

Mutation Organization Software for Adaptive Laboratory Evolution (ALE) Experimentation

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BACKGROUND

Adaptive Laboratory Evolution (ALE) is a tool for the study of microbial adaptation. The typical execution of an ALE experiment involves cultivating a population of microorganisms in defined conditions (i.e., in a laboratory) for a period of time that enables the selection of improved phenotypes. Standard model organisms, such as *Escherichia coli*, have proven well suited for ALE studies due to their ease of cultivation and storage, fast reproduction, well known genomes, and clear traceability of mutational events. With the advent of accessible whole genome resequencing, associations can be made between selected phenotypes and genotypic mutations.

A review of ALE methods lists 34 separate ALE studies to date. Each study reports on novel combinations of selection conditions and the resulting microbial adaptive strategies. Large scale analysis of ALE results from such consolidation efforts could be a powerful tool for identifying and understanding novel adaptive mutations.

TECHNOLOGY DESCRIPTION

Researchers at UC San Diego have developed software to aid in the consolidation of data on ALE methods. They have developed a package of scripts that enable processing of DNA sequencing data, call mutation identification software tools, output experimental reports, and build a consolidated database of experiments.

APPLICATIONS

A web platform named *ALEdb* (aledb.org) has been created to meet the need for accessible consolidated ALE mutations, conditions, and publication reporting. ALEdb additionally includes features to search for specific mutations, report key mutations, and export mutation data for custom analysis. With these features, ALEdb works to fill the gap in the field of experimental evolution for an accessible resource of consolidated experimental evolution mutations.

ADVANTAGES

Previously, no such database existed to aid researchers in ALE.

STATE OF DEVELOPMENT

ALEdb will continue to be developed to meet the needs of consolidating, reporting, and navigating ALE experiment data. This initial release of ALEdb considers previously generated mutation datasets. ALEdb will continue to grow with future inclusion of published ALE experiment results from currently contributing and new research organizations.

INTELLECTUAL PROPERTY INFO

License Information: For commercial use or those desiring to incorporate the software into commercial products or use for commercial purposes, please contact UC San Diego for a commercial copyright license.

RELATED MATERIALS

- Phaneuf PV, Gosting D, Palsson BO, Feist AM. ALEdb 1.0: a database of mutations from adaptive laboratory evolution experimentation. *Nucleic Acids Res.* 2019 Jan 8;47(D1):D1164-D1171. doi: 10.1093/nar/gky983. - 01/08/2020

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OTHER INFORMATION

KEYWORDS

Microbial adaptation, whole genome

comparative sequencing, microbial

database, Adaptive Laboratory

Evolution, E. coli, software

CATEGORIZED AS

- Computer
 - Software
- Research Tools
 - Other

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