

Physics Colloquium

Michigan Technological University

Thursday January 29, 2015
4:00 PM Fisher Hall 139

Photoreactions of the Chromophore-Binding Domain of Bacteriophytochrome

Heli Lehtivuori

Nanoscience Center, Department of Physics, University of Jyväskylä, Jyväskylä, Finland

Abstract:

Bacterial phytochromes are optically sensitive proteins. Knowing their photocycle is needed for developing better fluorescent proteins. A detailed analysis of the time-resolved absorption and fluorescence properties of the dimeric and monomeric *Deinococcus radiodurans* chromophore-binding domains (DrCBD and DrCBD_{mon}) and its dimeric DrCBD-D207H and DrCBD-Y263F variants were done. The primary step in photoconversion is a twist in the C15=C16 double bond of the biliverdin and hydrogen bond between His-290 and ring D. These events are apparently followed by three competing processes: excited state proton transfer, fluorescence, and isomerization in the C15=C16 double bond. The isomerization leads to the formation of Lumi-R state, which takes place within nanoseconds. Both Y263F and D207H substitution diminish the isomerization of DrCBD by changing the environment near the biliverdin. In DrCBD, the Lumi-R state is followed by the Meta-Rc-like state that forms via Meta-Ra state. However, in the case of DrCBD_{mon} the Meta-Ra state was not obtained. Overall, these studies reveal comprehensive photoinduced kinetics of DrCBD protein and its variants that range from femtoseconds to milliseconds.



BIO:

In 2000 Heli Lehtivuori began studies at NanoScience Center in University of Jyväskylä (JYU/NSC), physics as a major subject. In June 2006 gained the Master's degree. She worked as a post-graduate student in Time-resolved Spectroscopy group at the Department of Chemistry and Bioengineering, Tampere University of Technology (TUT) from 2006 to 2010. After graduation, Dr. Heli Lehtivuori was employed (1/4/2011–31/8/2014) as postdoctoral research fellow at the Department of Biological and Environmental science (JYU/NSC) in group of Prof. Janne Ihalainen. Her experimental approaches have been time-resolved spectroscopic measurements on *Deinococcus radiodurans* phytochrome and its variants. Apart from the main research project she is interested in teaching, and helping of three PhD students from other groups at JYU/NSC. Now, Dr. Heli Lehtivuori is employed (1/9/2014–) as an Academic post-doctoral research fellow at the Department of Physics (JYU/NSC) in group of Dr. Jussi Toppari. These studies she will concentrate on controlling primary reactions of photoswitchable proteins by surface plasmons and site-selective mutations. Currently Dr. Heli Lehtivuori is visiting Fulbright scholars in Prof. Katrina T. Forest group at the Department of Bacteriology, University of Wisconsin-Madison, where she is making site-selective mutations of the proteins.

MichiganTech