

Pharmaceuticals | Biotechnology | Technology Offer

Ribosomal Incorporation of Intercalators into Peptides and Proteins in Living Organisms

Field of Application

Protein- and peptide-based active pharmaceutical components often contain structures that act as intercalators. In this manner, their interaction with cellular nucleic acids is influenced, which can result in antiviral, antibacterial or tumor-inhibiting characteristics. Moreover, intercalators are used in biotechnology, e.g. for the detection of nucleic acids by fluorescence, or for increasing the nucleic acid binding affinity of various ligands such as other nucleic acids or nucleic acid analogues, peptides, proteins etc. The present invention creates for the first time a basis for the modification of proteins and peptides with intercalators in living organisms through the ribosomal incorporation of designer amino acids.

State of the Art

Modifications of proteins and peptides are normally achieved by chemical conjugation reactions or through solid phase peptide synthesis. Chemical conjugation reactions cannot be used in living cells and are also inefficient in terms of selectivity and degree of modification. The solid phase peptide synthesis on the other hand has disadvantages regarding the maximum chain length, the precise three dimensional folding of the modified peptides and in particular their purity.

Innovation

A novel and advantageous method has been developed at the University of Constance, which allows the inclusion of amino acids with nucleic acid-intercalating properties into proteins and peptides. The amino acids carry the intercalators in their side chains. Specifically, the genetic code of living organisms is expanded with non-canonical amino acids (ncAA) through their ribosomal incorporation. For this purpose, aminoacyl-tRNA synthetase (aaRS) mutants were developed, which recognize these ncAA and can use them for the aminoacylation of transfer-RNAs. The technology covered by this invention makes it possible to produce proteins and peptides that are modified with the specific intercalators using standard protein expression methods. This only requires the presence of the ncAA in the medium and the co-expression of the respective aminoacyl-tRNA synthetases as well as the tRNA. The invention therefore has substantial potential for the development of new applications and products, in particular in the above areas.

Advantages

- ✓ Modification of proteins and peptides by the co-translational ribosomal incorporation of chromophores with intercalative and fluorescent properties
- ✓ Genetically encoded biosynthesis enables the rapid production and testing (directed evolution) of a great diversity of modified peptides and proteins
- ✓ Freely selectable insertion positions in any protein or peptide including in living organisms
- ✓ Method exhibits very high selectivity
- ✓ Standard protein expression methods can be used

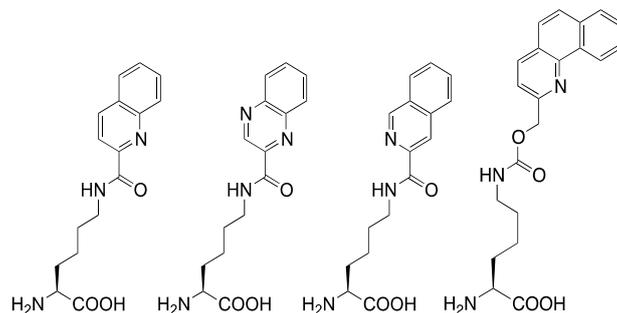


Figure: Examples of amino acids that can be built into proteins or peptides

Technology Transfer

The Technologie-Lizenz-Büro GmbH is responsible for the commercialisation of this technology and is now offering suitable enterprises licenses for the use of this technology.

Patent Portfolio

European patent application is pending.

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