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Jack E. Dixon Research

Dixon studies a family of enzymes called protein tyrosine phosphatases—biochemical “master control switches” that regulate virtually all activity in living cells. Phosphatases work with a closely related group of enzymes called kinases to turn cells on and off. This cellular activation-deactivation process is vital to a cell's ability to respond to signals from its environment. To turn cellular activity on, a protein tyrosine kinase attaches a phosphate molecule to a specific amino acid in a cell. To turn cellular activity off, a protein tyrosine phosphatase removes the phosphate molecule.

For the past 11 years, Dixon and his research team have worked to identify and understand this family of phosphatase enzymes. They have identified 10 amino acids in the phosphatase enzyme that are key players in removing the phosphate on-switch from cells. They have discovered how bacteria responsible for the plague, or “Black Death,” use phosphatases as a lethal weapon to disable a cell's natural immune response. In 1997, Dixon's laboratory showed how loss of the tumor suppressor gene *PTEN*, which shares sequence identity with phosphatases, results in the development of cancer. Currently, Dixon is studying how phosphatase master switches control the guidance signal that leads to establishing a wiring diagram for the nervous system.