Zeroing in on more powerful enzymes for degrading persistent pollutants

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For the first time, researchers have identified two important strategies for optimizing the effects of the enzymes involved in degrading persistent pollutants such as PCBs. These scientific advances, achieved by Professor Michel Sylvestre of Centre INRS–Institut Armand-Frappier in conjunction with U.S. and Indian researchers, will serve not only to help develop effective biocatalysts for resolving environmental pollution problems, but also to synthesize new chemical compounds of biopharmaceutical interest.

Certain chemical components, like PCBs, PAHs, and CFCs, are toxic biosphere pollutants that are resistant to microbial degradation. Microbial catabolic enzymes are unable to effectively metabolize them. The results obtained by Professor Sylvestre and his colleagues open up new possibilities for boosting the effectiveness of these enzymes to oxidize such compounds.

Professor Sylvestre's research team has shown that it is possible to obtain more flexible mutant enzymes by replacing some of their amino acids. Moreover, they have updated a sophisticated mechanism that helps boost the enzyme's performance not only with regard to the natural substrate, but also any other substrates it can metabolize. As such, more effective new enzymes can be developed using genetic engineering.

"From a green chemistry perspective, the results of our research could allow us to apply these enzymes to biocatalysis processes to synthesize biologically active compounds (such as flavonoids) that have strong

antioxidant properties," explained Professor Michel Sylvestre, also an enzyme engineering specialist.

More information: The results were published in the following works:

Mohammadi, M., Viger, J.F., Kumar, P., Barriault, D., Bolin, J. T., Sylvestre, M. 2011. "Retuning Rieske-type oxygenase to expand substrate range." J. Biol Chem. 286, 27612-27621. www.jbc.org/content/286/31/276 … 0a-a69a-932c85d04095

Kumar, P., Mohammadi, M., Viger, J.F., Barriault, D., Gomez-Gil, L., Eltis, L.D., Bolin, J. T., and Sylvestre, M. 2011. "Structural insight into the expanded PCB-degrading abilities of a biphenyl dioxygenase obtained by directed evolution." J. Mol. Biol. 405, 531-547. www.sciencedirect.com/science/ … ii/S002228361001209X

Dhindwal, S., D. N. Patil, M. Mohammadi, M. Sylvestre, S. Tomar, and P. Kumar. 2011. "Biochemical studies and ligand bound structures of biphenyl dehydrogenase from Pandoraea pnomenusa strain B-356 reveal a basis for broad specificity of the enzyme." J. Biol. Chem. 286, 37011-37022. www.jbc.org/content/286/42/370 … 0a-a69a-932c85d04095

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