

MELIS ANAHTAR

manahtar@mgh.harvard.edu | @melisanahtar

EDUCATION

2009 – 2017	M.D., Harvard Medical School, Harvard/MIT Health Sciences and Technology (HST) Program, <i>cum laude</i>
2011 – 2015	Ph.D., Immunology, Harvard University
2008 – 2009	M.Sc., Integrated Immunology, University of Oxford
2004 – 2008	S.B., Massachusetts Institute of Technology, Mechanical Engineering (Course 2A) with a minor in Biomedical Engineering. GPA 5.0/5.0

POSTDOCTORAL TRAINING

2021 – present	Research Fellow, Massachusetts General Hospital and the Broad Institute of MIT and Harvard
2019 – 2020	Fellow, Medical Microbiology, Massachusetts General Hospital
2017 – 2019;	Resident, Clinical Pathology, Massachusetts General Hospital
2020 – 2021	

SELECT RESEARCH TRAINING

07/21 – present	Postdoctoral Researcher, Broad Institute of MIT and Harvard Advisor: James J. Collins Machine learning-guided discovery and design of antibiotics for <i>Neisseria gonorrhoeae</i>
06/15 – 04/17	Medical Student, Ragon Institute of MGH, MIT, and Harvard Advisors: Douglas S. Kwon and Mehmet Toner MD Thesis: Rapid and comprehensive bacterial identification and antimicrobial resistance determination using microfluidic enrichment and whole-genome sequencing
09/11 – 06/15	Graduate Student, Ragon Institute of MGH, MIT, and Harvard Advisors: Douglas S. Kwon and Bruce D. Walker PhD Thesis: The contribution of cervicovaginal microbiota and hormonal contraceptives to genital inflammation and HIV acquisition risk
03/09 – 07/09	Masters Student, Weatherall Institute of Molecular Medicine, Oxford, England Advisor: David Jackson MSc Thesis: The role of lymphatic endothelial cells in innate immunity: Podoplanin as a ligand for neutrophil trafficking in lymphatic vessels and hyaluronan degradation products as Toll-like receptor agonists in lymphatic endothelium

CLINICAL LICENSURE AND BOARD CERTIFICATIONS

2021	Certification, Clinical Pathology, American Board of Pathology
2021	Certification, Medical Microbiology, American Board of Pathology
2021	Massachusetts Medical License

OTHER PROFESSIONAL POSITIONS

2016 – present	Co-founder and consultant, Day Zero Diagnostics, Boston, MA
2015	Scientific consultant, Epiva Biosciences/ Flagship Ventures, Boston, MA

PUBLICATIONS

* equal contribution first authors, # equal contribution last authors

Peer reviewed publications

1. Wong F*, Zheng EJ*, Valeri JA, Donghia NM, **Anahtar MN**, Omori S, Li A, Cubillos-Ruiz A, Krishnan A, Jin W, Manson AL, Friedrichs J, Helbig R, Hajian B, Fiejtek DK, Wagner FF, Soutter HH, Earl AM, Stokes JM, Renner LD, Collins JJ. “Discovery of a structural class of antibiotics with explainable deep learning.” *Nature* (2023).

2. Zheng EJ*, Valeri JA*, Andrews IW*, Krishnan A, Bandyopadhyay P, **Anahtar MN**, Herneisen A, Schulte F, Linnehan B, Wong F, Stokes JM, Renner LD, Lourido S, Collins JJ. “Discovery of antibiotics that selectively kill metabolically dormant bacteria.” *Cell Chemical Biology* (2023).
3. Turbett SE*, Tomkins-Tinch CH*, **Anahtar MN***, Dugdale CM*, Hyle EP, Shenoy ES, Shaw B, Egbuonu K, Bowman KA, Zachary KC, Adams GC, Hooper DC, Ryan ET, LaRocque RC, Bassett IV, Triant VA, Siddle KJ, Rosenberg E, Sabeti PC, Schaffner SF, MacInnis BL#, Lemieux JE#, Charles RC#. “Distinguishing SARS-CoV-2 persistence and reinfection: A retrospective cohort study.” *Clinical Infectious Diseases*, 76(5):850-860 (2023).
4. Yang C, **Anahtar MN**, Pierce VM. “It's Not You, It's SOSA: A Case Study on Breaking Up With an FDA-Cleared Susceptibility Testing System's Oxacillin Results for Staphylococcus spp. Other Than S. aureus and S. lugdunensis.” *Open Forum Infectious Diseases*, 9(9):ofac421 (2022).
5. Hughes SM, Levy CN, Katz R, Lokken EM, **Anahtar MN**, Hall MB, Bradley F, Castle PE, Cortez V, Doncel GF, Fichorova R, Fidel PL Jr, Fowke KR, Francis SC, Ghosh M, Hwang LY, Jais M, Jaspers V, Joag V, Kaul R, Kyongo J, Lahey T, Li H, Makinde J, McKinnon LR, Moscicki AB, Novak RM, Patel MV, Sriprasert I, Thurman AR, Yegorov S, Mugo NR, Roxby AC, Micks E, Hladik F; Consortium for Assessing Immunity Across the Menstrual Cycle. “Changes in concentrations of cervicovaginal immune mediators across the menstrual cycle: a systematic review and meta-analysis of individual patient data.” *BMC Medicine*, 20(1):353 (2022).
6. **Anahtar MN**, Bramante JT, Xu J, Desrosiers LA, Paer JM, Rosenberg ES, Pierce VM#, and Kwon DS#. “Prediction of antimicrobial resistance in clinical *Enterococcus faecium* isolates using a rules-based analysis of whole genome sequences.” *Antimicrobial Agents and Chemotherapy*, 66(1):e0119621. (2022).
7. Normandin E*, Holroyd KB*, Collens SI, Shaw BM, Siddle KJ, Adams G, Rudy M, Solomon IH, **Anahtar MN**, Lemieux JE, Trombetta BA, Kivisakk P, Arnold SE, Rapalino O, Piantadosi AL, Sen P, Rosenberg ES, Branda J, Sabeti PC#, Mukerji SS#. “Intrathecal inflammatory responses in the absence of SARS-CoV-2 nucleic acid in the CSF of COVID-19 hospitalized patients.” *Journal of the Neurological Sciences*, 430:120023 (2021).
8. Mukerji SS, Das S, Alabsi H, Brenner LN, Jain A, Magdamo C, Collens SI, Ye E, Keller K, Boutros CL, Leone MJ, Newhouse A, Foy B, Li MD, Lang M, **Anahtar MN**, Shao YP, Ge W, Sun H, Triant VA, Kalpathy-Cramer J, Higgins J, Rosand J, Robbins GK, Westover MB. “Prolonged Intubation in Patients With Prior Cerebrovascular Disease and COVID-19.” *Frontiers in Neurology*, 12:642912 (2021).
9. **Anahtar MN***, Shaw B*, Slater D*, Byrne EH, Botti-Lodovico Y, Adams G, Schaffner SF, Eversley JS, McGrath G, Gogakos T, Lennerz J, Marble HD, Ritterhouse LL, Batten J, Georgantas NZ, Pellerin R, Signorelli S, Thierauf J, Kembal M, Happi C, Grant DS, Ndiaye D, Siddle KJ, Mehta SB, Harris JB, Ryan ET, Pierce VM#, LaRocque RC#, Lemieux J#, Sabeti P#, Rosenberg E#, Branda J#, Turbett SE#. “Development of a qualitative real-time RT-PCR assay for the detection of SARS-CoV-2: A guide and case study in setting up an emergency-use, laboratory-developed molecular assay.” *Journal of Clinical Pathology*, 74(8):496-503 (2021).
10. **Anahtar MN**, Yang JH, Kanjilal S. “Applications of machine learning to the problem of antimicrobial resistance: An emerging model for translational research.” *Journal of Clinical Microbiology*, 59(7):e0126020 (2021).
11. **Anahtar MN**, McGrath GE, Rabe BA, Tanner NA, White BA, Lennerz JKM, Branda JA, Cepko CL, Rosenberg ES. “Clinical assessment and validation of a rapid and sensitive SARS-CoV-2 test using reverse-transcription loop-mediated isothermal amplification.” *Open Forum Infectious Diseases*, 8(2):ofaa631 (2020).
12. Lemieux JE*, Siddle KJ*, Shaw BM, Loreth C, Schaffner SF, Gladden-Young A, Adams G, Fink T, Tomkins-Tinch CH, Krasilnikova LA, DeRuff KC, Rudy M, Bauer MR, Lagerborg KA, Normandin E, Chapman SB, Reilly SK, **Anahtar MN**, Lin AE, Carter A, Myhrvold C, Kembal ME, Chaluvadi S, Cusick C, Flowers K, Neumann A, Cerrato F, Farhat M, Slater D, Harris JB, Branda JA, Hooper D, Gaeta JM, Baggett TP, O'Connell J, Gnrirke A, Lieberman TD, Philippakis A, Burns M, Brown CM, Luban J, Ryan ET, Turbett SE, LaRocque RC, Hanage WP, Gallagher GR, Madoff LC, Smole S, Pierce VM, Rosenberg E, Sabeti PC, Park DJ, MacInnis BL. “Phylogenetic analysis of SARS-CoV-2 in Boston highlights the impact of superspreading events.” *Science*, 371(6529):eabe3261 (2021).
13. Dugdale CM*, **Anahtar MN***, Chiosi JJ, Lazarus JE, McCluskey SM, Ciaranello AL, Gogakos T, Little BP, Branda JA, Shenoy ES, Walensky RP, Zachary KC, Hooper DC, Turbett SE#, Hyle EP#. “Clinical, laboratory,

and radiologic characteristics of patients with initial false-negative SARS-CoV-2 nucleic acid test results”. *Open Forum Infectious Diseases*, 8(1):ofaa559 (2020). *Selected as “Editor’s Choice”*.

14. Turbett SE, **Anahtar M**, Dighe AS, Garcia Beltran W, Miller T, Scott H, Durbin SM, Bharadwaj M, Thomas J, Gogakos TS, Astudillo M, Lennerz J, Rosenberg ES, Branda JA. “Evaluation of Three Commercial SARS-CoV-2 Serologic Assays and their Performance in Two-Test Algorithms.” *Journal of Clinical Microbiology*, 59(1):e01892-20 (2020).
15. Miller TE*, Garcia Beltran WF*, Bard AZ*, Gogakos T*, **Anahtar MN**, Astudillo MG, Yang D, Thierauf J, Fisch AS, Mahowald GK, Fitzpatrick MJ, Nardi V, Feldman J, Hauser BM, Caradonna TM, Marble HD, Ritterhouse LL, Turbett SE, Batten J, Georgantas NZ, Alter G, Schmidt AG, Harris JB, Gelfand JA, Poznansky MC, Bernstein BE, Louis DN, Dighe A, Charles RC, Ryan ET, Branda JA, Pierce VM, Murali MR, Iafrate AJ, Rosenberg ES, Lennerz JK. “Clinical sensitivity and interpretation of PCR and serological COVID-19 diagnostics for patients presenting to the hospital.” *FASEB Journal*, 34(10):13877-13884 (2020).
16. Dugdale CM, Turbett SE, McCluskey SM, Zachary KC, Shenoy ES, Ciaranello AL, Walensky RP, Rosenberg ES, **Anahtar MN**, Hooper DC, Hyle EP. “Outcomes from an infectious disease physician-guided evaluation of hospitalized persons under investigation for COVID-19 at a large US academic medical center.” *Infection Control and Hospital Epidemiology*, 42(3):344-347 (2020).
17. Shenoy ES, Pierce VM, Sater MRA, Pangestu FK, Herriott IC, **Anahtar MN**, Bramante J, Kwon DS, Hawkins FR, Suslak D, West LR, Huntley MH, Hooper DC. “Community-Acquired in Name Only: A Cluster of Carbapenem-Resistant *Acinetobacter baumannii* in a Burn Intensive Care Unit and Beyond.” *Infection Control and Hospital Epidemiology*, 41(5):531-538 (2020).
18. Gaiha GD, Rossin EJ, Urbach J, Landeros C, Collins DR, Nwonu C, Muzhingi I, **Anahtar MN**, Waring OM, Piechocka-Trocha A, Waring M, Worrall DP, Ghebremichael MS, Newman RM, Power KA, Allen TM, Chodosh J, Walker BD. “Structural topology defines protective CD8+ T cell epitopes in the HIV proteome.” *Science*, 364(6439):480-484 (2019).
19. Turbett SE*, **Anahtar MN***, Pattanayak V, Azar MM, Coffey KC, Eng G, Rudolf JW, Lewandrowski KB, Baron J, Rosenberg ES, Branda JA. “Use of routine complete blood count results to rule out anaplasmosis without the need for specific diagnostic testing.” *Clinical Infectious Diseases*, 70(6):1215-1221 (2020).
20. **Anahtar MN**, Gootenberg DB, Mitchell CM, Kwon DS. “Cervicovaginal Microbiota and Reproductive Health: The Virtue of Simplicity.” *Cell Host and Microbe*, 23(2):159-168 (2018).
21. Hogan NC, **Anahtar MN**, Taberner AJ, Hunter IW. “Delivery of immunoreactive antigen using a controllable needle-free jet injector.” *Journal of Controlled Release*, 258:73-80 (2017).
22. Gosmann C, **Anahtar MN**, Handley SA, Farcasanu M, Abu-Ali G, Bowman BA, Padavattan N, Desai C, Droit L, Moodley A, Dong M, Chen Y, Ismail N, Ndung’u T, Ghebremichael MS, Wesemann DR, Mitchell C, Dong KL, Huttenhower C, Walker BD, Virgin HW, Kwon DS. “*Lactobacillus*-Deficient Cervicovaginal Bacterial Communities Are Associated with Increased HIV Acquisition in Young South African Women”. *Immunity*, 46(1):29-37 (2017).
23. **Anahtar MN**, Bowman BA, Kwon DS. “Efficient nucleic acid extraction and 16S rRNA gene sequencing for bacterial community characterization.” *Journal of Visualized Experiments*, Issue 110 (2016).
24. Byrne EH*, **Anahtar MN***, Cohen KE, Moodley A, Padavattan N, Ismail N, Bowman B, Olson GS, Mabhula A, Leslie A, Ndung’u T, Walker BD, Ghebremichael MS, Dong KL, Kwon DS. “The association of injectable progestin-only contraceptives with HIV acquisition and HIV target cell frequency in the female genital tract in South African women: a prospective cohort study.” *Lancet Infectious Diseases*, 16 (4): 441-8 (2016).
25. **Anahtar MN**, Byrne EH, Doherty KE, Bowman BA, Yamamoto H, Soumillon M, Padavattan N, Ismail N, Moodley A, Sabatini M, Ghebremichael MS, Nusbaum C, Huttenhower C, Virgin HS, Ndung’u T, Dong KL, Walker BD, Fichorova RN, and Kwon DS. “Cervicovaginal microbiota modulate host inflammatory responses in the female genital tract”. *Immunity*, 42 (5): 965–976 (2015). *Recommended by three faculty at Faculty Reviewers. Previewed by Gopinath S and Iwasaki A (PMID 25992855)*.

26. Varadarajan N, Kwon DS, Law KM, Ogunniyi AO, **Anahtar MN**, Richter JM, Walker BD, Love JC. “Rapid, efficient functional characterization and recovery of HIV-specific human CD8+ T cells using microengraving.” *PNAS*, 109(10):3885-90 (2012).
27. Streeck H, Kwon DS, Pyo A, Flanders M, Chevalier MF, Law, K., Julg B, Trocha K, Jolin JS, **Anahtar MN**, Lian J, Toth I, Brumme, Z, Chang JJ, Caron T, Rodig SJ, Milner DA, Piechoka-Trocha A, Kaufmann DE, Walker BD, Altfeld M. “Epithelial adhesion molecules inhibit HIV-1-specific CD8+ T-cell functions.” *Blood*, 117(19):5112-22 (2011).
28. Aptekar JW, Cassidy MC, Johnson AC, Lee MY, Ogier AC, Vo C, **Anahtar MN**, Ren Y, Bhatia SN, Ramanathan C, Cory DG, Hill AL, Mair RW, Rosen M, Walsworth RL, Marcus CM. Silicon nanoparticles as hyperpolarized magnetic resonance imaging agents. *ACS Nano*, 3(12), 4003-8 (2009).
29. Sethu P, **Anahtar M**, Moldawer LL, Tompkins RG, Toner M. Continuous flow microfluidic device for rapid erythrocyte lysis. *Analytical Chemistry*, 76(21), 6247-53 (2004).

Non-peer reviewed medical publications

1. Chapman MM, Muse VV, Mojica JE, **Anahtar MN**. “Case 35-2021: A 50-Year-Old Woman with Pain in the Left Upper Quadrant and Hypoxemia.” *New England Journal of Medicine*, 385(21):1995-2001 (2021).
2. Ciaranello AL, Tran KM, Audin CR, **Anahtar MN**. “Case 21-2021: A 33-Year-Old Pregnant Woman with Fever, Abdominal Pain, and Headache.” *New England Journal of Medicine*, 385(3):265-274 (2021).
3. Bebell LM, Gilberto Gonzalez R, Barczak AK, **Anahtar MN**. “Case 1-2021: A 76-Year-Old Woman with Lethargy and Altered Mental Status”. *New England Journal of Medicine*, 384(2):166-176 (2021).
4. Berns JS, Rapalino O, Fenves AZ, El Khoury JB, Klepeis VE, **Anahtar MN**. “Case 11-2020: A 37-Year-Old Man with Facial Droop, Dysarthria, and Kidney Failure”. *New England Journal of Medicine*, 382(15):1457-1466 (2020).
5. Chiappa V, Anderson MA, Barrett CD, Stathatos N, **Anahtar MN**. “Case 24-2019: A 39-Year-Old Woman with Palpitations, Abdominal Pain, and Vomiting.” *New England Journal of Medicine*, 381(6):567-577 (2019).

PATENTS

Selective enrichment of a population of DNA in a mixed DNA sample through targeted suppression of DNA amplification. **US 11,795,485 B2** (2019).

INVITED TALKS

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| 2022 | European Congress of Clinical Microbiology & Infectious Diseases Conference , Lisbon, Portugal (virtual) |
| 2021 | Emerging Antimicrobials and Diagnostics in AMR Conference (virtual) |
| 2021 | Emerging Variants Meeting , Broad Institute (virtual) |
| 2020 | Technical Panel on COVID-19 , Center for Global Health, Massachusetts General Hospital (virtual) |
| 2020 | AYAT College of Nursing & Health Sciences , Maniknagar, Bangladesh (virtual) |
| 2016 | Infectious Disease and Microbiome Seminar , Broad Institute, Cambridge, MA |
| 2016 | Department of Medicine HIV/AIDS Conference , Tufts Medical Center, Boston, MA |
| 2016 | Center for Biostatistics in AIDS Research Seminar , Harvard School of Public Health, Boston, MA |
| 2016 | Clinical Pathology Conference , Yale University, New Haven, CT |
| 2012 | Turkish American Scientists and Scholars Association Conference , College Park, MD |

FELLOWSHIPS & GRANTS

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| 2024 | NIH NIAID, K08 Mentored Clinical Scientist Development Award . Title: <i>Harnessing machine learning to develop new antibiotics for Neisseria gonorrhoeae</i> . |
| 2021–24 | NIH NCI, T32 Postdoctoral training support through CA 9216-41 |
| 2022 | Wyss Institute , Director’s Fund Award - \$25,000 research grant. Title: <i>A rapid, CRISPR-based diagnostic for vaginal microbiota to improve women’s health outcomes</i> . |
| 2014 | Conference on Retroviruses and Opportunistic Infections (CROI) , Young Investigator Scholarship |

- 2012 **TEDMED**, Front-line Full Scholarship Recipient
- 2010 **Paul and Daisy Soros Fellowship for New Americans**, \$90,000 scholarship
- 2009-17 **NIH, Medical Scientist Training Program (MSTP) fellowship** through Harvard Medical School
- 2007 **Rhodes Scholarship**, Full scholarship and stipend
- 2007 **Lord Foundation Undergraduate Research Opportunities Program Fund**, stipend for research
- 2005 **Recipient of the Cathy Comeau (1987) Memorial Fund**, stipend for research

SELECT HONORS & AWARDS

- 2020 Translation Science Award, MGH Clinical Research Day
- 2019 Pathology Research Department First Place Award, MGH Clinical Research Day
- 2018 Pathology Research Department First Place Award, MGH Clinical Research Day
- 2017 Poster of Distinction, Harvard Pathology Annual Retreat
- 2017 CP Conference Best Speaker Award, MGH Clinical Pathology
- 2017 Leon Reznick Memorial Prize for excellence and accomplishments in research, Harvard Medical School
- 2017 Harvard President's Innovation Challenge, Finalist with Day Zero Diagnostics
- 2017 MIT Sloan Healthcare Innovations Prize, Audience Choice (\$1,000) with Day Zero Diagnostics
- 2016-17 Selected member of the Harvard Life Lab
- 2015-17 Selected member of Harvard Innovation Lab's Venture Incubation Program
- 2016 Harvard Business School Alumni New Ventures Competition, Winner of the New England Region for Day Zero Diagnostics (\$10,000 prize)
- 2014 Academy of Achievement, International Achievement Summit delegate
- 2008 USA TODAY's All-USA College Academic First Team Member
- 2007 Marshall Scholarship Finalist
- 2008 MIT Wunsch Foundation Silent Hoist and Crane Award for Academic Excellence
- 2008 MIT John C. and Elizabeth J. Chato Award for Excellence in Bioengineering
- 2007 MIT Society of Women Engineers Graduating Senior \$2000 Scholarship
- 2007 Finalist, Glamour's Top 10 College Women Competition
- 2007 L'Oreal "Beauty of Giving" Award
- 2006 2nd Place, Merck-MIT BE-BMES Poster Contest
- 2004 Finalist in the Intel Science Talent Search
- 2004 1st Place in Engineering, Intel Science and Engineering Fair

TEACHING EXPERIENCE

- 2023-24 **Harvard Medical School (HMS) AISC612.0: Microbiology & Infectious Diseases** – Invited lecturer
- 2020-23 **HMS HST.040: Mechanisms of Microbial Pathogenesis** – Tutorial leader
- 2017 **Wellesley College NEUR 333: Neuroengineering seminar** – Invited lecturer
- 2010-15 **HMS HST.175: Immunology** – Co-Head TA ('15), Head TA ('11-'14), Paper discussion leader ('10)
- 2014 **Harvard University CFAR Workshop on Metagenomics and Transcriptomics** – Teaching assistant
- 2012 **Harvard Immunology Summer Program** – Teaching assistant
- 2012 **HMS Imm.302qc Clinical Immunology** – Teaching assistant

ACADEMIC SERVICE AND OUTREACH

- 2020- **Ad hoc Reviewer: *Annals of Internal Medicine*** (acknowledged as an outstanding reviewer of 2020), *Nature Communications*, *Journal of Clinical Microbiology*, *PLoS Computational Biology*, *Open Forum Infectious Diseases*, *Epidemiology and Infection*, *Virology*, *Biosensors*
- 2022 **HMS Synthetic Biology Symposium, Diagnostics Breakout Session**, Co-leader, Boston, MA
- 2009-21 **MIT Distinguished Fellowships**, Committee member, Cambridge, MA

UNDERGRADUATE RESEARCH

- 09/07 – 05/08 Undergraduate Researcher, MIT
Advisors: Prof. Sangeeta Bhatia and Dr. Yin Ren

S.B. Thesis: Designing and characterizing hyperpolarizable silicon nanoparticles for Magnetic Resonance Imaging

- 06/06 – 08/08 Summer Intern, Medical Genetics Branch, National Human Genome Research Institute, NIH
Advisors: Dr. William A. Gahl and Dr. Marjan Huizing
- 09/05 – 05/07 Undergraduate Researcher, Bioinstrumentation Laboratory, MIT
Advisors: Prof. Ian Hunter and Dr. Cathy Hogan
- 06/02 – 08/03 Summer Student Researcher, Massachusetts General Hospital
Advisors: Prof. Mehmet Toner and Dr. Palaniappan Sethu