Biomolecular sensing and imaging techniques including AFM, Raman, smartphone based optical sensor were employed to better understand and improve life related issues containing air quality, water quality and obesity management. The cytoprotective effect of resveratrol on DEPs induced human primary cell was determined by non-invasive techniques (AFM and Raman). A continuous optical sensor was developed for water hardness monitoring in real-time and a functional nanoprobe was synthesized to explore the fatty acid recognition and uptake process in single cell.