, since bacteria modulate the fatty acid contents of their membranes in response to environmental factors.

The Biolog system (Biolog, Inc., Hayward, California) tests the metabolic phenotype of an organism using a 96-well plate format. Each well contains a different carbon source. The test organism is inoculated into the plate and incubated, usually for 24 hours. The pattern of wells that are positive or negative for substrate utilisation is then analysed on a plate reader and matched to a database which provides a presumptive identification for the organism. This identification has no phylogenetic context;

however, it does provide useful information about the substrates an organism has the potential to metabolise. There are a variety of plates available for Gram-negative and Gram-positive organisms as well as some other types.

MALDI-TOF-MS is a technique that was first introduced a decade ago, and only in the last few years has it began being used as a tool for bacterial typing[2,3]. MALDI uses a laser to irradiate intact cells, which are placed in a special matrix that ionises cell surface components, principally proteins. The masses of these ionised molecules are registered and a spectral profile or fingerprint is produced for an organism.

The potential advantages that MALDI offers over other techniques include minimal sample preparation, rapid results, and very low reagent costs. Perhaps most important is that this technique is dependent on a trait common to all prokaryotes: a complex macromolecular cell wall. Therefore it is a single authentication technique that covers the entire prokaryotic world.

ATCC evaluated a MALDI system produced by Micromass (Manchester, UK) that is specifically designed for bacterial identification including development of databases. We have evaluated over 50 prokaryotic genera and have found that MALDI produced consistent patterns for all of them. An example of organisms that have been analysed is shown in Figure 2.

Genotypic characterisation

A major thrust of microbial identification research has been the development of molecular methods for genotyping microorganisms. Genotypic methods can be highly specific and sensitive and are largely independent of the physiological or growth state of the organism.

For several years, ATCC has been using ribotyping as part of its QC process for bacteria. Ribotyping is done using the RiboPrinter microbial characterisation system (Qualicon, Wilmington, Delaware). The Riboprinter is a molecular workstation that performs a restriction digest (using EcoRI or other restriction enzymes) of the chromosomal DNA, separates the restriction fragments by gel electrophoresis, and simultaneously blots the DNA fragments to a membrane which is used for Southern blot analysis[4]. Restriction digest fragments are hybridised to a bacterial probe that is based on the conserved regions of the genes for the ribosomal DNA operon. The result is a DNA fingerprint which is strain specific. Each fingerprint is stored in a database so it can be accessed for future comparisons and identifications[5,6].

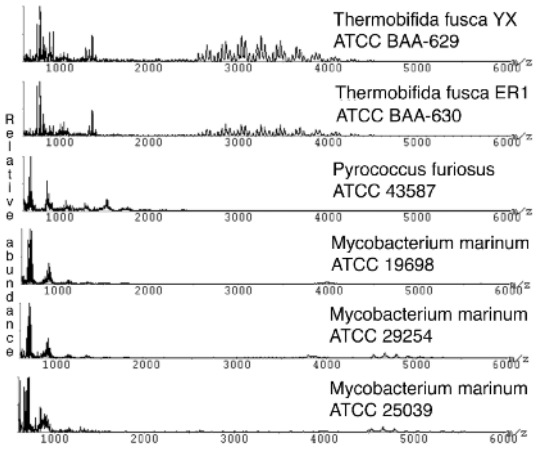

Figure 2. A sample of MALDI-TOF profiles. The two strains of *T. fusca*, a thermophilic actinomycete, show similar but distinct profiles. *P. furiosus* is a thermophilic archaeon that can grow at temperatures of 100°C. The three Mycobacterium strains are typically difficult to differentiate; their mass spectral profiles are similar but unique.

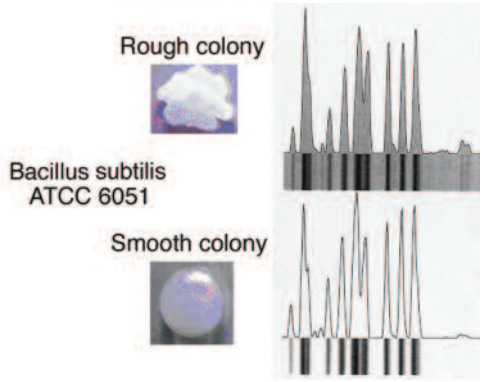

Figure 3. Riboprints of two colony variants of *Bacillus subtilis* ATCC® 6051™.

ATCC now ribotypes over 250 genera on the RiboPrinter and found that over 80% yield reproducible riboprints. As a result ATCC now ribotypes the original isolate that is received, the frozen seed stock, and each batch of distribution stock as part of our standard QC process for many bacteria. In addition the RiboPrinter can be useful for resolving phenotypic abnormalities among strains and ruling out contamination. For example, in the case of the *Bacillus subtilis* shown in Figure 3, ribotyping can show that two colony types from the same strain are genotypically identical.

The RiboPrinter system allows the flexibility in using other restriction enzymes beside the standard EcoRI. Some genera yield better patterns with PvuII or PstI. Other restriction enzymes can also be substituted in the process. Other advantages include the ease of operation and data analysis. The system requires only a single colony as inoculum and there are no restrictions on media and growth conditions.

Rep-PCR analysis

Ribotyping does not work for all organisms, including archaea and other challenging environmental microbes and some fastidious bacteria like Mycobacteria. In some cases ATCC uses sequencing of the 16S rRNA gene to confirm an organism's identity. ATCC uses rep-PCR as another genotyping tool. This technique takes advantage of specific repetitive DNA sequences that are randomly interspersed around the chromosome. By using PCR primers specific for these elements, it is possible to amplify the intervening sequences and separate them by gel electrophoresis, thus creating a genotypic fingerprint that is strain specific[7]. What is remarkable about this technique is that primer sets are available that allow the genotyping of archaea and other difficult organisms (Figure 4). Furthermore, rep-PCR appears to work well for fungi and protists, giving it the potential to be a universal typing technique.

ATCC incorporates the bioMérieux Diversilab system that uses lab-on-a-chip technology to enhance the speed, precision and reproducibility of the entire process.

Authentication of all our microorganisms is a task ATCC takes seriously. ATCC will continue to use a polyphasic approach that balances traditional phenotypic methods with the newest technologies to ensure the delivery of high quality microbial strains.

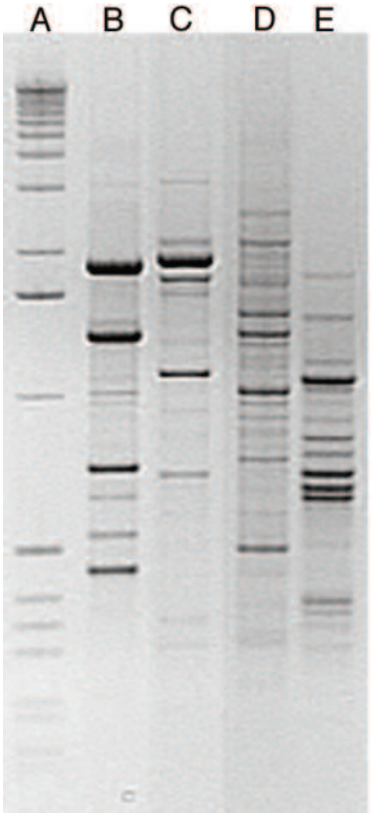

Figure 4. Fingerprinting of different archaea using rep-PCR. Lane A: MW standards; B: *Methanococcus maripaludis* ATCC® 43000™; C: *Methanocaldococcus jannaschii* ATCC® 43067™; D: *Haloferax volcanii* ATCC® 29605™; E: *Thermococcus gorgonarius* ATCC® 700654™

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Table 1. Schema of biochemical characterisation tests performed at ATCC.

Phenotype	Number of tests	Types of tests
Actinobacilli not requiring X or V	37	Acid production from 17 sugars; enzymatic tests; misc. biochemical tests
Agromyces	35	Utilisation of 13 substrates; temperature range; enzymatic tests; misc. biochemical tests
Anaerobic cocci	38	Utilisation of 10 substrates; enzymatic tests; misc. biochemical tests
Bacteroides	45	Utilisation of 16 substrates; enzymatic tests; misc. biochemical tests
Bifidobacterium	48	Acid production from 19 substrates; misc. biochemical tests; enzymatic tests
Campylobacter/Helicobacter	27	Temperature range; sensitivity to 3 antibiotics; misc. biochemical tests
Clostridium	40	Utilisation of 12 substrates; endospore formation and location; enzymatic tests; misc. biochemical tests
Corynebacterium	34	Acid production; enzymatic tests; misc. biochemical tests
Erysipelothrix	44	Misc. biochemical and hydrolytic tests; acid production from 21 substrates; hemolytic activity
Eubacterium	43	Utilisation of 15 substrates; enzymatic tests; misc. biochemical tests
Gram-negative aerobic bacteria	120	Temperature range; NaCl tolerance; O2 tolerance; NO3 utilisation; acid production from 16 substrates; 54 sole carbon source tests
Gram-negative facultative bacteria	79	NO3 utilisation; acid production from 16-26 substrates; gas production; misc. biochemical and hydrolytic tests
Gram-positive aerobic cocci	48	NaCl tolerance; temperature range; sugar utilisation; misc. hydrolytic and biochemical tests
Gram-positive aerobic sporeformers	66	Substrates utilisation; NaCl tolerance; pH, and temperature ranges; O2 tolerance and NO3 utilisation; misc. biochemical and hydrolytic tests
Gram-negative fastidious bacteria	61	Growth on 7 complex substrates; acid production from 8 substrates; NaCl tolerance; misc. biochemical and hydrolytic tests
Lactic-acid bacteria	60	Acid production from 24 substrates; temperature, NaCl and pH optima; misc. biochemical and hydrolytic tests
Mycobacteria	25	Temperature range and growth rate; pigment production; misc. biochemical tests; misc. biochemical tests
Neisseria	30	Pigmentation; penicillin sensitivity; misc. biochemical tests
Organisms requiring X and/or V factors	30	Utilisation of 10 sugars; enzymatic tests; misc. biochemical tests
Pasteurellaceae not requiring X or V	56	Acid production from 28 sugars; enzymatic tests; misc. biochemical tests
Propionibacterium	38	Acid production; enzymatic tests; misc. biochemical tests
Streptomycetes/Actinomycetes	28	Utilisation of 11 carbon sources; morphology of conidia and sporangia; pigmentation; enzymatic tests
Treponema	37	Utilisation of 8 sugars; enzymatic tests; misc. biochemical tests

Reprinted from ATCC® Technical Bulletin no. 5

Reference strains: How many passages are too many?

ATCC cultures have been cited in national and international standards for many years. Examples include the standards promulgated by the Clinical and Laboratory Standards Institute (formerly NCCLS) for the healthcare community and by the United States Pharmacopeia (USP) for the pharmaceutical and biopharmaceutical industries. Cultures are used in performance testing of products, as positive and negative controls, as indicator organisms and as identification standards.

Though the use of microbiological standards is widely accepted, there is still some confusion as to specific laboratory guidelines, especially when determining the number of subcultures allowed beyond the reference strain. As recently as 2009 discussions about passages took place on the Pharmaceutical Microbiological Mail List (PMFLIST)1-3. This article will attempt to clear up some of this confusion and provide some definitions and recommendations.

Strain definitions

The confusion starts with the different names that are ascribed to these cultures. In various CLSI and USP publications these cultures are called control strains, standard cultures, reference strains, test strains, and quality control strains. These terms can generally be used interchangeably, though the preference seems to be reference strain or reference culture. Both the CLSI and USP agree that reference strains should come from a reliable source; both organisations cite ATCC. There is agreement that the reference strains from ATCC are subcultured to make "stock cultures," which are subcultured weekly or monthly to make the "working cultures" used daily. Working cultures are often kept as slants, and it is these subcultures that raise the questions about passages from the original reference strain.

A subculture is a passage. The USP26 Antimicrobial Effectiveness Testing, section 51 states: "For the purposes of the test, one passage is defined as the transfer of organisms from an established culture to fresh medium. All transfers are counted[4]."

This definition was updated in the Pharmacopeial Previews to read: "One passage is defined as the transfer of organisms from a viable culture to fresh medium with growth of the microorganisms. Any form of subculturing is considered to be a transfer/passage[5]."

This updated definition is preferable. The earlier definition left questions about the meaning of "an established culture." There were several questions raised on the PMFLIST as to whether the frozen or freeze dried vial from ATCC was an established culture. To some, the phrase "established culture" implied a growing culture. It is clear, however, that these frozen or freeze dried vials of reference strains from ATCC are indeed "viable" cultures. A passage involves growing the microorganism with fresh medium, either on solid agar or in broth. Resuscitating frozen or freeze dried cultures by thawing or rehydrating is not by itself considered a passage. Thus subculturing the reference strain from ATCC's frozen or freeze dried vial to the stock culture is the first passage. Subculturing stock cultures to working cultures is the second passage from the original reference strain. Any subsequent subculture is another cumulative passage.

Authenticity of cultures

Another term used by commercial sources other than ATCC is "ATCC derived." A culture is derived from the ATCC reference strain by subculturing in other words, one or more passages. In most cases it is not known how many passages are used by the commercial source to produce their cultures. Some commercial sources charge a premium for cultures certified to be "only" two passages

from the ATCC. CLSI recognises reliable commercial sources for reference strains. However, you must take into account that these cultures are at least one or two passages from the ATCC reference strains.

Maintaining cultures

The USP recommends a seed lot system to maintain reference strains in laboratories. In this system the ATCC reference strain is subcultured to several replicates at one time, all of which are within one passage. These replicates of the stock culture are the seed vials for the laboratory. The seed stock is subcultured, the second passage, to make replicates of working cultures. This is the same system that the ATCC uses to minimise passages in its culture collection (Figure 1).

But how many passages are recommended or acceptable in the laboratory? There is agreement that the number of passages should be minimised to reduce the possibility of phenotypic variations, genetic drift, and contamination as much as possible, but standards organisations differ as to how many passages are acceptable.

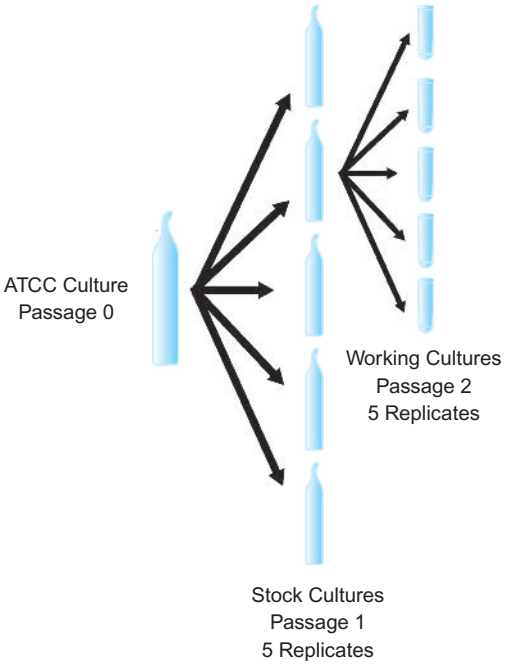

Figure 1. Seed lot system

Over the years the recommendations from CLSI have varied. The least specific recommendations call for subculturing stock cultures weekly with new working cultures subcultured monthly, with no maximum number of passages noted. Another CLSI standard recommends up to three subcultures of the stock cultures and up to three subcultures of the working cultures[6]. This would add up to up to seven passages from the original ATCC reference culture (one to make the first stock culture, plus three subcultures and three additional subcultures).

USP standards have been more specific. USP clearly states that the working cultures used for testing should not be more than five passages from the ATCC reference culture. The USP26 states: "The viable microorganisms used in this test must not be more than five passages from the original ATCC culture[4]."

The USP26 also contains the following definition: "Microbial Strains – Where a microbial strain is cited and identified by its ATCC catalogue number, the specified strain shall be used directly or, if subcultured, shall be used not more than five passages removed from the original strain[7]."

The recommendation of five passages or less from the ATCC reference culture has been broadly accepted in the healthcare community and the pharmaceutical and biopharmaceutical industries. ATCC agrees with this recommendation.

Utilising cold storage

Storage temperature of stock and working cultures can affect growth characteristics and viability. The CLSI recommendations include storage at −50 to −70°C for one year or below −70°C indefinitely[5], or −20°C or below (preferably below −70°C) for "prolonged" storage[8]. Storage of slants is recommended at 2 to 8°C for either one week[8,9] or two weeks[10]. The USP26 recommends storage in liquid nitrogen or a mechanical freezer below −50°C.

For long-term storage of frozen cultures, ATCC recommends the vapour phase of liquid nitrogen or a mechanical freezer at −80°C. Immersion in liquid nitrogen is not recommended. Frozen cultures may be kept at −20°C for short-term storage (less than one month). Do not store frozen cultures in a freezer with a defrost cycle; this will expose the cultures to higher temperatures. Freeze dried cultures should be stored at 2 to 8°C. Slants can be kept at 2 to 8°C for up to a week.

Conclusion: ATCC recommendations:

1. ATCC reference strains should be subcultured to replicate stock cultures in the laboratory. Stock cultures can be subcultured for working cultures weekly, typically kept as slants. A seed lot system is recommended.

2. A passage is defined as a subculture involving growth of the viable microorganism with fresh medium. Thawing or rehydrating ATCC reference cultures is not a passage.

3. Microorganisms for standard protocols should be used within five passages of the ATCC reference culture.

4. Frozen cultures should be stored in the vapour phase of liquid nitrogen or in a mechanical freezer at −80°C or below. Freeze dried cultures should be stored at 2 to 8°C. Slants may be stored at 2 to 8°C for up to a week.

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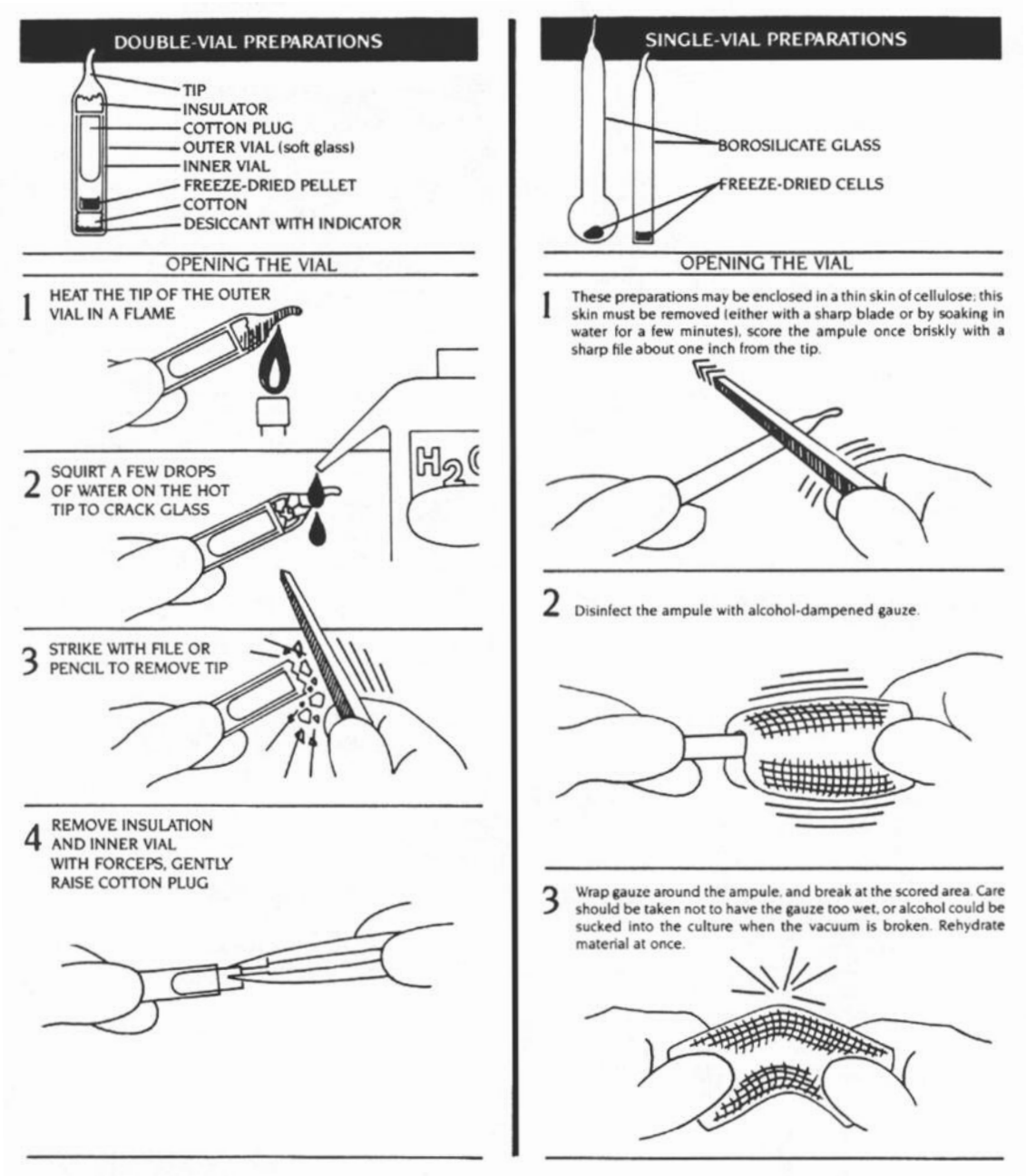
Reprinted from ATCC Connection 23(2): 6-7, 2003, with 2010 updates.

Rehydrating Freeze-Dried Cultures
Instructional Guide

- All cultures should be regarded as potentially hazardous and should be opened by persons trained in microbiological techniques working in facilities with containment requirements appropriate for the biosafety level of the cultures.
- Work in a biological safety cabinet. If this is not possible, wear suitable eye protection. Hold vials away from face and over a can or tray.
- Wear gloves.
- Sterilise all empty vials and fragments before disposal.



Rehydrating Freeze-Dried Cultures
Instructional Guide

Check each culture thoroughly upon receipt. If a culture is unsatisfactory, notify ATCC so that the strain in question can be investigated. Use the medium and incubation conditions specified on the product information sheet when first reviving strains to ensure optimal conditions for recovery.

If cultures are not revived immediately, store vials at 5°C or colder (plant viruses at -20°C or colder).

Bacteria and algae
Aseptically add 0.5 mL of liquid medium to the freeze-dried material with a sterile Pasteur pipette and mix well. For bacteria, transfer the total mixture to a test tube containing 5 to 6 mL of the recommended broth medium. The last few drops of this suspension also may be transferred to an agar slant. Algae cultures must be initiated on agar plates.

Incubate cultures under the appropriate conditions. Given proper treatment and conditions, most freeze-dried cultures will grow out in a few days. However, some may exhibit a prolonged lag period and should be given twice the normal incubation time before discarding as nonviable.

Bacteriophages
1. Prepare an actively growing broth culture of the host before opening the phage specimen. The host should be 18 to 24 hours old prior to inoculation.
2. To propagate phage: Aseptically rehydrate the freeze-dried phage specimen with 1.0 mL of appropriate broth (see maintenance conditions for host) and mix well. Add 0.1 mL of this mixture to 0.9 mL of broth medium and serially dilute as desired. One drop of each dilution can be spotted onto prepared plates (three or four dilutions per plate). Lysis should be visible after overnight incubation.
3. To prepare a high-titre phage stock: Refer to the product sheet for instructions.

Filamentous fungi and yeast
Use a Pasteur pipette to add 0.5 to 1 mL sterile water to the freeze-dried pellet then draw up the entire contents into the pipette and transfer to a test tube with about 5 mL sterile water.

Let the yeast or fungus rehydrate for a minimum of 2 hours (overnight is not too long) before transferring to broth or solid agar. Incubate at the recommended temperature. Keep in mind that some cultures may exhibit a prolonged lag period and should be given twice the normal incubation time before discarding as nonviable.

Save the mixture of lyophilised material and water until you know you have growth. If not contaminated, it will keep for several days in a refrigerator.

If you subsequently contaminate your culture, you can recover the desired microorganism by serial dilution and picking single colonies.

Plant viruses
Plant viruses are usually distributed in freeze-dried plant tissues within single, sealed vials. Open the vials carefully, removing the metal retaining cap and the rubber stopper. If the vial has been flame-sealed, open according to directions on the previous page.

For tissue reconstitution and inoculum preparation, place the contents of the vial in a precooled (4°C) mortar with 2 to 3 mL of an inoculation buffer (e.g., 0.05 M sodium phosphate buffer, pH 7.0, with 10 mM sodium sulfite). Triturate the tissue thoroughly with a pestle to prepare the inoculum.

Rub the inoculum onto host plants using a sterile cotton swab and a fine abrasive, such as 500- to 600-mesh Carborundum® (silicon carbide) or Celite® (diatomaceous earth). The abrasive may be added to the inoculum (50 to 100 mg/mL) or dusted onto the plants prior to inoculation. After inoculation, spray the plants with water to remove buffer salts and abrasive.

Cultures in stoppered serum vials
Open serum vials carefully by aseptically removing the metal retaining cap and the rubber stopper, then follow instructions for the appropriate type of organism.

If you have any questions, please contact a technical service representative or your local distributor. Details regarding our warranty can be found in the Material Transfer Agreement packed in your shipment or available at **www.lgcstandards-atcc.org**.

MATERIAL TRANSFER AGREEMENT ("MTA")

Last updated February 1, 2010

IMPORTANT! PLEASE READ CAREFULLY BEFORE SUBMITTING AN ORDER. THIS IS A CONTRACT.

This Material Transfer Agreement ("MTA") is between the_____, a_____type of organization, having its principal place of business at_____("Purchaser") and the American Type Culture Collection, a not-for-profit organization, having its principal place of business at 10801 University Boulevard, Manassas, VA 20110-2209 ("ATCC"). Purchaser must have an approved, current ATCC account to place an order. This MTA is effective as of the last date of execution by the parties and governs the purchase and use of all ATCC Materials under the terms and conditions set forth below.

TERMS AND CONDITIONS

Definitions

"**ATCC Material(s)**" means materials acquired from ATCC as documented on an ATCC Sales Order.

"**ATCC Sales Order**" means an order submitted for ATCC Materials in a form and format as determined by ATCC from time to time.

"**Biological Material(s)**" means ATCC Materials, Progeny, Unmodified Derivatives and any Unmodified Derivatives within Modifications, either individually or jointly.

"**Commercial Use**" means the sale, license, lease, export, transfer or other distribution of the Biological Materials to a person or entity not party to this MTA for financial gain or other commercial purposes and/or the use of the Biological Material: (a) to provide a service to a person or entity not party to this MTA for financial gain; (b) to produce or manufacture products for general sale or products for use in the manufacture of products ultimately intended for general sale (c) in connection with ADME (Absorption, Distribution, Metabolism and Excretion) testing; (d) in connection with drug potency or toxicity testing which does not include either screening multiple cell lines for potential inclusion in a screening assay system or screening multiple compounds in a system for internal research purposes only; (e) in connection with proficiency testing service(s), including but not limited to, providing the service of determining laboratory performance by means of comparing and evaluating calibrations or tests on the same or similar items or materials in accordance with predetermined conditions; or (f) for research conducted under an agreement wherein a for-profit entity receives a right whether actual or contingent to the results of the research. Commercial Use specifically does not include Industry Sponsored Academic Research.

"**Contributor(s)**" means an organization(s) and/or individual(s) providing original material to ATCC for deposit.

"**Industry Sponsored Academic Research**" means research sponsored by a for-profit organization carried out at a non-profit organization and by the non-profit organization's employees.

"**Investigator**" means the Purchaser's principal scientist or researcher using the Biological Material(s).

"**Modification(s)**" mean substances created by Purchaser which contain and/or incorporate a significant or substantial portion of ATCC Material.

"**Progeny**" means an unmodified descendant from the ATCC Materials, such as virus from virus, cell from cell, or organism from organism.

"**Purchaser(s)**" means the organization purchasing and receiving ATCC Material pursuant to this MTA.

"**Unmodified Derivative(s)**" mean substances created by Purchaser that constitute an unmodified functional sub-unit or product not changed in form or character and expressed by the ATCC Material provided by ATCC. Unmodified Derivatives include, but are not limited to, subclones of unmodified cell lines, purified or fractionated subsets of materials provided by ATCC, proteins expressed by DNA/RNA supplied by ATCC, or monoclonal antibodies secreted by a hybridoma cell line.

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Subject to the terms of this MTA, Purchaser's Investigator may make and use the Biological Materials provided to Purchaser by ATCC *for research purposes only in Purchaser's Investigator's laboratory only.* The Biological Materials are not intended for use in humans. Purchaser agrees that Biological Materials designated as biosafety level 2 or 3 constitute known pathogens and that other Biological Materials not so designated may be pathogenic under certain conditions. Purchaser assumes all risk and responsibility in connection with the receipt, handling, storage, disposal, transfer and Purchaser's use of the Biological Materials including without limitation taking all appropriate safety and handling precautions to minimize health or environmental risk. Purchaser agrees that any activity undertaken with the Biological Materials will be conducted in compliance with all applicable guidelines, laws and regulations, and that Purchaser will obtain all permits, licenses or other approvals required by any governmental authority in connection with Purchaser's receipt, handling, storage, disposal, transfer and use of the Biological Materials.

Purchaser shall not distribute, sell, lend or otherwise transfer, to a person other than the Purchaser's Investigator, or entity not party to this MTA, the Biological Material, as defined above, for any reason, without ATCC's prior written agreement.

Any Commercial Use of the Biological Material is strictly prohibited without ATCC's prior written consent. Purchaser acknowledges and agrees that Purchaser's use of certain Biological Material may require a license from a person or entity not party to this MTA, or be subject to restrictions that may be imposed by a person or entity not party to this MTA ("Third Party Terms"). To the

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The use permitted under this MTA for Industry Sponsored Academic Research extends only to the academic research carried out at the non-profit organization and the non-profit organization's employees. Any non-profit Purchaser using the Biological Materials in connection with Industry Sponsored Academic Research agrees to notify the industrial sponsor that any use of the Biological Materials by the industry sponsor will require a separate license from ATCC and/or its Contributors and that ATCC and/or its Contributors are under no obligation hereunder to license any Biological Materials to any such industry sponsor.

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ATCC warrants that (a) cells and microorganisms included in the ATCC Material shall be viable upon initiation of culture for a period of thirty (30) days after shipment thereof from ATCC and (b) any ATCC Material other than cells and microorganisms shall meet the specifications on the applicable ATCC Material product information sheet, certificate of analysis, and/or catalog description until the expiration date on the applicable ATCC Material's product label (such thirty (30) day period, or period until the expiration date, referred to herein as the "Warranty Period"). Purchaser's exclusive remedy, and ATCC's sole liability, for breach of the warranties set forth in this paragraph is for ATCC to, at ATCC's sole option, either (i) refund the fee paid to ATCC for such ATCC Material (exclusive of shipping and handling charges), or (ii) replace the ATCC Material. The warranties set forth in this paragraph apply only if Purchaser handles and stores the ATCC Material as described in the applicable ATCC Material product information sheet. To obtain the exclusive remedy, Purchaser must report the lack of viability or non-conformation to specifications to ATCC's Technical Service Department within the applicable Warranty Period. Any expiration date specified on the ATCC Material shipment documentation states the expected remaining useful life, but does not constitute a warranty or extend any applicable Warranty Period. **Except as expressly provided above, the ATCC Material and any technical information and assistance provided by ATCC are provided as-is, without warranties of any kind, express or implied, including but not limited to any implied warranties of merchantability, fitness for a particular purpose, typicality, safety, accuracy and/or non-infringement.**

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If Purchaser is a for-profit or private non-profit organization:
Purchaser hereby agrees to indemnify, defend and hold harmless ATCC and its Contributors against all third party claims, losses, expenses and damages, including reasonable attorneys' fees (collectively "Claims") arising out of or relating to Purchaser's use, receipt, handling, storage, transfer, disposal and other activities relating to Biological Materials, provided that Purchaser's liability shall be limited to the extent that any such Claim arises out of ATCC's gross negligence or willful misconduct. All non-monetary settlements of any such Claims are subject to ATCC's prior written consent, such consent not to be unreasonably withheld.

If Purchaser is a Federal or State non-profit organization or a foreign organization that is prohibited by law from entering into the indemnification obligation set forth in the above paragraph:
Purchaser assumes all liability for any and all third party claims, losses, expenses and damages, including reasonable attorneys' fees (collectively "Claims") arising out of or relating to Purchaser's use, receipt, handling, storage, transfer, disposal and other activities relating to Biological Materials, provided that Purchaser's liability shall be limited to the extent that any such Claim arises out of ATCC's gross negligence or willful misconduct, and provided further that if the Purchaser is the U.S. federal government or a state institution such Purchaser assumes such liability only to the extent provided under the Federal Tort Claims Act, 28 U.S.C. §§ 2671 et seq. or under equivalent applicable State or foreign law.

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Miscellaneous

Any disputes arising under this Agreement shall be tried exclusively in the United States District Court for the Eastern District of Virginia or if subject matter jurisdiction does not exist in that court, then in the state courts of Virginia for Prince William County, and Purchaser hereby expressly consents to, submits to and waives any objection to the jurisdiction of such courts; provided however, if Purchaser is a US Federal or State non-profit organization; then any disputes arising under this Agreement shall be tried in exclusively in a court of competent jurisdiction.

Purchaser agrees that any breach of this Agreement, including but not limited to any breach of the scope of use provisions of this Agreement, will entitle ATCC to immediately cease without notice to Purchaser further shipments of Biological Materials and may create such irreparable injury as to entitle ATCC to seek temporary restraining orders and other preliminary or permanent injunctive relief in addition to all other equitable and legal remedies that may be afforded under US or foreign laws.

Purchaser may not assign or otherwise transfer this MTA or any rights or obligations under this MTA, whether by operation of law or otherwise. Any such attempted assignment or transfer will be void and of no force or effect. This MTA, including all documents incorporated herein by reference, constitutes the entire agreement between ATCC and Purchaser with respect to the Biological Material and supersedes all previous agreements or representations (whether written or oral) between ATCC and Purchaser relating to the same subject matter. This MTA may not be modified, waived or terminated except in writing and signed by the parties hereto. No term or provision contained herein shall be deemed waived and no breach excused unless such waiver or consent shall be in writing and signed by the parties. If any provision of this MTA is for any reason found to be unenforceable, the remainder of this Agreement will continue in full force and effect. None of the provisions of this MTA are intended to create, nor shall be deemed or construed to create, any relationship between ATCC or Purchaser other than that of independent entities contracting with each other hereunder solely for the purpose of effecting the provisions of this MTA.

Any correspondence concerning the ATCC Material Transfer Agreement should be addressed to ATCC, Attention: Office of IP, Licensing and Services, P.O. Box 1549, Manassas, VA 20108, Phone: (703) 365-2700 or contact us at licensing@atcc.org

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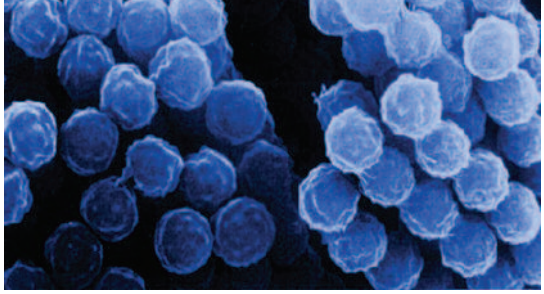

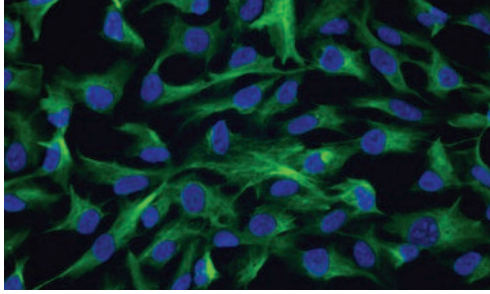

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CRM-11437™	*Clostridium sporogenes*	L.S. McClung 2006
CRM-8739™	*Escherichia coli*	Crooks
CRM-11229™	*Escherichia coli*	AMC 198
CRM-9341™	*Kocuria rhizophila*	FDA strain PCI 1001
CRM-9027™	*Pseudomonas aeruginosa*	R. Hugh 813
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LGC Standards S.a.r.l.
6, rue Alfred Kastler
BP 83076
67123 MOLSHEIM CEDEX
FRANCE

Tel: +33 (0)3 88 04 82 82
Fax: +33 (0)3 88 04 82 90
fr@lgcstandards.com

Countries served: Belgium, France, Luxembourg, Monaco, Switzerland.

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LGC Standards S.r.l.
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ITALY

Tel: +39 02 24126 830
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Sweden

LGC Standards AB
PO Box 1737
SE-501 17 BORÅS
SWEDEN

Tel: +46 (0)33 20 90 60
Fax: +46 (0)33 20 90 79
atcc.se@lgcstandards.com

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Germany

LGC Standards GmbH
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GERMANY

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LGC Standards Sp. z o.o.
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05-092 Lomianki
POLAND

Tel: +48 (0)22 751 31 40
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LGC Standards
Queens Road
Teddington
Middlesex TW11 0LY
UK

Tel: +44 (0)20 8943 8489
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atcc@lgcstandards.com

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LGC Promochem India Private Limited
488B, Fourth Floor
VITC Model Export Bhavan
14th Cross, IV Phase
Peenya Industrial Area
Bangalore 560 058
INDIA

Tel: +91 80 6701 2000
Fax: +91 80 6701 2046
in@lgcpromochem.com

Countries served: India.

Spain

LGC Standards S.L.U
C/ Salvador Espriu, Nº 59 2º planta
08005 Barcelona
SPAIN

Tel: +34 93 308 41 81
Fax: +34 93 307 36 12
es@lgcstandards.com

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