BIOGRAPHICAL SKETCH

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NAME: Wang, Yong

eRA COMMONS USER NAME (credential, e.g., agency login): yong1975

POSITION TITLE: Professor of Biomedical Engineering

EDUCATION/TRAINING *(Begin with baccalaureate or other initial professional education, such as nursing, include postdoctoral training and residency training if applicable. Add/delete rows as necessary.)*

INSTITUTION AND LOCATION	DEGREE (if applicable)	END DATE MM/YYYY	FIELD OF STUDY
Jilin University, Changchun, Jilin	BS	06/1995	Environmental Chemistry
Chinese Academy of Sciences, Dalian	MS	06/1998	Chemical Engineering
Duke University, Durham, NC	PHD	05/2004	Biomedical Engineering

A. Personal Statement

Wang has rich experience with the development of biomaterials for drug/gene/cell delivery, publishing numerous papers in high-profile journals such as Nature Biotechnology, Nature Communications, Journal of the American Chemical Society, Trends in Pharmacological Sciences, and Biomaterials. The WANG group has successfully developed aptamer-functionalized hydrogels for on-demand protein delivery. However, using aptamer-functionalized hydrogels to develop graft-like hydrogel particles as graft chaperones has never been explored. In this application, Wang (biomedical engineer) will collaborate with Ravnic (surgeon) to integrate biomaterials science and surgery seamlessly for the promotion of graft vascularization and survival.

NIH AR073364 05/15/2018-02/28/2023 Title: Semi-synthetic biomaterials for skin wound healing The goal of this project is to study protein release for skin wound healing and immunomodulation. Role: PI (with Dr. Xiong) NIH HL122311 08/01/2020-05/31/2024 Title: Aptamer-functionalized cardiac patches The goal of this project is to the stimulation of angiogenesis via controlled release of angiogenic factors. Role: PI (with Dr. Zhang)

These R01 grants have no overlap with this current application.

1. Abune L, Wang Y. Affinity Hydrogels for Protein Delivery. Trends Pharmacol Sci. 2021 Apr;42(4):300-312. PubMed Central PMCID: PMC7954985.
2. Li C, Xu M, Coyne J, Wang WB, Davila ML, Wang Y, Xiong N. Psoriasis-associated impairment of CCL27/CCR10-derived regulation leads to IL-17A/IL-22-producing skin T-cell overactivation. J Allergy Clin Immunol. 2021 Feb;147(2):759-763.e9. PubMed Central PMCID: PMC7726097.
3. Shi P, Zhao N, Coyne J, Wang Y. DNA-templated synthesis of biomimetic cell wall for nanoencapsulation and protection of mammalian cells. Nat Commun. 2019 May 20;10(1):2223. PubMed Central PMCID: PMC6527693.
4. Battig MR, Soontornworajit B, Wang Y. Programmable release of multiple protein drugs from aptamer-functionalized hydrogels via nucleic acid hybridization. J Am Chem Soc. 2012 Aug 1;134(30):12410-3. PubMed PMID: 22816442.

B. Positions, Scientific Appointments and Honors

Positions and Scientific Appointments

2022	Huck Chair in Cell Medicine, Penn State
2021 -	Associate Editor, Research (Science Partner Journal)
2021 - 2021	Chair, NIH Study Section ZRG1 BST-M (50)
2016 -	Professor of Biomedical Engineering, Penn State University
2016 - 2020	Editorial Board, ACS Biomaterials Science & Engineering
2016 - 2020	Editorial Board, Scientific Reports

2013 - 2016 Associate Professor of Biomedical Engineering, Penn State University
2011 - 2012 Associate Professor of Biomolecular & Biomedical Engineering, University of Connecticut
2006 - 2011 Assistant Professor of Chemical & Biomolecular Engineering, University of Connecticut
2004 - 2006 Postdoctoral Research Associate, Duke University Medical Center

Honors

2022 Huck Chair in Cell Medicine, Penn State
2019 Outstanding Research Award, Penn State Engineering Alumni Society
2019 Invitational Fellow, Japan Society for the Promotion of Science
2017 Fellow, American Institute for Medical and Biological Engineering
2012 INSPIRE Award, National Science Foundation
2010 CAREER Award, National Science Foundation

C. Contribution to Science

1. Aptamer-functionalized hydrogels for protein delivery

   Hydrogels are promising for protein delivery. However, this promise is limited by problems such as low protein sequestration efficiency, low protein bioactivity and difficult protein release control. To overcome these challenges, the WANG group has pioneered the development of aptamer-functionalized hydrogels. The data have shown that aptamer-functionalized hydrogels are capable of sequestering a large amount of protein drugs, reducing burst protein release and maintaining high protein bioactivity. Moreover, the kinetics of protein release can be tuned by regulating the binding affinity of aptamers. Aptamer-functionalized hydrogels have become an emerging class of biomaterials for regenerative medicine and immunotherapy.

   a. Abune L, Davis B, Wang Y. Aptamer-functionalized hydrogels: An emerging class of biomaterials for protein delivery, cell capture, regenerative medicine, and molecular biosensing. Wiley Interdiscip Rev Nanomed Nanobiotechnol. 2021 Nov;13(6):e1731. PubMed Central PMCID: PMC8526380.
   b. Abune L, Wang Y. Affinity Hydrogels for Protein Delivery. Trends Pharmacol Sci. 2021 Apr;42(4):300-312. PubMed Central PMCID: PMC7954985.
   c. Zhao N, Suzuki A, Zhang X, Shi P, Abune L, Coyne J, Jia H, Xiong N, Zhang G, Wang Y. Dual Aptamer-Functionalized in Situ Injectable Fibrin Hydrogel for Promotion of Angiogenesis via Codelivery of Vascular Endothelial Growth Factor and Platelet-Derived Growth Factor-BB. ACS Appl Mater Interfaces. 2019 May 22;11(20):18123-18132. PubMed Central PMCID: PMC6542593.
   d. Battig MR, Soontornworajit B, Wang Y. Programmable release of multiple protein drugs from aptamer-functionalized hydrogels via nucleic acid hybridization. J Am Chem Soc. 2012 Aug 1;134(30):12410-3. PubMed PMID: 22816442.

2. Cell surface engineering

   The cell surface plays an important role of determining cell functions. Depending on the needs, cell surface engineering can lead to promotion or inhibition of cell-environment interactions. The WANG group is studying a biomimetic cell wall for cell nanoencapsulation, delivery and release. The success will lead to enhanced survival and retention of mesenchymal stem cells in the lung for the treatment of lung inflammation. The same technology platform can be applied to deliver other therapeutic cells.

   a. Shi P, Wang X, Davis B, Coyne J, Dong C, Reynolds J, Wang Y. In Situ Synthesis of an Aptamer-Based Polyvalent Antibody Mimic on the Cell Surface for Enhanced Interactions between Immune and Cancer Cells. Angew Chem Int Ed Engl. 2020 Jul 13;59(29):11892-11897. PubMed PMID: 32307868.
   b. Shi P, Zhao N, Coyne J, Wang Y. DNA-templated synthesis of biomimetic cell wall for nanoencapsulation and protection of mammalian cells. Nat Commun. 2019 May 20;10(1):2223. PubMed Central PMCID: PMC6527693.

c. Shi P, Zhao N, Lai J, Coyne J, Gaddes ER, Wang Y. Polyvalent Display of Biomolecules on Live Cells. Angew Chem Int Ed Engl. 2018 Jun 4;57(23):6800-6804. PubMed Central PMCID: PMC5976537.

d. Chen N, Shi X, Wang Y. Molecularly Regulated Reversible DNA Polymerization. Angew Chem Int Ed Engl. 2016 Jun 1;55(23):6657-61. PubMed Central PMCID: PMC4884157.

3. Polyvalent antibody mimics

Antibodies have been applied to various areas such as drug and cell delivery. However, natural antibodies have limitations such as low stability and high costs. Thus, great efforts have been made to develop surrogates of antibodies. We are interested in using nucleic acids and polymers as building blocks to synthesize antibody mimics. We have developed both bivalent and polyvalent antibody mimics and applied them in cell imaging and delivery.

a. Shi P, Wang X, Davis B, Coyne J, Dong C, Reynolds J, Wang Y. In Situ Synthesis of an Aptamer-Based Polyvalent Antibody Mimic on the Cell Surface for Enhanced Interactions between Immune and Cancer Cells. Angew Chem Int Ed Engl. 2020 Jul 13;59(29):11892-11897. PubMed PMID: 32307868.

b. Gaddes ER, Gydush G, Li S, Chen N, Dong C, Wang Y. Aptamer-based polyvalent ligands for regulated cell attachment on the hydrogel surface. Biomacromolecules. 2015 Apr 13;16(4):1382-9. PubMed PMID: 25789558.

c. Richards E, Li S, Chen N, Battig MR, Wang Y. Polymerization of affinity ligands on a surface for enhanced ligand display and cell binding. Biomacromolecules. 2014 Dec 8;15(12):4561-9. PubMed PMID: 25329361.

d. Zhou J, Soontornworajit B, Wang Y. A temperature-responsive antibody-like nanostructure. Biomacromolecules. 2010 Aug 9;11(8):2087-93. PubMed PMID: 20690716.

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https://www.ncbi.nlm.nih.gov/sites/myncbi/145LRc2JGSV53/bibliography/46861108/public/?sortby=pubDate&sdirection=descending.