Carolyn R. Bertozzi

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Carolyn Bertozzi is the Anne T. and Robert M. Bass Professor of Chemistry and Professor of Chemical & Systems Biology and Radiology (by courtesy) at Stanford University, and an Investigator of the Howard Hughes Medical Institute. She completed her undergraduate degree in Chemistry from Harvard University in 1988 and her Ph.D. in Chemistry from UC Berkeley in 1993. After completing postdoctoral work at UCSF in the field of cellular immunology, she joined the UC Berkeley faculty in 1996. In June 2015, she joined the faculty at Stanford University coincident with the launch of Stanford's ChEM-H institute.

Prof. Bertozzi's research interests span the disciplines of chemistry and biology with an emphasis on glycoscience in human health and disease. She is known for launching the field of bioorthogonal chemistry, inventing reactions such as the Staudinger ligation, copper-free click chemistry and the Pictet-Spengler ligation, and applying these reactions to in vivo imaging and therapeutic protein engineering. Presently, her lab works on developing cancer immune therapies that target glyco-immune checkpoint receptors and their glycan ligands, on the development of point-of-care tuberculosis diagnostics that exploit carbohydrate metabolic pathways, and on the rare genetic disease NGly1 in which a defect in de-N-glycosylation leads to transcription factor dysregulation. She has been recognized with many honors and awards for her research accomplishments. She is an elected member of the Institute of Medicine, the National Academy of Sciences, the German Academy of Sciences Leopoldina, the National Academy of Inventors, the Inventors Hall of Fame, and the American Academy of Arts and Sciences. She has been awarded the National Academy of Sciences Award in the Chemical Sciences, the ACS Arthur C. Cope Award, the Lemelson-MIT Prize, the Heinrich Wieland Prize, and a MacArthur Foundation “Genius” Award, among many others. Her efforts in undergraduate education have earned her the UC Berkeley Distinguished Teaching Award and the Donald Sterling Noyce Prize for Excellence in Undergraduate Teaching.

Abstract: Cancer Immune Therapies Targeting Glyco-immune Checkpoints

Successful tumors are products on natural selection that survived the various mechanisms meant to prevent cancer in humans. Evading immune surveillance is a critical requirement for cancer progression, and likewise, tumor environments are often immune suppressive. Discovery of the specific receptor-ligand interactions that suppress immune cell reactivity against cancer cells has led to exciting new interventions such as the T cell checkpoint inhibitors. Studies of where these immune therapies succeed or fail hints at a much broader landscape of immune modulatory receptor-ligand interactions that have yet to be exploited for cancer therapy. We are studying tumor glycosylation as an axis of immune modulation that might be targetable for immune therapy. Altered glycosylation patterns have long been identified as hallmarks of cancer, but their functional significance with respect to immune suppression is just now coming into focus. For example, we discovered that overexpression of sialosides, a common cancer glycosylation phenotype, allows cancer cells to recruit immune suppressive Siglec receptors to the synapse with NK cells. Disruption of this interaction can be achieved using antibody-sialidase conjugates that selectively de-sialylate the cancer cell surface. Conversely, immune activating receptors that normally recognize microbial glycans can be redirected to respond to cancer cells using antibody-glycan conjugates. These and other new approaches to glycosylation-targeted cancer therapy will be discussed in this presentation.