

Researchers Discover Novel Method for Activating Enzymatic Reactions

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(PhysOrg.com) -- Researchers at North Carolina State University have discovered a new method for "switching on" enzymatic reactions with precise energy delivery: by using microwave radiation.

Dr. Alex Deiters, assistant professor of chemistry, and Dr. Bob Kelly, Alcoa Professor of Chemical and Biomolecular Engineering, along with other NC State researchers, found that hyperthermophilic enzymes - proteins that thrive in extremely hot environments - could be activated at temperatures far below those normally required for biocatalysis, the process by which enzymes chemically transform organic compounds.

Their findings appear in the online edition of the *Journal of the American Chemical Society*.

The use of enzymes as "biocatalysts" is nothing new - biocatalysis is important in everything from brewing beer to the creation of pharmaceutical components. Applying heat to the enzymes causes them to activate a chemical reaction; however, when temperatures become too high, the proteins can become "denatured," and the reaction can produce undesirable by-products. The researchers theorized that the unique properties of the hyperthermophiles and the use of microwave radiation as a heat source might help them avoid this pitfall.

"Using microwaves means that you are only heating up what you want to heat up," says Kelly. "You're focusing the energy much more specifically and rapidly, and the process can occur at a much lower temperature."

Hyperthermophilic enzymes are particularly well-suited to the process, because they are less likely to denature when exposed to the rapid heating from the microwave radiation.

The results bore out the researchers' expectations: the hyperthermophilic enzymes were activated when irradiated by microwaves, and at a much lower temperature than would normally be required to cause the reaction.

"The microwaves will allow us to be much more precise in our ability to induce these reactions, and to stop them quickly before denaturing occurs" Deiters says. "This is another tool we can use to maximize the utility of biocatalysis."

Future work will show if using microwave radiation to activate enzymes below their typical reaction temperature will create energy-saving benefits for researchers using biocatalytic processes.

Provided by North Carolina State University

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