Bioluminescence-based system for rapid detection of natural transformation

Horizontal gene transfer plays a significant role in bacterial evolution and has major clinical importance. Thus, it is vital to understand the mechanisms and kinetics of genetic transformations. Natural transformation is the driving mechanism for horizontal gene transfer in diverse genera of bacteria. Our study introduces a simple and rapid method for the investigation of natural transformation. This highly sensitive system allows the detection of a transformation event directly from a bacterial population without any separation step or selection of cells. The system is based on the bacterial luciferase operon from Photorhabdus luminescens. The studied molecular tools consist of the functional modules luxCDE and luxAB, which involve a replicative plasmid and an integrative gene cassette. A well-established host for bacterial genetic investigations, Acinetobacter baylyi ADP1, is used as the model bacterium. We show that natural transformation followed by homologous recombination or plasmid recircularization can be readily detected in both actively growing and static biofilm-like cultures, including very rare transformation events. The system allows the detection of natural transformation within 1 h of introducing sample DNA into the culture. The introduced method provides a convenient means to study the kinetics of natural transformation under variable conditions and perturbations.

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Department of Chemistry and Bioengineering, Research group: Industrial Bioengineering and Applied Organic Chemistry
Authors: Santala, V., Karp, M., Santala, S.
Publication date: 1 Jul 2016
Peer-reviewed: Yes

Publication information
Journal: FEMS Microbiology Letters
Volume: 363
Issue number: 13
Article number: fnw125
ISSN (Print): 0378-1097
Ratings:
Scopus rating (2016): SJR 0.747 SNIP 0.597 CiteScore 1.76
Scopus rating (2015): SJR 1.131 SNIP 0.752 CiteScore 2.08
Scopus rating (2014): SJR 1.122 SNIP 0.767 CiteScore 2.17
Scopus rating (2013): SJR 1.043 SNIP 0.72 CiteScore 2.25
Scopus rating (2012): SJR 1.069 SNIP 0.817 CiteScore 2.25
Scopus rating (2011): SJR 1.096 SNIP 0.761 CiteScore 2.26
Scopus rating (2010): SJR 1.07 SNIP 0.756
Scopus rating (2009): SJR 1.111 SNIP 0.835
Scopus rating (2008): SJR 1.067 SNIP 0.827
Scopus rating (2007): SJR 1.095 SNIP 0.859
Scopus rating (2006): SJR 1.091 SNIP 0.851
Scopus rating (2005): SJR 0.984 SNIP 0.798
Scopus rating (2004): SJR 0.989 SNIP 0.723
Scopus rating (2003): SJR 1.004 SNIP 0.87
Scopus rating (2002): SJR 0.94 SNIP 0.788
Scopus rating (2001): SJR 0.943 SNIP 0.75
Scopus rating (2000): SJR 0.88 SNIP 0.737
Scopus rating (1999): SJR 0.965 SNIP 0.753
Original language: English
Keywords: Acinetobacter baylyi ADP1, Bacterial luciferase, Bioluminescence, Horizontal gene transfer, In vivo monitoring, Natural transformation
ASJC Scopus subject areas: Microbiology, Genetics, Molecular Biology
DOI:
10.1093/femsle/fnw125
Links:
http://www.scopus.com/inward/record.url?scp=84977137869&partnerID=8YFLogxK (Link to publication in Scopus)
Source: Scopus
Source-ID: 84977137869
Research output: Scientific › peer-review › Article