

## **Research breakthrough for the protein factories of tomorrow**

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Using a kind of molecular 'hip joint operation,' researchers at Uppsala University have succeeded in replacing a natural amino acid in a protein with an artificial one. This step forward opens the possibility of creating proteins with entirely new properties that can be tailored to biotechnological applications. The study is presented in the latest issue of the prestigious journal *Chemistry and Biology*.

All proteins are made out of twenty amino acids. These natural building blocks determine the structure and function of the protein. Bengt Mannervik's research team at Uppsala University has now demonstrated that artificial amino acids can be exchanged for a natural one that is critical to the stability and catalytic properties of the protein. The study opens the possibility of a new chemical biology where entirely new properties can be custom made for biotechnological applications.

Their research work has focused on an important enzyme, glutation transferase, which participates in the detoxification of the body from carcinogenic substances. The enzyme is made up of two identical protein structures that are joined by a contact similar to a key that fits a lock. The key is an amino acid that fits a cavity in the neighboring protein structure. In their work, the key has been replaced by artificial amino acids. Some exchanges yielded a fully active enzyme, while others did not.

The current study is a molecular equivalent to a hip joint operation, where the natural joint is replaced by an artificial part that is more



robust. With the same methodology it is also possible not only to replace natural structures and functions but also to give proteins entirely new properties. Using simple chemistry, the twenty existent amino acids can be exchanged for hundreds of new chemical structures. In this way new proteins can be created with building blocks far beyond the limits of the genetic code.

Source: Uppsala Universitet

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