LGC

Technical note

High-efficiency *E. coli* strains for phage display combinatorial peptide libraries

Abstract

Phage display technology allows expression of foreign peptides and proteins on the surface of filamentous bacteriophages. This methodology is used to identify peptide ligands for a wide variety of targets by screening for the ability to bind with high affinity and specificity. Phage display has become a cornerstone method to investigate molecular interactions involving protein surfaces.

Library construction using existing technology can generate 3×10^8 recombinants, which is adequate for coverage of the hexapeptide sequence space ($20^6 = 6.4 \times 10^7$). Although random peptide libraries with longer amino acid sequences have been constructed, they are of limited utility because libraries are not sufficiently large to completely explore the additional sequence space.

Other variations of phage display, such as antibody display and cDNA display, incorporate large proteins into the virion. The functional utility of these libraries is also limited by the number of transformants that can be generated.

E. coli strains manufactured using optimised methods designed to enhance DNA uptake can improve the transformation efficiency over existing methods by approximately ten-fold ($2\text{-}4 \times 10^{10}$ cfu/µg). These improvements can dramatically increase the absolute number of recombinants for challenging applications, significantly reducing the cost to produce and screen phage display libraries of peptides and proteins.

BIOSEARCH™ TECHNOLOGIES
GENOMIC ANALYSIS BY LGC

For Research Use Only. Not for use in diagnostic procedures.

Technical note

High-efficiency *E. coli* strains for phage display combinatorial peptide libraries

Methods

The electrocompetent cells were made using a proprietary method of cell preparation developed by LGC Biosearch Technologies. This method produces electrocompetent cells that have higher transformation efficiencies than that of cells produced using traditional methods. The transformation efficiency was tested by transforming 10 pg of pUC19 DNA into 25 µL of cells. A 1 mm gap electroporation cuvette was used in a Bio-Rad Micro Pulser #165-2100 with settings of 10 µF, 600 Ohms, 1800 Volts. Following the pulse,

975 µL of Recovery Medium was added to the cuvette and the cells resuspended by pipetting up and down three times.

The cells and Recovery Medium were transferred to a culture tube and placed in a shaking incubator at 250 rpm for 1 hour at 37 °C. The transformed cells were diluted 1 in 100 and spread on YT agar plates containing carbenicillin. The plates were incubated overnight at 37 °C.

Genotypes

ER2738 (Cat # 60522-1 & 60522-2)
F´*proA*$^+$*B*$^+$ *lacI*^{q} *Δ(lacZ)M15 zzf::Tn10(Tet*^{R}*)/ fhuA2 glnV Δ(lac-proAB) thi-1 Δ(hsdS-mcrB)5*

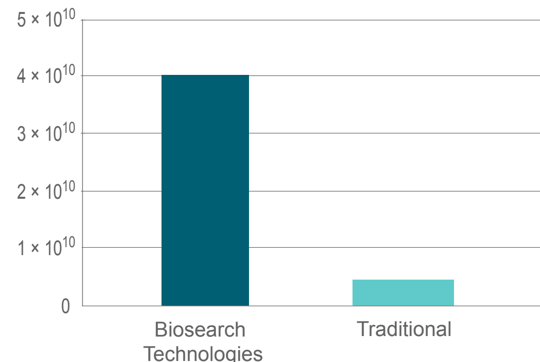
MC1061 F- (Cat # 60514-1 & 60514-2)
araD139 Δ(ara-leu)7696 galE15 galK16 Δ(lac) X74 rpsL (Str^R*) hsdR2 (rK– mK+) mcrA mcrB1*

SS320 (MC1061F´) (Cat # 60512-1 & 60512-2)
F'[proAB lacIqZ ΔM15 Tn10 (Tet^R*)] araD139 Δ(ara-leu)7696 galE15 galK16 Δ(lac)X74 rpsL (Str*^{R}*) hsdR2 (rK– mK+) mcrA mcrB1*

TG1 (Cat # 60502-1 & 60502-2)
[F' *traD36 proAB lacIqZ ΔM15] supE thi-1 Δ(lac- proAB) Δ(mcrB-hsdSM)5(rK - mK -)*

Results

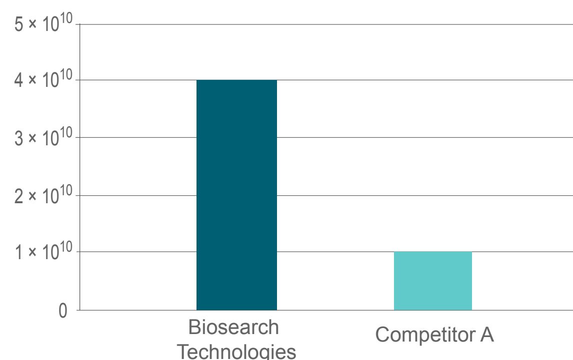
Method comparison for the preparation of SS320 cells



Method of preparation	Transformation efficiency
Biosearch Technologies	4×10^{10} cfu/µg
Traditional	6×10^{9} cfu/µg

Figure 1. Comparison of Biosearch Technologies' SS320 cells with cells prepared using traditional methods.

Comparison of transformation efficiency of TG1 cells



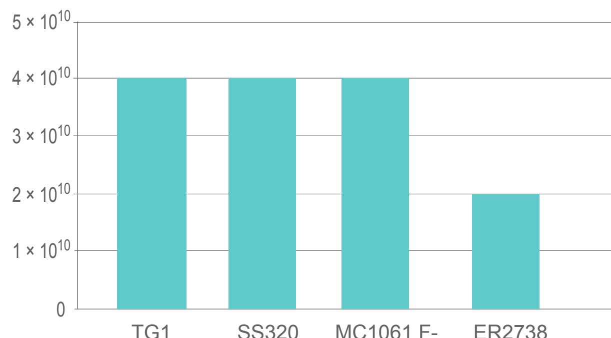
Company	Transformation efficiency
Biosearch Technologies	4×10^{10} cfu/µg
Competitor A	1×10^{10} cfu/µg

Figure 2. Comparison of Biosearch Technologies' TG1 cells with cells from competitor A using pUC DNA.

Technical note

High-efficiency *E. coli* strains for phage display combinatorial peptide libraries

Comparison of phage display strains



Cell line	Transformation efficiency
TG1	4×10^{10} cfu/µg
SS320	4×10^{10} cfu/µg
MC1061 F-	4×10^{10} cfu/µg
ER2738	2×10^{10} cfu/µg

Figure 3. Transformation efficiency of Biosearch Technologies' electrocompetent cells for phage display using pUC DNA.

Summary

- The proprietary protocol developed by Biosearch Technologies allows greater *E. coli* host strain transformation efficiencies.
- Competent cells produced by Biosearch Technologies outperform competitor cells by up to 5-fold.
- Several strains of Biosearch Technologies' phage display competent cells are available with exceptional transformation efficiencies (>2 × 10^{10} cfu/µg with pUC DNA).

@LGCBiosearch | biosearchtech.com

All trademarks and registered trademarks mentioned herein are the property of their respective owners. All other trademarks and registered trademarks are the property of LGC and its subsidiaries. Specifications, terms and pricing are subject to change. Not all products are available in all countries. Please consult your local sales representative for details. No part of this publication may be reproduced or transmitted in any form or by any means, electronic or mechanical, including photocopying, recording or any retrieval system, without the written permission of the copyright holder. © LGC Limited, 2023. All rights reserved. GEN/1128/SW/0623

For Research Use Only. Not for use in diagnostic procedures.

BIOSEARCH™ TECHNOLOGIES
GENOMIC ANALYSIS BY LGC