

Research Project

A European Biotechnology Training Network for the Support of Chemical Manufacturing

Third-party funded project

Project title A European Biotechnology Training Network for the Support of Chemical Manufacturing

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Organisation / Research unit

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Project Website <http://www.chemie.unibas.ch/ward/>

Project start 01.07.2009

Probable end 30.06.2013

Status Completed

The past few years have witnessed impressive progress in chemical biology. The post-genomic era heralds a multitude of challenges for chemists and biologist alike, with the study of protein functions at the heart of much research. The elucidation of protein structure, localization, stabilization, post-translational modifications, and protein-macromolecule interactions will steadily unveil the role of each protein and its associated biological function in the cell. The push to develop new technologies has necessitated the integration of various disciplines in science. Consequently, the role of chemistry has never been so important for the study of biological processes. The site-specific covalent incorporation of molecular entities, by virtue of a ligation reaction, with the unique chemical functionalities in proteins or other biologically relevant molecules has many potential applications in chemical and biological studies of proteins, cellular biology, biotechnology, biomedical research, and chemical biology.

A number of important criteria need to be met in order for such reactions to work inside complex cellular environments. Firstly, such reactions have to proceed efficiently in aqueous conditions. Secondly, the two (or more) participating functional groups in the reaction should be carefully tuned, such that their reaction is highly specific and devoid of any interference from other chemical entities present in surrounding molecules (e.g., proteins, DNA/RNA, etc). Lastly, the reaction should yield a product that is highly stable in its physiological environment.

The research project presented herein describes novel approaches for the discovery of new bio-compatible and chemo-specific ligation reactions. The site specific incorporation of molecular entities, by virtue of a ligation reaction, with the unique chemical functionalities in protein or in other biologically relevant molecules has many potential applications in chemical and biological studies of protein. The aim of this project is to develop new ligation processes with higher efficiency, larger scope of application, higher chemoselectivity and higher rates.

Keywords biocompatible chemical ligation, orthogonal chemistry, in vivo catalysis

Financed by

Commission of the European Union

Add publication

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Specify cooperation partners