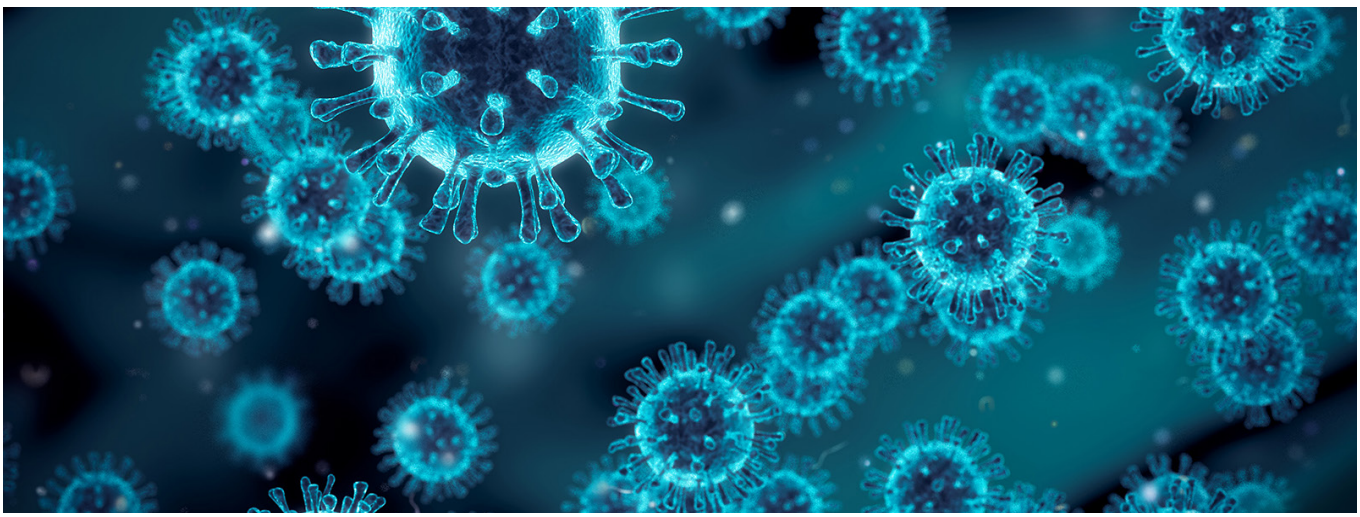
Overview

QCM-D analysis in virus-related research

Examples of publications



QCM-D, which is a surface-sensitive technology, has been used to explore and characterize various aspects of biological systems for more than two decades. The time-resolved information of mass changes at the surface can be used to study biomolecular interactions and reveal insights that are useful in virus-related research. Over the years, QCM-D technology has been used in fundamental as well as applied studies to shed light on several different aspects of virus behavior and interaction with their surroundings. Below, we have compiled a list of references in this area.

List of Publications

- **Probing the influence of tether density on tethered bilayer lipid membrane (tBLM)-peptide interactions**
  Park S, Yorulmaz Avsar S, Cornell B, Ferhan AR, Jeon WY, Chung M, Cho NJ
  Applied Materials Today 2020; 100527
- **Comparing the Membrane Interaction Profiles of Two Antiviral Peptides: Insights into Structure-Function Relationship**
  Park S, Jackman JA, Cho NJ
  Langmuir 2019; 35, 30, 9934-9943
- **Quantitative Accounting of Dye Leakage and Photobleaching in Single Lipid Vesicle Measurements: Implications for Biomacromolecular Interaction Analysis**
  Park S, Jackman JA, Cho NJ
  Colloids and Surfaces B: Biointerfaces 2019; 182,110338
- **Competition for Membrane Receptors: Norovirus Detachment via Lectin Attachment**
  Nagma Parveen, Gustaf E. Rydell, Göran Larson, Vesa P. Hytönen, Vladimir P. Zhdanov, Fredrik Höök, Stephan Block
  J. Am. Chem. Soc. 2019, 141, 41, 16303-16311
- **In-depth characterization of congenital Zika syndrome in immunocompetent mice: Antibody-dependent enhancement and an antiviral peptide therapy**
  Camargos VN, et al.
  EBioMedicine 2019; 44, 516-529
- **Micropatterned Viral Membrane Clusters for Antiviral Drug Evaluation**
  Park S, Jackman JA, Xu XB, Weiss PS, Cho NJ
  ACS Applied Materials & Interfaces 2019; 11 (15), 13984–13990
- **Targeting the Achilles Heel of Mosquito-Borne Viruses for Antiviral Therapy**
  Jackman JA, Shi PY, Cho NJ
  ACS Infectious Diseases 2019; 5(1), 4-8

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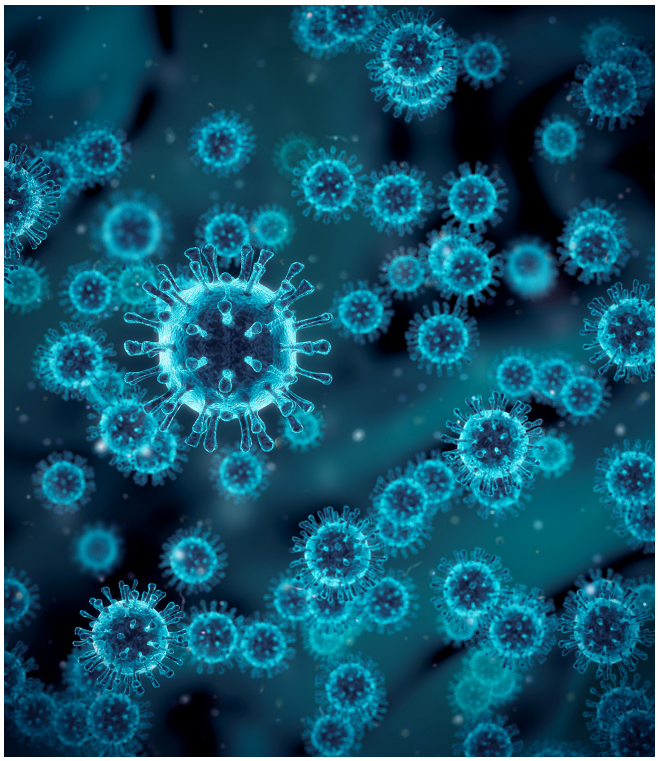
- **Therapeutic Treatment of Zika Virus Infection Using a Brain-Penetrating Antiviral Peptide**
  Jackman JA, et al.
  Nature Materials 2018; 17, 971–977
- **Targeting vesicle size: An amphipathic peptide has been engineered and is capable of penetrating the blood-brain barrier as well as possessing a potent antiviral activity against Zika and other mosquito-borne viruses**
  Zing Zou, Pei-Yong Shi
  Nature Materials 2018; 17, 950–957
- **Real-time analysis of protein and protein mixture interaction with lipid bilayers**
  S Heider, E Reimhult, C Metzner
  Biochimica et Biophysica Acta, Volume 1860, Issue 2, February 2018, Pages 319-328
- **Targeting the Achilles Heel of Zika Virus and Other Emerging Viral Pathogens**
  Jackman JA, Cho NJ
  Advanced Therapeutics 2018; 1(5), 1800045
- **Membrane Deformation Induces Clustering of Norovirus Bound to Glycosphingolipids in a Supported Cell-Membrane Mimic**
  Nagma Parveen, Inga Rimkute, Stephan Block, Gustaf E. Rydell, Daniel Midtvedt, Göran Larson, Vesa P. Hytönen, Vladimir P. Zhdanov, Anders Lundgren, Fredrik Höök
  J. Phys. Chem. Lett. 2018, 9, 9, 2278-2284
- **Self-Association and Conformational Variation of NS5A Domain 1 of Hepatitis C Virus**
  Beldar S, Manimekalai MSS, Cho NJ, Baek KH, Gruber G, Yoon HS
  Journal of General Virology 2018; 99(2), 194-208
- **Detection of Amphipathic Viral Peptide on Screen-Printed Electrodes by Liposome Rupture Impact Voltammetry**
  Nasir MZM, Jackman JA, Cho NJ, Ambrosi A, Pumera M
  Analytical Chemistry 2017; 89(21), 11753-11757
- **Real-time monitoring of interactions between Ebola fusion peptide and solid-supported phospholipid membranes: Effect of peptide concentration and layer geometry**
  M.Khorshid, P.Losada-Pérez, G.Wackers, D.Yongabi, F.U.Renner, R.Thoelen, P. Wagner
  Physics in Medicine, Volume 4, December 2017, Pages 1-7
- **Detachment of Membrane Bound Virions by Competitive Ligand Binding Induced Receptor Depletion**
  Nagma Parveen, Stephan Block, Vladimir P. Zhdanov, Gustaf E. Rydell, and Fredrik Höök
  Langmuir 2017, 33, 16, 4049-4056
- **Quantitative Evaluation of Viral Protein Binding to Phosphoinositide Receptors and Pharmacological Inhibition**
  Kim SO, Jackman JA, Elazar M, Cho SJ, Glenn JS, Cho NJ
  Analytical Chemistry 2017; 89(18), 9742-9750
- **Random sequential adsorption of human adenovirus 2 onto polyvinylidene fluoride surface influenced by extracellular polymeric substances**
  R Lu, Q Li, TH Nguyen
  Journal of colloid and interface science, Volume 466, 15 March 2016, Pages 120-127
- **Reconstitution and Functional Analysis of a Full-Length Hepatitis C Virus NS5B Polymerase on a Supported Lipid Bilayer**
  Cho NJ, Pham EA, Hagey RJ, Leveque VJ, Ma H, Klumpp K, Glenn JS
  ACS Central Science 2016; 2(7), 456-466
- **Polyethylenimine surface layer for enhanced virus immobilization on cellulose**
  G Tiliket, G Ladam, QT Nguyen, L Lebrun
  Applied Surface Science, Vol. 370, 1 May 2016, Pages 193-200
- **Plasmonic Nanohole Sensor for Capturing Single Virus-Like Particles towards Virucidal Drug Evaluation**
  Jackman JA, Linardy E, Yoo DH, Seo JE, Ng WB, Klemme D, Wittenberg N, Oh SH, Cho NJ
  Small 2016; 12(9), 1159-1166
- **Nanomedicine for Infectious Disease Applications: Innovation towards Broad-Spectrum Treatment of Viral Infections**
  Jackman JA, Lee JW, Cho NJ
  Small 2016; 12(9), 1133-1139
- **Deciphering How Pore Formation Causes Strain-Induced Membrane Lysis of Lipid Vesicles**
  Jackman JA, Goh HZ, Zhdanov VP, Knoll W, Cho NJ
  Journal of the American Chemical Society 2016; 138(4), 1406-1413
- **Cholesterol-Enriched Domain Formation Induced by Viral-Encoded, Membrane-Active Amphipathic Peptide**
  Hanson JM, Gettel DL, Tabaei SR, Jackman JA, Kim MC, Sasaki DY, Liedberg B, Groves JT, Cho NJ, Parikh AN
  Biophysical Journal 2016; 110(1), 176-187
- **Combination of Pharmacophore Hypothesis and Molecular Docking to Identify Novel Inhibitors Targeting Thumb Site II of HCV NS5B Polymerase**
  Amaravadhi H, Li E, Lee JJ, Cho NJ, Yoon HS
  Molecular Diversity 2015; 19(3) 529-539
- **Correlation between Membrane Partitioning and Functional Activity in a Single Lipid Vesicle Assay Establishes Design Guidelines for Antiviral Peptides**
  Jackman JA, Saravanan R, Zhang Y, Tabaei SR, Cho NJ
  Small 2014; 11(20), 2372-2379

- **Procedure for developing linear and Bayesian classification models based on immunosensor measurements**
  Stephen Mobley, Sunil Yalamanchili, Hongzheng Zhang, Rossella Marullo, Zhuo G. Chen, Carlos S. Moreno, Dong M. Shin, Paul W. Doetsch, William D. Hunt
  Sensors and Actuators B: Chemical Volume 190, January 2014, Pages 165–170
- **Phosphatidylinositol 4,5-Bisphosphate is an HCV NS5A Ligand and Mediates Replication of the Viral Genome**
  Cho NJ, Lee CH, Pang PS, Sklan EH, Koytak ES, Kay CK, Kanazawa KK, Frank CW, Glenn JS
  Gastroenterology 2015; 148(3), 616-625
- **Rupture of Lipid Vesicles by a Broad-Spectrum Antiviral Peptide: Influence of Vesicle Size**
  Jackman JA, Goh HZ, Zhdanov VP, Cho NJ
  Journal of Physical Chemistry B 2013; 117(50), 16117-16128
- **Location of the Bacteriophage P22 Coat Protein C-Terminus Provides Opportunities for the Design of Capsid-Based Materials**
  Amy Servid, Paul Jordan, Alison O'Neil, Peter Prevelige, Trevor Douglas
  Biomacromolecules, 2013, 14 (9), pp 2989–2995
- **Single Vesicle Analysis Reveals Nanoscale Membrane Curvature Selective Pore Formation in Lipid Membranes by an Antiviral α–Helical Peptide**
  Tabaei SR, Rabe M, Zhdanov VP, Cho NJ, Höök F
  Nano Letters 2012; 2(11), 5719-5725
- **Model Membrane Platforms for Biomedicine: Case Study on Antiviral Drug Development**
  Jackman JA, Cho NJ
  Biointerphases 2012; 7(18), 1-20
- **Deposition kinetics of MS2 bacteriophages on clay mineral surfaces**
  Meiping Tong, Yun Shen, Haiyan Yang, Hyunjung Kim
  Colloids and Surfaces B: Biointerfaces, Volume 92, 1 April 2012, Pages 340–347
- **Application of Quartz Crystal Microbalance with Dissipation Monitoring Technology for Studying Interactions of Poxviral Proteins with Their Ligands**
  Amod P. Kulkarni, Lauriston A. Kellaway and Girish J. Kotwal
  VACCINIA VIRUS AND POXVIROLOGY Methods in Molecular Biology, 2012, Volume 890, 289-303
- **Norovirus GII.4 Virus-like Particles Recognize Galactosylceramides in Domains of Planar Supported Lipid Bilayers**
  Marta Bally, Gustaf E. Rydell, Raphael Zahn, Waqas Nasir, Christian Eggeling, Michael E. Breimer, Lennart Svensson, Fredrik Höök, Göran Larson
  Angewandte Chemie Volume 124, Issue 48, pages 12186–12190, November 26, 2012
- **Interactions between Rotavirus and Suwannee River Organic Matter: Aggregation, Deposition, and Adhesion Force Measurement**
  Leonardo Gutierrez † and Thanh H. Nguyen
  Environ. Sci. Technol., 2012, 46 (16), pp 8705–8713
- **Biomimetic supported lipid bilayers with high cholesterol content formed by α-helical peptide-induced vesicle fusion**
  Hardy G.J., Nayak R., Munir Alam S., Shapter J.G., Heinrich F., Zauscher S.
  J. Mater. Chem., 2012,22, 19506-19513
- **Influence of solution chemistry on the deposition and detachment kinetics of RNA on silica surfaces**
  Shen Y., Kim H., Tong M., Li Q.
  Colloids and Surfaces B: Biointerfaces, Volume 82, Issue 2, 1 February 2011, Pages 443-449
- **A mechanistic investigation of cell-penetrating Tat peptides with supported lipid membranes**
  Piantavigna S., McCubbin G.A, Boehnke S., Graham B., Spiccia L., Martin L.L.
  Biochimica et Biophysica Acta (BBA) - Biomembranes, Volume 1808, Issue 7, July 2011, Pages 1811-1817
- **Self-assembly of anisotropic tobacco mosaic virus nanoparticles on gold substrate**
  Peng B., Liu N., Lin Y., Wang L., Zhang W., Niu Z., Wang Q., Su Z.
  SCIENCE CHINA Chemistry, Volume 54, Number 1, p 137-143, 2011
- **Adsorption and Aggregation Properties of Norovirus GI and GII Virus-like Particles Demonstrate Differing Responses to Solution Chemistry**
  da Silva A.K., Kavanagh O.V., Estes M.K., Elimelech M.
  Environ. Sci. Technol., 2011, 45 (2), pp 520–526
- **Identification of a Class of HCV Inhibitors Directed Against the Nonstructural Protein NS4B**
  Cho NJ, Dvory-Sobol H, Lee CH, Cho SJ, Glenn JS
  Science Translational Medicine 2010; 2(15), 15ra6
- **A Small Molecule Inhibits HCV Replication and Alters NS4B's Subcellular Distribution**
  Bryson PD, Cho NJ, Einav S, Lee CH, Tai V, Bechtel J, Sivaraja M, Roberts C, Schmitz U, Glenn JS
  Antiviral Research 2010; 87(1), 1-8
- **Deposition and Aggregation Kinetics of Rotavirus in Divalent Cation Solutions**
  Gutierrez L., Mylon S.E., Nash B., Nguyen T.H.
  Environ. Sci. Technol., 2010, 44 (12), pp 4552–4557

- **Virus particles as active nanomaterials that can rapidly change their viscoelastic properties in response to dilute solutions**
  Rayaprolu V., Manning B. M., Douglas T., Bothner B.
  SOFT MATTER, Volume: 6, Issue: 21, Pages: 5286-5288, 2010
- **Use of the quartz crystal microbalance to monitor ligand-induced conformational rearrangements in HIV-1 envelope protein gp120**
  Lee H-S, Contarino M, Umashankara M., Schön A., Freire E., Smith A.B., Chaiken I.M., Penn L.S.
  Analytical and Bioanalytical Chemistry, Volume 396, Number 3 / February, 2010, Pages 1143-1152
- **A versatile SERS-based immunoassay for immunoglobulin detection using antigen-coated gold nanoparticles and malachite green-conjugated protein A/G**
  Neng J., Harpster M.H., Zhang H., Mecham J.O., Wilson W.C, Johnson P.A
  Biosensors and Bioelectronics, Volume 26, Issue 3, 15 November 2010, Pages 1009-1015
- **QCM-D studies of human norovirus VLPs binding to glycosphingolipids in supported lipid bilayers reveal strain-specific characteristics**
  Rydell G.E., Dahlin A.B., Höök F., Larson G.
  Glycobiology vol. 19 no. 11 pp. 1176–1184, 2009
- **Mechanism of an Amphipathic α-Helical Peptide's Antiviral Activity Involves Size-Dependent Virus Particle Lysis**
  Cho NJ, Dvory-Sobol H, Xiong A, Frank CW, Glenn JS
  ACS Chemical Biology 2009; 4(12), 1061-1067
- **Viral Infection of Human Progenitor and Liver-Derived Cells Encapsulated in Three-Dimensional PEG-based Hydrogel**
  Cho NJ, Elazar M, Xiong A, Lee WJ, Chiao E, Baker EJ, Frank CW, Glenn JS
  Biomedical Materials 2009; 4(1), 011001
- **SERS detection of indirect viral DNA capture using colloidal gold and methylene blue as a Raman label**
  Harpster M.H., Zhang H., Sankara-Warrier A.K., Ray B.H., Ward T.R., Kollmar J.P., Carron K.T., Mecham J.O., Corcoran R.C., Wilson W.C., Johnson P.A.
  Biosensors and Bioelectronics, Volume 25, Issue 4, 15 December 2009, Pages 674-681
- **G-protein coupled receptor array technologies: Site directed immobilisation of liposomes containing the H1-histamine or M2-muscarinic receptors**
  Bailey K., Bally M., Leifert W, Vörös J, McMurchie T.
  PROTEOMICS, 9 (8), No. 8 April 2009, Pages: 2052-2063
- **Parallel acoustic detection of biological warfare agents surrogates by means of piezoelectric immunochips**
  Alava T., Berthet-Duroure N., Ayela C., Trévisiol E., Pugnière M., Morel Y., Rameil P., Nicu L.
  Sensors and Actuators B: Chemical, 138 (2), 6 May 2009, Pages 532-538



- **Lipopeptides derived from HIV and SIV mimicking the prehairpin intermediate of gp41 on solid supported lipid bilayers**
  Schuy S., Schäfer E., Yoder N.C, Kumar K., Vogel R., Janshoff A.
  Journal of Structural Biology, Volume 168, Issue 1, October 2009, Pages 125-136
- **Assembly of Multilayer Arrays of Viral Nanoparticles via Biospecific Recognition: A Quartz Crystal Microbalance with Dissipation Monitoring Study**
  Steinmetz N.F., Bock E., Richter R.P., Spatz J.P., Lomonossoff G.P., Evans D.J.
  Biomacromolecules 2008, 9, 456–462
- **Employing an Amphipathic Viral Peptide to Create a Lipid Bilayer on Au and TiO2**
  Cho NJ, Cho SJ, Cheong KH, Glenn JS, Frank CW
  Journal of the American Chemical Society 2007; 129(33), 10050-10051
- **Binding Dynamics of Hepatitis C Virus' NS5A Amphipathic Peptide to Cell and Model Membranes**
  Cho NJ, Cheong KH, Lee CH, Frank CW, Glenn JS
  Journal of Virology 2007; 81(12), 6682-6689
- **Creation of Lipid Partitions by Deposition of Amphipathic Viral Peptides**
  Cho NJ, Cho SJ, Hardesty JO, Glenn JS, Frank CW
  Langmuir 2007; 23(21), 10855-10863

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