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Using Peptide-based Novel Biosensors to Detect Anaplastic Lymphoma Kinase Activity by Sensitization of Terbium Luminescence

A highly sensitive, high-throughput peptide-based biosensor accurately detects anaplastic lymphoma kinase (ALK) activity for improved lymphoma and lung cancer diagnostics and screening of kinase inhibitors.

Researchers at Purdue University have developed a new peptide-based biosensor for detecting anaplastic lymphoma kinase (ALK) activity by sensing terbium(III) luminescence for lymphoma diagnostics. Many current biosensors are unable to distinguish between specific kinases and are often time consuming to analyze. The technique for ALK detection created by Purdue researchers implements a combination of phosphorylated and unphosphorylated biosensors where the biosensors are phosphorylated in vitro by ALK on the biosensor's tyrosine residue. Then, a biosample is allowed to bind to Tb3+ ions so that luminescence can be quantified and analyzed using an enzyme-linked immunosorbent assay (ELISA) as this measure is directly proportional to enzymatic activity. As one example, a sample was prepared with 25 micromolar concentration of peptides, 0.1 units of kinase, 100 micromolar ATP, 10 millimolar magnesium(II) ion, 25 millimolar HEPES buffer of pH 7.5, and 5 microliters of biomaterial which was quenched in 20 microliters of 40 millimolar EDTA solution. Then, ELISA was performed on a four plate reader with excitation wavelength 266nm where the phosphorylated signal was stronger than that of the unphosphorylated. In addition, a 1:1 ratio of terbium(III) and the biosensors were compared in a Job's plot to observe the percent of phosphorylation that occurred. The new biosensors can be implemented for high-throughput measurement of intracellular ALK activity in living cells and ALK positive lung cancer cells to improve patient care.

Advantages:

-High-Throughput

-Highly Sensitive

Technology ID

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Category

Biotechnology & Life Sciences/Biomarker Discovery & Diagnostics

Pharmaceuticals/Drug Discovery & Development

Biotechnology & Life Sciences/Analytical & Diagnostic Instrumentation

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Potential Applications:

-Research and Discovery of Kinase Inhibitors

-In Vitro Intracellular Screening

-Lymphoma and Positive Lung Cancer Screening

Technolog Validation: The performance of the new biosensors have been validated in lab by ELISA

TRL: 4

Intellectual Property:

Provisional-Patent, 2014-03-21, United States | PCT-Patent, 2015-03-20, WO | NATL-Patent, 2016-09-20, United States

Keywords: peptide-based biosensor, anaplastic lymphoma kinase, ALK activity detection, terbium(III) luminescence, lymphoma diagnostics, phosphorylated biosensors, tyrosine residue, enzyme-linked immunosorbent assay, ELISA, high-throughput measurement, intracellular ALK activity, lung cancer cells