

# Oxygen Independent E. Coli

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## BACKGROUND

Lactic acid, an important precursor for the production of biodegradable plastics, is produced in varying amounts in anaerobic (anoxic) and aerobic (oxic) *E. coli* fermentation. Such biochemical difference leads to technical challenges in the mixing and aeration of the bacterial culture in industrial productions, as consistent productivity is the key.

## TECHNOLOGY DESCRIPTION

UC San Diego researchers have invented a new strain of *E. coli* that experiences the same level of growth in anoxic conditions as it does in oxic conditions and can convert glucose into D-lactate (lactic acid) at the same rate in either condition.

In this process fermentation started in the aerobic medium without gas sparging. Levels of oxygen in the medium naturally reduced to zero within first couple of hours. No additional aeration control was applied.

Yields for lactic acid in this partially anaerobic fermentation process are at around 95 percent for this strain.

## APPLICATIONS

This technology can potentially enable more efficient and cost-effective fermentation process by reducing the need to mix and aerate the *E. Coli* culture to ensure consistent oxygen consumption.

## STATE OF DEVELOPMENT

We observed fermentation yield (defined at gram lactate/gram glucose consumed) to vary between 0.8 g/g to 0.95 g/g. Fluctuation in fermentation yield is often dependent on the amount of biomass built up during fermentation: if we start with high level of biomass (OD (600nm) = 1 or 0.45 gDCW/L), fermentation yield will be at a higher range than if the starting level is low (OD (600nm) =0.5 or less). To assay the purity of D-lactate with enzymatic assay, its purity if more than 99.0%

## RELATED MATERIALS

An earlier version of this strain was described in the following paper.

- Portnoy, V.A., Herrgård, M.J., Palsson, B.Ø. [Aerobic Fermentation of D-Glucose by an Evolved Cytochrome Oxidase Deficient Escherichia coli Strain](#), Appl Environ Microbiol. 2008 Dec;74(24):7561-9.

## PATENT STATUS

Country	Type	Number	Dated	Case
United States Of America	Issued Patent	9,080,178	07/14/2015	2009-158

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## OTHER INFORMATION

### KEYWORDS

fermentation, wastewater treatment,  
  
adaptive evolution, plastics

### CATEGORIZED AS

- **Environment**
- Other
- **Medical**
- Other
- Research Tools

### RELATED CASES

2009-158-0

