Curriculum Vitae
Ralph S. Baric

I. PERSONAL INFORMATION:

A. Business Address:
Department of Epidemiology
School of Public Health
University of North Carolina at Chapel Hill
McGavran-Greenberg Hall, CB# 7435
Chapel Hill, North Carolina 27599-7435
Phone: 919-966-3895

II. EDUCATION:

A. North Carolina State University, Raleigh, North Carolina, B.S., Zoology, 1977
B. North Carolina State University, Raleigh, North Carolina, Ph.D., Microbiology, 1983
C. University of Southern California, School of Medicine, Department of Microbiology and Neurology, Post-doctoral Fellow, 1982-1986

III. PROFESSIONAL EXPERIENCE:

A. Assistant Professor, Department of Parasitology and Laboratory Practice, University of North Carolina at Chapel Hill, March 1986-June 1990
B. Assistant Professor, Department of Epidemiology, University of North Carolina at Chapel Hill, July 1990-June 1993.
C. Associate Professor, Department of Epidemiology, University of North Carolina at Chapel Hill, July 1993-2001.
D. Associate Professor, Department of Microbiology and Immunology, University of North Carolina at Chapel Hill, July 1993-2001
E. Professor, Department of Epidemiology, Department of Microbiology and Immunology, University of North Carolina at Chapel Hill, July 2001-current

IV. HONORS:

A. Full Athletic Scholarship, Swimming, North Carolina State University, 1972-1976
B. Atlantic Coast Conference Champion and record holder: 500 yard Freestyle, 1000 yard Freestyle, 1650 yard Freestyle, 400 yard Individual Medley, 800 yard Freestyle Relay
C. Teaching Assistantship, North Carolina State University, 1977-1978
D. Agricultural Foundation Predoctoral Research Assistantship, 1978-1981
E. Teaching Assistantship, North Carolina State University, 1981-1982
F. NIH Postdoctoral Fellowship, Neurology Training Grant, 1982-1984
G. Harvey Weaver Scholar, National Multiple Sclerosis Society Fellowship, 1984-86
H. Outstanding Young Man of America, 1987
I. Established Investigator, American Heart Association, 1989-1994
J. Delta Omega Honor Society, 1990
K. WHO Working Group: SARS-CoV 2003
L. Nominated World Technology Award Finalist-2004;
M. World Technology Award Finalist and Member, 2004
N. Permanent Member, Virology B Study Section; Oct 2005-2009.
O. Editorial Board, Journal of Virology, 2004-2006, 2007-2011
P. Editorial Board, Plos Pathogen, 2007-
Q. Senior Editor-Plos Pathogens 2008-.
R. Internal Advisory Board, Pacific Northwest Regional Center for Excellence, 2009-2014.

S. National Academy of Sciences: Working Group: Gene Sequence Methods for Classification of Select Agents
T. Fellow, American Academy of Microbiology, 2010
U. Innovation/Inspiration Award for Faculty Research, UNC Gillings School of Public Health, 2011.
V. WHO Working Group: Virus-like Particle Vaccines, June 2011.
W. WHO Working Group: Flu Vaccine selection, April 2013.
X. National Academy of Sciences, Committee on Risks and Benefits of Gain of Function Research. Committee Member, 2014.
Y. MERS-CoV Stakeholders Workshop April 2015
Z. William Rand Kenan, Jr. Distinguished Professorship, 2019
AA. Clarivate Analytics Highly Cited Researchers 2017, 2018, 2019

V. MEMBERSHIPS:

1. American Society for Microbiology
2. American Society for Virology

VI. UNIVERSITY AFFILIATIONS:

A. Lineberger Cancer Center
B. Biotechnology Center
C. Curriculum in Genetics
D. Center for Infectious Diseases

VII. BIBLIOGRAPHY AND PRODUCTS OF SCHOLARSHIP

A. Peer review articles access through the NCBI link to Bibliography

https://www.ncbi.nlm.nih.gov/myncbi/ralph.baric.1/bibliography/public/

B. Book Chapters/Invited Comments

1. Lai, M.M.C., **Baric, R.S**., Brayton, P.R., and Stohlman, S.A., 1984. Studies on the mechanism of RNA synthesis of a murine coronavirus. In: Coronaviruses: Molecular Biology and Pathogenesis. P. Rottier, B. van deer Zeijst, W. Spaan, and M. Horzinek, Eds. Plenum, New York.
2. Sobsey, M.D., Shieh, V.S., and **Baric, R.S.,** 1990. Deletion of hepatitis A virus and other enteroviruses in environmental samples using gene probe methods. In: Biotechnology and Food Safety. (Shain-dou Kung, Bills, D.D. and Quantrano, R., Eds.)
3. Schwab, K.J., De Leon, R., **Baric, R.S**. and Sobsey, M.D. (1992). Detection of rotavirus, enteroviruses and HAV by reverse transcriptase-polymerase chain reaction. AWWA WOTC Proceedings, Orlando, FL.
4. Vine, MF, Moe, CL, Hulka, BS, **Baric, RS** and R. Millikan. 1995. On the teaching of Molecular Epidemiology. Epi.Monitor, Aug/Sept.

C. Published Abstracts/Presentations (Selected)

1. **Baric, R.S**., and Johnston, R.E., 1979. Characterization of a Sindbis virus variant with a host determined latent period. North Carolina Society for Microbiology.
2. **Baric, R.S**., and Johnson, R.E., 1979. Sindbis virus variant with a cell determined latent period. American Society for Microbiology Annual Meeting, Los Angeles, CA.

3. **Baric, R.S**. and Johnston, R.E., 1980. In vitro selection of an attenuated variant of Sindbis virus. J. Supramol. Struc. Supplement 4, p.248.
4. **Baric, R.S.,** Carlin, L.J., Lineberger, D.W., Klinger, J.K., and Johnston, R.E., 1980. Inhibitors of host transcription block Sindbis virus replication. North Carolina Society for Microbiology.
5. **Baric, R.S.,** Carlin, L.J., Lineberger, D.W., and Johnston, R.E., 1981. Inhibitors of host transcription block Sindbis virus replication. Annual meeting of the American Society for Microbiology, p.245.
6. **Baric, R.S.,** Carlin, L.J., Lineberger, D.W., and Johnston, R.E., 1981. Inhibitors of host transcription block Sindbis virus replication. Fifth International Congress on Virology, p.383.
7. **Baric, R.S.,** Carlin, L.J., Lineberger, D.W., and Johnston, R.E., 1982. Requirement for host transcription in the replication of Sindbis virus RNA. American Society for Virology.
8. **Baric, R.S.**, Stohlman, S.A., and Lai, M.M.C., 1983. Characterization of replicative intermediate and replicative form RNA of mouse hepatitis virus: Presence of free leader RNA sequences on nascent chains. American Society for Virology.
9. **Baric, R.S.**, Stohlman, S.A., Razavi, M.K., and Lai, M.M.C., 1984. Presence of free leader RNA in MHV infected cell. American Society for Virology.
10. Keck, J.G., **Baric, R.S.,** Stohlman, S.A., and Lai, M.M.C., 1985. Isolation and characterization of MHV RNA recombinants. American Society for Virology, Albuquerque, NM.
11. Lai, M.M.C., Makino, S., **Baric, R.S.**, Soe, L., Shieh, C.K., Keck, J.g., and Stohlman, S.A., 1987. RNA positive strand viruses. ICN-UCLA Symposium, Keystone, CO.
12. **Baric R.S**., Soe, L., Shieh, C.K., Stohlman, S.A., and Lai, M.M.C., 1986. Studies into the mechanism of MHV transcription. ICN-UCLA Symp. Positive-stranded RNA Viruses Meetings, Keystone, CO
13. **Baric, R.S.,** Soe, L., Shieh, C.K., Stohlman, S.A., and Lai, M.M.C., 1986. Studies into the mechanism of MHV transcription. Third International Coronavirus Symposium.
14. Small, J.D., Soukup, J., Woods, R.D., Gambling, R.M., and **Baric,** R.S., 1987. Coronavirus-induced cardiomyopathy in rabbits. Seventh International Congress of Virology, Edmonton, Canada.
15. Small, J.D., Soukup, J., Woods, R.D., Gambling, T.M., and **Baric,R.S.,** 1987. Coronavirus-induced cardiomyopathy in rabbits. American Society for Virology, Chapel Hill, NC.
16. Stohlman, S.A., Deans, R., **Baric, R.S.,** Nelson, G., and Lai, M.M.C., 1988. Specific Interactions between the coronavirus nucleocapsid protein and the MHV leader RNA sequences. J. Cell Biochem. Supp. 12C.
17. Small, J.D., Woods, R.D., Soukup, J., Gambling, T.M., and **Baric, R.S.,** 1988. Coronavirus-induced cardiomyopathy in rabbits. International Symposium on Inflammatory Heart Disease. Snowmass, CO.
18. **Baric, R.S.**, Edwards, S., and Small, J.D., 1989. Rabbit Cardiomyopathy. 4th International Coronavirus Symposium, England.
19. **Baric, R.S.**, Egbert, J., Lum, K., and Stohlman, S.A., 1989. Coronavirus temperature sensitive mutants. 4th International coronavirus Symposium, England.

20. Shieh, Y.D.C., **Baric, R.S.**, and Sobsey, M.D., 1989. Development and evaluation of a Hepatitis A virus RNA probe for environmental samples. American Society of Microbiology, New Orleans, LA.
21. Peel, S.A., Merritt, S.C., Bowdre, J.H., and **R.S. Baric**. Mefloquine resistance in plasmodium falciparum. Southeastern Parasitology Meeting. April 1990.
22. De Leon, R., Shieh, Y.D.C., **Baric, R.S.** and M.D. Sobsey. Detection of enteroviruses and hepatitis A virus in environmental samples by gene probes and polymerase chain reaction. Nov. 1990, Water Quality Technology Conference, San Diego.
23. De Leon, R., **Baric, R.S**. and Sobsey, M.D. Detection of enteroviruses, hepatitis A virus and rotavirus by reverse transcriptase-polymerase chain reaction (RT-PCR) and non-radioactive oligoprobes. American Society of Microbiology, Dallas, 1991.
24. Peel, S.A., Bowdre, J.H. and **R.S. Baric**. 1992. Mutation and amplification in the pfmdr1 gene of P.falciparum is associated with mefloquine and halofantrine resistance. Molecular Parasitology Meetings, Woods Hole, Ma.
25. Fu, K. and **R.S. Baric.** Variable rates of recombination in the MHV genome. Amer. Society of Virology, Colorado 1992.
26. Alexander, L.K. and **R.S. Baric.** Myocarditis and dilated cardiomyopathy following rabbit coronavirus infection. Amer. Soc. Virol., Colorado, 1992.
27. Peel, S.A., Yount, B., and **R.S. Baric.** A strong association between mutation and amplification in pfmdr1 and mefloquine resistance in P.falciparum. Molecular/Biochemic. Parasitology Meetings, Woods Hole, MA 1993.
28. **Baric, R.S.** and Schaad, M.A. 1995. Evidence that subgenomic negative stranded RNAs function in MHV transcription. International Positive strand RNA Virus Meetings, The Netherlands.
29. **Baric, R.S.**, Yount, B., Chen, W. and Peel, S.A. 1995. Interspecies transfer of a murine coronavirus. International Positive Strand RNA Virus Meeting, The Netherlands.
30. **Baric, R.S.**, Yount, B., L. Hensley, and S.A. Peel. Interspecies transfer and remodeling the MHV glycoproteins. 1996. Keystone Symposium: Cell Biology of Virus Entry, Santa Fe, New Mexico.
31. Chen, W. and **R.S. Baric.** 1996. Mechanism of MHV Persistence: Coevolution of increasing host resistance and virus virulence. Keystone Symposium: Cell Biology of Virus Entry, Santa Fe, New Mexico.
32. Gibson, C., D.Rhodes, H.Sum, **R.Baric,** R.Guerrant, and C.Moe. Human caliciviruses and pediatric gastroenteritis: genetic diversity of small round structured viruses in an urban Brazilian slum. ASV, Montana, 1997.
33. **Baric, R.S**. and Schaad, M.C. (1996). Evidence that mouse hepatitis virus subgenomic negative strands are functional templates (Quebec, Canada, International Coronavirus Symposium).
34. **Baric, R.S.,** Chen, W., Yount, B., and Fu, K. (1996). High RNA recombination and mutation rates in MHV suggest that coronaviruses may be potentially important emerging viruses. (Quebec, Canada. International Coronavirus Symposium).
35. Alexander, L.K., Keene, B., Yount, B., and **Baric, R.S.** (1996). Echocardiographic changes following rabbit coronavirus infection. (Quebec, Canada. International Coronavirus Symposium).

36. Chen, W. and **Baric, R.S**. Evolution and persistence mechanisms in mouse hepatitis virus. (1997). (Quebec, Canada. International Coronavirus Symposium).
37. Hensley, L. and **R.S. Baric**. 1997. Human Biliary glycoprotein functions as receptors for Interspecies transfer of mouse hepatitis virus. (Madrid, Spain; International Coronavirus Symposium).
38. Hensley, L.E. and **R.S. Baric.** 1997. Virus receptor interactions and cross species transfer of mouse hepatitis virus. (Madrid, Spain; International Coronavirus Symposium).
39. Chen, W. and **R.S. Baric**. 1997. Receptor Homologue Scanning Functions in the Maintenance of Mouse Hepatitis Virus Persistence. (Madrid, Spain; International Coronavirus Symposium).
40. Shieh, C.Y.S, **R.S. Baric,** and M.D. Sobsey. 1998. Detection of low levels of enteric viruses in metropolitan and airplane sewage. American Society for Microbiology.
41. **Baric, R.S**. 1998. Molecular and Evolutionary Mechanisms of Virus Cross species Transmission. (July 1998, NIH Bethesda--Cross Species Infectivity Meeting)
42. Shieh, Y.-S. C, S.S. Monroe, R.L. Frankhauser, G.W. Langlois, W. Burkhardt, and **RS Baric**. 1999. Detection of Norwalk-like viruses in shellfish implicated in illness. International Calicivirus Symposium, Atlanta Ga.
43. Shieh, Y.-S, and **Baric, RS**. 2000. Detection of Norwalk-like viruses in shellfish. American Society for Virology, Colorado, USA.
44. **Baric, RS**, Harrington, P., Tseng, F., and Moe, C. 2000. Production of Norwalk like viruses from Venezuelan equine encephalitis virus replicon RNAs. American Society for Virology, Colorado, USA.
45. **Baric, RS,** Curtis, K. and Yount, B. 2000. Development of Coronavirus Infectious cDNAs. International Nidovirus Symposium, New York, USA.
46. **Baric, RS** and Yount, B. 2000. Subgenomic negative strand function during MHV infection. International Nidovirus Symposium, New York, USA.
47. **Baric, RS** and Yount, B. 2000. Mechanisms of MHV Persistence. International Nidovirus Symposium, New York, USA.
48. Harrington, P., Moe, C. and **Baric, RS**. 2001. Mucosal, systemic and cross immunity against Norwalk like viruses. American Society for Virology, Madison, Wis.
49. **Baric, RS** and Yount, B. 2001. Coronavirus Heterologous Expression Vectors. American Society for Virology, Madison, Wis.
50. Lindesmith, L., **Baric, RS** and Moe, CL. 2001. Evidence of a protective immune response against Norwalk like viruses. American Society for Virology, Madison, Wis.
51. Curtis, C., Yount, B. and **Baric, RS**. 2001. Heterologous gene expression from transmissible gastroenteritis virus replicon particles. International Symposium on Positive Strand RNA Viruses, Paris, Fr.
52. **Baric, RS**, Curtis, K. and Yount, B. 2001. Coronavirus heterologous gene expression vectors. International Symposium on Positive Strand RNA viruses. Paris, Fr.
53. Harrington, P., Moe, C. and **Baric, RS.** 2001. Systemic, mucosal and heterotypic protection against Norwalk like viruses using Venezuelan equine encephalitis virus replicons. International symposium on positive strand RNA viruses. Paris, Fr.

54. Harrington, P and **Baric, RS**. NLV Vaccines. Southeastern Virology Meetings, Atlanta GA, April, 2002.
55. Mcroy, W and **Baric, RS**. Mechanisms of MHV Cross species Transmission. Southeastern Virology Meeting, Atlanta GA, 2002.
56. McRoy, W and **Baric, RS**. Molecular Mechanisms of MHV Cross Species Transmission, American Society for Virology, Lexington, Ky. July, 2002.
57. Curtis, K, Yount, B and **Baric, RS**. Development of TGEV Replicon Particles. American Society for Virology, Lexington, Ky. July 2002.
58. Executive decision to stop listing abstracts, but on average we are providing abstracts at a rate of 4-15/yr.

VIII. TEACHING ACTIVITIES

A. Courses taught

1. EPID 745 Molecular Techniques for Public Health Research, Guest lecturer
2. MCRO 630 Virology. Guest Lecturer

B. Students supervised

1. Current Students-Dissertation Advisor

a) Kenneth Dinnon (Micro). Thesis: Viral determinants of coronavirus pathogenesis. Fall 2016-Present
b) Ethan Fritch (Micro) Thesis: Roles of RNA Secondary Structure in Genome Replication and Expression of MERS-CoV. Fall 2017
c) Jesica Swantstrom (EPID) Fall 2018-present
d) Deanna Zhu (EPID) Fall 2018-present

2. Former Doctoral Students

a) Mary Schaad, PhD (Epid), Thesis: Genetics of mouse hepatitis virus transcription: Characterization of temperature-sensitive mutants. Fall 1987-Spring 1994 Senior Scientist Ambion
b) Kaisong Fu, PhD (Epid), Thesis: The mechanism of RNA recombination in the mouse hepatitis virus. 1989-Spring 1995. Senior Scientist, RTP
c) Sheila Peel, PhD (Epid), Thesis: Mefloquine resistance in multidrug resistant Plasmodium falciparum in vitro. 1986-1990 Research Scientist, Walter Reed Medical Center
d) Jia-Gang Want, PhD (Micro). Thesis: Structural and functional analysis of hepatitis delta virus antigen. 1990-1994
e) Lisa Hensley, PhD (Epid) Thesis: Molecular mechanisms of the cross-species transmission of mouse hepatitis virus. 1994-1999, Senior Scientist USAMRIID
f) Kristopher Curtis, PhD (Micro) Thesis: Reverse genetic analysis of TGEV gene function and replication. Fall 1998-Fall 2003, Senior Scientist, INDEXX.
g) Patrick Harrington, PhD (Micro) Thesis: Norovirus attachment and vaccine design. Fall 1999-Fall 2003, FDA
h) Will McRoy, PhD (Micro) Thesis: Determinants of mouse hepatitis virus host range expansion. Fall 2001-2006, Assistant Professor
i) Damon Deming, PhD (Micro), Thesis: Genetic approaches to the study of coronavirus replication and pathogenesis. Fall1999- Spring 2007, FDA
j) Anna LoBue, PhD (Micro) Thesis: Norovirus immunobiology and vaccine design Fall 2002-Spring 2008

k) Eric Donaldson, PhD (Micro) Thesis: Computational and molecular biology approaches to viral replication and pathogenesis. Spring 2004-Spring 2008, FDA
l) Timothy Sheahan,PhD (Micro) Thesis: SARS coronavirus pathogenesis and therapeutic treatment design. Fall 2003- Spring 2008, Res Assistant Professor, UNC
m) Meagan Bolles, MD PhD (Micro) Thesis: Evaluations Of Severe Acute Respiratory Syndrome Coronavirus Therapeutics And A Viral Capacity For Plasticity And Escape. Fall 2008 – Spring 2013, Medical Student, UNC
n) Kari Debbink, PhD (Micro) Thesis: Mechanisms of GII.4 norovirus antigenic variation and evolution Fall 2010-Spring 2014, Postdoctoral fellow, NIH
o) Allison Totura, PhD (Micro) SARS coronavirus antagonizes innate immune signaling initiated by RIG-I but is recognized by TLR signaling via the adaptor molecule TRIF. Fall 2007-Spring 2014, USAMRID
p) Kayla Peck, PhD (Biology) Thesis: Characterizing the biochemical determinants governing MERS-coronavirus host range. 2013-Summer 2016, Postdoctoral Fellow, Michigan University
q) Emily Gallichotte, (Micro) Thesis: The human antibody response to DENV2 infection and vaccination; Fall 2014-Spring 2018 Fellow, Colorado State U, Ft. Collins
r) Anne Beall, (Micro) Thesis: Models of Coronavirus Pathogenesis and Innate Immunity; Fall 2014- Fall 2019, Fellow J Craig Venter Institute

3. Dissertation Committee Member

a) John Meschke (ENVR)
b) Fu-Chih Hsu (ENVR)
c) Jin Haw Chou, (EPID)
d) Julie Smith (ENVR)
e) Rebecca Cleveland (EPID)
f) Nicole Gregoricus (ENVR)
g) Amy Pickard (Epid), graduated Spring 2004
h) Jennifer Konnapka (M&I), graduated Spring 2007
i) Cindy Ma (Epid), graduated Spring 2007
j) Jason Simons (M&I) graduated Spring 2010
k) Catherine Cruz (M&I) graduated Spring 2010
l) Amy Wollish (M&I)
m) Alina Lotstein (M&I)
n) Kari Hacker (M&I)
o) Yang Zhou (M&I)
p) Bronwyn Gunn (M&I)
q) Kizzmekia Corbett (M&I)
r) Richard Watkins (M&I)
s) Kizzmekia Corbett (M&I)
t) Jennifer McGraw (M&I)
u) Paul Maurizio (Genetics)
v) Cesar Lopez (M&I)
w) Derek Carbaugh (M&I)

4. Current Postdoctoral/Research Associate

a) Dr. Alexandra Schaefer, 2010-present
b) Dr. Ellen Young, 2016-present
c) Dr. Sarah Leist, 2016-present
d) Dr. David Martinez, 2018-present

e) Dr. Victor Long Ping Tse 2019-present
f) Dr. Jacob Hou, 2019-present

5. Former Postdoctoral Fellows

a) Sheila Peel, Senior Researcher, Walter Reed Medical Institute
b) Lorraine Alexander, Res. Asst Professor, Dept. of Epidemiology, UNC-CH
c) Carol Shieh, Research Scientist, Food and Drug Administration
d) Amy Sims, 2002-2005 Biomedical ScientistPacific Northwest National Laboratories
e) Kirk Prutzman, 2006-2008, Food and Drug Administration
f) Damon Deming, 2007-2009, Food and Drug Administration,
g) Matthew Frieman, 2004-2009 Assistant Professor, Univ. of Maryland
h) Barry Rockx, 2004-2008 Workgroup Leader, Exotic Viruses, Erasmus, MC
i) Eric Donaldson, 2008-2009, Clinical Virology Reviewer, Food and Drug Administration
j) William Messer, 2008-2012, Asst Professor, Oregon Health Science University
k) Rachel Graham, 2007-2013, Research Assistant Professor, UNC-CH
l) Sudhakar Agnihothram, 2008-2014, Fellow, Food and Drug Administration
m) Schafer, Alexandra, 2010-2012, Research Associate, UNC-CH
n) Gralinski, Lisa 2008-2013, Research Asst Professor, UNC-CH
o) Widman, Douglas 2013-2016, R& D Project Mgr., Karyopharm Therapeutics
p) Cockrell, Adam, 2014-2018, AveXis, Inc, Principal Scientist.
q) Jessica Plante, 2014-2016, Fellow, UTMB
r) Vineet Menachery, 2010-2017, Assistant Professor. UTMB
s) Dr. Jacob Kocher, 2014-2018, Staff Research, Smithfield Foods
t) Dr. Kara Jensen, 2015-2019

IX. CONRACTS AND GRANTS

A. Current Funding

1. U19 AI100625 (Baric, Heise MPI) 08/05/2012-8/31/2022
NIH/NIAID Total Direct Cost $14,543071
Systems Immunogenetics of Biodefense Pathogens in the Collaborative Cross
The Collaborative Cross, a mouse resource designed to study complex genetic interactions in diverse populations, to identify novel polymorphic genes regulating immune responses to SARS, influenza and West Nile viruses, gain new insights into genetic interactions that shape immune phenotypes in mice and humans, and generate panels of genetically defined mice to probe how sets of polymorphic genes affect immune responses against a variety of pathogens or other immune stimuli.

2. R01 AI 107731 (PI: De Silva) 08/01/13-08/31/23
NIH/NIAID $300,000
Molecular Basis of Dengue Virus Neutralization by Human Antibodies
These studies proposed here are directly relevant to developing simple assays to predict the performance of the leading dengue vaccine candidates and also for developing the next generation of safe and effective dengue vaccines.
Role: Co-Investigator

3. R01 AI108197 (MPI: Denison/Baric) 08/01/13-07/31/23
Vanderbilt University/NIH/NIAID $280,000
Determinants of Coronavirus Fidelity in Replication and Pathogenesis

Experiments in this aim will test the hypothesis nsp1 functions in maintaining high replication fidelity and viral RNA synthesis are coupled and that targeted engineered mutations across nsp14 alter: a) RNA fidelity outcomes; b) sensitivity nucleoside mutagens, terminators and polymerase inhibitors; c) the kinetics and magnitude of positive, negative, genomic and subgenomic RNA synthesis; and d) RNA recombination frequencies.

4. **R01 AI110700 (PI: Baric) 04/20/15-03/31/20**
   NIH/NIAID $3,675,513
   Mechanisms of MERS-CoV Entry, Cross-species Transmission and Pathogenesis
   The overall goal is to build a comprehensive understanding of the molecular mechanisms guiding group 2c CoV receptor recognition, entry and pathogenesis.

5. **00008956 (PI: Harris) 07/29/15-06/30/20**
   UCB/NIH/NIAID $275,000
   Protective immunity following dengue virus natural infections and vaccination
   We will perform studies to characterize the B-cell/ antibody (responses in people who receive dengue live attenuated virus vaccines (DLAV).
   Role: Co-Investigator

6. **R01 AI125198 (de Silva) 05/04/16 – 04/30/21**
   NIH/NIAID $1,153,997
   Preclinical Assays To Predict Tetravalent Dengue Vaccine Efficacy
   Dengue is the most significant mosquito transmitted viral infection of humans. Vaccination is a feasible solution to prevent and control dengue. Although dengue vaccines are under development, we do not know the specific properties of antibodies induced by vaccines that are likely to protect from infection. In this project investigators from the University of North Carolina and Sanofi Pasture, a leading dengue vaccine developer, will collaborate to define properties of antibodies induced by the Sanofi vaccine that correlate with protection. The main goal of the project is to develop new assays to support the current global effort to develop dengue virus vaccines. Role: Co-Investigator

7. **R01AI089726 (PI: Li) 06/07/16-05/31/21**
   Univ Minn/NIH $120,384
   Receptor recognition and cell entry of coronaviruses
   To investigate how CoVs explore host receptors and host proteases for regulation of their host range, cross-species transmission, tissue tropism, and pathogenesis. Role: Consortium PI

8. **Burroughs Welcome Trust (PI-Judy Breuer) 2/1/2017-1/31/2020**
   University College London 500,000£
   Why do Norovirus pandemics occur and how can we control them?
   The program uses hospital and community cohorts of NoV infected individuals to ask fundamental questions into the molecular and evolutionary epidemiology of human NoV infections, focusing on the GII.4 strains, leading to new models of virus emergence and disease prevention. (Funded pending execution of subcontract). Role: Co-Investigator.

9. **R21 AI135682 (MPI: Georgiou/Baric) 02/01/2018-1/31/2020**
   Univ of Texas Austin/NIH $213,813
   Molecular Analysis of Serum Antibody Constituents in Zika Virus Infection
   To identify nonneutralizing antibodies which enhance ZIKV infection in primary adult and fetal cord monocytes (antibody dependent enhancement-ADE), which may be associated with more severe clinical presentations like Guillain-Barre syndrome and microcephaly.

10. **R21 AI137887** **(MPI: Moorman/Heise)** **02/05/18-01/31/20**
NIH/NIAID **$150,000**
Molecular Characterization of Functional RNA Structures in the ZikV genome
The goal of this project is to study The RNA Structure of Zika virus, an emerging pathogen that is associated with severe congenital neurologic defects, such as microcephaly. The proposed studies will identify new viral virulence determinants that can be targeted to generate safer and more effective Zika virus vaccines and therapeutics. Role: Co-I

11. **U19 AI 142759 CETR** **(PI: Whitley)** **03/07/19-02/28/24**
UAB/NIH/NIAID **$375,233**
Antiviral Drug Discovery and Development Center
The specific aims of the proposal will identify small molecule inhibitors of CoV fidelity and RNA capping, define their mechanism of action, and determine their efficacy against SARS-CoV and across CoV families using in vivo mouse models of acute and persistent CoV disease. Role: Investigator

12. **K24AI141744** **(Becker-Dreps)** **12/06/18-11/30/23**
NIH/NIAID **$157,100**
The Development of Norovirus Immunity in Early Childhood and Implications for Norovirus Vaccines To acquire new research skills and carry out a research plan that will allow guidance of the development of pediatric norovirus vaccines.
Role: Investigator

13. **U01 AI149644** **(PI: Baric)** **04/19/19-03/31/24**
NIH/NIAID $644,071
Respiratory Virus Vaccine and Adjuvant Exploration
This project takes advantage of expertise in adjuvant development, vaccinology, and complex trait genetics, proposes to use advanced Systems Vaccinology and Genetics approaches to define the polymorphic genes/gene networks that regulate the immune response to select respiratory virus adjuvanted immunogens.

14. **R01 AI127845** **(PI: Becker-Dreps)** **09/27/16-08/31/21**
NIH/NIAID **$498,959**
Natural history, immunity, and transmission patterns of sapovirus in a Nicaraguan birth cohort
To characterize the natural history and risk factors for sapovirus gastroenteritis, elucidate the development of immunity to sapovirus in early childhood and the potential protective effect of maternal immunity, and apply novel genetic and analytic tools to characterize patterns of sapovirus transmission in households and communities. Role: Investigator

15. **R01 AI132178** **(PI: Baric/Sheahan)** **08/09/17-07/31/22**
NIH/NIAID **$919,427**
Broad-spectrum antiviral GS-5734 to treat MERS-CoV and related emerging CoV
To focus on two areas: novel second generation compounds or compounds not previously provided by Gilead Sciences; and selecting and evaluating drug resistance profiles for SARS-CoV and MERS-CoV mutants in primary human lung cells.

16. **D43 TW010923** **(PI: Becker-Dreps/Meshnick)** **05/10/18-02/28/23**
NIH **$230,000**
Nicaraguan Emerging and Endemic Diseases (NEED)
The goals of this program are to 1) train young Nicaraguan scientists in Infectious Disease Epidemiology at the UNC, 2) create a sustainable supply of scientists in the region by establishing an accredited PhD program in Biomedical Sciences at the Universidad

Nacional Autonoma de Nicaragua Leon and 3) foster professional growth and development among trainees and local faculty to ensure academic and research success. Role: Investigator

17. **U01 AI141997** **(PI: Kirkpatrick)** **02/01/19-01/31/24**
Univ Vermont/NIH/NIAID $64,128
Mechanisms of Protection and Durability for a Live Attenuated Tetravalent Dengue Vaccine
Tetravalent dengue vaccination must offer safe and durable protection against all four serotypes of dengue viruses. We leverage four vaccine trials and viral challenges evaluating the NIH dengue vaccine to explore and confirm immune mechanisms associated with protection. Role: Investigator

18. **HHSN272201700036I** **(PI: Baric)** **07/15/19-07/14/20**
NIH/NIAID $442,129
Task Order A24 - Establishment of Chronic Bacterial Infection Models in Mouse Models of Cystic Fibrosis with Pseudomonas aeruginosa and Staphylococcus aureus
To test and refine currently available mouse models of cystic fibrosis (CF) chronic lung infections. Key determinants for this refinement include the ability to screen existing clinical isolate collections (both P. aeruginosa and S. aureus) to identify bacterial strains with increased likelihood of establishing chronic lung infections in wild-type (WT) mice using an established protocol for embedding bacteria in agar beads and the availability of Cftr-deficient mice to test the outcome of chronic infection with novel bacterial strains.

19. **HHSN272201700036I** **(PI: Baric)** **09/15/19-03/14/21**
NIH/NIAID $271,640
Task Order A36 - Efficacy of Coronavirus Vaccines and Monoclonal Antibodies in Mouse Models
To use our novel panel of recombinant virus challenge strains to assess the efficacy of candidate vaccine and therapeutic monoclonal antibodies in murine coronavirus challenge models and to understand the immunological mechanisms and correlates of protection.

B. Career Development Awards

1. **Harvey Weaver Scholar, National Multiple Sclerosis Society**. 7/1/84-5/1/86. $44,000**.** Postdoctoral fellow research fellow support. **PI: RS Baric**

2. **Career Development Award from the National American Heart Association, Established Investigator Award** "Coronavirus-Induced Rabbit Cardiomyopathy".. Direct costs $175,000. 7/1/89 - 6/30/94. PI: RS Baric

C. Mentor: Student/Postdoc Fellowship Awards

1. Lorraine K. Alexander. Rabbit Coronavirus induced myocarditis and dilated cardiomyopathy. $60,000, Bird Dunn Awardee.(Postdoctoral Fellowship-North Carolina Chapter from the American Heart Association, RS Baric, Mentor

2. Wan Chen. Persistence and evolution mechanisms of Mouse Hepatitis Virus. Pathogenesis Training Grant. Postdoctoral Fellowship Support $36,000 direct costs. RS Baric, Mentor

3. Kris Curtis, Virology Training Grant 9/1/01-8/30/02. Coronavirus reverse genetics, $18,000 direct costs, RS Baric, Mentor

4. Patrick Harrington, Virology Training grant 9/1/02-8/30/03. Norovirus capsid-ABH antigen interactions. $18,000 Direct Costs, RS Baric, Mentor.

5. Will McRoy, Virology Training Grant 9/1/03-8/30/04. Coronavirus Host Shifting Mechanisms. ~$18,000 Direct Costs. RS Baric, Mentor

6. R.J. Cleveland, Department of Defense, Breast Cancer Research Program. Insulin-like-growth factor 1-gene polymorphisms in breast cancer. Predoctoral fellowship award 4/1/01-3/31/04; $65,858 total costs. Mentor: M. Gamon, RS Baric and B. Millikan, co investigators.

7. Amy Sims, Postdoctoral Fellowship Award; Pathogenesis Training Grant. 6/1/02-5/30/04. $75,000/total costs. RS Baric, Mentor

8. Matt Frieman, NIH Postdoctoral Fellowship Award, "SARS-CoV mediated Modulation of Innate Immunity". $120,000 total costs; Oct 1, 2005-Sept 31, 2008. RS Baric, Mentor

9. Rachael Graham, NIH Postdoctoral Fellowship Award. Rewiring the SARS-CoV Genome. $120,000 total costs; Oct 2008-2010. RS Baric, Mentor

10. Vineet Menachery, NIH Postdoctoral Fellowship Award. RS Baric, Mentor

11. Victor Long Ping Tze, Pfizer-NCBiotech Distinguished Postdoctoral Fellowship in Gene Therapy $190,340 total cost; Dec 2019-Nov 2021, RS Baric, Mentor

D. Training Grant Participation at UNC

1. Virology Training Grant (Department of Microbiology, Mark Heise, PhD, Director) 1993-present.

2. Pathogenesis Training Grant (Department of Microbiology and Division of Infectious Diseases; David Margolis, Director) 1992-Present.

3. Nutritional Biochemistry and Epidemiology of Cancer (Epidemiology Department; Lenore Kohlmeier, Director). 1997

4. Environmental and Molecular Epidemiology Training Grant (David Savitz, Director) 1997-2004.

X. SERVICE

A. Grant Review-pre1998

1. USDA, Molecular Biology/Gene Animal Structure, 1988-2002
2. NIH AID Ad Hoc reviewer 1992 (1 proposal)
3. Veterans Administration 1992, 1996 (1 proposal each)
4. NIH Evolution of Infectious Diseases, Special ad hoc committee. July 1997
5. Programme de Recherche Fondamentale en Microbiologie et Maladies Infectieuses et Parasitaires French Government 1998 (1 proposal).

A2. Grant Review 1999:

1. NIH MBRS Score: primary reviewer 7 grant applications from University of Puerto Rico MBRS-SCORE PROGRAM, Decide which proposals are submitted to NIH for review
2. Ad hoc reviewer United States Department of Agriculture-Animal Health and well-being
3. Ad hoc reviewer, National Institutes of Health, Experimental Virology Study Section, 1 grant, conference call

A3. Grant Review 2000-2001

1. National Institutes of Health, Genetics Study Section, Feb 2000. Ad hoc
2. National Institutes of Health, Genetics Study Section June 2000. Ad hoc National Institutes of Health, AIDS Vaccines Study Section, Sept. 2000. Conference call
3. National Institutes of Health, Genetics Study Section, Feb 2001. Ad hoc National Institutes of Health, 3. Genetics Study Section June 2001. Ad hoc.
4. Veterans Administration, Virology (March, 2001). Ad hoc.
5. Experimental Virology Study Section. Ad hoc reviewer with 6 grants to review. Oct 15-17, 2001.

A4. Grant Review 2002

1. National Institutes of Health, Genetics Study Section, Feb 2002. Ad hoc
2. AD hoc reviewer, The Welcome Trust. March, 2002

A5. Grant Review 2003

1. Genetics study section Feb and Oct, 2003. Ad hoc.
2. Experimental Virology, February, 2003. Ad hoc
3. NIH ad hoc review, Poxvirus vaccine program project. Sept 2003.

A6. Grant Review 2004

1. National Institutes of health, Experimental Virology Study Section, Feb 2004. Ad hoc member
2. National Institutes of health, Experimental Virology Study Section, Oct 2004. Ad hoc reviewer
3. National Institutes of health, Experimental Virology Study Section, Mar, 2005. Ad hoc reviewer

A7. Grant Review, 2005-09

1. Permanent Member, Virology B Study Section, Oct 2005-2009. Three Meetings/year in Oct, Feb and June. Average 6-9 grants to review per session.

A8. Grant review 2017, 2018

1. Ad Hoc member of Imm

XI. Other Professional Development

A. NIH MBRS External Review Committee (1999-2010) National Institutes of Health, MBRS SCORE Proposal for the University of Puerto Rico at San Juan. Visit yearly and review the UPR MRBS SCORE NIH PROGRAM PROJECT GRANT (a compilation of 17 NIH grants to a minority institution), recommended and reviewed new grants for submission to NIH as

part of MBRS SCORE (5 projects), reviewed individual PI progress (5 funded applications), reviewed UPR research infrastructure and made recommendations to the Chancellor and Dean of the Medical School for enhancing basic and clinical research on campus.

B. Task force on Veterinary Virology-American Society for Virology

C. Veterinary Virology Finance Committee-American Society for Virology

D. Manuscript Review/Editorial Boards:

1. Editorial Board, Journal of Virology 2004-2006.
2. Editorial board, Journal of Virology, 2007-.
3. Associate Editor, Plos Pathogen 2007-2008.
4. Senior Editor, Plos Pathogens 2008-2014.

E. University and Department Committees:

1. UNC-School of Public Health Shop Committee, 1987-89
2. Departmental (Parasitology and Lab Practice) Curriculum Committee, 1987-1990
3. Co-Chair, Parasitology Departmental Space Committee, 1987, 1988
4. Infectious Disease Program Task Force, 1988
5. UNC-School of Public Health Safety Committee, 1988-1989
6. Epidemiology Doctoral Program Committee, 1990-95
7. Infectious Disease Program Committee, 1990-present
8. Epidemiology Laboratory Committee, 1991-present, Chair
9. University Recombinant DNA Committee (1996-2001)
10. Space Committee (School of Public Health) 1998-2009
11. BSL-3 Team Committee (University wide) 2012-present
12. Task Force for Select Agents (University wide) 2013-present
13. School of Public Health Appointment and Promotion Committee 2014-2017

F. Meeting Organization, Planning and Committees:

1. International RNA Positive Meeting Steering Committee, Atlanta 2010
2. International Calcivirus Conference Steering Committee, Chile 2010
3. International Nidovirus Conference Steering Committee, US 2011
4. Systems Biology Conference, Host: Chapel Hill, NC 2011
5. International Nidovirus Conference Steering Committee, US 2014
6. Going Viral Flu Symposium, Planning Committee, SPH 2018
7. International Nidovirus Conference Steering Committee, US 2020

G. Faculty Mentorship Committee

1. Raymond Pickles, Associate Professor, Microbiology and Immunology
2. Jason Whitmire, Assistant Professor, Genetics
3. Jennifer Smith, Research Assistant Professor, Epidemiology
4. Amy Sims, Research Assistant Professor, Epidemiology
5. Martin Ferris, Research Assistant Professor, Genetics
6. Kathleen Dorsey, Research Assistant Professor, Epidemiology
7. Rachel Graham, Research Assistant Professor, Epidemiology
8. Patricia Basta, Research Assistant Professor, Epidemiology
9. Timothy Sheahan, Research Assistant Professor, Epidemiology

XII. UNC Patent/Invention Reports

A. US. Patent No. 6,593,111. 2003. Ralph S. Baric, Boyd Yount. Directional Assembly of Large Viral Genomes and Chromosomes.

B. US Patent No. 7,279,327, 2007. Ralph S. Baric, Boyd Yount, Kristopher Curtis. Methods for Producing Recombinant Coronavirus
C. US Patent No.7,618,802. Ralph S. Baric, Kristopher Curtis, Rhonda Roberts, Boyd Yount. Methods and Compositions for Infectious cDNA of SARS Coronavirus.
D. US Patent Pending. Application #: 12/875367. Ralph S. Baric, Anna LoBue, Joseph M. Thompson, Robert E. Johnston, and Lisa Lindesmith. Multivalent Immunogenic Compositions against Noroviruses and methods of use.
E. Invention Report (Protected under US Patent 6,593,111). Dengue virus infectious clone: Methods for producing recombinant Dengue Viruses. Ralph S. Baric, Boyd Yount, William Messer and Aravinda de Silva.
F. WIPO/PCT International Publication Number WO 2014/145245 A2. Ralph S Baric, Lisa C Lindesmith, Kari M Debbink, Eric F Donaldson, Jesica A Swanstrom. Methods and Compositions for Norovirus Blockade Epitopes.