IN BRIEF

POST-TRANSLATIONAL MODIFICATION

Regulation of cellular metabolism by protein lysine acetylation

Zhao, S. *et al. Science* **327**, 1000–1004 (2010)

Lys acetylation in the nucleus modifies histones and regulators of transcription. To investigate the non-nuclear functions of protein acetylation, Zhao *et al.* analyzed the mitochondrial and cytosolic fractions of human liver tissues by tandem liquid chromatography–tandem mass spectrometry. They found that almost every enzyme involved in glycolysis, gluconeogenesis, the tricarboxylic acid cycle, the urea cycle, fatty acid metabolism and glycogen metabolism is acetylated. The acetylation status of the enzymes they investigated further is regulated by the concentration of metabolic fuels, and the acetylation status regulates enzyme activity. For example, the acetylation and activity of enoyl CoA hydratase–3-hydroxyacyl CoA, which catalyzes two steps in fatty acid oxidation, increases in the presence of fatty acids. Thus, in response to metabolic fuels, Lys acetylation regulates the activity of enzymes that catalyze cellular metabolism.

PROTEIN TRANSLOCATION

The peroxisomal importomer constitutes a large and highly dynamic pore

Meinecke, M. *et al. Nature Cell Biol.* **12**, 273–277 (2010)

The peroxisomal protein import machinery is unique because it allows the passage of folded and oligomerized proteins into the peroxisome. Meinecke *et al.* now show that this translocation is enabled by a large, dynamic pore formed by the peroxisomal targeting signal receptor Pex5, which cycles between the cytosol and the peroxisomal membrane, and the peroxisomal membrane protein Pex14, to which cargo-bound Pex5 binds. Pex5 and Pex14 are part of the importomer complex, which is involved in peroxisomal receptor docking and recycling, and cargo translocation at the peroxisome membrane. The authors isolated, characterized and reconstituted Pex5-containing complexes from yeast peroxisomal membranes and showed that when Pex5 is associated with its cargo, the Pex5–Pex14 peroxisomal complex transiently shifts from an inactive state to a single, gated ion-conducting channel that forms a pore which can expand to 9 nm. Thus, the peroxisomal pore is Pex5 inducible and can transiently expand to accommodate large Pex5-bound cargo.

TECHNOLOGY

A two color photoactivatable probe for selective tracking of proteins and cells

Welman, A. *J. Biol. Chem.* 5 Feb 2010 (doi:10.1074/jbc.M110.102392)

Welman *et al.* report on the development of a two-colour photoactivatable probe called photoactivatable green cherry ($G^{PA}C$). In live cells, $G^{PA}C$ continuously emits red fluorescence (mCherry), allowing the entire probe population to be monitored. $G^{PA}C$ can be photoactivated in a specific location to emit green fluorescence. This allows a probe subpopulation to be visualized in the context of the whole probe population, without having to mark the cellular area of interest with a separate probe. The authors monitored the movement of zyxin, a cytoskeletal protein important in focal adhesions, using $G^{PA}C$. Unactivated $G^{PA}C$–zyxin (red) was present in the cytosol and in focal adhesions. Photoactivated cytosolic $G^{PA}C$–zyxin (green) rapidly redistributed into existing focal adhesions, validating this two-colour probe. $G^{PA}C$ also enables the tracking of cells in *Drosophila melanogaster* models, further emphasizing its potential in cell biology research.

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