



PRO-CULT®

FIRST GENERATION QUALITY CONTROL ORGANISMS

First generation explained



EUCAST strains included

THIRD EDITION

www.pro-lab.co.uk

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PRO-CULT® INTRODUCTION

Pro-Cult® discs are manufactured exclusively from NCTC® (National Collection of Type Cultures) and NCPF® (National Collection of Pathogenic Fungi) cultures and are guaranteed to be first generation from the source strains. NCTC®, NCPF® and National Collection of Type Cultures are trademarks of Public Health England (PHE). Equivalent ATCC® strains are listed where available. ATCC® is registered trade mark of the American Type Culture Collection.

Each Pro-Cult® disc is a freeze-dried presentation of approximately 10^6 - 10^9 viable organisms. Unlike many other cultures, Pro-Cult® discs are sourced from recognised culture collections; each lot number of Pro-Cult® is guaranteed as "first generation" directly traceable to its source.

Pro-Cult® organisms are used in clinical, food, pharmaceutical, water and veterinary laboratories to control commonly used detection methods, culture media, identification techniques and sensitivity testing methods. Many of the strains are recommended by Public Health England, the British Society for Antimicrobial Chemotherapy (BSAC) and/or The European Committee on Antimicrobial Susceptibility Testing (EUCAST), as well as various European and American organisations regulating microbial testing methods.

Bacterial control strains with well-documented phenotypic characteristics are used to check that laboratory tests are producing correct results. Pro-Cult® strains are manufactured exclusively from Public Health England Culture Collections and are first generation subcultures, unlike many other products on the market which can be 2nd, 3rd or 4th generation subcultures. They are preserved in such a way as to minimize any alterations to the phenotype due to mutations.

FIRST GENERATION EXPLAINED

With the advent of laboratory ISO 15189:2012, UKAS inspections are of course inevitable. It has been brought to our attention that there is a little confusion over the traceability of Pro-Cult®, and also the "First Generation Claim". This may have been due to the use of the word "derivative" that has now been removed from all references to Pro-Cult®.

Pro-Cult® discs are manufactured exclusively from NCTC® (National Collection of Type Cultures) and NCPF® (National Collection of Pathogenic Fungi) cultures and are guaranteed to be first generation from the source strains. Each Pro-Cult® disc is a freeze-dried presentation of approximately 10^6 - 10^9 viable organisms.

The unique manufacturing process uses the parent strain suspended in an inert medium which is then freeze dried immediately into the presentation format. When the strains are then reconstituted in your laboratory, for the first time, you have the guaranteed first generation. All QC testing is done in the same way that the customers reconstitute the strain to guarantee first generation in accordance with ISO 13485:2016 in a UKAS accredited laboratory (No. 2496), certificates are available on request.

Should you have any additional questions concerning the generation, traceability or use of Pro-Cult®, please do not hesitate to contact us.

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PRO-CULT® PRODUCT DETAILS

SHELF LIFE

Pro-Cult® discs are guaranteed to contain at least 10^6 organisms at the time of purchase; this number is sufficient to ensure that when the discs are used and stored as directed there will be viable organisms culturable up to the stated end of the shelf life, which is usually 9 months from the time the vial is first opened.

QUALITY CONTROL

Pro-Cult® batches are tested in a UKAS accredited testing laboratory (number 2496). A test report for each batch of Pro-Cult® is available on request. The reporting of Pro-Cult® test results comes under appropriate UKAS accreditation.

All Pro-Cult® cultures are rigorously tested to confirm identity, possession of essential phenotypic characteristics and to exclude contamination with other organisms. Photographic evidence of the test results is retained for each batch, along with retained appropriately stored samples.

COLONIAL VARIATION

In common with many bacterial strains, some Pro-Cult® organisms are well known to produce one or more colonial variants. Colonial variation may depend on media type and duration of incubation; longer incubation times will tend to reveal more variants.

EUCAST CONTROLS

The Pro-Cult® range offers a comprehensive selection of EUCAST recommended controls for routine and extended internal quality control (QC) testing.

Routine EUCAST Recommended Quality Control Strains

Product		Code
<i>Escherichia coli</i>	NCTC®12241/ATCC®25922	PLD02
<i>Pseudomonas aeruginosa</i>	NCTC®12903/ATCC®27853	PLD10
<i>Staphylococcus aureus</i>	NCTC®12973/ATCC®29213	PLD14
<i>Enterococcus faecalis</i>	NCTC®12697/ATCC®29212	PLD18
<i>Streptococcus pneumoniae</i>	NCTC®12977/ATCC®49619	PLD95
<i>Haemophilus influenzae</i>	NCTC®12975/ATCC®49766	PLD37
<i>Campylobacter jejuni</i>	NCTC®11351/ATCC®33560	PLD36
<i>Escherichia coli</i>	NCTC®13846	PLD34

Extended Quality Control Strains for Detection of Resistance Mechanisms

Product		Code
<i>Escherichia coli</i>	NCTC®11954/ATCC®35218	PLD24
<i>Klebsiella pneumoniae</i>	NCTC®13368/ATCC®700603	PLD83
<i>Staphylococcus aureus</i>	NCTC®12493	PLD64
<i>Enterococcus faecalis</i>	NCTC®13379/ATCC®51299	PLD52
<i>Haemophilus influenzae</i>	NCTC®12699/ATCC®49247	PLD81

ESBL AND AMPC PRODUCING ORGANISMS

The Pro-Cult® range includes quality control organisms which will allow quality control of detection methods applicable to detection of Extended Spectrum β -Lactamase (ESBL) and AmpC producing organisms in UK laboratories.

Product			Code
<i>Klebsiella pneumoniae</i>	NCTC®13368/ATCC®700603	ESBL positive	PLD83
<i>Enterobacter cloacae</i>	NCTC®13406	AmpC positive	PLD51
<i>Escherichia coli</i>	NCTC®12241/ATCC®25922	Negative	PLD02

ESBL-producing strains have been identified since 1983 and are observed globally. The most significant group of ESBLs in the UK are CTX-M enzymes, followed by SHV- and TEM-derived ESBLs. They are mostly observed in Enterobacteriaceae, and most frequently encountered in *Escherichia coli* and *Klebsiella pneumoniae*.

ESBLs are enzymes capable of hydrolysing most penicillins and cephalosporins, including aztreonam and third- and fourth-generation cephalosporins. However, ESBLs do not hydrolyse cephamycins and carbapenems.

Most ESBLs belong to Ambler class A and are inhibited by β -lactamase inhibitors (clavulanate, sulbactam and tazobactam). Most are acquired, and are encoded by genes on plasmids. There is considerable variation in expression of acquired ESBLs and their activity against specific β -lactams. Co-presence of other resistance mechanisms (other β -lactamases, efflux mechanisms, altered permeability, etc.) results in various phenotypes amongst ESBL positive isolates.

AmpC-producing strains have been identified since the end of the 1980s and are observed globally as a result of plasmid-mediated horizontal gene transfer.

Many Enterobacteriaceae species and some other Gram-negative bacilli produce natural AmpCs, either constitutively at a trace level (e.g. *Escherichia coli*, *Acinetobacter baumannii*) or inducibly (e.g. *Enterobacter* spp., *Citrobacter freundii*, *Morganella morganii*, *Pseudomonas aeruginosa*). De-repression or hyper-production of natural AmpCs (due to various genetic changes) may confer high-level resistance to cephalosporins and to penicillin- β -lactamase inhibitor combinations.

Escherichia coli, *Klebsiella pneumoniae*, *Klebsiella oxytoca*, *Salmonella enterica* and *Proteus mirabilis* are the most often identified as producers of acquired AmpCs. The overall global frequency of acquired AmpCs remains far below that of ESBLs.

ESBL and AmpC identification and detection is recommended for infection control purposes. Detection is often based on non-susceptibility to indicator antibiotics, followed by phenotypic and/or genotypic confirmation tests.

CARBAPENEMASE PRODUCING ORGANISMS

The Pro-Cult® range now includes a panel of control organisms which will allow quality control of carbapenemase detection methods applicable to the most frequently encountered carbapenemase-producing organisms in UK laboratories.

Product		Carbapenemase	Code
<i>Klebsiella pneumoniae</i>	NCTC®13440	VIM	PLD55
<i>Klebsiella pneumoniae</i>	NCTC®13443	NDM	PLD56
<i>Escherichia coli</i>	NCTC®13476	IMP	PLD57
<i>Klebsiella pneumoniae</i>	NCTC®13438	KPC	PLD58
<i>Klebsiella pneumoniae</i>	NCTC®13442	OXA-48	PLD59
<i>Escherichia coli</i>	NCTC®10418	Negative	PLD33

Delay in treating severe infections caused by carbapenemase-producing organisms is associated with increased mortality. Consequently, early detection is critical and PHE recommend that all clinically-significant isolates of Gram-negatives (in practice, Enterobacteriaceae, *Pseudomonas* spp. and *Acinetobacter* spp.) should be screened for the presence of acquired carbapenem-hydrolysing β -lactamases (carbapenemases). These enzymes confer reduced susceptibility/resistance to carbapenem antibiotics such as doripenem, ertapenem, imipenem and meropenem, as well as to most other β -lactam antibiotics. Isolates should ideally be identified to genus/species level for the interpretation of resistance patterns.

Many organisms which produce carbapenemases are often multi-drug resistant strains, which are also resistant to other classes of antibiotics such as aminoglycosides and quinolones. The incidence of these strains is increasing in the UK and Europe. The resistance mechanisms can be transmitted on transposable elements between bacteria of the same or similar genera.

The carbapenemases currently of concern in Gram-negatives in Europe ('the big five') are the Class A **KPC** enzymes, the Class B metallo-β-lactamases **NDM**, **VIM** and **IMP** and the Class D enzyme **OXA-48**. There are many other carbapenemases which occur in various parts of the world, and in time are likely to be identified in the UK.

Besides resistance to carbapenems caused by the production of carbapenemase enzymes, resistance can be due to alterations in PBPs, ESBL production or AmpC beta-lactamase hyper-production coupled with porin loss. It is possible for organisms to possess more than one resistance mechanism for carbapenems. If appropriate, screening for the presence of these other mechanisms can be performed concurrently with carbapenemase screening.

COLISTIN RESISTANCE

Since its discovery, the *mcr-1* gene has since been identified globally in human associated pathogenic bacteria and associated with conferring low-level resistance to a drug of last resort – colistin. With growing concern for multi-drug resistance within Gram-negative bacteria, it is important for us to be confident in our testing for susceptibility to these drugs.

The Pro-Cult® range now includes an appropriate strain for colistin QC testing.

Product			Code
<i>Escherichia coli</i>	NCTC®13846	Colistin resistant	PLD34

PROPERTIES AND USES OF PRO-CULT® ORGANISMS

Aspergillus brasiliensis

PLD94 NCPF®2275/ATCC®16404

Formerly known as *Aspergillus niger*. Used in pharmaceutical industry. Colonies are initially white or yellowish, and on the reverse are greyish or greenish-yellow. Sporing heads on the colony surface are initially pale, becoming dark brown to black. Sporulation may be inhibited in sealed plates.

Bacillus cereus

PLD86 NCTC®7464/ATCC®10876

PHE recommended media and ID test control organism.

Bacillus subtilis

PLD29 NCTC®10400/ATCC®6633

Used in antibiotic assays (fully susceptible phenotype). PHE recommended media and ID test control organism. The colonial morphology of this strain varies considerably depending on the temperature of incubation, medium used and length of time incubated.

Bacteroides fragilis

PLD44 NCTC®9343/ATCC®25285

β-lactamase positive. PHE recommended strain for media and sensitivity control.

Burkholderia cepacia

PLD70 NCTC®10661/ATCC®17759

PHE recommended strain for media control.

Campylobacter jejuni

PLD36 NCTC®11351/ATCC®33560

EUCAST recommended control strain for susceptibility testing.

Campylobacter jejuni

PLD82 NCTC®11322/ATCC®29428

PHE recommended strain for media control.

Candida albicans

PLD28 NCPF®3255/ATCC®2091

Sensitivity control/industrial use. Serotype A.

Candida albicans

PLD42 NCPF®3179/ATCC®10231

Pharmaceutical media testing. PHE recommended strain for media control.

Candida krusei

PLD53 NCPF®3953/ATCC®6258

May also be known as *Issatchenkia orientalis* or *Pichia kudriavzevii*. Type strain. Used in itraconazole and ketoconazole assays, and antifungal susceptibility testing.

Candida parapsilosis

PLD54 NCPF®8334/ATCC®22019

Type strain. Used in itraconazole and ketoconazole assays, and antifungal susceptibility testing.

Citrobacter freundii

PLD27 NCTC®9750/ATCC®8090

Type strain. Quality control strain.

Clostridium perfringens

PLD45 NCTC®8237/ATCC®13124

Type strain. PHE recommended strain for food testing (Tryptose Sulphite Cycloserine agar – lactose and gelatin positive) and sensitivity test control. *Clostridium perfringens* is listed in Schedule 5 of the Anti-terrorism, Crime and Security Act 2001, and should be securely stored in accordance with the guidelines of the Act. However, PLD45 is a type A strain which does not produce the lethal epsilon toxin of potential interest in bioterrorism.

Clostridium sporogenes

PLD31 NCTC®532/ATCC®19404

Used for media control. PHE recommended strain for media quality control (lactose gelatin medium for ID of *C. perfringens*; lactose negative and gelatin positive).

Enterobacter aerogenes

PLD26 NCTC®10006/ATCC®13048

Type strain.

Enterobacter cloacae

PLD01 NCTC®13380/ATCC®23355

Disinfectant control. Produces cephalosporinase β -lactamase II.

Enterobacter cloacae

PLD51 NCTC®13406

AmpC β -lactamase de-repressed (constitutive hyper-producing) mutant of NCTC®13405. Control for AmpC detection tests.

Enterococcus faecalis

PLD17 NCTC®775/ATCC®19433

Used in water industry and QC. PHE recommended strain for media control. Fully susceptible phenotype. Lancefield group D.

Enterococcus faecalis

PLD18 NCTC®12697/ATCC®29212

Susceptible to vancomycin and gentamicin. PHE recommended positive control strain for aesculin test. CLSI and EUCAST recommended media control for trimethoprim/sulfamethoxazole testing and general susceptibility testing control. Lancefield group D.

Enterococcus faecalis

PLD52 NCTC®13379/ATCC®51299

Vancomycin resistant (low-level, *vanB* gene mediated) and exhibits high-level resistance to aminoglycosides. Used to confirm methodologies used to detect these resistances are working correctly. Lancefield group D. Genotype: vanB ant(6)-I aac(6') aph(2''').

Enterococcus hirae

PLD35 NCTC®13383/ATCC®10541

Disinfectant control. Colonies are entire, circular, smooth and convex. Alpha-haemolytic on sheep blood agar.

Escherichia coli

PLD02 NCTC®12241/ATCC®25922

EUCAST, CLSI, PHE and BSAC recommended control strain for susceptibility testing (susceptible phenotype). β -lactamase negative. It is preferable to maintain cultures on agar as passage in broth can result in a change in MIC levels. Exhibits two colony types: the most prevalent type is slightly irregular, smooth and translucent; the secondary type appears more opaque.

Escherichia coli

PLD24 NCTC®11954/ATCC®35218

β -lactamase (TEM-1, non-ESBL) producer. CLSI recommended strain for susceptibility testing ONLY for penicillin/ β -lactamase inhibitor combinations. Susceptible to amoxicillin/clavulanic acid.

Escherichia coli

PLD33 NCTC®10418/ATCC®10536

PHE recommended alternative to NCTC®12241, fully susceptible control strain. PHE recommended positive control for indole test, ONPG test; negative control for oxidase test, PHE recommended negative control for ESBL testing. Colonies are entire, glistening, circular and smooth.

Escherichia coli

PLD34 NCTC®13846

EUCAST recommended control strain for susceptibility testing against colistin. This strain possesses the *mcr-1* gene associated with colistin resistance.

Escherichia coli

PLD38 NCTC®12923/ATCC®8739

Used in pharmaceutical/water industry. Three colony types: the first is entire, glistening, smooth and translucent; second is entire, glistening smooth and opaque; third is irregular, rough and translucent. The rough colonies appear after 48 hours of incubation.

Escherichia coli

PLD57 NCTC®13476

Carbapenemase producer. Produces Class B IMP-type metallo- β -lactamase (type unsequenced).

Escherichia coli

PLD63 NCTC®11560

TEM-1 β -lactamase (non-ESBL) producer.

Escherichia coli

PLD75 NCTC®9001/ATCC®11775

Used in water/chemical industry. PHE recommended strain for media QC.

Escherichia coli O:157

PLD93 NCTC®12900/ATCC®700728

O157:H7 strain (non-toxigenic). PHE recommended strain for media quality control.

Haemophilus influenzae

PLD37 NCTC®12975/ATCC®49766

EUCAST recommended control strain for susceptibility testing. Ampicillin susceptible.

Haemophilus influenzae

PLD81 NCTC®12699/ATCC®49247

BLNAR strain – (β -lactamase non-producing, ampicillin/amoxicillin resistant). These strains are important clinically because the susceptibility results obtained using conventional testing procedures maybe misleading in the case of cephalosporins. PHE and CLSI recommended control strain for susceptibility testing.

Haemophilus influenzae

PLD98 NCTC®11931

Fully susceptible strain. PHE recommended strain for porphyrin synthesis test. BSAC recommended susceptibility testing control.

Haemophilus influenzae

PLD100 NCTC®8468/ATCC®9334/

Fully susceptible strain, which reportedly gives results which are easier to interpret when Mueller-Hinton medium is used in preference to Iso-Sensitest medium (EUCAST recommendation).

Klebsiella aerogenes

PLD88 NCTC®9528

Used in water/pharmaceutical industry. PHE recommended negative control for Trypton Bile X-Glucuronide agar and Yeast Extract agar.

Klebsiella pneumoniae

PLD04 NCTC®9633/ATCC®13883

Type strain. Colonies of varying size may be produced. Two colony types may be seen: the predominant type is entire, glistening, smooth and opaque; the secondary type is slightly smaller and more translucent.

Klebsiella pneumoniae

PLD55 NCTC®13440

Carbapenemase producer. Produces a Class B VIM (Verona Integron-encoded Metallo- β -lactamase) enzyme (VIM-1 sequence). QnrS1 positive (sporadic).

Klebsiella pneumoniae

PLD56 NCTC®13443

Carbapenemase producer. Produces a Class B NDM (New Delhi Metallo- β -lactamase) enzyme (NDM-1 sequence).

Klebsiella pneumoniae

PLD58 NCTC®13438

Carbapenemase producer. Produces a Class A KPC (Klebsiella Pneumoniae Carbapenemase) enzyme (KPC-3 sequence). Member of the international ST258 clone.

Klebsiella pneumoniae

PLD59 NCTC®13442

Carbapenemase producer. Produces a Class D OXA-48 enzyme.

Klebsiella pneumoniae

PLD83 NCTC®13368/ATCC®700603

SHV-18 extended spectrum β -lactamase (ESBL) producing strain. BSAC and EUCAST recommended control strain. Two colony types may be observed: the first is entire, glistening, circular, smooth, opaque and low convex; the second is entire, smooth and circular.

Lactobacillus brevis

PLD76 NCTC®13386/ATCC®8287

Used in food industry.

Legionella pneumophila

PLD08 NCTC®11192/ATCC®33152

Media control strain.

Listeria innocua

PLD92 NCTC®11288/ATCC®33090

Type strain. Serotype 6a. Non-pathogenic. Colonies appear entire, smooth, glistening, raised, circular and translucent.

Listeria monocytogenes

PLD47 NCTC®10527/ATCC®13932

Antigenic serotype 4b. Non-haemolytic and non-motile strain. Phenotypically identifies as *Listeria innocua*. Two phenotypes may be observed: one circular and translucent; the other smooth and opaque with irregular margins.

Listeria monocytogenes

PLD48 NCTC®7973/ATCC®35152

Produces two phenotypes: one is beta-haemolytic and virulent; the other non-haemolytic and non-virulent.

Listeria monocytogenes

PLD77 NCTC®13372/ATCC®7644

Used in food microbiology Q.C. Colonies are entire, glistening, circular, smooth, translucent and raised. Exhibits beta-haemolysis on sheep blood agar.

Listeria monocytogenes

PLD87 NCTC®11994

Type strain, PHE recommended positive control strain for *Listeria* detection in food.

Neisseria gonorrhoeae

PLD05 NCTC®8375/ATCC®19424

Susceptible phenotype. PHE recommended strain for media QC.

Neisseria gonorrhoeae

PLD96 NCTC®12700

Low-level but clinically relevant chromosome mediated resistance to penicillin. PHE and BSAC recommended control for susceptibility testing. Methodology assesses the ability of testing to detect resistance rather than sensitivity. Some variation in size and texture of colonies may be observed. Increased CO₂ is helpful in growth.

Proteus hauseri

PLD09 NCTC®4175/ATCC®13315

Originally the type strain of *P. vulgaris*, but is atypical and has now been recognised as a separate species. Used for media control. Colonies are glistening with spreading edges.

Proteus mirabilis

PLD43 NCTC®13376/ATCC®14153

Pharmaceutical, disinfectant and media control. Colonies are entire, circular, glistening, opaque and convex.

Proteus mirabilis

PLD68 NCTC®10975

Media control. PHE recommended control for motility test.

Pseudomonas aeruginosa

PLD10 NCTC®12903/ATCC®27853

Susceptible to antipseudomonal antibiotics. BSAC and EUCAST recommended control. Produces both fluorescein and pyocyanin pigments. Contains inducible AmpC β -lactamase. Two colony types may be observed: first are predominantly flat colony with spreading edges and a rough surface; second are small and compact.

Pseudomonas aeruginosa

PLD40 NCTC®12924/ATCC®9027

Used in water industry and disinfectant testing. Colonies on agar plates are entire, glistening and mucoid with a grainy surface. This strain also produces both fluorescein and pyocyanin pigments.

Pseudomonas aeruginosa

PLD41 NCTC®13359/ATCC®15442

Used in water industry and disinfectant testing. Broad spectrum of resistance to various commercial germicides. Three different colony types:

1. 60% circular, undulated edge, convex, rough and opaque.
2. 39% circular, entire edge, convex smooth and translucent.
3. 1% irregular undulated edge, convex, rough, spreading and translucent.

Colony type 3 reverts to type 1 after 24 hours incubation. Pyocyanin is not produced.

Pseudomonas aeruginosa

PLD65 NCTC®10662/ATCC®25668

Susceptible phenotype (alternative BSAC control). PHE recommended control strain for media control. Varying resistance to gentamicin may be observed.

Rhodococcus equi

PLD97 NCTC®1621/ATCC®6939

Type strain. Avirulent; lacks virulence-associated proteins and plasmid.

Saccharomyces cerevisiae

PLD73 NCPF®3178

PHE recommended strain for food testing and enumeration of yeasts and moulds.

Salmonella Typhimurium

PLD11 NCTC®12023/ATCC®14028

Salmonella enterica subsp. *enterica* serovar Typhimurium. Serotype properties: 4,5,12:i:1,2. Used for media and test quality control. This is a common serotype from animals and from human infections. The strains listed below are unusual serotypes, used to avoid any chance of confusion with strains commonly found in animals/food etc., and are used to control media and detection methods in food industry. Colonies are entire, glistening and smooth.

Salmonella Nottingham

PLD84 NCTC®7832

Salmonella enterica subsp. *enterica* serovar Nottingham. Serotype properties: 16:d:e,n,z15. PHE recommended control for water testing.

Salmonella Poona

PLD89 NCTC®4840

Salmonella enterica subsp. *enterica* serovar Poona. Serotype properties: 13,22:z:1,6. PHE recommended control strain for food testing.

Serratia marcescens

PLD12 NCTC®13382/ATCC®8100

Used for disinfectant testing. PHE recommended negative control for indole test. Colonies are entire, glistening, smooth and translucent. Non-pigmented.

Staphylococcus aureus

PLD13 NCTC®12981/ATCC®25923

Susceptible phenotype. Used in susceptibility and media testing control. BSAC recommended strain. Susceptible to all anti-staphylococcal antibiotics including penicillin and methicillin/oxacillin. β -lactamase and *mecA* negative. It is preferable to maintain cultures on agar as passage in broth can result in a change in MIC levels. Colonies are circular white to cream, convex to flat in elevation. After 48 hours of incubation a few grey/translucent variants may be noted. May appear β -haemolytic on sheep blood agar.

Staphylococcus aureus

PLD14 NCTC®12973/ATCC®29213

Reduced susceptibility to penicillin, due to production of a weak β -lactamase. Used for susceptibility testing, especially for automated methodology. EUCAST and CLSI recommended strain. Sensitive to methicillin/oxacillin. *mecA* negative. Colonies are entire, glistening, circular and smooth. Beta-haemolytic, golden-orange colour.

Staphylococcus aureus

PLD30 NCTC®7447/ATCC®6538P

Penicillin resistant. Used for susceptibility testing, antibiotic assays, disinfectant testing. Methicillin/oxacillin sensitive, Penicillin resistant. Colonies are entire, circular and smooth. Weakly beta-haemolytic, coagulase positive and beta-lactamase negative.

Staphylococcus aureus

PLD46 NCTC®10788/ATCC®6538

Used in pharmaceutical industry for testing disinfectants etc. Colonies are yellow pigmented and can produce a white, colonial variant. Beta-haemolytic.

Staphylococcus aureus

PLD64 NCTC®12493

Methicillin resistant (MRSA). Possesses *mecA* gene and shows homogeneous resistance, which produces high-level ceftoxitin/oxacillin/methicillin resistance. BSAC recommended strain.

Staphylococcus aureus

PLD85 NCTC®6571/ATCC®9144

Susceptible phenotype. Historically used for susceptibility testing (known as the Oxford Staph), but largely superseded by PLD13, as it has unusually low MICs and so is unrepresentative of normal range of strains of *S. aureus*. Susceptible to penicillin and oxacillin. PHE recommended for coagulase, DNase and catalase positive controls.

Staphylococcus aureus

PLD91 NCTC®13373/ATCC®43300

Methicillin resistant (MRSA). Possesses *mecA* gene (SCC*mec*: Type II) but is hetero-resistant; as few as 1 per thousand cells demonstrate the resistance and consequently has low-level resistance to oxacillin/cefoxitin. Used to confirm test procedures for methicillin resistance are working. Provides a more stringent test than testing with an MRSA which shows homogeneous resistance and has a much higher MIC. This organism will have a zone of inhibition reduced in size compared to a fully cefoxitin/oxacillin/methicillin sensitive strain (such as PLD13). Panton-Valentine leucocidin (PVL) negative. CLSI recommended strain. Two colony types may be observed; β -haemolytic with a slight yellow tint and non-haemolytic and white.

Staphylococcus epidermidis

PLD15 NCTC®13360/ATCC®12228

Used for media control/antibiotic assay. PHE recommend NCTC®11047 as negative control for Mannitol Salt agar. Colonies are entire, glistening, circular, smooth, small and β -haemolytic.

Streptococcus agalactiae

PLD16 NCTC®8181/ATCC®13813

β -haemolytic, Lancefield group B. Type strain, used for quality control. PHE recommended negative control for aesculin test. Colonies are entire, glistening, circular, smooth and slightly convex and opaque.

Streptococcus pneumoniae

PLD19 NCTC®12695/ATCC®6303

Susceptible phenotype. Colonies are mucoid, entire, smooth and alpha-haemolytic. A few colonies may have an irregular edge.

Streptococcus pneumoniae

PLD95 NCTC®12977/ATCC®49619

Has low-level, but clinically relevant, intermediate resistance to penicillin due to an altered penicillin binding protein (PBP) – recommended control for assessing detection of resistance rather than susceptibility. CLSI, BSAC and EUCAST recommended control strain for susceptibility testing. PHE recommended positive control for bile solubility test. Serotype 19.

Streptococcus pyogenes

PLD20 NCTC®12696/ATCC®19615

Used for QC and media testing. Lancefield group A, beta-haemolytic.

Vibrio parahaemolyticus

PLD06 NCTC®10885

Used for QC of media and ID testing. PHE recommended strain used mainly in food industry.

Yersinia enterocolitica

PLD80 NCTC®12982/ATCC®9610

Type strain used for media control. Biovar 1 and Serogroup O:8, which is a pathogenic serotype – the most common in USA. Colonies are entire, smooth and glistening with a slightly darker centre.

PASSAGES

A Pro-Cult® disc is a first-generation subculture from a master culture sourced from Public Health England Culture Collections, and is designed to be used to obtain working stock cultures for use in testing. It is generally accepted that no more than a total of five passages should be made from the master culture, in order to avoid genetic drift and mutant selection. Therefore, no more than four further passages (fresh cultures) from the Pro-Cult® disc should be made.

OUT OF SPECIFICATION RESULTS

Laboratories use Pro-Cult® for Quality Control of biochemical and susceptibility testing methodologies. When a laboratory test result, an MIC or biochemical reaction is unexpected or out-of-specification, the test should first be repeated to confirm the result; an out-of-specification result is an indication that the testing procedure should be reviewed; it is not always in the first instance a sign of a problem with the control organism.

If incorrect results are obtained on re-testing, the following guidance is offered:

- Check that the test procedure was followed correctly – check all standard operating procedures.
- Check for instrumentation error – check calibration, mechanical functioning, etc.
- Check the expiry date and storage conditions for the Pro-Cult®.
- Check that the culture has not become contaminated.

TECHNICAL SUPPORT

If an explanation for out-of-spec results cannot be found, and repeated tests still give unacceptable results, please contact the Technical Support Team at Pro-Lab Diagnostics (Tel: 0151 353 1613, Fax: 0151 353 1614, email: uksupport@pro-lab.com), or contact your local Territory Manager directly.

Please retain any remaining discs of organisms about which you have concerns, and the organisms involved so they can be investigated alongside our retained samples if required.

MICROBANK™



A ready-to-use system designed to simplify the storage and retrieval of bacterial and fungal cultures. Comprised of a unique cryovial system incorporating treated beads and a special cryo-preservative solution, Microbank™ (product code PL.170) provides a more reliable means of maintaining important cultures than repetitive sub-culturing, which can result in contamination, perishing or changes in characteristics. The specially formulated preservative ensures longer survival of fastidious cultures and higher quantitative recoveries.

Each 2.0ml Microbank™ vial contains approximately 25 beads, providing repeat cultures of the original organism using a single procedure. Extensive, proven performance reference data is available on request in the "Microbank™ World Wide Performance Portfolio".

Call the Sales desk on 0151 353 1613 or e-mail uksupport@pro-lab.com to receive your copy.

PREPARING QC AND VALIDATION SPIKES FROM PRO-CULT®

PREPARING THE SPIKE

1. Place a Pro-Cult® disc in BHI broth* or equivalent, and culture overnight (18 hours) at appropriate temperature for the organism.
2. Assume the count in the broth to be 10^8 organisms per ml (A)
3. Mix and transfer 100 µl of (A) to 100 ml of saline or ¼ strength Ringer's solution (B)
4. Mix and transfer 100 µl of (B) to 10 ml of saline or ¼ strength Ringer's solution (C)
5. Mix and transfer 100 µl of (C) to your homogenized food sample.

VERIFYING THE INOCULUM

Pipette 5 x 10 µl drops from (C) onto each of two agar plates for Miles and Misra counts. Using the assumptions and dilutions above:

(A) Contains 10^8 organisms per ml

(B) Contains 10^5 organisms per ml

(C) Contains 10^3 organisms per ml

If the Miles and Misra counts indicate that the required count was not achieved:

- If the count was too high by a factor of 10, reduce the volume transferred from (A) to (B) from 100 µl to 10 µl
- If the count was too low a factor of 10, increase the volume transferred from (A) to (B) from 100 µl to 1 ml.

Keep a record of the correct dilutions for each organism type for future use.

This method is very repeatable.

***Note:** BHI broth will work for many of the Pro-Cult® organisms; however, for the more fastidious organisms an appropriate culture broth must be selected, e.g. Fastidious Anaerobe Broth for strictly anaerobic organisms.

GLOSSARY

ARMRL:	Antibiotic Resistance Monitoring and Reference Laboratory
ATCC®:	American Type Culture Collection
BHI:	Brain-Heart Infusion
BSAC:	British Society for Antimicrobial Chemotherapy
CLSI:	Clinical Laboratory Standards Institute
ESBL:	Extended Spectrum Beta-Lactamase
EUCAST:	European Committee on Antimicrobial Susceptibility Testing
IMP:	<u>Imipenemase</u> (metallo- β -lactamase)
KPC:	Klebsiella Pneumoniae Carbapenemase
MIC:	Minimum Inhibitory Concentration
MRSA:	Methicillin resistant <i>Staphylococcus aureus</i>
NCPF®:	National Collection of Pathogenic Fungi
NCTC®:	National Collection of Type Cultures
NDM:	New-Delhi Metallo- β -lactamase
OXA-48:	Type 48 of oxacillinase family (metallo- β -lactamase)
PHE:	Public Health England
QC:	Quality Control
SHV:	A contraction of <u>sulphydryl-variable</u> : a description of the biochemical properties of this β -lactamase

- TEM:** β -lactamase named after the patient – Temoniera – in whom the *E. coli* was found producing this enzyme
- UKAS:** United Kingdom Accreditation Service

NCTC® and NCPF® are registered trademarks of Public Health England. ATCC® strains are listed as a reference only. ATCC® is a registered trademark of the American Type Culture Collection.



Culture collection: Cultures of fully characterized organisms maintained in such a way as to minimize sub-culturing.

First generation: A single passage from a master culture, such as a Pro-Cult® disc.

Master culture: Culture taken from a reference culture vial.

Passage: An equivalent term for a subculture.

Reference cultures: Quality control strains selected on the basis of their phenotypic biochemical and antimicrobial susceptibility characteristics to be used as controls in microbiological testing. These are obtained as freeze-dried vials from culture collections.

Stock culture: Cultures derived from Pro-Cult® discs can be stored for up to a week, usually on agar slants, or stored long term in Microbank™ (product reference PL.170 Pro-Lab Diagnostics)

Working cultures: A stock culture further sub-cultured to provide 18-24 hours of growth for use in testing.

PRODUCT AVAILABILITY

Product		Code	Size
<i>Aspergillus brasiliensis</i>	NCPF*2275/ATCC*16404	PLD94	10
<i>Bacillus cereus</i>	NCTC*7464/ATCC*10876	PLD86	10
<i>Bacillus subtilis</i>	NCTC*10400/ATCC*6633	PLD29	10
<i>Bacteroides fragilis</i>	NCTC*9343/ATCC*25285	PLD44	10
<i>Burkholderia cepacia</i>	NCTC*10661/ATCC*17759	PLD70	10
<i>Campylobacter jejuni</i>	NCTC*11351/ATCC*33560	PLD36	10
<i>Campylobacter jejuni</i>	NCTC*11322/ATCC*29428	PLD82	10
<i>Candida albicans</i>	NCPF*3255/ATCC*2091	PLD28	10
<i>Candida albicans</i>	NCPF*317.509/ATCC*10231	PLD42	10
<i>Candida krusei</i>	NCPF*3953/ATCC*6258	PLD53	10
<i>Candida parapsilosis</i>	NCPF*8334/ATCC*22019	PLD54	10
<i>Citrobacter freundii</i>	NCTC*9750/ATCC*8090	PLD27	10
<i>Clostridium perfringens</i>	NCTC*8237/ATCC*13124	PLD45	10
<i>Clostridium sporogenes</i>	NCTC*532/ATCC*19404	PLD31	10
<i>Enterobacter aerogenes</i>	NCTC*10006/ATCC*13048	PLD26	10
<i>Enterobacter cloacae</i>	NCTC*13380/ATCC*23355	PLD01	10
<i>Enterobacter cloacae</i>	NCTC*13406	PLD51	10
<i>Enterococcus faecalis</i>	NCTC*775/ATCC*19433	PLD17	10
<i>Enterococcus faecalis</i>	NCTC*12697/ATCC*29212	PLD18	10
<i>Enterococcus faecalis</i>	NCTC*13379/ATCC*51299	PLD52	10
<i>Enterococcus hirae</i>	NCTC*13383/ATCC*10541	PLD35	10
<i>Escherichia coli</i>	NCTC*12241/ATCC*25922	PLD02	10
<i>Escherichia coli</i>	NCTC*11954/ATCC*35218	PLD24	10
<i>Escherichia coli</i>	NCTC*10418/ATCC*10536	PLD33	10
<i>Escherichia coli</i>	NCTC*13846	PLD34	10
<i>Escherichia coli</i>	NCTC*12923/ATCC*8739	PLD38	10
<i>Escherichia coli</i>	NCTC*13476	PLD57	10
<i>Escherichia coli</i>	NCTC*11560	PLD63	10
<i>Escherichia coli</i>	NCTC*9001/ATCC*117.5075	PLD75	10
<i>Escherichia coli</i> O:157 (NT)	NCTC*12900/ATCC*700728	PLD93	10

Product		Code	Size
<i>Haemophilus influenzae</i>	NCTC*12975/ATCC*49766	PLD37	10
<i>Haemophilus influenzae</i>	NCTC*12699/ATCC*49247	PLD81	10
<i>Haemophilus influenzae</i>	NCTC*11931	PLD98	10
<i>Haemophilus influenzae</i>	NCTC*8468/ATCC*9334	PLD100	10
<i>Klebsiella aerogenes</i>	NCTC*9528	PLD88	10
<i>Klebsiella pneumoniae</i>	NCTC*9633/ATCC*13883	PLD04	10
<i>Klebsiella pneumoniae</i>	NCTC*13440	PLD55	10
<i>Klebsiella pneumoniae</i>	NCTC*13443	PLD56	10
<i>Klebsiella pneumoniae</i>	NCTC*13438	PLD58	10
<i>Klebsiella pneumoniae</i>	NCTC*13442	PLD59	10
<i>Klebsiella pneumoniae</i>	NCTC*13368/ATCC*700603	PLD83	10
<i>Lactobacillus brevis</i>	NCTC*13386/ATCC*8287	PLD76	10
<i>Legionella pneumophila</i>	NCTC*11192/ATCC*33152	PLD08	10
<i>Listeria innocua</i>	NCTC*11288/ATCC*33090	PLD92	10
<i>Listeria monocytogenes</i>	NCTC*10527/ATCC*13932	PLD47	10
<i>Listeria monocytogenes</i>	NCTC*7973/ATCC*35152	PLD48	10
<i>Listeria monocytogenes</i>	NCTC*13372/ATCC*7644	PLD77	10
<i>Listeria monocytogenes</i>	NCTC*11994	PLD87	10
<i>Neisseria gonorrhoeae</i>	NCTC*8375/ATCC*19424	PLD05	5
<i>Neisseria gonorrhoeae</i>	NCTC*12700/ATCC*49226	PLD96	5
<i>Proteus hauseri</i>	NCTC*4175/ATCC*13315	PLD09	10
<i>Proteus mirabilis</i>	NCTC*13376/ATCC*14153	PLD43	10
<i>Proteus mirabilis</i>	NCTC*10975	PLD68	10
<i>Pseudomonas aeruginosa</i>	NCTC*12903/ATCC*27853	PLD10	10
<i>Pseudomonas aeruginosa</i>	NCTC*12924/ATCC*9027	PLD40	10
<i>Pseudomonas aeruginosa</i>	NCTC*13359/ATCC*15442	PLD41	10
<i>Pseudomonas aeruginosa</i>	NCTC*10662/ATCC*25668	PLD65	10
<i>Rhodococcus equi</i>	NCTC*1621/ATCC*6939	PLD97	10
<i>Saccharomyces cerevisiae</i>	NCPF*317.508	PLD73	10
<i>Salmonella</i> Typhimurium	NCTC*12023/ATCC*14028	PLD11	10
<i>Salmonella</i> Nottingham	NCTC*7832	PLD84	10
<i>Salmonella</i> Poona	NCTC*4840	PLD89	10
<i>Serratia marcescens</i>	NCTC*13382/ATCC*8100	PLD12	10
<i>Staphylococcus aureus</i>	NCTC*12981/ATCC*25923	PLD13	10
<i>Staphylococcus aureus</i>	NCTC*12973/ATCC*29213	PLD14	10

Product		Code	Size
<i>Staphylococcus aureus</i>	NCTC*7447/ATCC*6538P	PLD30	10
<i>Staphylococcus aureus</i>	NCTC*10788/ATCC*6538	PLD46	10
<i>Staphylococcus aureus</i> (MRSA)	NCTC*12493	PLD64	10
<i>Staphylococcus aureus</i>	NCTC*6571/ATCC*9144	PLD85	10
<i>Staphylococcus aureus</i> (MRSA)	NCTC*13373/ATCC*43300	PLD91	10
<i>Staphylococcus epidermidis</i>	NCTC*13360/ATCC*12228	PLD15	10
<i>Streptococcus agalactiae</i>	NCTC*8181/ATCC*13813	PLD16	10
<i>Streptococcus pneumoniae</i>	NCTC*12695/ATCC*6303	PLD19	10
<i>Streptococcus pneumoniae</i>	NCTC*12977/ATCC*49619	PLD95	10
<i>Streptococcus pyogenes</i>	NCTC*12696/ATCC*19615	PLD20	10
<i>Vibrio parahaemolyticus</i>	NCTC*10885	PLD06	10
<i>Yersinia enterocolitica</i>	NCTC*12982/ATCC*9610	PLD80	10

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