

# Stanford

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## Eric Appel

Associate Professor of Materials Science and Engineering, Senior Fellow at the Woods Institute for the Environment and Associate Professor, by courtesy, of Pediatrics (Endocrinology) and of Bioengineering

### Bio

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#### BIO

Eric A. Appel is an Associate Professor of Materials Science & Engineering at Stanford University. He received his BS in Chemistry and MS in Polymer Science from Cal Poly, San Luis Obispo. Eric performed his MS thesis research with Robert D. Miller and James L. Hedrick at the IBM Almaden Research Center in San Jose, CA. He then obtained his PhD in Chemistry working in the lab of Dr. Oren A. Scherman in the Melville Laboratory for Polymer Synthesis at the University of Cambridge. His PhD research focused on the preparation of dynamic and stimuli-responsive supramolecular polymeric materials. For his PhD work, Eric was the recipient of the Jon Weaver PhD prize from the Royal Society of Chemistry and a Graduate Student Award from the Materials Research Society. Upon graduating from Cambridge in 2012, he was awarded a National Research Service Award from the NIH (NIBIB) and pursued a Wellcome Trust Postdoctoral Fellowship at MIT working with Robert S. Langer on the development of supramolecular biomaterials for drug delivery and tissue engineering. Eric's research at Stanford focuses on the development of biomimetic polymeric materials that can be used as tools to better understand fundamental biological processes and to engineer advanced healthcare solutions. His research has led to more than one hundred publications, 35 pending or granted patents, and formed the basis for three start-up companies. He has received a Margaret A. Cunningham Immune Mechanisms in Cancer Research Award and young faculty awards from the Hellman Scholars Fund, the American Diabetes Association, the American Cancer Society, and the PhRMA Foundation. Eric received the IUPAC Hanwha-Total Young Polymer Scientist Award for 2022, the Society for Biomaterials Young Investigator Award for 2023, and the Biomaterials Science Lectureship Award from the Royal Society of Chemistry for 2023.

#### ACADEMIC APPOINTMENTS

- Associate Professor, Materials Science and Engineering
- Senior Fellow, Stanford Woods Institute for the Environment
- Associate Professor (By courtesy), Bioengineering
- Associate Professor (By courtesy), Pediatrics - Endocrinology and Diabetes
- Member, Bio-X
- Member, Cardiovascular Institute
- Member, Wu Tsai Human Performance Alliance
- Member, Maternal & Child Health Research Institute (MCHRI)
- Faculty Fellow, Sarafan ChEM-H
- Member, Stanford Cancer Institute
- Member, Wu Tsai Neurosciences Institute

#### HONORS AND AWARDS

- Biomaterials Science Lectureship Award, Royal Society of Chemistry (2023)

- Young Investigator Award, Society for Biomaterials (2023)
- Hanwha-Total IUPAC Young Polymer Scientist Award, IUPAC (2022)
- Junior Faculty Development Award, American Diabetes Association (2018-2022)
- Hellman Faculty Fellowship, Hellman Fellows Fund (2016-2017)
- PhRMA Research Starter Grant, PhRMA Foundation (2016-2017)
- Margaret A. Cunningham Immune Mechanisms in Cancer Research Award, Proctor Foundation (2015-2016)
- Wellcome Trust Fellowship, Wellcome Trust (2013-2017)
- National Research Service Award, National Institute of Biomedical Imaging and Bioengineering (2013-2016)
- Graduate Student Award, Materials Research Society (2012)
- Jon Weaver PhD Prize, Royal Society of Chemistry of the United Kingdom (2013)

## PROFESSIONAL EDUCATION

- Postdoc, MIT , Bioengineering
- Ph.D., University of Cambridge , Chemistry (2012)
- M.S., Cal Poly, SLO , Polymer Science (2008)
- B.S., Cal Poly, SLO , Chemistry (2008)

## PATENTS

- E.A. Appel. "United States Methods of producing moldable hydrogels and uses thereof", Leland Stanford Junior University
- E.A. Appel, J.Y. Woo, L.M. Stapleton. "United States Adhesion Prevention with Shear-thinning Polymeric Hydrogels", Leland Stanford Junior University
- Eric Appel. "United States Co-formulation of Amylin Analogues with Insulin Analogues", E.A. Appel, B. Buckingham, D. Maahs, C. Maikawa, G. Agmon
- J.L. Hedrick, E.A. Appel, R.D. Miller, F. Nederberg, R.M. Waymouth. "United States Methods for Making Multi-Branched Polymers", Leland Stanford Junior University
- E.A. Appel, J.L. Hedrick, V.Y. Lee, R.D. Miller, J. Sly. "United States Star Polymers, Methods of Preparation Thereof, and Uses Thereof", IBM
- M.J. Webber, E.A. Appel, R. Langer, D.G. Anderson. "United States Supramolecular Modification of Proteins", Massachusetts Institute of Technology
- O.A. Scherman, E.A. Appel, X.J. Loh, F. Biedermann, M. Rowland. "United Kingdom Cucurbituril-Based Hydrogels", Cambridge Enterprises Limited
- E.A. Appel, M.W. Tibbitt, R. Langer. "United States Shear-thinning Self-healing Networks", Massachusetts Institute of Technology
- E. Abo-Hamed, O.A. Scherman, E.A. Appel. "United Kingdom Hydrogen Storage and Catalysts", The inventors
- Y. Dong, W. Wang, E.A. Appel, B.C. Tang, M.J. Webber, O. Veiseh, K. Xue, R. Langer, D.G. Anderson. "United States Polymers, Hydrogels, and Uses Thereof", Massachusetts Institute of Technology
- O.A. Scherman, E.A. Appel, T.L. Hughes. "United States Viscous Wellbore Fluids", Schlumberger Technology Corp

## LINKS

- Lab Site: [supramolecularbiomaterials.com](http://supramolecularbiomaterials.com)
- LinkedIn: <https://www.linkedin.com/in/eric-appel-29203111>

## Research & Scholarship

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### CURRENT RESEARCH AND SCHOLARLY INTERESTS

The underlying theme of the Appel Lab at Stanford University integrates concepts and approaches from supramolecular chemistry, natural/synthetic materials, and biology. We aim to develop supramolecular biomaterials that exploit a diverse design toolbox and take advantage of the beautiful synergism between physical properties, aesthetics, and low energy consumption typical of natural systems. Our vision is to use these materials to solve fundamental biological questions and to engineer advanced healthcare solutions.

## Teaching

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### COURSES

#### 2023-24

- Organic and Biological Materials: MATSCI 190, MATSCI 210 (Spr)
- The History and Science of Vaccine Technology: OSPOXFRD 30A (Aut)

#### 2022-23

- Biomaterials for Drug Delivery: BIOE 385, MATSCI 385 (Win)

#### 2021-22

- Biomaterials for Drug Delivery: BIOE 385, MATSCI 385 (Win)
- Materials Science Colloquium: MATSCI 230 (Aut, Spr)
- Organic and Biological Materials: MATSCI 190, MATSCI 210 (Spr)

#### 2020-21

- Biomaterials for Drug Delivery: BIOE 385, MATSCI 385 (Win)
- Materials Science Colloquium: MATSCI 230 (Aut, Win, Spr)
- Organic and Biological Materials: MATSCI 190, MATSCI 210 (Spr)

### STANFORD ADVISEES

#### Doctoral Dissertation Reader (AC)

Matine Azadian, Neil Baugh, Brandon Clark, Linus Hein, Sebastian Hendrickx-Rodriguez, Yueming Liu, Narelli Paiva, Amnahir Pena-Alcantara, Jeremy Treiber, Jonathan Weiss, Benj Wollant

#### Postdoctoral Faculty Sponsor

FNU Alakesh, Sophia Bailey, Hector Lopez, Alex Prossnitz, Samya Sen, Andrea d'Aquino

#### Doctoral Dissertation Advisor (AC)

Ibukun Ajifolokun, Lyla Dong, Noah Eckman, Priya Ganesh, Kyra Gillard, Carolyn Jons, John Klich, Emily Meany, Anahita Nejatfard, Leslee Nguyen, Ben Ou, Saira Reyes-Zelaya, Rachel SONG, Olivia Saouaf, Christian Williams, Shoshana Williams, Jerry Yan, Lucy Zhang

#### Doctoral Dissertation Co-Advisor (AC)

Joyce An, Yihang Chen, Gloria Chyr

#### Master's Program Advisor

Rachel Avina, Adam Barsotti, Tomi Sogade

#### Doctoral (Program)

Lyla Dong, Louis Wang, Christian Williams, Felipe de Quesada

#### Postdoctoral Research Mentor

Hector Lopez, Alex Prossnitz

## Publications

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### PUBLICATIONS

- Delivery of CAR-T cells in a transient injectable stimulatory hydrogel niche improves treatment of solid tumors. *Science advances*

- Grosskopf, A. K., Labanieh, L., Klysz, D. D., Roth, G. A., Xu, P., Adebowale, O., Gale, E. C., Jons, C. K., Klich, J. H., Yan, J., Maikawa, C. L., Correa, S., Ou, et al  
2022; 8 (14): eabn8264
- **Hydrogel-Based Slow Release of a Receptor-Binding Domain Subunit Vaccine Elicits Neutralizing Antibody Responses Against SARS-CoV-2.** *Advanced materials (Deerfield Beach, Fla.)*  
Gale, E. C., Powell, A. E., Roth, G. A., Meany, E. L., Yan, J., Ou, B. S., Grosskopf, A. K., Adamska, J., Picece, V. C., d'Aquino, A. I., Pulendran, B., Kim, P. S., Appel, et al  
2021: e2104362
  - **Designing spatial and temporal control of vaccine responses.** *Nature reviews. Materials*  
Roth, G. A., Picece, V. C., Ou, B. S., Luo, W., Pulendran, B., Appel, E. A.  
2021: 1-22
  - **Physical networks from entropy-driven non-covalent interactions.** *Nature communications*  
Yu, A. C., Lian, H., Kong, X., Lopez Hernandez, H., Qin, J., Appel, E. A.  
2021; 12 (1): 746
  - **A Quantitative Description for Designing the Extrudability of Shear-Thinning Physical Hydrogels.** *Macromolecular bioscience*  
Lopez Hernandez, H., Souza, J. W., Appel, E. A.  
2020: e2000295
  - **An ultrafast insulin formulation enabled by high-throughput screening of engineered polymeric excipients.** *Science translational medicine*  
Mann, J. L., Maikawa, C. L., Smith, A. A., Grosskopf, A. K., Baker, S. W., Roth, G. A., Meis, C. M., Gale, E. C., Liang, C. S., Correa, S., Chan, D., Stapleton, L. M., Yu, et al  
2020; 12 (550)
  - **Injectable Hydrogels for Sustained Codelivery of Subunit Vaccines Enhance Humoral Immunity.** *ACS central science*  
Roth, G. A., Gale, E. C., Alcántara-Hernández, M. n., Luo, W. n., Axpe, E. n., Verma, R. n., Yin, Q. n., Yu, A. C., Lopez Hernandez, H. n., Maikawa, C. L., Smith, A. A., Davis, M. M., Pulendran, et al  
2020; 6 (10): 1800–1812
  - **A co-formulation of supramolecularly stabilized insulin and pramlintide enhances mealtime glucagon suppression in diabetic pigs.** *Nature biomedical engineering*  
Maikawa, C. L., Smith, A. A., Zou, L. n., Roth, G. A., Gale, E. C., Stapleton, L. M., Baker, S. W., Mann, J. L., Yu, A. C., Correa, S. n., Grosskopf, A. K., Liang, C. S., Meis, et al  
2020
  - **Wildfire prevention through prophylactic treatment of high-risk landscapes using viscoelastic retardant fluids.** *Proceedings of the National Academy of Sciences of the United States of America*  
Yu, A. C., Lopez Hernandez, H., Kim, A. H., Stapleton, L. M., Brand, R. J., Mellor, E. T., Bauer, C. P., McCurdy, G. D., Wolff, A. J., Chan, D., Criddle, C. S., Acosta, J. D., Appel, et al  
2019
  - **A Multiscale Model for Solute Diffusion in Hydrogels.** *Macromolecules*  
Axpe, E., Chan, D., Offeddu, G. S., Chang, Y., Merida, D., Hernandez, H. L., Appel, E. A.  
2019; 52 (18): 6889–97
  - **Use of a supramolecular polymeric hydrogel as an effective post-operative pericardial adhesion barrier.** *Nature biomedical engineering*  
Stapleton, L. M., Steele, A. N., Wang, H. n., Lopez Hernandez, H. n., Yu, A. C., Paulsen, M. J., Smith, A. A., Roth, G. A., Thakore, A. D., Lucian, H. J., Totherow, K. P., Baker, S. W., Tada, et al  
2019; 3 (8): 611–20
  - **Biomimetic Non-ergodic Aging by Dynamic-to-covalent Transitions in Physical Hydrogels.** *ACS applied materials & interfaces*  
Sen, S., Dong, C., D'Aquino, A. I., Yu, A. C., Appel, E. A.  
2024
  - **Label-Free Composition Analysis of Supramolecular Polymer-Nanoparticle Hydrogels by Reversed-Phase Liquid Chromatography Coupled with a Charged Aerosol Detector.** *Analytical chemistry*  
Tang, S., Pederson, Z., Meany, E. L., Yen, C., Swansiger, A. K., Prell, J. S., Chen, B., Grosskopf, A. K., Eckman, N., Jiang, G., Baillet, J., Pellett, J. D., Appel, et al  
2024

- **Composite gels designed to stick to biological tissue** *NATURE*  
Bailey, S. J., Appel, E. A.  
2024; 625 (7995): 455-457
- **Nanoparticle-Conjugated Toll-Like Receptor 9 Agonists Improve the Potency, Durability, and Breadth of COVID-19 Vaccines.** *ACS nano*  
Ou, B. S., Baillet, J., Picece, V. C., Gale, E. C., Powell, A. E., Saouaf, O. M., Yan, J., Nejatfard, A., Lopez Hernandez, H., Appel, E. A.  
2024
- **Use of a biomimetic hydrogel depot technology for sustained delivery of GLP-1 receptor agonists reduces burden of diabetes management.** *Cell reports. Medicine*  
d'Aquino, A. I., Maikawa, C. L., Nguyen, L. T., Lu, K., Hall, I. A., Jons, C. K., Kasse, C. M., Yan, J., Prossnitz, A. N., Chang, E., Baker, S. W., Hovgaard, L., Steensgaard, et al  
2023; 4 (11): 101292
- **A Regimen Compression Strategy for Commercial Vaccines Leveraging an Injectable Hydrogel Depot Technology for Sustained Vaccine Exposure** *ADVANCED THERAPEUTICS*  
Yan, J., Ou, B. S., Saouaf, O. M., Meany, E. L., Eckman, N., Appel, E. A.  
2023
- **Broad and Durable Humoral Responses Following Single Hydrogel Immunization of SARS-CoV-2 Subunit Vaccine.** *Advanced healthcare materials*  
Ou, B. S., Saouaf, O. M., Yan, J., Bruun, T. U., Baillet, J., Zhou, X., King, N. P., Appel, E. A.  
2023: e2301495
- **Microfluidic encapsulation of photosynthetic cyanobacteria in hydrogel microparticles augments oxygen delivery to rescue ischemic myocardium.** *Journal of bioscience and bioengineering*  
Stapleton, L. M., Farry, J. M., Zhu, Y., Lucian, H. J., Wang, H., Paulsen, M. J., Totherow, K. P., Roth, G. A., Brower, K. K., Fordyce, P. M., Appel, E. A., Woo, Y. J.  
2023
- **Polyacrylamide-based hydrogel coatings improve biocompatibility of implanted pump devices.** *Journal of biomedical materials research. Part A*  
Chan, D., Maikawa, C. L., d'Aquino, A. I., Raghavan, S. S., Troxell, M. L., Appel, E. A.  
2023
- **Subcutaneous delivery of an antibody against SARS-CoV-2 from a supramolecular hydrogel depot.** *Biomaterials science*  
Kasse, C. M., Yu, A. C., Powell, A. E., Roth, G. A., Liang, C. S., Jons, C. K., Buahin, A., Maikawa, C. L., Zhou, X., Youssef, S., Glanville, J. E., Appel, E. A.  
2023
- **Stable High-Concentration Monoclonal Antibody Formulations Enabled by an Amphiphilic Copolymer Excipient.** *Advanced therapeutics*  
Klich, J. H., Kasse, C. M., Mann, J. L., Huang, Y., d'Aquino, A. I., Grosskopf, A. K., Baillet, J., Fuller, G. G., Appel, E. A.  
2023; 6 (1)
- **Injectable Polymer-Nanoparticle Hydrogel for the Sustained Intravitreal Delivery of Bimatoprost** *ADVANCED THERAPEUTICS*  
Meany, E. L., Andaya, R., Tang, S., Kasse, C. M., Fuji, R. N., Grosskopf, A. K., D'Aquino, A. L., Bartoe, J. T., Ybarra, R., Shelton, A., Pederson, Z., Hu, C., Leung, et al  
2022
- **Stable High-Concentration Monoclonal Antibody Formulations Enabled by an Amphiphilic Copolymer Excipient** *ADVANCED THERAPEUTICS*  
Klich, J. H., Kasse, C. M., Mann, J. L., Huang, Y., D'Aquino, A., Grosskopf, A. K., Baillet, J., Fuller, G. G., Appel, E. A.  
2022
- **Angiogenic stem cell delivery platform to augment post-infarction neovasculature and reverse ventricular remodeling.** *Scientific reports*  
Shin, H. S., Thakore, A., Tada, Y., Pedroza, A. J., Ikeda, G., Chen, I. Y., Chan, D., Jaatinen, K. J., Yajima, S., Pfrender, E. M., Kawamura, M., Yang, P. C., Wu, et al  
2022; 12 (1): 17605
- **Extreme Extensibility in Physically Cross-Linked Nanocomposite Hydrogels Leveraging Dynamic Polymer-Nanoparticle Interactions.** *Macromolecules*  
Grosskopf, A. K., Mann, J. L., Baillet, J., Lopez Hernandez, H., Autzen, A. A., Yu, A. C., Appel, E. A.  
2022; 55 (17): 7498-7511
- **Injectable Nanoparticle-Based Hydrogels Enable the Safe and Effective Deployment of Immunostimulatory CD40 Agonist Antibodies.** *Advanced science (Weinheim, Baden-Wuerttemberg, Germany)*

- Correa, S., Meany, E. L., Gale, E. C., Klich, J. H., Saouaf, O. M., Mayer, A. T., Xiao, Z., Liang, C. S., Brown, R. A., Maikawa, C. L., Grosskopf, A. K., Mann, J. L., Idoyaga, et al  
2022: e2103677
- **Formulation Excipients and Their Role in Insulin Stability and Association State in Formulation.** *Pharmaceutical research*  
Maikawa, C. L., Nguyen, L. T., Mann, J. L., Appel, E. A.  
2022
  - **Extreme Extensibility in Physically Cross-Linked Nanocomposite Hydrogels Leveraging Dynamic Polymer-Nanoparticle Interactions** *MACROMOLECULES*  
Grosskopf, A. K., Mann, J. L., Baillet, J., Hernandez, H., Autzen, A. A., Yu, A. C., Appel, E. A.  
2022
  - **Yield-Stress and Creep Control Depot Formation and Persistence of Injectable Hydrogels Following Subcutaneous Administration** *ADVANCED FUNCTIONAL MATERIALS*  
Jons, C. K., Grosskopf, A. K., Baillet, J., Yan, J., Klich, J. H., Saouaf, O. M., Appel, E. A.  
2022
  - **Sustained delivery approaches to improving adaptive immune responses.** *Advanced drug delivery reviews*  
Ou, B. S., Saouaf, O. M., Baillet, J., Appel, E. A.  
2022: 114401
  - **Injectable liposome-based supramolecular hydrogels for the programmable release of multiple protein drugs** *MATTER*  
Correa, S., Grosskopf, A. K., Klich, J. H., Hernandez, H., Appel, E. A.  
2022; 5 (6)
  - **Injectable Liposome-based Supramolecular Hydrogels for the Programmable Release of Multiple Protein Drugs.** *Matter*  
Correa, S., Grosskopf, A. K., Klich, J. H., Hernandez, H. L., Appel, E. A.  
2022; 5 (6): 1816-1838
  - **Combinatorial Polyacrylamide Hydrogels for Preventing Biofouling on Implantable Biosensors.** *Advanced materials (Deerfield Beach, Fla.)*  
Chan, D., Chien, J., Axpe, E., Blankemeier, L., Baker, S. W., Swaminathan, S., Piunova, V. A., Zubarev, D. Y., Maikawa, C. L., Grosskopf, A. K., Mann, J. L., Soh, H. T., Appel, et al  
2022: e2109764
  - **The living interface between synthetic biology and biomaterial design.** *Nature materials*  
Liu, A. P., Appel, E. A., Ashby, P. D., Baker, B. M., Franco, E., Gu, L., Haynes, K., Joshi, N. S., Kloxin, A. M., Kouwer, P. H., Mittal, J., Morsut, L., Noireaux, et al  
2022; 21 (4): 390-397
  - **PNP Hydrogel Prevents Formation of Symbiophara in Mice After Ocular Alkali Injury.** *Translational vision science & technology*  
Swarup, A., Grosskopf, A. K., Stapleton, L. M., Subramaniam, V. R., Li, B., Weissman, I. L., Appel, E. A., Wu, A. Y.  
2022; 11 (2): 31
  - **Real-time monitoring of drug pharmacokinetics within tumor tissue in live animals.** *Science advances*  
Seo, J. W., Fu, K., Correa, S., Eisenstein, M., Appel, E. A., Soh, H. T.  
2022; 8 (1): eabk2901
  - **Multimerization of Ebola GPΔtamucin on protein nanoparticle vaccines has minimal effect on elicitation of neutralizing antibodies.** *Frontiers in immunology*  
Powell, A. E., Xu, D., Roth, G. A., Zhang, K., Chiu, W., Appel, E. A., Kim, P. S.  
2022; 13: 942897
  - **Gelation and yielding behavior of polymer-nanoparticle hydrogels.** *Journal of polymer science (2020)*  
Grosskopf, A. K., Saouaf, O. A., Lopez Hernandez, H., Appel, E. A.  
2021; 59 (22): 2854-2866
  - **Gelation and yielding behavior of polymer-nanoparticle hydrogels** *JOURNAL OF POLYMER SCIENCE*  
Grosskopf, A. K., Saouaf, O. A., Lopez Hernandez, H., Appel, E. A.  
2021

- **Self-Assembled, Dilution-Responsive Hydrogels for Enhanced Thermal Stability of Insulin Biopharmaceuticals.** *ACS biomaterials science & engineering*  
Meis, C. M., Salzman, E. E., Maikawa, C. L., Smith, A. A., Mann, J. L., Grosskopf, A. K., Appel, E. A.  
2021; 7 (9): 4221-4229
- **Ultra-Fast Insulin-Pramlintide Co-Formulation for Improved Glucose Management in Diabetic Rats.** *Advanced science (Weinheim, Baden-Wuerttemberg, Germany)*  
Maikawa, C. L., Chen, P. C., Vuong, E. T., Nguyen, L. T., Mann, J. L., d'Aquino, A. I., Lal, R. A., Maahs, D. M., Buckingham, B. A., Appel, E. A.  
2021: e2101575
- **Consistent tumorigenesis with self-assembled hydrogels enables high-powered murine cancer studies.** *Communications biology*  
Grosskopf, A. K., Correa, S., Baillet, J., Maikawa, C. L., Gale, E. C., Brown, R. A., Appel, E. A.  
2021; 4 (1): 985
- **Affinity-Directed Dynamics of Host-Guest Motifs for Pharmacokinetic Modulation via Supramolecular PEGylation.** *Biomacromolecules*  
Maikawa, C. L., d'Aquino, A. I., Vuong, E. T., Su, B., Zou, L., Chen, P. C., Nguyen, L. T., Autzen, A. A., Mann, J. L., Webber, M. J., Appel, E. A.  
2021
- **Engineering Insulin Cold Chain Resilience to Improve Global Access.** *Biomacromolecules*  
Maikawa, C. L., Mann, J. L., Kannan, A., Meis, C. M., Grosskopf, A. K., Ou, B. S., Autzen, A. A., Fuller, G. G., Maahs, D. M., Appel, E. A.  
2021
- **More than a fertilizer: wastewater-derived struvite as a high value, sustainable fire retardant** *GREEN CHEMISTRY*  
Kim, A. H., Yu, A. C., El Abbadi, S. H., Lu, K., Chan, D., Appel, E. A., Criddle, C. S.  
2021
- **Modulation of injectable hydrogel properties for slow co-delivery of influenza subunit vaccine components enhance the potency of humoral immunity.** *Journal of biomedical materials research. Part A*  
Saouaf, O. M., Roth, G. A., Ou, B. S., Smith, A. A., Yu, A. C., Gale, E. C., Grosskopf, A. K., Picece, V. C., Appel, E. A.  
2021
- **Translational Applications of Hydrogels.** *Chemical reviews*  
Correa, S., Grosskopf, A. K., Lopez Hernandez, H., Chan, D., Yu, A. C., Stapleton, L. M., Appel, E. A.  
2021
- **Full closed loop open-source algorithm performance comparison in pigs with diabetes.** *Clinical and translational medicine*  
Lal, R. A., Maikawa, C. L., Lewis, D., Baker, S. W., Smith, A. A., Roth, G. A., Gale, E. C., Stapleton, L. M., Mann, J. L., Yu, A. C., Correa, S., Grosskopf, A. K., Liong, et al  
2021; 11 (4): e387
- **Controlling properties of thermogels by tuning critical solution behaviour of ternary copolymers dagger** *POLYMER CHEMISTRY*  
Smith, A. A., Maikawa, C. L., Lopez Hernandez, H., Appel, E. A.  
2021
- **Enhanced Humoral Immune Response by High Density TLR Agonist Presentation on Hyperbranched Polymers** *ADVANCED THERAPEUTICS*  
Liong, C. S., Smith, A. A., Mann, J. L., Roth, G. A., Gale, E. C., Maikawa, C. L., Ou, B. S., Appel, E. A.  
2021
- **Injectable Supramolecular Polymer-Nanoparticle Hydrogels for Cell and Drug Delivery Applications.** *Journal of visualized experiments : JoVE*  
Meis, C. M., Grosskopf, A. K., Correa, S., Appel, E. A.  
2021
- **Seasonal Impact of Phosphate-Based Fire Retardants on Soil Chemistry Following the Prophylactic Treatment of Vegetation.** *Environmental science & technology*  
Yu, A. C., Reinhart, M., Hunter, R., Lu, K., Maikawa, C. L., Rajakaruna, N., Acosta, J. D., Stubler, C., Appel, C., Appel, E. A.  
2021
- **Dynamic Hydrogels for Prevention of Post-Operative Peritoneal Adhesions** *ADVANCED THERAPEUTICS*  
Stapleton, L. M., Lucian, H. J., Grosskopf, A. K., Smith, A. A., Tothorow, K. P., Woo, Y., Appel, E. A.  
2021

- **Prolonged Codelivery of Hemagglutinin and a TLR7/8 Agonist in a Supramolecular Polymer-Nanoparticle Hydrogel Enhances Potency and Breadth of Influenza Vaccination.** *ACS biomaterials science & engineering*  
Roth, G. A., Saouaf, O. M., Smith, A. A., Gale, E. C., Hernandez, M. A., Idoyaga, J., Appel, E. A.  
2021
- **Engineering biopharmaceutical formulations to improve diabetes management.** *Science translational medicine*  
Maikawa, C. L., d'Aquino, A. I., Lal, R. A., Buckingham, B. A., Appel, E. A.  
2021; 13 (578)
- **Isthmin-1 is an adipokine that promotes glucose uptake and improves glucose tolerance and hepatic steatosis.** *Cell metabolism*  
Jiang, Z., Zhao, M., Voilquin, L., Jung, Y., Aikio, M. A., Sahai, T., Dou, F. Y., Roche, A. M., Carcamo-Orive, I., Knowles, J. W., Wabitsch, M., Appel, E. A., Maikawa, et al  
2021
- **miR-106a-363 cluster in extracellular vesicles promotes endogenous myocardial repair via Notch3 pathway in ischemic heart injury.** *Basic research in cardiology*  
Jung, J. H., Ikeda, G. n., Tada, Y. n., von Bornstädt, D. n., Santoso, M. R., Wahlquist, C. n., Rhee, S. n., Jeon, Y. J., Yu, A. C., O'Brien, C. G., Red-Horse, K. n., Appel, E. A., Mercola, et al  
2021; 116 (1): 19
- **A fluorescence sandwich immunoassay for the real-time continuous detection of glucose and insulin in live animals.** *Nature biomedical engineering*  
Poudineh, M., Maikawa, C. L., Ma, E. Y., Pan, J., Mamerow, D., Hang, Y., Baker, S. W., Beirami, A., Yoshikawa, A., Eisenstein, M., Kim, S., Vuckovic, J., Appel, et al  
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