James P. Tam is the Director of the Drug Discovery Laboratory at Nanyang Technological University, Singapore. He was the founding dean of the School of Biological Sciences, founding director of the double-degree program in Biomedical Science and Chinese Medicine, and the founding director of NTU Biological Research Center.

His research focuses on synthetic methodology, drug design of metabolic-stable peptidyl biologics and intracellular delivery of peptides. He developed peptide dendrimers as synthetic vaccines. His current research also includes herbalomics in traditional medicines to discover novel peptides as potential therapeutics.

He received his Ph.D. in Medicinal Chemistry from the University of Wisconsin, Madison, USA and held appointments as Associate Professor at The Rockefeller University, USA (1982-1991), Professor at Vanderbilt University, USA (1991-2004) and The Scripps Research Institute, USA (2004-2008).

Professor Tam has published more than 330 papers in these areas of research. He received the Vincent du Vigneaud Award in 1986, the Rao Makineni Award by American Peptide Society in 2003, the Ralph F. Hirschmann Award by the American Chemical Society (ACS) in 2005, and the Merrifield Award by American Peptide Society in 2013 for his outstanding contributions to peptide and protein sciences. In addition to his scientific research, he has also been active in the peptide community. Besides serving on many editorial boards, he organized international peptide and protein symposia and was co-founder of the past ten International Chinese Peptide Symposia. He received the Cathay Award from the Chinese Peptide Society, China in 1996.

Proteins Deconstructed: Approach in the Design and Synthesis of Peptide Biologics

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Over the years, my laboratory has focused on the design and synthesis of peptide biologics, mostly in the MW range of 2 to 10 kDa. Our goal is to improve the metabolic stability of bioactive peptides to be potential drug candidates and in some cases, we aim for their oral delivery. Our approach is loosely tied to themes related to protein deconstruction, a term which I borrowed from arts and humanity fields and used for teaching purpose. In design, protein deconstruction involves breaking a protein to parts of interest and then modifying them or in some cases, reassembling them to a simplified form to attain the desired bioactivity. This has been a guiding principle for many laboratories in the design of bioactive peptides and is broadly referred to as structre-activity-relationship study. In synthesis, the process of protein destruction has been exploited for developing new methods in peptide synthesis, and is generally known as a biomimetic approach. In particular, we have been interested to mimic some of these proteins in making and breaking peptide bonds through the proximity-driven acyl transfer reactions, modulating acidity function and accelerating the oxidative folding process for cystene-rich peptides. Here, I will describle some of our work in the design and synthesis based on a protein deconstruction approach to study peptide biologics. They include peptide hormones, synthetic vaccines, antibotics, antivirals, and peptide dendrimers. I will also briefly discuss our recent efforts in herbalomics of traditional medicines and lessons learned from nature to increase molecular diversity and metabolic stability of peptide biologics.