HKU Faculty of Dentistry researcher improves enzyme used in antibiotic discovery

A joint research team from The University of Hong Kong and the Chinese University of Hong Kong has modified the gene for a yeast enzyme to speed up a chemical reaction that is used in antibiotic development and production.

The conventional method of converting the antibiotic cephalosporin C into related antibiotics uses harsh conditions and toxic chemicals. Therefore, industrial companies have started to use an enzyme (o-amino acid oxidase) extracted from the yeast Trigonopsis variabilis to catalyse one of the key steps in a “green” way, according to the researchers.

To further improve the enzyme’s activity, the research team computer-modelled the 3-dimensional protein structure of the enzyme to predict which amino acid subunit is the most important for its activity. They chose to swap the amino acid at position 54 (phenylalanine) for the one (tyrosine) that appears in an equivalent position in the same enzyme in other species, including humans, mice, rats, and rabbits. This substitution was made by altering the enzyme’s gene sequence at a specific location, and the modified gene was put into bacteria to mass-produce the enzyme.

The modified enzyme was about six times as active as the naturally occurring version, making it “a potential candidate for industrial bioconversion” of cephalosporin C into a compound that can eventually become other antibiotics, the researchers conclude. The team is now making further developments for industrial application.

The research was published in the international peer-reviewed journal New Biotechnology earlier this year.

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