

Deb Kelly

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Biography:

Our research at Penn State University uses innovative approaches to study human development and disease. In particular, we use a combination of structural and functional tools to investigate how cells communicate with each other. Protein receptors found on the surfaces of cells transmit signals from the external microenvironment into the cell's nucleus to turn on genes at the appropriate time. Poorly transmitted signals between cells or within cells result in a myriad of diseases including cancer. We would like to better understand how these signaling mechanisms drive tumor initiation.

In addition to studying receptors on the surface of cancer cells, we are also working to understand how improper signals are conveyed to the nucleus. When genes become improperly turned on during cell division, cancer cells thrive and evade traditional forms of treatment. These evasive tumor initiation cells, also known as cancer stem cells, are thought to give rise to malignant tumors. We are working to define the 3D structures of how protein complexes interact inappropriately with DNA for the design of new therapeutic interventions aimed at specifically targeting cancer stem cells.

Cryo-Electron Microscopy (EM) is an ideal technique to visualize cells and macromolecular assemblies at high-resolution. We use cryo-EM to investigate how cancer cells differ from normal cells. Protein receptors found on the surface of cancer cells control the processes that sustain cellular viability. Problems with the structural integrity of these receptors cause a small population of cells to migrate away from a primary tumor site and reattach elsewhere in the body, a process called metastasis. Our newly developed Affinity Capture platform allows us to isolate the cells that cause metastasis and study their molecular landscapes. Using our specialized molecular imaging toolkit, we are discovering the underlying causes of bone, breast and brain cancer at unprecedented resolution.

Research Interests:

- Cryo-EM,
- Structural biology,
- In situ TEM,
- Breast cancer, glioblastoma, pancreatic cancer