New protein tag enhances view within living cells

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The view into the inner world of living cells just got a little brighter and more colorful. A powerful new research tool, when used with other labeling technologies, allows simultaneous visualization of two or more different proteins as well as the ability to distinguish young and old copies of a protein within one living cell. The research is published by Cell Press in the February issue of *Chemistry and Biology*.

Scientists have developed innovative technologies that make use of fluorescent molecules to visualize proteins and biochemical processes in living cells. Various technologies exist that allow transfer of fluorescent properties to specific proteins of interest. One such method, developed by Dr. Kai Johnsson and colleagues at Ecole Polytechnique Fédérale de Lausanne, is derived from the human DNA repair enzyme alkylguanine-DNA alkyltransferase (AGT). This tool, called SNAP-tag, can be covalently labeled in living cells using benzylguanine (BG) derivatives bearing a chemical probe.

Now, Dr. Johnsson's group has modified SNAP-tag to generate a new AGT-based tag, named CLIP-tag, which reacts specifically with benzylcytosine (BC) derivatives. "Use of SNAP-tag in conjunction with CLIP-tag permits simultaneous labeling of two proteins with different molecular probes for multiparameter imaging of cellular functions in living cells," explains Dr. Johnsson.

The researchers demonstrate that SNAP-tag and CLIP-tag have some significant advantages over existing labeling methods for conducting

multi-protein studies within living cells. Both tags can label proteins in any cellular compartment, have very high specificity towards their native substrates, low reactivity to other BC and BG derivatives and have similar properties that will aid in comparison of one fusion protein to another. Further, chemical labeling methods allow for visualization of proteins in organisms that are not suitable for expression of autofluorescent proteins and are well suited for experiments that make use of other biochemical characterizations after imaging.

“The labeling of CLIP-tag fusion proteins is highly specific and mutually independent from other existing labeling approaches, making the method a highly valuable tool for chemical biology,” concludes Dr. Johnsson. “Furthermore, we show for the first time simultaneous pulse-chase experiments to visualize different generations of two different proteins in one sample, allowing concurrent investigation of two different dynamic processes.”

Source: Cell Press

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