MSU researchers develop temperature-tolerant enzymes for advancing genetic manipulation tools

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Researchers at Montana State University have found a method for creating more robust, temperature-tolerant enzymes that can be used as tools in the process of genetic manipulation.

A patent is pending on the method, which previously had been realized in principle but not proven in practice until now.

The research team was been able to identify the structural elements responsible for the enzyme's extreme thermal tolerance.

The enzymes, particularly the tyrosine recombinase and its subfamily integrase, assist in recombining genetic material and used widely in biotechnology applications including gene splicing, cloining and gene therapy. They are notoriously fragile and require cooling to remain viable. Once a sample has risen to room temperature, its usefulness is short lived.

Integrases allow viruses to alter the genetic structure of host cells. Site-specific integrases perform recombinations of DNA segments by recognizing and binding to short DNA sequences (sites), at which they cleave the DNA backbone, exchange strands between the two DNA helices, and rejoin the DNA strands.

Because increased thermal stability can provide more user-friendly

laboratory enzymes from test-tube to animal applications, the findings have the potential for developing superior site-specific recombinases for academic and commercial biotech applications.

The findings can also be applied to other recombinases, including as Cre, Flp and Lamda, to increase stability of industrial tyrosine recombinase enzymes in general.

Provided by Montana State University