제 128회
ORGAN ON A CHIP 기술교류회

한림대학교

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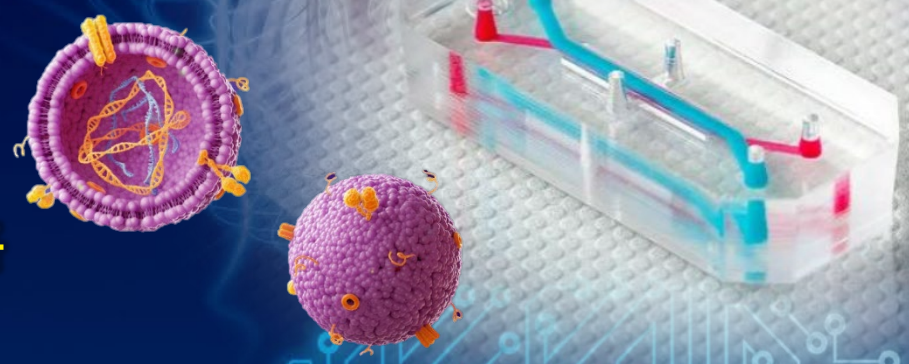
한림대학교 의료·바이오융합연구원 포스터홀



오승수 교수

포항공과대학교

1. Education

박사: Materials Dept., Univ. of California, Santa Barbara (2012)
석사: 서울대학교 재료공학부 (2007)
학사: 서울대학교 재료공학부 (2005)

2. Experience

2016 ~ 현재 포항공과대학교 신소재공학과, 부교수
2014 ~ 2016 Massachusetts General Hospital/ Harvard Medical School, Research Fellow
2012 ~ 2014 Institute of Collaborative Biotechnologies, Santa Barbara, Post-doc

단백질 모방: 바이오센싱을 위한 분자인식 기반 기능성 핵산 물질 개발

PROTEIN MIMICKING: creation of synthetic nucleic acids that enable molecular recognition for biosensing applications

In nature, there are a number of different proteins to play critical roles in sustaining cellular lives. Based on long chains of 20 different amino acid molecules, the exceptionally complicated biomolecules typically possess unique folding structures, which can perform their own molecular functions essential for living organisms. Among the abilities of proteins, molecular recognition would be one of the most important and fundamental ones; many proteins specifically bind to other molecules by providing the binding pockets with molecular complementary to the target molecules. For example, cells communicate with each other through a variety of cellular signaling pathways as cell membrane receptors specifically recognize desired signaling molecules, such as extracellular proteins, hormones, neurotransmitters, and even ions. For the adaptive immune system, biological antibodies identify and neutralize foreign substances by selectively binding to different antigens, which serves as an effective way of protection against infectious pathogens and viruses. Moreover, enzymes, as biocatalysts, need the specific substrate binding ability to catalyze many different biochemical reactions that are chemo- and regioselective and even stereospecific unlike the reactions of chemical catalysts.

My work has focused on the development of novel methodologies to generate nucleic acid-based proteomimetic biopolymers and their applications. In this talk, I will introduce three different classes of highly functionalized, protein-like nucleic acid biopolymers: ones that mimic membrane receptors, enzymes, and ion channels, respectively. As an exemplar, mimicking ACE2, which is known to mediate the entry of SARS-CoV-2 into human cells for viral infection, will be demonstrated by our newly developed in vitro selection strategy. Moreover, in mimicking enzymes, I will introduce the discovery of catalytic nucleic acids that enable amide bond formation for ultra-site-specific conjugations. Furthermore, creation of ion-selective artificial membranes is attainable by synthesis of ion channel-mimicking nucleic acid constructs; unidirectional stacking of ion binding motifs in a free standing phospholipid bilayer membrane will be also demonstrated for development of real-time ion recording system.

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