

# Methods To Biosynthesize Kainic Acid And Analogues Thereof

Tech ID: 30077 / UC Case 2019-168-0

## BACKGROUND

Kainic acid is a chemical first derived from seaweed. Neuroscientists routinely use Kainic acid to simulate brain degeneration in lab experiments. Certain inotropic receptors in the brain--known as kainate receptors--are selectively activated only by kainic acid. Research into kainate receptors helps researchers to understand Alzheimer's disease, epilepsy, and other brain disorders. Some scientists use kainic acid to find answers to more fundamental questions such as the function of glutamate receptors.

Currently, there are two procedures for generating kainic acid commercially. The first involves the farming and collection of kainic acid-containing seaweed and that method is impacted by seasonal fluctuations of seaweed growth and kainic acid production. The second involves synthetic processes, but the current procedures generally require at least 6 synthetic steps with yields less than 40% and generate environmentally toxic byproducts including heavy metals, cyanides, or halogenated organics.

## TECHNOLOGY DESCRIPTION

Researchers at UC San Diego have developed a novel bio-based approach to produce kainic acid involving the first use of biocatalysis and biotransformation. The researchers discovered two genes from seaweeds and showed in the laboratory that the encoded enzymes can be used to produce kainic acid in a very efficient manner. The inventors developed several complementary methods using a combination of enzymes, chemical synthesis, and bacterial fermentation to produce kainic acid at the gram-scale level.

Furthermore, this technology is scalable and economical, requiring reagents that cost less than 10% of reagents found in other current kainic acid syntheses, while also offering a simplified purification procedure.

## APPLICATIONS

This work firmly establishes a cost-effective and atom-economy approach to prepare the commercially important neurochemical kainic acid.

## ADVANTAGES

This bio-based technology is fast, efficient, green and scalable, positioning it as the superior choice for supplying kainic acid and derivatives for commercial markets.

## STATE OF DEVELOPMENT

The inventors have reduced to practice the 2-step, scalable production of kainic acid at the gram-scale. This biotransformation procedure is convenient and results in an efficient production of kainic acid that can be purified in an effective process involving charcoal filtration and C18 reversed phase liquid chromatography to yield a product in 99% purity. This process sets the stage for an even larger production and with engineered KabC enzyme and engineered production host to achieve even higher yields at large scale.

## INTELLECTUAL PROPERTY INFO

This technology is patent pending and UC San Diego is seeking companies interested in commercializing this technology.

## PATENT STATUS

Country	Type	Number	Dated	Case
Patent Cooperation Treaty	Published Application	2020/117792	06/11/2020	2019-168

## CONTACT

University of California, San Diego  
Office of Innovation and Commercialization  
[innovation@ucsd.edu](mailto:innovation@ucsd.edu)  
tel: 858.534.5815.



## OTHER INFORMATION

### KEYWORDS

Kainic acid, seaweed, biocatalysis, biotransformation, kainate receptors

### CATEGORIZED AS

- **Materials & Chemicals**
  - Biological
- **Research Tools**
  - Other

### RELATED CASES

2019-168-0

