Stanford

Shirit Einav

Professor of Medicine (Infectious Diseases) and of Microbiology and Immunology

Medicine - Infectious Diseases

CLINICAL OFFICE (PRIMARY)

- **Infectious Disease**

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  Stanford, CA 94305

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Bio

CLINICAL FOCUS

- Infectious Disease

ACADEMIC APPOINTMENTS

- Professor, Medicine - Infectious Diseases
- Professor, Microbiology & Immunology
- Member, Bio-X
- Member, SPARK at Stanford
- Member, Maternal & Child Health Research Institute (MCHRI)
- Member, Wu Tsai Neurosciences Institute

ADMINISTRATIVE APPOINTMENTS

- Professor (with tenure), Department of Medicine, Department of Microbiology and Immunology, (2023- present)
- Associate Professor, Department of Medicine, Department of Microbiology and Immunology, (2018-2023)
- Assistant Professor (UTL), Department of Medicine, Department of Microbiology and Immunology, (2011-2018)
- Instructor of Medicine, Division of Infectious Diseases and Geographic Medicine, Stanford University School of Medicine, (2009-2011)
- Infectious Diseases Fellowship, Division of Infectious Diseases and Geographic Medicine, Stanford University School of Medicine, (2004-2008)
- Postdoctoral Fellowship. Supervisor: Dr. Jeffrey S. Glenn, Division of Gastroenterology and Hepatology, Stanford University School of Medicine, (2003-2004)
- Medical Internship and Residency, Internal Medicine, Beth Israel Deaconess Medical Center, Harvard Medical School, Boston, MA, (1999-2002)
- Research Studentship, Supervisor: Dr. Michael C. Carroll., Brigham and Women’s Hospital and the Center for Blood Research, Harvard Medical School, Boston, MA, (1999-1999)
- Rotating internship (part of the M.D. requirements in Israel), Suraski Medical Center, Tel-Aviv, Israel, (1997-1998)

HONORS AND AWARDS

- Chan Zuckerberg Biohub Investigator, Chan Zuckerberg Biohub (2022)

- Investigator-Initiated Research Award, Department of Defense (2022)
- Expansion award, Department of Defense (2021)
- Transformation award, Dr. Ralph & Marian Falk Medical Research Trust (2020)
- Investigator-Initiated Research Award, Department of Defense (2019)
- Catalyst Award, Dr. Ralph & Marian Falk Medical Research Trust (2018)
- Interdisciplinary Initiative Program Award, Stanford Bio-X (2016)
- Investigator-Initiated Research Award, Department of Defense (2016)
- McCormick Faculty Award, Stanford University School of Medicine, Office of Diversity and Leadership (2015)
- Research Scholar Grant, American Cancer Society (2014)
- Clinical Scientist Development Award, Doris Duke Charitable Foundation (2013)
- IDSA 2012 IDWeek Investigator Award, Infectious Diseases Society of America (IDSA) (2012)
- Stanford Bio-X Interdisciplinary Initiative Program Award, Stanford, Bio-X (2012)
- DDC Pilot/Feasibility Award, Stanford Digestive Disease Center (DDC) (2009)
- IDSA 2009 Program Committee Choice Award, Infectious Diseases Society of America (IDSA) (2009)
- Mentored Clinical Scientist Development Award (KO8), NIH/NIAID (2008 - 2013)
- ITI Young Investigator Innovation Award, Stanford Institute for Immunity, Transplantation, and Infection (ITI) (2008)
- American Liver Foundation Postdoctoral Fellowship Award, American Liver Foundation (ALF) (2006)
- Dean's Fellowship Award, Stanford University School of Medicine, Stanford, CA (2004)
- Outstanding Thesis Award, Sackler School of Medicine, Tel-Aviv University (1999)

BOARDS, ADVISORY COMMITTEES, PROFESSIONAL ORGANIZATIONS

- Investigator, Chan Zuckerberg Biohub (2022 - present)
- Fellow (FIDSA), Infectious Diseases Society of America (2018 - present)
- Faculty Fellow, Center for Innovation in Global Health (2016 - present)
- Member, Bio-X Leadership Council (2016 - present)
- Member, Stanford Biosafety committee (2016 - 2020)

PROFESSIONAL EDUCATION

- Board Certification: Infectious Disease, American Board of Internal Medicine (2006)
- Fellowship: Stanford University Pediatric Infectious Disease Fellowship (2009) CA
- Residency: Beth Israel Deaconess Med Center/Harvard (2002) MA
- Medical Education: Sackler School of Medicine (1998) Israel
- Internship: Beth Israel Deaconess Med Center/Harvard (2000) MA
- MD, Sackler School of Medicine, Israel , Medicine (1999)
- BA, Sackler School of Medicine, Israel , Medical sciences (1994)

LINKS

- Einav Lab Website: http://med.stanford.edu/einavlab
- In the news: http://www.the-scientist.com/?articles.view/articleNo/33759/title/Macro--Mini--Micro/
- In the news: http://news.stanford.edu/news/2013/september/einav-quake-antiviral-092613.html
- In the news: https://med.stanford.edu/news/all-news/2017/02/drug-combination-defeats-dengue-ebola-in-mice-study-finds.html

- In the news: http://www.fiercebiotech.com/research/cancer-drugs-tarceva-and-sutent-hold-ebola-and-dengue-at-bay-mice

Research & Scholarship

CURRENT RESEARCH AND SCHOLARLY INTERESTS

Our basic research program focuses on understanding the roles of virus-host interactions in viral infection and disease pathogenesis via both molecular and systems virology/immunology single cell approaches. This program is combined with translational efforts to apply this knowledge for the development of broad-spectrum host-centered antiviral approaches to combat emerging viral infections, including dengue, encephalitic alphaviruses, SARS-CoV-2 and Ebola, and means to predict disease progression.

Our interdisciplinary studies focus on the following emerging concepts that are transforming our understanding of virus-host interactions:

1. Understanding the pathogenesis of viral infections via an integrative systems immunology single cell approach. The goal of this project is to elucidate the cellular and molecular factors contributing to increased severity of viral infections e.g. dengue, Zika COVID-19 in distinct patient populations. To achieve this goal, we are advancing and utilizing various single-cell immunological approaches (virus-inclusive single cell RNA-seq, CyTOF etc), PBMC samples from our large Colombia dengue cohort (>500 patients) and Zika cohort, tissue samples from cadavers infected with arboviruses, as well as various unique human organoid models. We are mapping an atlas of viral immune cellular targets and studying critical protective and pathogenic elements of the host response to these viruses in multiple distinct infected and bystander cell subtypes with an unprecedented resolution. The translational goals of this project are to identify candidate biomarkers associated with infection outcome and candidate targets for antiviral therapy, as well as improve vaccine strategies. Notably, we have recently discovered such candidate biomarkers that are highly predictive of progression to severe dengue and are currently translating this discovery into the development of the first molecular prognostic assay to predict severe dengue early in the course of infection.

2. Deciphering the intracellular membrane trafficking pathways essential for viral pathogens. We use transcriptomic, proteomic, genetic, and pharmacological approaches to identify proteins that are critical for the replication of multiple globally relevant RNA viruses including dengue virus, Zika virus, encephalitis alphaviruses, SARS-CoV-2, hepatitis C virus, and Ebola virus. We are studying the molecular mechanisms by which these viruses hijack cellular membrane trafficking pathways for mediating key steps in their viral life cycle and are characterizing the roles these factors play in cellular biology using viruses as complexed probes. Ongoing work focuses on the roles of cellular kinases (NUMB-associated kinases, receptor tyrosine kinases, lipid kinases) and adaptor protein complexes in viral trafficking during various stages of the viral life cycle, the role of the ESCRT machinery in intracellular viral budding, and the roles of ubiquitin signaling pathways in the regulation of trafficking during viral assembly and release.

3. Advancing the development of small molecules targeting host functions as broad-spectrum antivirals. Most direct antiviral strategies targeting viral enzymes provide a “one drug, one bug” approach and are associated with the emergence of viral resistance. We have discovered several host functions exploited by multiple viruses as targets for broad-spectrum antivirals. We have demonstrated the utility of a repurposed approach that inhibits these factors in suppressing replication of multiple RNA viruses both in vitro and in mouse models, and are advancing this approach into the clinic and studying its mechanism of action. In parallel, we are developing chemically distinct small molecules targeting various cellular functions as pharmacological tools to study cell biology and viral infection and as broad-spectrum antivirals to combat SARS-CoV-2, dengue virus, encephalitic alphaviruses and Ebola virus.

Teaching

STANFORD ADVISEES

Med Scholar Project Advisor

Praveen Tummalapalli

Doctoral Dissertation Reader (AC)

Jeanna Enriquez

Postdoctoral Faculty Sponsor

Busra Cagirici, Orianne Constant, Veronica Duran, Aakriti Gangwal, Manon Gourdelier, Marwah Karim, Chieh Wen Lo, Manjari Mishra, Amrita Ojha

Postdoctoral Research Mentor

Busra Cagirici, Orianne Constant, Veronica Duran, Aakriti Gangwal, Marwah Karim, Chieh Wen Lo, Manjari Mishra

GRADUATE AND FELLOWSHIP PROGRAM AFFILIATIONS

- Microbiology and Immunology (Phd Program)

Publications

PUBLICATIONS

- **An orally bioavailable SARS-CoV-2 main protease inhibitor exhibits improved affinity and reduced sensitivity to mutations.** *Science translational medicine*
  Westberg, M., Su, Y., Zou, X., Huang, P., Rustagi, A., Garhyan, J., Patel, P. B., Fernandez, D., Wu, Y., Hao, C., Lo, C. W., Karim, M., Ning, et al
  2024; 16 (738): eadi0979
- **Chemical inactivation strategies for SARS-CoV-2-infected cells and organoids.** *STAR protocols*
  Karim, M., Pohane, A. A., Lo, C. W., Einav, S., Garhyan, J.
  2024; 5 (1): 102906
- **Back-pocket optimization of 2-aminopyrimidine-based macrocycles leads to potent dual EPHA2/GAK kinase inhibitors with antiviral activity.** *bioRxiv : the preprint server for biology*
  Gerninghaus, J., Zhubi, R., Krämer, A., Karim, M., Tran, D. H., Joerger, A. C., Schreiber, C., Berger, L. M., Berger, B. T., Ehret, T. A., Elson, L., Lenz, C., Saxena, et al
  2024
- **Systems immunology of transcriptional responses to viral infection identifies conserved antiviral pathways across macaques and humans.** *Cell reports*
  Ratnasiri, K., Zheng, H., Toh, J., Yao, Z., Duran, V., Donato, M., Roederer, M., Kamath, M., Todd, J. M., Gagne, M., Foulds, K. E., Francica, J. R., Corbett, et al
  2024; 43 (2): 113706
- **Global and cell type-specific immunological hallmarks of severe dengue progression identified via a systems immunology approach.** *Nature immunology*
  Ghita, L., Yao, Z., Xie, Y., Duran, V., Cagirici, H. B., Samir, J., Osman, I., Rebellón-Sánchez, D. E., Agudelo-Rojas, O. L., Sanz, A. M., Sahoo, M. K., Robinson, M. L., Gelvez-Ramirez, et al
  2023
- **Single B cell transcriptomics identifies multiple isotypes of broadly neutralizing antibodies against flaviviruses.** *PLoS pathogens*
  Lubow, J., Levoir, L. M., Ralph, D. K., Belmont, L., Contreras, M., Cartwright-Acar, C. H., Kikawa, C., Kannan, S., Davidson, E., Duran, V., Rebellon-Sanchez, D. E., Sanz, A. M., Rosso, et al
  2023; 19 (10): e1011722
- **Anticancer pan-ErbB inhibitors reduce inflammation and tissue injury and exert broad-spectrum antiviral effects.** *The Journal of clinical investigation*
  Saul, S., Karim, M., Ghita, L., Huang, P. T., Chiu, W., Durán, V., Lo, C. W., Kumar, S., Bhalla, N., Leyssen, P., Alem, F., Boghdeh, N. A., Tran, et al
  2023
- **Preparing for the next viral threat with broad-spectrum antivirals.** *The Journal of clinical investigation*
  Karim, M., Lo, C. W., Einav, S.
  2023; 133 (11)
- **Magnitude and kinetics of the human immune cell response associated with severe dengue progression by single-cell proteomics.** *Science advances*
  Robinson, M. L., Glass, D. R., Duran, V., Agudelo Rojas, O. L., Sanz, A. M., Consuegra, M., Sahoo, M. K., Hartmann, F. J., Bosse, M., Gelvez, R. M., Bueno, N., Pinsky, B. A., Montoya, et al
  2023; 9 (12): eade7702
- **Nonlytic cellular release of hepatitis A virus requires dual capsid recruitment of the ESCRT-associated Bro1 domain proteins HD-PTP and ALIX.** *PLoS pathogens*

Shirasaki, T., Feng, H., Duyvesteyn, H. M., Fusco, W. G., McKnight, K. L., Xie, L., Boyce, M., Kumar, S., Barouch-Bentov, R., Gonzalez-Lopez, O., McNamara, R., Wang, L., Hertel-Wulff, et al
2022; 18 (8): e1010543

- **Numb-associated kinases are required for SARS-CoV-2 infection and are cellular targets for antiviral strategies.** *Antiviral research*
  Karim, M., Saul, S., Ghita, L., Sahoo, M. K., Ye, C., Bhalla, N., Lo, C. W., Jin, J., Park, J., Martinez-Gualda, B., East, M. P., Johnson, G. L., Pinsky, et al
  2022: 105367
- **The cargo adaptor protein CLINT1 is phosphorylated by the Numb-associated kinase BIKE and mediates dengue virus infection.** *The Journal of biological chemistry*
  Schor, S., Pu, S., Nicolaescu, V., Azari, S., Koivomagi, M., Karim, M., Cassonnet, P., Saul, S., Neveu, G., Yueh, A., Demeret, C., Skotheim, J. M., Jacob, et al
  2022: 101956
- **An 8-gene machine learning model improves clinical prediction of severe dengue progression.** *Genome medicine*
  Liu, Y. E., Saul, S., Rao, A. M., Robinson, M. L., Agudelo Rojas, O. L., Sanz, A. M., Verghese, M., Solis, D., Sibai, M., Huang, C. H., Sahoo, M. K., Gelvez, R. M., Bueno, et al
  2022; 14 (1): 33
- **Synthesis and evaluation of 3-alkynyl-5-aryl-7-aza-indoles as broad-spectrum antiviral agents.** *Frontiers in chemistry*
  Martinez-Gualda, B., Graus, M., Camps, A., Vanhulle, E., Saul, S., Azari, S., Nhu Tran, D. H., Vangeel, L., Chiu, W., Neyts, J., Schols, D., Einav, S., Vermeire, et al
  2022; 10: 1058229
- **Optimization of 4-Anilinoquinolines as Dengue Virus Inhibitors.** *Molecules (Basel, Switzerland)*
  Huang, P., Saul, S., Einav, S., Asquith, C. R.
  2021; 26 (23)
- **PIKfyve: a lipid kinase target for COVID-19, cancer and neurodegenerative disorders** *NATURE REVIEWS DRUG DISCOVERY*
  Huang, P., Einav, S., Asquith, C. M.
  2021; 20 (10): 730
- **Discovery of 3-phenyl- and 3-N-piperidinyl-isothiazolo[4,3-b]pyridines as highly potent inhibitors of cyclin G-associated kinase.** *European journal of medicinal chemistry*
  Martinez-Gualda, B., Saul, S., Froeyen, M., Schols, D., Herdewijn, P., Einav, S., De Jonghe, S.
  2021; 213: 113158
- **The transcriptional landscape of Venezuelan equine encephalitis virus (TC-83) infection.** *PLoS neglected tropical diseases*
  Yao, Z. n., Zanini, F. n., Kumar, S. n., Karim, M. n., Saul, S. n., Bhalla, N. n., Panpradist, N. n., Muniz, A. n., Narayanan, A. n., Quake, S. R., Einav, S. n.
  2021; 15 (3): e0009306
- **Evaluation and identification of 4-anilinoquin(az)olines as potent inhibitors of both dengue virus (DENV) and Venezuelan equine encephalitis virus (VEEV).** *Bioorganic & medicinal chemistry letters*
  Saul, S., Huang, P. T., Einav, S., Asquith, C. R.
  2021: 128407
- **BIKE regulates dengue virus infection and is a cellular target for broad-spectrum antivirals.** *Antiviral research*
  Pu, S., Schor, S., Karim, M., Saul, S., Robinson, M., Kumar, S., Prugar, L. I., Dorosky, D. E., Brannan, J., Dye, J. M., Einav, S.
  2020: 104966
- **Potent antiviral activity of novel multi-substituted 4-anilinoquin(az)olines.** *Bioorganic & medicinal chemistry letters*
  Saul, S., Pu, S., Zuercher, W. J., Einav, S., Asquith, C. R.
  2020; 30 (16): 127284
- **Towards Predicting Progression to Severe Dengue.** *Trends in microbiology*
  Robinson, M. n., Einav, S. n.
  2020
- **Old Drugs for a New Virus: Repurposed Approaches for Combating COVID-19.** *ACS infectious diseases*
  Saul, S. n., Einav, S. n.
  2020

- **Broadly neutralizing human antibodies against dengue virus identified by single B cell transcriptomics.** *eLife*
  Durham, N. D., Agrawal, A., Waltari, E., Croote, D., Zanini, F., Fouch, M., Davidson, E., Smith, O., Carabajal, E., Pak, J. E., Doranz, B. J., Robinson, M., Sanz, et al
  2019; 8
- **Structure-activity relationship study of the pyridine moiety of isothiazolo[4,3-b]pyridines as antiviral agents targeting cyclin G-associated kinase.** *Bioorganic & medicinal chemistry*
  Martinez-Gualda, B., Pu, S., Froeyen, M., Herdewijn, P., Einav, S., De Jonghe, S.
  2019: 115188
- **A 20-Gene Set Predictive of Progression to Severe Dengue.** *Cell reports*
  Robinson, M., Sweeney, T. E., Barouch-Bentov, R., Sahoo, M. K., Kalesinskas, L., Vallania, F., Sanz, A. M., Ortiz-Lasso, E., Albornoz, L. L., Rosso, F., Montoya, J. G., Pinsky, B. A., Khatri, et al
  2019; 26 (5): 1104
- **A 20-Gene Set Predictive of Progression to Severe Dengue** *CELL REPORTS*
  Robinson, M., Sweeney, T. E., Barouch-Bentov, R., Sahoo, M., Kalesinskas, L., Vallania, F., Maria Sanz, A., Ortiz-Lasso, E., Luis Albornoz, L., Rosso, F., Montoya, J. G., Pinsky, B. A., Khatri, et al
  2019; 26 (5): 1104-+
- **Screening of Interactions with the ESCRT Machinery by a Gaussia princeps Split Luciferase-Based Complementation Assay.** *Methods in molecular biology (Clifton, N.J.)*
  Barouch-Bentov, R. n., Jacob, Y. n., Einav, S. n.
  2019; 1998: 291–304
- **MARCH8 Ubiquitinates the Hepatitis C Virus Nonstructural 2 Protein and Mediates Viral Envelopment.** *Cell reports*
  Kumar, S. n., Barouch-Bentov, R. n., Xiao, F. n., Schor, S. n., Pu, S. n., Biquand, E. n., Lu, A. n., Lindenbach, B. D., Jacob, Y. n., Demeret, C. n., Einav, S. n.
  2019; 26 (7): 1800–1814.e5
- **Synthesis and Structure-Activity Relationships of 3,5-Disubstituted-pyrrolo[2,3- b]pyridines as Inhibitors of Adaptor-Associated Kinase 1 with Antiviral Activity.** *Journal of medicinal chemistry*
  Verdonck, S. n., Pu, S. Y., Sorrell, F. J., Elkins, J. M., Froeyen, M. n., Gao, L. J., Prugar, L. I., Dorosky, D. E., Brannan, J. M., Barouch-Bentov, R. n., Knapp, S. n., Dye, J. M., Herdewijn, et al
  2019
- **Virus-inclusive single-cell RNA sequencing reveals the molecular signature of progression to severe dengue.** *Proceedings of the National Academy of Sciences of the United States of America*
  Zanini, F., Robinson, M. L., Croote, D., Sahoo, M. K., Sanz, A. M., Ortiz-Lasso, E., Albornoz, L. L., Rosso, F., Montoya, J. G., Goo, L., Pinsky, B. A., Quake, S. R., Einav, et al
  2018
- **Cyclin G-associated kinase (GAK) affinity and antiviral activity studies of a series of 3-C-substituted isothiazolo[4,3-b]pyridines.** *European journal of medicinal chemistry*
  Wouters, R., Pu, S., Froeyen, M., Lescrinier, E., Einav, S., Herdewijn, P., De Jonghe, S.
  2018; 163: 256–65
- **Viral journeys on the intracellular highways.** *Cellular and molecular life sciences : CMLS*
  Robinson, M., Schor, S., Barouch-Bentov, R., Einav, S.
  2018
- **Repurposing of Kinase Inhibitors as Broad-Spectrum Antiviral Drugs.** *DNA and cell biology*
  Schor, S., Einav, S.
  2018; 37 (2): 63-69
- **Single-cell transcriptional dynamics of flavivirus infection.** *eLife*
  Zanini, F. n., Pu, S. Y., Bekerman, E. n., Einav, S. n., Quake, S. R.
  2018; 7
- **Hepatitis C Virus Proteins Interact with the Endosomal Sorting Complex Required for Transport (ESCRT) Machinery via Ubiquitination To Facilitate Viral Envelopment (vol 47, e01456-16, 2016)** *MBIO*
  Barouch-Bentov, R., Neveu, G., Xiao, F., Beer, M., Bekerman, E., Schor, S., Campbell, J., Boonyaratanakornkit, J., Lindenbach, B., Lu, A., Jacob, Y., Einav, S.

2018; 9 (1)

- **Feasibility and biological rationale of repurposing sunitinib and erlotinib for dengue treatment.** *Antiviral research*
  Pu, S. Y., Xiao, F. n., Schor, S. n., Bekerman, E. n., Zanini, F. n., Barouch-Bentov, R. n., Nagamine, C. M., Einav, S. n.
  2018; 155: 67–75
- **Optimization of Isothiazolo[4,3- b]pyridine-Based Inhibitors of Cyclin G Associated Kinase (GAK) with Broad-Spectrum Antiviral Activity.** *Journal of medicinal chemistry*
  Pu, S. Y., Wouters, R. n., Schor, S. n., Rozenski, J. n., Barouch-Bentov, R. n., Prugar, L. I., O'Brien, C. M., Brannan, J. M., Dye, J. M., Herdewijn, P. n., De Jonghe, S. n., Einav, S. n.
  2018
- **Combating Intracellular Pathogens with Repurposed Host-Targeted Drugs.** *ACS infectious diseases*
  Schor, S. n., Einav, S. n.
  2018; 4 (2): 88–92
- **Turning Up Your Nose for a Flaviviral Encephalitis Cure.** *Cell host & microbe*
  Barouch-Bentov, R. n., Einav, S. n.
  2018; 23 (4): 427–29
- **Interactions between the Hepatitis C Virus Nonstructural 2 Protein and Host Adaptor Proteins 1 and 4 Orchestrate Virus Release.** *mBio*
  Xiao, F. n., Wang, S. n., Barouch-Bentov, R. n., Neveu, G. n., Pu, S. n., Beer, M. n., Schor, S. n., Kumar, S. n., Nicolaescu, V. n., Lindenbach, B. D., Randall, G. n., Einav, S. n.
  2018; 9 (2)
- **Anticancer kinase inhibitors impair intracellular viral trafficking and exert broad-spectrum antiviral effects** *JOURNAL OF CLINICAL INVESTIGATION*
  Bekerman, E., Neveu, G., Shulla, A., Brannan, J., Pu, S., Wang, S., Xiao, F., Barouch-Bentov, R., Bakken, R. R., Mateo, R., Govero, J., Nagamine, C. M., Diamond, et al
  2017; 127 (4): 1338-1352
- **Repurposing of Kinase Inhibitors as Broad-Spectrum Antiviral Drugs.** *DNA Cell Biol.*
  Schor, S., Einav, S.
  2017: 63–69
- **Hepatitis C Virus Proteins Interact with the Endosomal Sorting Complex Required for Transport (ESCRT) Machinery via Ubiquitination To Facilitate Viral Envelopment.** *mBio*
  Barouch-Bentov, R., Neveu, G., Xiao, F., Beer, M., Bekerman, E., Schor, S., Campbell, J., Boonyaratanakornkit, J., Lindenbach, B., Lu, A., Jacob, Y., Einav, S.
  2016; 7 (6)
- **Pathogen receptor discovery with a microfluidic human membrane protein array** *PROCEEDINGS OF THE NATIONAL ACADEMY OF SCIENCES OF THE UNITED STATES OF AMERICA*
  Glick, Y., Ben-Ari, Y., Drayman, N., Pellach, M., Neveu, G., Boonyaratanakornkit, J., Avrahami, D., Einav, S., Oppenheim, A., Gerber, D.
  2016; 113 (16): 4344-4349
- **Epidermal Growth Factor Receptor-Dependent Mutual Amplification between Netrin-1 and the Hepatitis C Virus** *PLOS BIOLOGY*
  Plissonnier, M., Lahlali, T., Michelet, M., Lebosse, F., Cottarel, J., Beer, M., Neveu, G., Durantel, D., Bartosch, B., Accardi, R., Clement, S., Paradisi, A., Devouassoux-Shisheboran, et al
  2016; 14 (3)
- **Response—Applying antibiotics lessons to antivirals.** *Science*
  Bekerman, E., Einav, S.
  2015; 348 (6242): 1437-?
- **Selective Inhibitors of Cyclin G Associated Kinase (GAK) as Anti-Hepatitis C Agents** *JOURNAL OF MEDICINAL CHEMISTRY*
  Kovackova, S., Chang, L., Bekerman, E., Neveu, G., Barouch-Bentov, R., Chaikuad, A., Heroven, C., Sala, M., De Jonghe, S., Knapp, S., Einav, S., Herdewijn, P.
  2015; 58 (8): 3393-3410
- **Infectious disease. Combating emerging viral threats.** *Science*
  Bekerman, E., Einav, S.
  2015; 348 (6232): 282-283

- **AP-2-Associated Protein Kinase 1 and Cyclin G-Associated Kinase Regulate Hepatitis C Virus Entry and Are Potential Drug Targets** *JOURNAL OF VIROLOGY*
  Neveu, G., Ziv-Av, A., Barouch-Bentov, R., Berkerman, E., Mulholland, J., Einav, S.
  2015; 89 (8): 4387-4404
- **Isothiazolo[4,3-b]pyridines as inhibitors of cyclin G associated kinase: synthesis, structure-activity relationship studies and antiviral activity** *MEDCHEMCOMM*
  Li, J., Kovackova, S., Pu, S., Rozenski, J., De Jonghe, S., Einav, S., Herdewijn, P.
  2015; 6 (9): 1666-1672
- **B-cell receptors expressed by lymphomas of hepatitis C virus (HCV)-infected patients rarely react with the viral proteins.** *Blood*
  Ng, P. P., Kuo, C., Wang, S., Einav, S., Arcaini, L., Paulli, M., Portlock, C. S., Marcotrigiano, J., Tarr, A., Ball, J., Levy, R., Levy, S.
  2014; 123 (10): 1512-1515
- **Identification and Targeting of an Interaction between a Tyrosine Motif within Hepatitis C Virus Core Protein and AP2M1 Essential for Viral Assembly** *PLOS PATHOGENS*
  Neveu, G., Barouch-Bentov, R., Ziv-Av, A., Gerber, D., Jacob, Y., Einav, S.
  2012; 8 (8)
- **The hepatitis C virus (HCV) NS4B RNA binding inhibitor clemizole is highly synergistic with HCV protease inhibitors.** *journal of infectious diseases*
  Einav, S., Sobol, H. D., Gehrig, E., Glenn, J. S.
  2010; 202 (1): 65-74
- **The Hepatitis C Virus (HCV) NS4B RNA Binding Inhibitor Clemizole Is Highly Synergistic with HCV Protease Inhibitors** *Annual Meeting of the Infectious-Diseases-Society-of-America*
  Einav, S., Dvory-Sobol, H., Gehrig, E., Glenn, J. S.
  OXFORD UNIV PRESS INC.2010: 65–74
- **A small molecule inhibits HCV replication and alters NS4B's subcellular distribution** *ANTIVIRAL RESEARCH*
  Bryson, P. D., Cho, N., Einav, S., Lee, C., Tai, V., Bechtel, J., Sivaraja, M., Roberts, C., Schmitz, U., Glenn, J. S.
  2010; 87 (1): 1-8
- **Six RNA Viruses and Forty-One Hosts: Viral Small RNAs and Modulation of Small RNA Repertoires in Vertebrate and Invertebrate Systems** *PLOS PATHOGENS*
  Parameswaran, P., Sklan, E., Wilkins, C., Burgon, T., Samuel, M. A., Lu, R., Ansel, K. M., Heissmeyer, V., Einav, S., Jackson, W., Doukas, T., Paranjape, S., Polacek, et al
  2010; 6 (2)
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