Research

Ubiquitination rivals phosphorylation in its widespread importance in many processes. Degradation, vesicular transport and the DNA damage response are all regulated by ubiquitination. Our lab has a long-standing interest in two ubiquitin ligases, the APC and the SCF. Both the APC and the SCF are Cullin Ring ubiquitin ligases with core catalytic subunits and specificity factors that recruit substrates. Both have important roles in cell cycle progression, as well as other processes. We have developed methods to identify substrates of these ligases, and are applying these to both yeast and human cells. Importantly, ubiquitin ligases represent an important class of both oncogenes and tumor suppressors, and drugs with efficacy in the treatment of Multiple Myeloma, such as the IMiDs, have been shown to specifically target this class of enzyme.

The DNA damage response is a critical responder to environmental stress. Previously, our laboratory has explored how the checkpoint pathway becomes activated by chromosomal breaks. More recently, our efforts have focused on identifying targets of this pathway that alter cellular physiology in response to DNA damage. These targets include replication proteins, such as Sld3, that regulate origin firing, transcription factors, such as Ndd1, which regulates mitotic gene expression, and the sirtuin Hst3, which deacetylates histones. To do this, we use a combination of candidate approaches and phosphoproteomics.

Here are titles of some of the current projects in our lab, and the people working on them:

Ligase Trapping to identify substrates of ubiquitin ligases in yeast and human cells
Theresa Berens, Jessica Lao, Frances Hundley and Katie Ulrich

Proteome-wide characterization of post-translational modifications
Nerea Sanvisens Delgado, Jessica Lao, Emma Powell

Characterization of the functions of atypical polyubiquitin chains
Fernando Meza Gutierrez

Identification of DNA Damage Checkpoint Targets
Jessica Lao

Feel free to contact anyone in the lab if you are interested in our research in general or specific projects!