

CURRICULUM VITAE

NAME. Colin Ross PARRISH

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EDUCATION.

Cornell University, Ithaca, New York, USA

- Veterinary Virology
- Ph.D., 1984

Massey University, Palmerston North, New Zealand

- Microbiology
- B.Sc. (1st Class Honors), 1979

Auckland Technical Institute, Auckland, New Zealand

- Microbiology and Biochemistry
- New Zealand Certificate of Science, 1975

HONORS and AWARDS.

John M. Olin Professor of Virology, 2005.

Councilor for Veterinary Virology, American Society for Virology, 2004 – 2007.

Chair, sessions at International Parvovirus Meetings, 1991, 1999, 2002, 2004, 2006, 2008, 2010.

Chair, Parvovirus workshop, American Society for Virology, 19th Annual Meeting, July 1998.

Chair, Session on “Parvovirus Structure”, 6th International Parvovirus Workshop, Montpellier, France, September 1995.

SmithKline Beecham Award for Research Excellence, 1992.

Chair, Parvovirus workshop, American Society for Virology, 10th Annual Meeting, July 1992.

Carlsberg Foundation Travel Award, 4th International Parvovirus Workshop, 1991.

American Kennel Club Postdoctoral Fellowships, 1984, 1985 and 1986.

Fulbright Travel Award, 1980.

F. W. W. Rhodes Memorial Scholarship, 1980 – 1983.

New Zealand University Grants Council Postgraduate Scholarships, 1979, 1980.

Massey University Postgraduate Scholarship, 1979.

Science Technician Association Prize (New Zealand), 1976.

New Zealand Association of Scientists Award, 1976.

RESEARCH AND PROFESSIONAL EXPERIENCE.

Director, Baker Institute for Animal Health and
Feline Health Center 2010 - present
John M. Olin Professor of Virology 2005 - present
Professor 2002 - 2005
Associate Professor 1994 - 2002
Assistant Professor 1988 - 1994
James A. Baker Institute for Animal Health
Department of Microbiology and Immunology
College of Veterinary Medicine
Cornell University, Ithaca, New York, USA

Research Officer 1986 - 1988
Department of Microbiology
Monash University, Clayton, Victoria, Australia

Research Assistant Professor (non-tenure track) 1984 - 1986
James A. Baker Institute for Animal Health
Department of Microbiology and Immunology
College of Veterinary Medicine
Cornell University, Ithaca, New York, USA

Graduate Research Assistant 1980 - 1984
James A. Baker Institute for Animal Health
Department of Microbiology and Immunology
College of Veterinary Medicine
Cornell University, Ithaca, New York, USA

Scientist 1979 - 1980
Virology Section
Animal Health Reference Laboratory
New Zealand Ministry of Agriculture and Fisheries
Upper Hutt, New Zealand

Technician 1973 - 1975
Plant Diseases Division
Department of Scientific and Industrial Research
Auckland, New Zealand

SCIENTIFIC SOCIETIES.

American Society for Microbiology
Society for General Microbiology
American Society for Virology
American Society for Cell Biology
American Society for Glycobiology

MAJOR RESEARCH INTERESTS.

Virology
Viral Pathogenesis and Immunology
Infectious Disease Research
Viral Evolution

PUBLICATIONS.

Peer-Reviewed Publications.

- 1) Parrish, C.R., Oliver, R.E., McNiven, R. (1982). Canine parvovirus infection in a colony of dogs. Veterinary Microbiology 7: 317-324.
- 2) Parrish, C.R., Oliver, R.E., Corrin, K.C., Weddell, W. (1982). Bovine leukaemia virus infection in New Zealand cattle. New Zealand Veterinary Journal 30: 56-58.
- 3) Parrish, C.R., Carmichael, L.E., Antczak, D.F. (1982). Antigenic relationships between canine parvovirus type-2, feline panleukopenia virus and mink enteritis virus using conventional antisera and monoclonal antibodies. Archives of Virology 72: 267-278.
- 4) Appel, M.J.G., Parrish, C.R. (1982). Raccoons are not susceptible to canine parvovirus. Journal American Veterinary Medical Association 181: 489.
- 5) Parrish, C.R., Carmichael, L.E. (1983). Antigenic structure and variation of canine parvovirus type-2, feline panleukopenia virus and mink enteritis virus. Virology 129: 401-414.
- 6) Parrish, C.R., Gorham, J.R., Schwartz, T.M., Carmichael, L.E. (1984). Characterization of antigenic variation amongst mink enteritis virus isolates. American Journal of Veterinary Research 45: 2591-2599.
- 7) Parrish, C.R., O'Connell, P.H., Evermann, J.F., Carmichael, L.E. (1985). Natural variation of canine parvovirus. Science 230: 1046-1048.
- 8) Parrish, C.R., Carmichael, L.E. (1986). Characterization and recombination mapping of an antigenic and host range mutation of canine parvovirus. Virology 148: 121-132.
- 9) Parrish, C.R., Leathers, C.W., Pearson, R., Gorham, J.R. (1987). Comparisons of feline panleukopenia virus, canine parvovirus, raccoon parvovirus and mink enteritis virus and their pathogenicity for mink and ferrets. American Journal of Veterinary Research 48: 1429-1435.
- 10) Parrish, C.R., Burtonboy, G., Carmichael, L.E. (1988). Characterization of a non-hemagglutinating mutant of canine parvovirus. Virology 163: 230-232.
- 11) Parrish, C.R., Have, P., Foreyt, W.J., Evermann, J.F., Senda, M., Carmichael, L.E. (1988). The global spread and replacement of canine parvovirus strains. Journal of General Virology 69: 1111-1116.
- 12) Macartney, L., Parrish, C.R., Binn, L.N., Carmichael, L.E. (1988). Characterization of minute virus of canines (MVC) and its pathogenicity for pups. Cornell Veterinarian 78: 131-145.
- 13) Parrish, C.R., Aquadro, C.F., Carmichael, L.E. (1988). Canine host range and a specific epitope map along with variant sequences in the capsid protein gene of canine parvovirus and related feline, mink and raccoon parvoviruses. Virology 166: 293-307.
- 14) Parrish, C.R. (1990). The emergence, natural history, and variation of canine, mink and feline parvoviruses. Advances in Virus Research 38: 403-450.
- 15) Parrish, C.R., Woo, W.S., Wright, P.J. (1991). Expression of the NS1 gene of dengue virus type 2 using vaccinia virus: dimerization of the NS1 glycoprotein. Archives of Virology 117: 279-286.
- 16) Parrish, C.R., Coia, G., Hill, A., Mullbacher, A., Westaway, E.G., Blanden, R.V. (1991). Preliminary analysis of murine cytotoxic T cell responses to the proteins of the flavivirus Kunjin using vaccinia virus expression. Journal of General Virology 72: 1645-1653.
- 17) Tsao, J., Chapman, M.S., Agbandje, M., Keller, W., Smith, K., Wu, H., Luo, M., Smith, T.J., Rossmann, M.G., Compans, R.W., Parrish, C.R. (1991). The three-dimensional structure of canine parvovirus and its functional implications. Science 251: 1456-1464.

- 18) Parrish, C.R. (1991). Mapping specific functions in the capsid structure of canine parvovirus and feline panleukopenia virus using infectious plasmid clones. Virology 183: 195-205.
- 19) Parrish, C.R., Aquadro, C.F., Strassheim, M.L., Evermann, J.F., Sgro, J.-Y., Mohammed, H.O. (1991). Rapid antigenic type replacement and DNA sequence evolution of canine parvovirus. Journal of Virology 65: 6544-6552.
- 20) Saliki, J.T., Mizak, B., Flore, H.P., Gettig, R.R., Burand, J.P., Carmichael, L.E., Wood, H.A., Parrish, C.R. (1992). Canine parvovirus empty capsids produced by expression in a baculovirus vector - use in analysis of viral properties and immunization of dogs. Journal of General Virology 73: 369-374.
- 21) Kulkarni, A.B., Müllbacher, A., Parrish, C.R., Westaway, E.G., Coia, G., Blanden, R.V. (1992). Analysis of the murine MHC class II-restricted T cell responses to the flavivirus kunjin using vaccinia expression. Journal of Virology 66: 3583-3592.
- 22) Hill, A.B., Müllbacher, A., Parrish, C.R., Coia, G., Westaway, E.G., Blanden, R.V. (1992). Broad cross-reactivity with marked fine specificity in the cytotoxic T cell response to flaviviruses. Journal of General Virology 73: 1115-1123.
- 23) Hill, A.B., Blanden, R.V., Parrish, C.R., Mullbacher A. (1992). Restimulated memory Tc cells have a higher apparent avidity of interaction with targets than primary virus-immune Tc cells as indicated by anti-CD8 blocking. Immunology and Cell Biology 70:259-265.
- 24) Truyen, U., Parrish, C.R. (1992). The canine and feline host ranges of canine parvovirus and feline panleukopenia virus: distinct host cell tropisms of each virus *in vitro* and *in vivo*. Journal of Virology 66: 5399-5408.
- 25) Barbis, D.P., Chang, S-F., Parrish, C.R. (1992). Mutations adjacent to the dimple of the canine parvovirus capsid structure affect sialic acid binding. Virology 191: 301-308.
- 26) Chang, S-F., Sgro, J-Y., Parrish, C.R. (1992). Multiple amino acids in the capsid structure of canine parvovirus coordinately determine the canine host range and specific antigenic and hemagglutination properties. Journal of Virology 66: 6858-6867.
- 27) Agbandje, M., McKenna, R., Rossmann, M.G., Strassheim, M.L., Parrish, C.R. (1993). Structure determination of feline panleukopenia virus empty particles. Proteins 16: 155-171.
- 28) Soiné, C., Watson, S.K., Rybicki, E., Lucion, B., Nordgren, R.M., Parrish, C.R., Schat, K.A. (1993). Determination of the detection limit of the polymerase chain reaction for chicken infectious anemia virus. Avian Diseases 37: 467-476.
- 29) Alexander, K.A., Conrad, P.A., Gardner, I.A., Parrish, C.R., Appel, M.J., Levy, M.G., Lerche, N., Kat, P. (1993). Serologic survey of selected canine pathogens in African Wild Dogs (*Lycaon pictus*) and sympatric domestic dogs in Masai Mara, Kenya. Journal of Zoo Wildlife Medicine 24: 140-144.
- 30) Strassheim, M.L., Gruenberg, A., Veijalainen, P., Sgro, J-Y., Parrish, C.R. (1994). Two dominant neutralizing antigenic determinants of canine parvovirus are found on the threefold spike of the virus capsid. Virology 198: 175-184.
- 31) Truyen, U., Agbandje, M., Parrish, C.R. (1994). Characterization of the feline host range and a specific epitope of feline panleukopenia virus. Virology 200: 494-503.
- 32) Wikoff, W.R., Wang, G., Parrish, C.R., Cheng, R.H., Strassheim, M.L., Baker, T.S., Rossmann, M.G. (1994). The structure of a neutralized virus: canine parvovirus complexed with neutralizing antibody fragment. Structure 2: 595-607.
- 33) Truyen, U., Platzer, G., Parrish, C.R., Hänichen, T., Hermanns, W., Kaaden, O.-R. (1994). Detection of canine parvovirus DNA in paraffin-embedded tissues by polymerase chain reaction. Journal of Veterinary Medical Biology 41: 148-152.
- 34) Lin, B., Parrish, C.R., Murray, J.M., Wright, P.J. (1994). Localization of a neutralizing epitope on the envelope protein of Dengue virus type 2. Virology 202: 885-890.
- 35) Senda, M., Parrish, C.R., Harasawa, R., Gamoh, K., Muramatsu, M., Hirayama, N., Itoh, O. (1995). Detection by PCR of wild-type canine parvovirus which contaminates dog vaccines. Journal of

- Clinical Microbiology 33: 110-113.
- 36) Jia, W., Karaca, K., Parrish, C.R., Naqi, S.A. (1995). A novel variant of avian infectious bronchitis virus resulting from recombination among three different strains. Archives of Virology 140: 259-271.
 - 37) Tresnan, D.B., Southard, L., Weichert, W., Sgro, J.-Y., Parrish, C.R. (1995). Analysis of the cell and erythrocyte binding activities of the dimple and canyon regions of the canine parvovirus capsid. Virology 211: 123-132.
 - 38) Truyen, U., Gruenberg, A., Chang, S.-F., Obermaier, B., Veijalainen, P., Parrish, C.R. (1995). Evolution of the feline-subgroup parvoviruses and the control of canine host range *in vivo*. Journal of Virology 69: 4702-4710.
 - 39) Jia, W., Wang, X., Parrish, C.R., Naqi, S.A. (1996). Analysis of the serotype-specific epitopes of avian infectious bronchitis virus strains Ark99 and Mass41. Journal of Virology 70:7255-7259.
 - 40) Truyen, U., Evermann, J.F., Vieler, E., Parrish, C.R. (1996). Evolution of canine parvovirus involved loss and gain of feline host range. Virology 215: 186-189.
 - 41) Llamas-Saiz, A. L., Agbandje-McKenna, M., Parker, J. S., Wahid, A. T., Parrish, C. R., Rossmann, M. G. (1996). Structural analysis of a mutation in canine parvovirus which controls antigenicity and host range. Virology 225: 65-71.
 - 42) Truyen, U., Platzer, G., Parrish, C. R. (1996). Antigenic type distribution among canine parvoviruses in dogs and cats in Germany. Veterinary Record 138: 365-366.
 - 43) Spitzer, A. L., Parrish, C. R., Maxwell, I. H. (1997). Tropic determinant for canine parvovirus and feline panleukopenia virus functions through the capsid protein VP2. Journal of General Virology 78: 925-928.
 - 44) Parker, J.S.L., Parrish, C.R. (1997). Canine parvovirus host range is determined by the specific conformation of an additional region of the capsid. Journal of Virology 71: 9214-9222.
 - 45) Rovnak, J., Quackenbush, S.L., Reyes, R.A., Baines, J.D., Parrish, C.R., Casey, J.W. (1998). Detection of a novel bovine lymphotropic herpesvirus. Journal of Virology 72: 4237-4242.
 - 46) Quackenbush, S.L., Work, T.M., Balazs, G.H., Casey, R.N., Rovnak, J., Chaves, A., duToit, L., Baines, J.D., Parrish, C.R., Bowser, P.R., Casey, J.W. (1998). Three closely related herpesviruses are associated with fibropapillomatosis in marine turtles. Virology 246: 392-399.
 - 47) Steinel, A., Venter, E.H., Van Vuuren, M., Parrish, C.R., Truyen, U. (1998). Antigenic and genetic analysis of canine parvoviruses in southern Africa. Onderstepoort Journal of Veterinary Research 65: 239-242.
 - 48) Wang, D. Yuan, W, Davis, I, Parrish, C.R. (1998). Non-structural protein-2 (NS2) and the replication of canine parvovirus. Virology 240: 273-281.
 - 49) Truyen, U., Geissler, K., Parrish, C.R., Hermanns, W., Siegl, G. (1998). No evidence for a role of modified live virus vaccines in the emergence of canine parvovirus. Journal of General Virology 79: 1153-1158.
 - 50) Weichert, W.S., Parker, J.S.L., Chang, S-F., Wahid, A.T.M., Meier, E., Parrish, C.R. (1998). Assaying for structural variation in the parvovirus capsid and its role in infection. Virology 250: 106-117
 - 51) Wang, D., Parrish, C.R. (1999). A heterogeneous nuclear ribonucleoprotein A/B-related protein binds to single-stranded DNA near the 5' end or within the genome of feline parvovirus and can modify virus replication. Journal of Virology 73: 7761-7768.
 - 52) Geissler, K., Parrish, C. R., Schneider, K., Truyen, U. (1999). Feline calicivirus capsid protein expression and self-assembly in cultured feline cells. Veterinary Microbiology 69: 63-66.
 - 53) Geissler, K., Schneider, K., Fleuchaus, A., Parrish, C. R., Sutter, G., Truyen, U. (1999). Feline calicivirus capsid protein expression and capsid assembly in cultured feline cells. Journal of Virology 73: 834-838.
 - 54) Parker, J.S.L., Parrish, C.R. (2000). Cellular uptake and infection by canine parvovirus involves rapid dynamin-regulated clathrin-mediated endocytosis, followed by slower intracellular trafficking.

- Journal of Virology 74: 1919-1930.
- 55) Roy, A-M.M., Parker, J.S., Parrish, C.R., Whittaker, G.R. (2000). Early stages of influenza virus entry into Mv-1 lung cells: involvement of dynamin. Virology 267: 17-28.
 - 56) Vihinen-Ranta, M., Yuan, W., Parrish, C.R. (2000). Cytoplasmic trafficking of the canine parvovirus capsid and its role in infection and nuclear transport. Journal of Virology 74: 4853-4859
 - 57) Yuan, W., Parrish, C.R. (2000). Comparison of two single chain antibodies that neutralize canine parvovirus: analysis of antibody -combining site and mechanisms of neutralization. Virology 269: 471-480.
 - 58) Simpson, A.A., Chandrasekar, V., Hébert, B., Sullivan, G.M., Rossmann, M.G., Parrish, C.R. (2000). Host range and variability of calcium binding by surface loops in the capsids of canine and feline parvoviruses. Journal of Molecular Biology 300: 597-610.
 - 59) Yuan, W., Parrish, C.R. (2001). Canine parvovirus capsid assembly and differences in mammalian and insect cells. Virology 279: 546-557.
 - 60) Parker, J.S.L., Murphy, W.J., Wang, D., O'Brien, S.J., Parrish, C.R. (2001). Canine and feline parvoviruses can use the human or feline transferrin receptors to bind, enter and infect cells. Journal of Virology 75: 3896-3902.
 - 61) Steinel, A., Parrish, C.R., Bloom, M.E., Truyen, U. (2001). Parvovirus infections in wild carnivores. Journal of Wildlife Diseases 37: 594-607.
 - 62) Simpson, A.A., Hebert, B., Sullivan, G.M., Parrish, C.R., Zadori, Z., Tjissen, P. Rossmann, M.G. (2002). The structure of porcine parvovirus: comparison with related viruses. Journal of Molecular Biology 315: 1189-1198.
 - 63) Vihinen-Ranta, M., Wang, D., Weichert, W.S., Parrish, C.R. (2002). The VP1 N-terminal sequence of canine parvovirus affects nuclear transport of capsids and efficient cell infection. Journal of Virology 76: 1884-1891.
 - 64) Badgett, M.R., Auer, A., Carmichael, L.E., Parrish, C.R., Bull, J.J. (2002). Evolutionary dynamics of a viral attenuation. Journal of Virology 76: 10524-10529.
 - 65) Schwartz, D., Green, B., Carmichael, L.E., Parrish, C.R. (2002). The canine minute virus (Minute Virus of Canines) is a distinct parvovirus that is most similar to bovine parvovirus. Virology 302: 219-223.
 - 66) Mochizuki, M., Hashimoto, M., Hajima, T., Takiguchi, M., Hashimoto, A., Une, Y., Roerink, F., Ohshima, T., Parrish, C.R., Carmichael, L.E. (2002). Virologic and serologic identification of minute virus of canines (canine parvovirus type 1) from dogs in Japan. Journal of Clinical Microbiology 40: 3993-3998
 - 67) Hueffer, K., Parker, J.S.L., Weichert, W.S., Geisel, R.E., Sgro, J-Y., Parrish, C.R. (2003). The natural host range shift and subsequent evolution of canine parvovirus resulted from virus-specific binding to the canine transferrin receptor. Journal of Virology 77: 1718-1726.
 - 68) Palermo, L.M., Hueffer, K., Parrish, C.R. (2003). Residues in the apical domain of the feline and canine transferrin receptors control host-specific binding and cell infection of canine and feline parvoviruses. Journal of Virology 77: 8915-8923.
 - 69) Hueffer, K., Govindasamy, L., Agbandje-McKenna, M., Parrish, C.R. (2003). Combinations of two capsid regions controlling canine host range determine canine transferrin receptor binding by canine and feline parvoviruses. Journal of Virology 77: 10099-10105.
 - 70) Govindasamy, L., Hueffer, K., Parrish, C.R., Agbandje-McKenna, M. (2003). Structures of host range-controlling regions of the capsids of canine and feline parvoviruses and mutants. Journal of Virology 77: 12211-12221.
 - 71) Schatzberg, S. J., N. J. Haley, S. C. Barr, C. Parrish, S. Steingold, B. A. Summers, A. deLahunta, J. N. Kornegay, N. J. Sharp. 2003. Polymerase chain reaction (PCR) amplification of parvoviral DNA from the brains of dogs and cats with cerebellar hypoplasia. J Vet Intern Med 17:538-544.

- 72) Hueffer, K., Palermo, L.M., Parrish, C.R. (2004). Parvovirus infection of cells using variants of the feline transferrin receptor altering clathrin-mediated endocytosis, membrane domain localization and capsid binding domains. Journal of Virology 78: 5601-5611.
- 73) Shackelton, L.A., Parrish, C.R., Truyen, U., Holmes, E.C. (2005). High rate of viral evolution associated with the emergence of carnivore parvovirus. Proc. Natl. Acad. Sci (USA) 102:379-384.
- 74) Shackelton, L.A., Parrish, C.R., Holmes, E.C. (2006). Evolutionary basis of codon usage and nucleotide composition bias in vertebrate DNA viruses. Journal of Molecular Evolution 62: 551-563.
- 75) Palermo, L.M., Hafenstein, S.L., Parrish, C.R. (2006). Purified feline and canine transferrin receptors reveal complex interactions with the capsids of canine and feline parvoviruses that correspond to their host ranges. Journal of Virology 80: 8482-8492.
- 76) Rossmann, M.G., Arisaka, F., Battisti, A.J., Bowman, V.D., Chipman, P.R., Fokine, A., Hafenstein, S., Kanamaru, S., Kostyuchenko, V.A., Mesyanzhinov, V.V., Shneider, M.M., Morais, M.C., Leiman, P.G., Palermo, L.M., Parrish, C.R., Xiao, C. (2007). From structure of the complex to understanding of the biology. Acta Crystallographica Section D Biological Crystallography D63:9-16.
- 77) Nelson, C.D.S., Palermo L.M., Hafenstein, S.L., Parrish, C.R. (2007). Different mechanisms of antibody-mediated neutralization of parvoviruses revealed using the Fab fragments of monoclonal antibodies. Virology 361:283-293.
- 78) Hafenstein, S., Palermo, L.M., Kostyuchenko, V.A., Xiao, C., Morais, M.C., Nelson, C.D.S., Bowman, V.D., Battisti, A.J., Chipman, P.R., Parrish, C.R., Rossmann, M.G. (2007). Asymmetric binding of transferrin receptor to parvovirus capsids. Proceedings of the National Academy of Sciences (USA) 104:6589-6589.
- 79) Kaufmann, B., Lopez-Bueno, A., Mateu, M. G., Chipman, P.R., Nelson, C.D., Parrish, C.R., Almendral, J.M. and Rossmann, M.G. (2007). Minute virus of mice, a parvovirus, in complex with the Fab fragment of a neutralizing monoclonal antibody. Journal of Virology 81:9851-9858.
- 80) Shackelton, L.A., Hoelzer, K., Parrish, C.R., and Holmes, E.C. (2007). Comparative analysis reveals frequent recombination in the parvoviruses. Journal of General Virology 88:3294-3301.
- 81) Rosas, C., Van de Walle, G.R, Metzger, S.M , Hoelzer, K. , Dubovi, E.J., Sung, K., Parrish, C.R. and Osterrieder, N. (2008). Evaluation of a vectored equine herpesvirus type 1 (EHV-1) vaccine expressing H3 haemagglutinin in the protection of dogs against canine influenza. Vaccine 26:2335-2343.
- 82) Hoelzer, K., Shackelton, L.A., Parrish, C.R. Holmes, E.C. (2008). Phylogenetic analysis reveals the emergence, evolution and dispersal of carnivore parvoviruses. Journal of General Virology 89:2280-2289
- 83) Nelson, C.D.S., Minkinen, E., Bergkvist, M., Hoelzer, H., Fisher, M., Bothner, B.P., Parrish, C.R. (2008). Detecting small changes and additional peptides in the canine parvovirus capsid structure. Journal of Virology 82:10397-10407.
- 84) Hoelzer, K., Shackelton, L.A., Holmes, E.C., Parrish, C.R. (2008) Within-host genetic diversity of endemic and emerging parvoviruses of dogs and cats. Journal of Virology 82:11096-11105.
- 85) Hafenstein, S., Bowman, V.D., Sun, T., Nelson, C.D.S., Palermo, L.M., Chipman, P.R., Battisti, T.J., Parrish, C.R., Rossmann, M.G. (2009) Structural comparison of different antibodies interacting with parvovirus capsids. Journal of Virology 83:5556-5566.
- 86) Harbison, C.E., Lyi, S.M., Weichert, W.S., Parrish, C.R. (2009). Early steps in cell infection by parvoviruses: host specific differences in cell receptor binding but similar endosomal trafficking. Journal of Virology 83:10504-10514.
- 87) Goodman, L.B., Lyi, S.M., Johnson, N.C., Cifuentes, J., Hafenstein, S., Parrish, C.R. (2010). The binding site on the transferrin receptor for the parvovirus capsid, and the effects of altered affinity on cell uptake and infection. Journal of Virology 84:4969-4978.

- 88) Hoelzer, K., Murcia, P.R., Baillie, G.J., Wood, J.L., Metzger, S.M., Osterrieder, N., Dubovi, E.J., Holmes, E.C., and Parrish, C.R. (2010). Intra-host evolutionary dynamics of canine influenza virus in naive and partially immune dogs. Journal of Virology 84:5329-5335.
- 89) Murcia, P.R., Baillie, G.J., Daly, J., Elton, D., Jervis, C., Mumford, J.A., Newton, R., Parrish, C.R., Hoelzer, K., Dougan, G., Parkhill, J., Lennard, N., Ormond, D., Moule, S., Whitwham, A., McCauley, J.W., McKinley, T.J., Holmes, E.C., Grenfell, B.T., and Wood, J.L. (2010). The intra- and inter-host evolutionary dynamics of equine influenza virus. Journal of Virology 84:6943-6954.
- 90) Hayward, J.J., Dubovi, E.J., Scarlett, J.M., Janeczko, S., Holmes, E.C., Parrish, C.R. (2010). Microevolution of canine influenza virus in shelters and its molecular epidemiology in the United States. Journal of Virology 84:12636-12645.
- 91) Braganza, A., Wallace, K., Pell, L., Parrish, C.R., Siegel, D.L., Mason, N.J. (2011) Generation and validation of canine single chain variable fragment phage display libraries. Veterinary Immunology and Immunopathology 139:27-40.
- 92) Kim, J.W., Lyi, S.M., Parrish, C.R., Parker, J.S. (2011). A proapoptotic peptide derived from reovirus outer capsid protein $\mu 1$ has membrane-destabilizing activity. Journal of Virology 85:1507-1516.
- 93) Markovich, J.E., Stucker, K.M., Carr, A.H., Harbison, C.E., Scarlett, J.M., Parrish, C.R. Effects of canine parvovirus strain variations on diagnostic testing and clinical management of enteritis in dogs. (2012) Journal of the American Veterinary Medical Association, 241:66 – 72.
- 94) Allison, A.B., Harbison, C.E., Pagan, I., Stucker, K.M., Kaelber, J.T., Brown, J.T., Ruder, M.G., Keel, M.K., Dubovi, E.J., Holmes, E.C., Parrish, C.R. (2012). Role of multiple hosts in the cross-species transmission and emergence of a pandemic parvovirus. Journal of Virology, 86:865-872.
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- 96) Harbison, C.E., Weichert, W.S., Gurda, B.L., Chiorini, J.A., Agbandje-McKenna, M., Parrish, C.R. (2012). Examining the cross-reactivity and neutralization mechanisms of a panel of mAbs against adeno-associated virus serotypes 1 and 5. Journal of General Virology 93:347-355.
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- 100) Löfling, J., Lyi, S.M., Parrish, C.R., Varki, A. (2013) Canine and feline parvoviruses preferentially recognize the non-human cell surface sialic acid *N*-glycolylneuraminic acid. Virology 440:89-96.
- 101) Gurda, B.S., DiMattia, M.A., Miller, E.B., Bennett, A., McKenna, R., Weichert, W.S., Nelson, C.D., Chen, W-J., Muzyczka, N., Olson, N.H., Sinkovits, R.S., Chiorini, J.A., Zolotutkhin, S., Kozyreva, O.G., Samulski, R.J., Baker, T.B., Parrish, C.R., Agbandje-McKenna, M. (2013). Capsid antibodies to different adeno-associated virus serotypes bind common regions. Journal of Virology 87:9111-9124.
- 102) Lyi, S.M., Tam, M.J., Parrish, C.R. (2014) Parvovirus particles and movement in the cellular cytoplasm and effects of the cytoskeleton. Virology (in press)
- 103) Dalziel, B.D., Kai Huang, K., Geoghegan, J.L., Arinaminpathy, N., Dubovi, E.J., Bryan T. Grenfell, B.T., Ellner, S.P., Holmes, E.C., Parrish, C.R. (2014) Dalziel, B.D., Population dynamics, evolution and control of emerging canine influenza virus in the United States. PLoS Pathogens (submitted).

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- 106) Mazzara, G.P., Destree, A.T., Williams, H.W., Sue, J.M., Belanger, L.M., Panicali, D., Parrish, C.R. (1987). Successful vaccination of dogs with empty capsids derived from canine parvovirus-bovine papillomavirus chimeric plasmids. In: Vaccines '87 (Eds. Chanock, R.M., Lerner, R.A., Brown, F., Ginsberg, H.), Cold Spring Harbor Laboratory, Cold Spring Harbor, NY, pp. 419-424.
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- 108) Parrish, C.R. (1992). Parvovirus. In: "Veterinary Diagnostic Virology: A Practitioner's Guide" (Eds. Castro, A.E. and Heuschele, W.P.), Mosby Year Book, St. Louis, MO, pp. 150-153.
- 109) Parrish, C.R. (1992). Mink enteritis. In: "Veterinary Diagnostic Virology: A Practitioner's Guide" (Eds. Castro, A.E. and Heuschele, W.P.), Mosby Year Book, St. Louis, MO, pp. 191-193.
- 110) Parrish, C.R. (1992). Panleukopenia. In: "Veterinary Diagnostic Virology: A Practitioner's Guide" (Eds. Castro, A. E. and Heuschele, W. P.), Mosby Year Book, St. Louis, MO, pp. 194-197.
- 111) Parrish, C.R. (1993). Canine parvovirus 2: a probable example of interspecies transfer. In: "Emerging Viruses" (Eds. Morse, S. S. and Lederberg, J.), Oxford University Press, pp. 194-202.
- 112) Parrish, C. R. (1994). The Emergence and Evolution of Canine Parvovirus - an Example of Recent Host Range Mutation. In: "Seminars in Virology / New and emerging viral diseases" (Eds. Murphy, F. A. and Nathanson, N.), pp. 121-132.
- 113) Parrish, C.R. (1994). The host range and variation of canine parvovirus, feline panleukopenia virus and mink enteritis virus. In: "Encyclopedia of Virology" (Eds. Webster, R. G. and Granoff, A.). pp. 1061-1067.
- 114) Truyen, U., Parrish, C.R., Harder, T.C., Kaaden, O.-R. (1995). There is nothing permanent except change. The emergence of new virus diseases. Veterinary Microbiology 43: 103-122.
- 115) Parrish, C.R. (1995). Pathogenesis of feline panleukopenia virus and canine parvovirus. In: "Baillière's Clinical Haematology," Vol. 8 (Ed. Young, N.S.), Baillière Tindall, London, pp. 57-71.
- 116) Agbandje, M., Parrish, C.R., Rossmann, M.G. (1995). The recognition of parvovirus capsids by antibodies. In: "Seminars in Virology / Antibody Recognition of Viruses" (Ed. Smith, T.J.), Vol. 6/4, pp. 219-231.
- 117) Parrish, C.R. (1995). Introduction. In: "Seminars in Virology / Autonomous Animal Parvovirus" (Ed. Parrish, C.R.), Vol. 6/5, pp. 269-270.
- 118) Agbandje, M., Parrish, C.R., Rossmann, M.G. (1995). The structure of parvoviruses. In: "Seminars in Virology / Autonomous Animal Parvovirus" (Ed. Parrish, C.R.), Vol. 6/5, pp. 299-309.
- 119) Truyen, U., Parrish, C.R. (1995). The evolution and control of parvovirus host ranges. In: "Seminars in Virology / Autonomous Animal Parvovirus" (Ed. Parrish, C.R.), Vol. 6/5, pp. 311-317.
- 120) Parrish, C.R. (1997). How canine parvovirus suddenly shifted host range. American Society for Microbiology News 63: 307-311.
- 121) Parrish, C.R. (1999). The host range and variation of canine parvovirus, feline panleukopenia virus and mink enteritis virus. In: "Encyclopedia of Virology" 2nd Edition (Eds. Webster, R. G. and Granoff, A.)
- 122) Parrish, C.R., Truyen, U. (1999). The evolution of parvoviruses. In: "Origin and Evolution of Viruses" (Eds. Domingo, E., Webster, R.G., Holland, J.J., Picknett, T.), Academic Press, London. pp. 421-439.
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- 124) Barker, I.K., Parrish, C.R. (2000). Parvovirus infections of wild mammals. In: "Infectious Diseases of Wild Mammals" (Eds. Williams, E.S., Barker, I.K.), 3rd Edition, University of Iowa Press, pp. 131-146.
 - 125) Hueffer, K., Parrish, C.R. (2003). Parvovirus host range, cell tropism and evolution. Current Opinion in Microbiology. 6: 392-398.
 - 126) Vihinen-Ranta, M., Suikkanen, S., Parrish, C.R. (2004). Pathways of cell infection by parvoviruses and adeno-associated viruses. Journal of Virology 78: 6709-6714.
 - 127) Parrish, C.R., Kawaoka, Y. (2005). The origins of new pandemic viruses: the acquisition of new host ranges by canine parvovirus and influenza A viruses. Annual Review of Microbiology 59:553-586.
 - 128) Vihinen-Ranta, M., Parrish, C.R. (2006). Cell infection processes of autonomous parvoviruses. In: "Parvoviruses" (Eds. Kerr, J.R., Cotmore, S.F., Bloom, M.E., Linden, R.M., Parrish, C.R.). Hodder Arnold, London. pp. 157-163.
 - 129) Parrish, C.R., Hueffer, K. (2006). Parvovirus host range, cell tropism and evolution – studies of canine and feline parvoviruses, minute virus of mice, porcine parvovirus, and Aleutian mink disease virus. In: "Parvoviruses" (Eds. Kerr, J.R., Cotmore, S.F., Bloom, M.E., Linden, R.M., Parrish, C.R.). Hodder Arnold, London. pp. 343-350.
 - 130) Parrish, C.R. (2006). Minute virus of canines (Canine Minute Virus) – the virus and its diseases. In: "Parvoviruses" (Eds. Kerr, J.R., Cotmore, S.F., Bloom, M.E., Linden, R.M., Parrish, C.R.). Hodder Arnold, London. pp. 473-477.
 - 131) Parrish, C.R. (2006). Pathogenesis of feline panleukopenia virus and canine parvovirus. In: "Parvoviruses" (Eds. Kerr, J.R., Cotmore, S.F., Bloom, M.E., Linden, R.M., Parrish, C.R.). Hodder Arnold, London. pp. 429-434.
 - 132) Parrish, C.R. (2006). Autonomous parvovirus variation and evolution. In: "Parvoviruses" (Eds. Kerr, J.R., Cotmore, S.F., Bloom, M.E., Linden, R.M., Parrish, C.R.). Hodder Arnold, London. pp. 47-53.
 - 133) Parrish, C.R., Berns, K.I. (2007). Parvoviridae chapter, In: Fields Virology, 5th edition (Eds. Knipe, D.M., Howley, P.M., Griffin, D.E., Lamb, R.A., Martin, M.A.) Lippincott Williams & Wilkins.
 - 134) Hoelzer, K., Parrish C.R. (2008). Evolution and variation of the parvoviruses. Chapt. 17. In: Origin and Evolution of Viruses, 2nd Edn. (Eds. Domingo, E. Holland, J., Parrish, C.R.). Elsevier. pp 393-416.
 - 135) Hoelzer, K.; Shackleton, L.A. and Parrish, C.R. (2008). Presence and roles of cytosine methylation in DNA viruses of animals. Nucleic Acids Res. 36:2825-2837
 - 136) Harbison, C.E., Chiorini, J.A., and Parrish, C.R. (2008) The parvovirus capsid odyssey: from the cell surface to the nucleus. Trends in Microbiology 16:208-214
 - 137) Parrish, C.R., Holmes, E.C., Morens, D., Park, E-C., Burke, D., Calisher, C., Saif, L., Daszak, P. (2008). Cross-species transmission and the emergence of new epidemic diseases. Microbiology and Molecular Biology Reviews. 72:457-470.
 - 138) Hoelzer, K., Parrish, C.R. (2010). The emergence of parvoviruses of carnivores. Veterinary Research 41:39.
 - 139) Parrish, C.R. (2010). Structures and functions of parvovirus capsids and the process of cell infection. Current Topics in Microbiology and Immunology 343:149-176.
 - 140) Parrish, C.R. Microscopic analysis of viral cell binding, entry and infection in live cells. In: RSC Biomolecular Sciences No. 21, Structural Virology, Chap. 2. (Eds. Agbandje-McKenna, M., and McKenna, R.), Royal Society of Chemistry (in press).
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- 143) Peiris, M.J.S., Parrish, C.R. (2011) *Current Opinion Virology* 1:617-619.
- 144) Morse, S.S., Mazet J.A., Woolhouse, M, Parrish, C.R., Carroll, D., Karesh, W.B., Zambrana-Torrel, C, Lipkin, W.I., Daszak, P. (2012). Prediction and prevention of the next pandemic zoonosis. *Lancet*. 380:1956 – 1965.
- 145) Berns, K.I., Parrish, C.R. (2013). Chapter 57, Parvoviridae. *Fields Virology*. Pp. 1768 – 1791.
- 146) Allison, A.B., Parrish, C.R. (2013). Parvoviruses of carnivores: their transmission and the variation of viral host range. In: *The Role of Animals in the Emergence of Infectious Disease*, Ed. Nicolas Johnson, pp 39 – 61.

PATENTS ISSUED.

Wood, H.A., Parrish, C.R. US Patent 4,971,793. Subunit canine parvovirus vaccine. Issued 1990.

Parrish, C.R., Carmichael, L.E., Gruenberg, A. US Patent 5,814,510. Attenuated canine parvovirus vaccine. Issued 1998.

FINANCIAL SUPPORT.

<u>Research Grants: Pending, Active, and Planned Resubmissions.</u>	<u>Direct Costs (Annual)</u>
1) 2010 - 2015. PI. “Structural controls of functional receptor and antibody binding to viral capsids.” National Institutes of Health, NIAID (with Dr. Susan Hafenstein, Penn State University - Hershey Medical Center). 1 R01 AI092571-01 (Chosen as example for NIH grant preparation website).	\$250,000
2) 2012 - 2016. PI. “The evolutionary and biological bases of host switching in viruses,” National Institutes of Health, NIAID (with Eddie Holmes, University of Sydney, Co-PI). Grant 5 R01 GM080533-05	Funded 3-2012 – 2-2016. \$150,000 direct costs to Cornell.
3) 2013 – 2015. Ruth L. Kirschstein National Research Service Award (NRSA) to Andrew Allison, Faculty sponsor.	Funded 2-2013.
4) 2014 – 2021. Centers of Excellence in Influenza Research, subcontract. PI – Adolfo Garcia-Sastre, Mount Sinai School of Medicine.	Requested \$130,000

<u>Training Grants: Pending, Active, and Former.</u>	<u>Direct Costs (Annual)</u>
1) 2010 - 2015. Faculty Participant (Trainer). “Graduate training program in comparative medicine.” National Institutes of Health, National Center for Research Resources, 2 T32 RR07059-16 (Douglas D. McGregor, PI)	Active Funding: \$415,281
2) 2009 - 2014. Faculty Participant (Trainer, Co-PI). “Veterinary student training in biomedical research.” National Institutes of Health, NCRR, 2 T32 RR018269-06 (Robert F. Gilmour, PI; Colin Parrish, Co-PI). 2006 – 2009. Former Funding (Robert F. Gilmour, PI) 2003 - 2006. Former funding (Mark S. Roberson, PI)	Active Funding: \$126,208 Former Funding: \$126,081 (2009) \$114,831 (2005)

3)	2006 - 2011. PI. "Training in molecular virology and pathogenesis." National Institutes of Health, Institutional National Research Service Award – NIAID, 5 T32 AI07618-08 2000-2006. Former funding (with 1 year no cost extension) Resubmitted 9/2011	Former Funding: \$152,837 Former Funding: \$127,431 (2005)
4)	2013 - 2017. Faculty Participant (Trainer) "Short-term training program for students in health professional schools." National Institutes of Health, National Institute of Allergy and Infectious Diseases, 5 T35 AI07227-23 (John Parker, PI) 2000 - 2012. Former funding (with 1 year no cost extension) 1994 - 1999. Former funding	Active Funding: \$68,185 Former Funding: \$76,568 (2005) \$33,120 (1999)
5)	2007 - 2012. Faculty Participant (Trainer). "Predoctoral training in genetics and development." National Institutes of Health, 5 T32 GM07617-28 (Kenneth J. Kemphues, PI) 2000 - 2007. Former funding (extended interim funding to 6/20/07)	Active Funding: \$339,038 Former Funding: \$65,444 (interim) \$311,254 (2005)
6)	2005 - 2010. Faculty Participant (Trainer). "Graduate training program in comparative medicine." National Institutes of Health, National Center for Research Resources, 5 T32 RR07059-14 (Douglas D. McGregor, PI) 2000 - 2005. Former funding 1995 - 2000. Former funding	Active Funding: \$388,902 Former Funding: \$359,268 (2005) \$169,056 (2000)
7)	2003 - 2008. Faculty Participant (Trainer). "Biomedical research training for science undergraduates." National Institutes of Health, R25GM66910 (Douglas D. McGregor, PI) (with 1 year no cost extension)	Former Funding: \$74,006
8)	1994 - 1999. Faculty Participant (Trainer), "Training in cellular and molecular medicine." National Institutes of Health, National Center for Research Resources, T32 RR07060 (Douglas D. McGregor, PI)	Former Funding: \$85,584
9)	1992 - 1997. Faculty Participant (Trainer). "Food and agricultural sciences national needs graduate fellowships program/animal biotechnology." Grant 92-38420-7366 (Roger J. Avery, PI)	Former Funding: \$108,000 (total open award)

<u>Previous Financial Support.</u>	<u>Direct Costs (Final Year Annual)</u>
1) 2007 - 2011. Principal Investigator. "Mechanisms of parvovirus infection and host range." National Institutes of Health, National Institute of Allergy and Infectious Diseases. Grant 5 R01 AI028385-18 (funded since 1990; renewal submitted 9-2011).	Funded 1-2007: \$220,725 (yr 5)
2) 2008 - 2009. Collaborator. "Bioengineering to optimize monoclonal antibodies for passive immunotherapy." Northeast Biodefense Center (with A. Moscona, Cornell Weill Medical School, PI; M. Jin, Biomed. Engr., Cornell, Co-PI)	\$115,000 total; \$7,500 (Parrish)
3) 2007 - 2010. Principal Investigator. "Antigenic structure of adeno-associated virus capsids and antibody escape mutants," National Institutes of Health, NIAID (with Dr. Mavis Agbandje-Mckenna, Univ. of Florida-Gainesville). Grant 5R21 AI072341-02 (currently in no cost extension)	Funded 9-2007 \$173,637 (yr 2)
4) 2010-2012. Sponsor. K. Stucker (Postdoctoral Fellow). "Host adaptation events during a virus host switch." NIH, NRSA Grant 1 F32 AI085913-01A1.	Submitted 12-2009: \$70,854 (stipend/ tuition yr 1)

5)	2009-2012. Sponsor. L. Goodman (Postdoctoral Fellow). "Engineering altered receptors and antibodies to study viral functions." NIH, NRSA Grant 1 F32 AI082922-01.	Funded 9-2009: \$50,054 (stipend)
6)	2008-2010. Sponsor. K. Hoelzer (Postdoctoral Fellow). "Mechanisms of canine and feline parvovirus emergence and spread." Morris Animal Foundation. Grant #D08FE-403.	Funded 11-2008 \$35,595
7)	2003 - 2009. Principal Investigator. "Parvovirus structure, capsid assembly, and receptors." National Institutes of Health, NIAID (with Dr. Michael G. Rossmann, Purdue University). Grant 5 R01 AI033486 (renewal; funded since 1992).	\$237,045
8)	2006-2008. Co-Mentor; L. Palermo (Fellow). "Effects of virus-receptor interaction on feline and canine parvoviruses infection." Morris Animal Foundation, #D06MS-402.	\$37,800
9)	2007. Principal Investigator. "Engineering virus-receptor interactions to determine their roles in cell infection and disease," Ithaca-NYC Seed Grant program (with Moonsoo Jin, Biomedical Engineering; Anne Moscona, Matteo Porotto, Pediatrics, Weill Medical College).	\$50,000
10)	2001 - 2006. Principal Investigator. "Mechanisms of parvovirus infection and host range." National Institutes of Health, National Institute of Allergy and Infectious Diseases. Grant R01 AI028385 (renewal; funded since 1990)	\$150,000
11)	2005 - 2006. Co-investigator. "Cell binding and tropism of feline caliciviruses and mechanisms of antibody neutralization." Cornell Feline Health Center (John S. Parker, PI)	\$13,500
12)	2005. Co-investigator. "Identification of <i>in vitro</i> correlates of differences in virulence between feline calicivirus strains – what determines the increased virulence of feline calicivirus isolated from cats with severe systemic disease?" The Winn Feline Foundation – Miller Trust (John S. Parker, PI)	\$20,940
13)	2004 - 2005. Co-investigator (with Ed Dubovi and John Parker). "Viral surrogates for use in studies of disinfectants or cleaning procedures." JohnsonDiversey Corp.	\$52,512
14)	2004. Co-investigator. "Virus entry studies of feline calicivirus: Is virulence related to differences in attachment and update?" Cornell Feline Health Center (Principal Investigator John S. Parker).	\$20,000
15)	2001. Principal Investigator. "The feline transferrin receptor (TfR) - characterization and development of diagnostic reagents." Cornell Feline Health Center (Co-Investigator Rodney L. Page)	\$19,832
16)	1999. Principal Investigator. "Confocal microscopy for biological research." National Institutes of Health.	\$107,823
17)	1999 - 2002. Faculty Sponsor. "Research training in virus entry studies." National Institutes of Health, National Research Service Award to Dr. John S. L. Parker	Awarded February 1999
18)	1998 - 2003. Principal Investigator "Parvovirus structure, capsid assembly, and receptors." National Institutes of Health, National Institute of Allergy and Infectious Diseases, Grant R01 AI33486 (with Michael G. Rossmann, Purdue University; Mavis Agbandje, University of Florida)	\$189,313

19)	1995 - 1996. Co-Principal Investigator. "Investigation for adenovirus in liver tissue from dogs with chronic hepatitis using PCR and immunohistochemistry." Cornell University Consolidated Research Program.(Principal Investigator Sharon A. Center)	\$11,190
20)	1994 - 2000. Principal Investigator. "Mechanisms of parvovirus infection and host range." National Institutes of Health, National Institute of Allergy and Infectious Diseases. Grant R01 AI28385 (renewal; funded since 1990)	\$103,444
21)	1994 - 1998. Faculty Sponsor. "Research training in virus-cell interactions." National Institutes of Health, National Institute of Allergy and Infectious Diseases, Individual Physician Scientist Award, 1K11 AI01151. Award to Dr. Dina P. Barbis Tresnan. Assisted in preparation of the original and then revised Physician Scientist Award application. Transferred to the University of Colorado 8/1/95.	\$70,000
22)	1993 - 1996. Faculty Sponsor "Parvovirus cell binding - capsid and receptor studies." National Institutes of Health, National Research Service Award to Dr. Dina P. Barbis, 1F32 AI08783. Note: This grant was replaced by the following funding for Dr. Barbis, NIH 1K11 AI01151.	\$89,700
23)	1992 - 1997. Principal Investigator. "Parvovirus Structure, Capsid assembly and receptors". National Institutes of Health, National Institute of Allergy and Infectious Diseases, Grant RO1 AI33468. (Co-Principal Investigator Michael G. Rossmann, Purdue University)	\$142,994
24)	1992 - 1996. Principal Investigator. "Preparation of an attenuated strain of the most recent antigenic type of canine parvovirus." Virbac, Nice, France. (Co-Principal Investigator L. E. Carmichael)	\$43,009
25)	1992 - 1995. Co-Principal Investigator. "The epidemiology of equine monocytic ehrlichiosis." United States Department of Agriculture (National Research Initiative), Grant #92-37204-8043. (Principal Investigator Hussini O. Mohammed)	\$75,000
26)	1991. Principal Investigator. "Collaborative research in virology." The American Scandinavian Foundation. National Veterinary Research Institute, Helsinki, Finland.	\$2,000
27)	1990 - 1994. Principal Investigator. "Parvovirus structure, function and host range." National Institutes of Health, National Institute of Allergy and Infectious Diseases, Grant RO1 AI28385	\$76,844
28)	1990. Principal Investigator. "Genetic and structural studies of canine and feline parvoviruses." Cornell University Consolidated Research Program	\$14,736
29)	1988. Principal Investigator. "Analysis of strain variation in canine parvovirus." Cornell University Consolidated Research Program	\$16,496
30)	1983 - 1986. "Parvoviruses of carnivores - structure and function." National Institutes of Health, National Institutes of Allergy and Infectious Diseases. Grant RO1 AI19817. (This grant was written by C. R. Parrish as graduate student; Principal Investigator L. E. Carmichael)	\$65,861

TEACHING EXPERIENCES.

Veterinary Curriculum:

Tutoring. Foundation Course IV, “Host Agent and Defense”, 1994 – present. Substitute tutoring, 2001 and 2003, full time tutoring in the 11 week session in 2002, 2004, 7 week session in 2006, 2008, 2010.

Lecturing. Foundation Course IV.

Lecture on “Emerging Infectious Diseases” 2001 – 2012.

Infectious Disease Round on Avian Influenza virus – in 2001 with Syed Naqi, in 2002 with Amy Glaser.

Block IV Virology lectures – ~8 lectures on specific virus groups annually 2006 – present.

Organized laboratories. “Intracellular Pathogens”, 1994 - present. Involved preparation of tissue culture cells and viruses for use in laboratory exercises to demonstrate the culture of viruses, features of virus-induced cytopathic effects of 3 different viruses (feline calicivirus, feline herpes virus and canine parvovirus), and examination of plaques, virus-induced inclusions, and antibody neutralization.

“Viral Diagnostic Techniques” 2002 – present. As well as the existing laboratory (including chicken embryo inoculation and immunohistochemical staining with antibodies), added a hemagglutination assay and hemagglutination inhibition assay for Newcastle disease virus antigen and antibodies, as well as an agar gel immunodiffusion assay for avian influenza.

Foundation Course IV Curriculum Design group Membership. Member of the “Curriculum Design Group” for Foundation Course IV (Host Agent and Defense), 1996 - 2006. Involves weekly meetings to discuss the Foundation Course IV of the Veterinary Curriculum, and in the Fall Semester design of the final Exam. In 2002 I was also the primary author of the Mid-Course exam, 2003 to 2006 primary author of one final exam.

VMI739 - Viruses in Veterinary Medicine.

Responsible for this 1.5 credit course for the Spring 2001 A-B course period. Taught jointly with Dr. Joel Baines in this Department. I give 5-7 lectures in the course. The objective is to describe the major veterinary viruses in various taxonomic groups, and the diseases they cause. A lecture format course which aims to provide the “coverage” of veterinary viruses and diseases that is apparently lacking in Foundation Course IV. Taught in Spring of 2003, 2004 and 2005 (along with Joel Baines and Klaus Osterrieder). In 2005, this course was incorporated into Foundation Course IV.

GRADUATE COURSES ORGANIZED AND TAUGHT.

Responsible for organizing and teaching two graduate level courses:

- VM700, ‘The Biology of Animal Viruses’
- VM701, ‘Models in Viral Pathogenesis’.

VMI700 - The Biology Of Animal Viruses.

Taught during Fall semesters of odd numbered years since 1989.

Outline. The course is designed as an advanced course in the study of animal viruses, and covers selected topics in the area of virology, focusing on the most recent work in the field. Students attending include graduate students and senior undergraduate students.

VMI701 - Models Of Viral Pathogenesis.

Taught during the Fall semesters 1990, 1992 & 1994.

Outline. In this course the most recent advances in viral pathogenesis are examined by reviewing model systems. This course was taken over by Dr. Joel Baines in 1997 but not continued after 2000.

Other Teaching:

Genetics 781 - Problems in Genetics. One session on “Viral Evolution” in Fall 1997 and 1998.

Biomedical Engineering 4110 One 2 hr lecture session on “Emergence of New Pandemic viruses”, 2010, 2012.

Explorations in Biology. For Freshmen. Taught a session on Viral Structure and Function in the Fall Semester 1997, Spring Semester 1998-2008.

JOURNAL CLUBS, SEMINARS AND OTHER ACTIVITIES ORGANIZED.

1990 - 1998 Organized and participated in Journal Club around the area of Infectious Disease Pathogenesis.

1996 - 1999 Chair and organizer, Seminar series in the Department of Microbiology and Immunology, College of Veterinary Medicine

1989 - present Participant in research Journal Club in the area of Virology.

2002 - present Organizer, Virology Focus group, responsible for web site, organized retreats various years and member of oversight committee.

2008 – present Organizer, Ecology and Evolution of Infections and Disease, coordinate journal club, responsible for web site, organized retreats, member of oversight committee.

COLLEGE OF VETERINARY MEDICINE DVM-PH.D DUAL DEGREE PROGRAM.

I have been involved in the organization and oversight of the Cornell DVM/Ph.D, program since its inception in 2002, and have been Chair of the oversight committee from 2003 until the present.

UNDERGRADUATES AND VETERINARY STUDENT RESEARCH SUPERVISED.

Veterinary Summer students (Leadership Program) or Veterinary Investigator Program.

1990	Richard Haworth
1991	Ian Davis
1992	Christine Hawke
1993	Melinda Stewart
1994	Jeff Phillips
1995	Damian Dressler
1996	Polly Peterson (Program Prize winner)
1997	Nicolete Zarday
1999	Nadine Bowden (Program Prize winner)
2000	Rachel Geisel (Molecular Biology Prize winner)
2001	Karin Hoelzer
2002	Anne Lo
2003	John Baker (Cell Biology Prize winner)
2004	Karla Dreckmann
2005	Kai-Biu Shiu
2006	Swaantje Roth
2007	Ciara Murphy
2008	Ming Lui
2009	Hans Winkler
2010	Marie Killerby
2011	Hannah Atkins
2012	Peter Silke
2013	Loke Jin Wong
2014	Jonathan Wilson

Undergraduate Research Students.

- 1996 - 1997 Peter Kolchinsky – honors student; Howard Hughes Undergraduate program, (Ph.D., Harvard University)
1998 (spring) Eric Batterson.
1998 - 1999 Bryan Green.
1999 - 2001 Daniel Schwartz, (Ph.D., Harvard University)
2000 (summer) Alexandra Auer, University of Regensburg, Germany. (Ph.D. University of Ulm)
2000 - 2003 Eric Miller, Cornell Presidential Research Fellow, (Ph.D., UT - Austin).
2001 Shannan Rossi, (Ph.D., University of Texas Medical branch).
2002 Jennifer Schneider
2003 - 2004 Christian Nelson (Ph.D., Cornell University)
2004 Haoming Qiu, (MD/PhD, University of Pittsburgh).
2005 - 2007 Nell Bond
2006 - 2007 Alvin Tan, (Ph.D., Harvard University).
2007 - 2008 Melanie Ho
2007 - 2008 Tyler Lillie, (MD, University Michigan)
2008 - 2011 Jason Kaelber, (Ph.D. Baylor College of Medicine).
2009 Jeffry Petracca
2009 Leigh MacAyeal (DVM Student, Cornell University).
2010 - 2011 Candy Wu (DVM student, UC Davis).
2011 - 2012 Alicia Ortega
2012 - 2013 Casey Cazer (DVM student, Cornell University).
2012 - 2013 Karen Tracey
2013 - 2014 Sho Iketani

CORNELL GRADUATE FIELD MEMBERSHIPS.

- Comparative Biomedical Sciences: 1989 – present
(formerly Veterinary Medicine), elected to Executive Committee, 1994- 1997, re-elected 1997,
Director of Graduate Studies 2009 – 2011
Genetics and Development 1996 – present
Infection and Immunity 2012 - present

GRADUATE STUDENTS AND FELLOWS SUPERVISED.

Major Advisor to, and Fellowships Awarded.

Shwu-Fen Chang “Studies of the host range restriction, antigenic type and hemagglutination properties of canine and feline parvoviruses”

Ph.D. 1989 - 1992

Post-doctoral position, Academia Sienica, Taipei, Taiwan.

Professor, Graduate Institute of Medical Sciences, Taipei Medical University.

Dina Barbis-Tresnan “Analysis of parvovirus-cell interactions”

Ph.D. 1991 - 1995

1993 - 1996. Faculty Sponsor, "Parvovirus Cell Binding - Capsid and Receptor Studies." National Institutes of Health, National Research Service Award 1F32 AI08783.

This grant was replaced by NIH 1K11 AI01151.

1994 - 1998. Faculty Sponsor. "Research Training in Virus-Cell Interactions." National Institutes of Health, National Institute of Allergy and Infectious Diseases, Individual Physician Scientist Award, 1K11 AI01151.

Post-doctoral position with Kay Holmes, University of Colorado Health Sciences Center.

1997 - 2003 Sr. Research Scientist; Project Leader, Pfizer Central Research, Groton, CT.

- 2003 - 2007 Asst. Director (2003-2005), Director (2006-2007), Intellectual Property, Pfizer Legal, IP Strategy Management, Groton, CT.
2007- Director, Medical Division, Pfizer Inc., Safety & Risk Management, New London, CT.
- John Parker** “Studies of the capsid determinants of canine parvovirus host range and mechanisms of virus uptake and infectious entry into cells in vitro”
Ph.D. 1994 - 1999
1999 - 2001 Faculty Sponsor, “Research training in virus entry studies.” National Institutes of Health, National Research Service Award, awarded February 1999.
1999 - 2000 Post-doctoral Fellow, Baker Institute
2000 - 2003 Post-doctoral position with Max Nibert, Harvard University.
2003- Assistant (2003-09), Associate (09-) Professor of Virology, Cornell University.
- Dai Wang** “Nonstructural protein-2 and cellular factors in canine and feline parvovirus infection”
Ph.D. 1995 - 2000
Post-doctoral position with Thomas Shenk, Princeton University.
2007- Research Scientist, Dept. of Vaccine Basic Research, Merck & Co., West Point, PA.
- Wen Yuan** “Studies of canine parvovirus capsid – assembly, disassembly, and antibody neutralization.”
Ph.D. 1995 - 2000
Post-doctoral position with Joseph Sodroski, Harvard University.
2007- Asst. Professor, Dept. of Medicine, Division of Infectious Diseases, University of Virginia, Charlottesville, VA.
- Karsten Hueffer** “Virus receptor interactions in canine parvovirus determining host range and viral entry during cell infection”
Ph.D. 1998 - 2003
2003-2006 Post-doctoral position with Jorge Galan, Yale University.
2006- Asst. Professor of Microbiology, Inst. of Arctic Biology, Univ. of Alaska-Fairbanks
- Laura Palermo** “Virus receptor interactions in feline and canine parvoviruses and their roles in host range”
Ph.D. 2001 – 2006
Post-doctoral Assoc., Pediatrics/Infectious Diseases, Weill Medical College, Cornell Univ.
2006-2008 Co-Mentor, “Effects of virus-receptor interaction on feline and canine parvoviruses infection.” Morris Animal Foundation fellowship grant, #D06MS-402
- Jennifer Val** “Role of the fivefold axis in the function of the canine parvovirus capsid”
Ph.D. candidate, in training 2002 -2003 – left mid-2003.
Patent Attorney, New York.
- Christian Nelson** - “Studies of conformational changes and the effect of antibody and receptor binding on canine parvovirus”
Ph.D. 2006 – 2008
Post-doctoral Assoc., Dept. of Molecular Biology, Cell Biology & Biochemistry, Brown University and Yale University.
- Karin Hoelzer** “The molecular and evolutionary determinants of host switching viruses”
Ph.D. 2006 – 2009
2008-2009 Mentor, 2009-2010, Co-Mentor, “Mechanisms of canine and feline parvovirus emergence and spread.” Morris Animal Foundation fellowship grant, #D08FE-403.
Post-doctoral Assoc., Dept. of Food Sciences, Cornell University;
Analyst – Food and Drug Administration, MD.
- Karla Stucker** “The role of co-receptors or other cellular factors in the infection of cells by canine and feline parvoviruses”
Ph.D. (DVM/Ph.D. program), 2003 – 2010; Postdoctoral Associate 2011.

Postdoctoral Associate, J Craig Venter Institute, 2011 - present.

Carole Harbison - “The role of receptors in controlling uptake, endocytosis and infection of parvovirus capsids.”

Ph.D. candidate (DVM/Ph.D. program) – 2006 - 2011.

Resident in Pathology, New England Primate Center, Post-doctoral Harvard University (Peter Howley)

Kurtis Feng – “Host range and tropisms of Canine and Equine influenza viruses”.

Ph.D. 2012 – present.

Minor Advisor to.

Maria Fernandez-Mallio	Ph.D.	1989
Anthony Vella	Ph.D.	1989 - 1993
Jeffery Boschwitz	Ph.D.	1989 - 1994
Randall W. Renshaw	Ph.D.	1989 - 1992
Gertrude Thompson	Ph.D.	1990 - 1995
Gabrielle Grunig	Ph.D.	1990 - 1994
Robert Atwill	Ph.D.	1991 - 1994
Wei Jai	Ph.D.	1991 - 1995
Laura Hanson	Ph.D.	1991 - 1993
Jeremiah Saliki	Ph.D.	1992 - 1993
Steven Campbell	Ph.D.	1992 - 1993
David Peters	Ph.D.	1992 - 1997
Lauren Trepanier	Ph.D.	1993 - 1997
Clarissa Santos	Ph.D. (MS)	1993 - 1995
Martin Weidmann	Ph.D.	1993 - 1996
Stephen Davies	Ph.D.	1993 - 1998
Jeffery Slack	Ph.D.	1995 - 1999
Fan Long	Ph.D. (MS)	1995 - 1997
Simon Peek	Ph.D.	1995 - 1998
Lauri Goodrich	Ph.D.	2001 - 2004
Kari Peter	Ph.D.	2002 - 2007
Danso Ako-Adjei	Ph.D.	2003 - 2007
Judith Phillips	Ph.D.	2003 - 2008
Boram Kim	Ph.D.	2008 – 2010
Andrew Regan	Ph.D.	2008 – 2010
Robert Dick	Ph.D.	2007 – 2013
Adam Wong	Ph.D.	2009 – present
Ben Dalziel	Ph.D.	2010 – 2014
Gregory Ray	Ph.D.	2010 – 2013
Longping Victor Tse	Ph.D.	2011 – 2013

Field Appointed Committee Member for.

Kasuhiko Ohashi	Ph.D.	1990 – 1993
Liang-biao Hu	Ph.D.	1991 – 1995
Hung-Chi Cheng	Ph.D.	1994 – 1999
Satomi Kato	Ph.D.	1999 – 2003
Myrna Miller	Ph.D.	2001 – 2004

ad hoc Advisor to.

Christopher Ngichabe	Ph.D.	1989 – 1992
Marcia Sellos-Moura	Ph.D	1992 – 1993

Thesis Exam.

Nicoletta Previsani	Ph.D.	1996
University of Laussane, Switzerland		

Post-Doctoral Fellows.

Uwe Truyen		1991 – 1993
Dean, Professor, University of Leipzig.		
Allen Gruenberg		1991 – 1994
Laurel Southard		1993 - 1994
Director of Undergraduate Research, Undergraduate Biology, Cornell University.		
A. T. M. Wahid		1993 - 1995
In medical practice.		
Martha Harding		1995 - 1997
Associate Research Scientist, Comparative Medicine, Yale University.		
Maija Vihinen-Ranta		1999 - 2000
Academy Research Fellow, University of Jyväskylä, Finland.		
John Parker		1999 - 2000
NRSA and K08 awardee, Associate Professor of Virology, Cornell University.		
Laura Goodman		2007 – 2010
Post-doctoral Fellow under NRSA Grant #1 F32 AI0-82922		
S. Michael Lyi		2008 – 2011.
Jessica Hayward		2009 – 2011
Andrew Allison		2011 – present
Post-doctoral Fellow under NRSA.		
Kai Huang		2013 – present

Visiting Fellows.

Beata Mizak		1990 - 1991
Klaus Geissinger		1998
Vito Martella		2001
Mara Battilani		2001
Swaanjte Roth		2010 – 2011

OTHER ACTIVITIES.**Various.**

2004-2007	Councilor for Veterinary Virology, American Society for Virology.
2005; 2007	Organizer and Program Chair, Veterinary Virology Satellite meetings, June 2005, July 2007.
2007-2008	Organizer of 2008 American Society for Virology annual meeting, Cornell University.
2010	Organizer of the workshop in the Ecology and Evolution of Infectious Diseases, Cornell University.
2012	Organizer of the International Parvovirus Workshop, Cornell University.
2014	Councilor for Viral Evolution, American Society for Virology.

Study Section Memberships.

1992	Panel member/reviewer for USDA National Research Initiative, Mechanisms of
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Animal Disease, Panel I.

- 1995 Panel member/reviewer for RFA on “Emerging Viruses”, NIH.
 1997 *ad hoc* panel member/reviewer for “Experimental Virology”, NIH.
 1999 – 2002 Regular panel member/reviewer for “Experimental Virology”, NIH.
 2001, 2002, 2004 Reviewer, intramural grant programs, NIH.
 2005, 2007 *ad hoc* member of Virology A study section, NIH.
 2006 *ad hoc* member, Biological Chemistry and Macromolecular Biophysics study section, Special emphasis panel.
 2007 *ad hoc* member, NIAID Microbiology and Infectious Diseases B subcommittee reviewing training grants (March and October)
 2007 National Center for research Resources, External review panel to advise on NCRR training programs for Veterinary Students and Veterinary Graduates.
 2008 SBIR topic 42 Teleconference.
 FDA Antiviral Drugs Advisory Committee meeting
 NIH NHLBI Teleconference - evaluation of parvovirus B19 vaccine
 2009 NIH Gastrointestinal Mucosal Pathobiology Study Section - predoctoral fellowship applications (F31s) for minority and disabled students (three meetings)
 NSF Panel Member - Ecology of Infectious Diseases Program
 2009 – 2013 NIH Virology A Study section 3 meetings per year (regular member from 7/1/2009 – 6/30/2013).
 2010 Virus Pathogen Database and Analysis Resource (ViPR) application reviewer (2010)
 NSF and NIH Fogarty - The Ecology of Infectious Diseases program overall review and strategic assessment committee, NIH campus 2010.
 2011 NSF Panel Member - Ecology of Infectious Diseases Program (2/2012)
 2011 Chair, Special Emphasis Panel, NIH, Program Project review (11/2011)
 Reviewer, DTRA Chemical and Biological Technologies Directorate Phase II program.
 2012 NSF Panel - Ecology and Evolution of Infectious Diseases Program (2/2012).
 2013 NIH Special Emphasis Panel, Program Project Review NIAID (1/2013).
 CDC Panel to review projects from Funding Opportunity Announcements.
CSR Pilot Study: Participated in Center for Scientific Review (CSR) at the National Institutes of Health (NIH) pilot study to evaluate the relative quality of grant applications reviewed in different study sections within Integrated Review Groups (IRGs). Read and ranked 9 applications from different study sections.
 2014 NIH Panel Member, Review panel (3/14) NIH Microbiology and Infections Diseases B Institutional Research Training Grants (T32) and Career Development awards (K).
 CDC Panel to review projects from Funding Opportunity Announcements.

Book Editor.

- 2005 – 2008 Origins and Evolution of Viruses (2nd Edition) (with Esteban Domingo and John J. Holland)

Editorial Boards.

- 2004 – present Journal of Virology (2009 – “Top 20 reviewer”; 2011, 2012, 2013 – “Top 25 reviewer”)
 2006 – present Virology
 2006 – present Veterinary Microbiology
 2007 – present Virus Genes
 2008 – present PLoS Pathogens; Section Editor 6-2009 – 6-2011.
 2009 – 2012 PLoS Currents - Influenza

ad hoc Reviewer for.

1992 National Institutes of Health, Animal Resources Program.
 1992 US-Israeli Foundation.
 1991, 1992 World Health Organization Steering Committee on development of vaccines
 against Dengue and Japanese Encephalitis.
 1990 - 1992 International Centre for Genetic Engineering and Biotechnology.
 2006 National Science Foundation.

ad hoc Reviewer – Scientific Journals:

1992 - present Journal of Infectious Diseases
 Archives of Virology
 Journal of General Virology
 American Journal of Veterinary Research
 Vaccines
 PNAS

DEPARTMENT, INSTITUTE AND UNIVERSITY ACADEMIC DUTIES.

1991 - 1992 Organizing Committee, 1992 Annual Meeting, American Society for Virology at
 Cornell.
 1988 - 2005 Cornell University Committee on Recombinant DNA Research (Chair, 1995-2002).
 1990 - present Organized James A. Baker Institute library and journal subscriptions.
 1991 Search Committee, Animal Molecular Biology (appointing Dr. Jamie MacLeod).
 1991 Search Committee, Director, James A. Baker Institute for Animal Health (appointing
 Dr. Gustavo Aguirre).
 1992 Search Committee, Virologist, Department of Microbiology, Immunology and
 Parasitology (appointing Dr. Joel Baines).
 1992 - present Review Committee and Project Evaluation Panel, College Summer Students Program.
 1993 - 1998 College of Veterinary Medicine, Computer Committee
 1994 - 2000 Field of Veterinary Medicine, Executive Committee
 1995 - 1996 Search Committee, Virologist, Department of Microbiology, Immunology (appointing
 Dr. Gary Whittaker).
 1996 - 1998 Research Council, College of Veterinary Medicine - reviewing Consolidated, Hatch,
 Graduate Research Assistantship applications (Chair, 1998).
 1997 Search Committee, Plant Virologist, Department of Plant Pathology, College of
 Agriculture and Life Sciences, Cornell (appointing Dr. Sondra Lazarowitz).
 1998 - 1999 Chair, Search Committee for Bacterial Infectious Disease positions, College of
 Veterinary Medicine, Cornell (appointing Dr. David Russell as Department Chair).
 1998 - 1999 Chair, Organizing committee, Conference on Canine Infectious Diseases, held at the
 Baker Institute for Animal Health, August, 1999.
 2001 Search Committees, Bacterial Genomics, Department of Microbiology and
 Immunology, Veterinary College, and Department of Microbiology, College of
 Agriculture and Life Sciences, Cornell (appointing Joseph Peters).
 2001 - 2002 Search Committee for new faculty members for the Baker Institute in the areas of
 Microbiology, Immunology, or Genetics/Genomics (appointing John Parker and
 Alex Travis).
 2001 - 2004 Chair, Research Council, College of Veterinary Medicine; co-chair with Rory
 Todhunter 2002 – 2004.
 2002 Organized Cornell-wide Virology Retreat – September 2002.

- 2002 Organizer of the J.A. Baker Institute future planning retreat January 2002.
2002 - 2003 Member and Chair, Committee to Consider the Relationship between the Baker Institute and the College of Veterinary Medicine.
2002 - present Organizer of the American Society for Virology Meeting at Cornell, 2008.
2002 - 2005 Member, (Chair 2004) General Committee, College of Veterinary Medicine.
2005 Search Committee for new faculty members for the Baker Institute in the areas of Mammalian Genomics/Genetics of Disease, appointing Susana Mendez.
2006 Organized Cornell-wide Virology Retreat.
2006 - present Organized the Cornell Virology program web site.
2006-2007 Search Committee for Dean, College of Veterinary Medicine.
2006- 2008 Member Local Advisory Committee, advising the Vice President for Research, Cornell University.
2007 - 2008 Chaired Committee evaluating the current status and future of the Feline Health center. Submitted report January 2008.
2008 - 2009 Search Committee, Biomedical Engineering faculty member(s).
2008 - present Organization and oversight committee, Cornell program in the Ecology and Evolution of Infections and Diseases (EEID).
2009 Organized the EEID campus-wide retreat; organized EEID web site.
2010 Local organizer, Ecology and Evolution of Infectious Disease meeting for June 2-5, 2010
2011 – 2012 Chair, Search Committee, Baker Viral Pathogenesis candidate, appointing Gerlinde van de Walle.
2011 Organized the Cornell-wide Virology Retreat.
2011 – present Technology Transfer Advisory Committee at Cornell.
2013 – present Chair, Cornell Institutional Biosafety Committee.
2014 Search Committee, Assistant Dean for Communications and Outreach, College of Veterinary Medicine.

Other Scientific Activities.

- 1992 Biosafety Committee, Guthrie Clinic, Sayre, PA.
1992 - 1993 Biosafety Committee, Harlan Sprague Dawley - United Vaccines, Madison, WI.

RECENT SCIENTIFIC PRESENTATIONS.

- 2002** Iowa State University, College of Veterinary Medicine.
FASEB meeting on Virus Structure, Saxtons River, VT.
American Society for Virology meeting, Lexington, KY (2 talks from my laboratory).
International Parvovirus workshop, Bologna, Italy – Program organizing Committee and Chair of the session on Viral Structure and Function.
Keystone Meeting on Pathogen-Host Interactions, Snowmass, CO.
Noble Foundation Virus Evolution Workshop, Ardmore, OK.
American Society for Virology meeting (3 presentations from my laboratory).
- 2003** Harvard Medical School, Department of Microbiology.
Meeting on “Small DNA tumor viruses”, Sienna, Italy – invited speaker.
Gordon Conference on Viruses and Cells, Lucca, Italy.
NY State Department of Health, Albany, NY.
American Society for Virology, Davis, CA (2 talks and 1 poster from my laboratory).
University of North Carolina, Center for Gene Therapy, Chapel Hill, NC.
Mount Sinai Medical School, Carl Icahn Center for Gene Therapy, NYC, NY.

American Society for Cell Biology - annual meeting, San Francisco, CA (Poster).

- 2004** University of Massachusetts, Worcester, MA.
American Society for Virology (1 talk and 1 poster from my laboratory).
10th International Parvovirus workshop (1 talk and 2 posters from my laboratory).
Virus Evolution workshop, Ardmore, OK.
- 2005** NIH-NIAID sponsored workshop, "Emergence of new epidemic viruses through host switching," Washington, D.C. – Steering Committee Chair, and speaker on "Parvovirus evolution and the control of host range."
Symposium Talk, American Society for Virology, Annual Meeting, Penn State University.
Washington State University, Department of Pathobiology.
Gordon Conference, Lucca, Italy, "Parvovirus evolution and the control of host range - influences of specific receptor binding by the capsids and the role of antigenic selection." Invited Speaker.
International Parvovirus Meeting, Leipzig, Germany. Invited Speaker.
International Congress of Veterinary Virology, Liverpool, England. Invited Speaker.
- 2006** Ecology & Evolution of Infectious Diseases (EEID), Penn State University. Invited speaker.
American Society for Virology annual meeting, Madison WI. (3 presentations from my laboratory).
Brazilian Society for Virology annual meeting, Campos do Jordao, Sao Paulo, Brazil. Invited speaker.
FASEB Summer Research Conference, Virus Assembly, Vermont. Invited speaker.
XIth Parvovirus workshop, Les Diablerets, Switzerland, Session chair.
International School for Crystallography: Structure and Function of Large Molecular Assemblies. Erice, Italy. Invited speaker.
8th International Feline Retroviruses Research Symposium, Washington, DC. Invited speaker.
- 2007** Wellcome Trust meeting, Cambridge, UK. Animal Health Research: Recent Developments and Future Directions. Invited speaker.
University of Florida, Center for Emerging Diseases. Invited speaker.
University of Tennessee, Knoxville. Invited speaker.
Structural Biology of Small DNA Viruses, Siena, Italy. Invited speaker, session chair.
Cornell Alumni Association, New York City.
Medical School, Glycobiology Research and Training Center, University of California, San Diego.
European Meeting on Parvovirus Research, Bari, Italy. Invited speaker.
Ecology and Evolution of Infectious Diseases - PI meeting of NIH and NSF grant holders, Albuquerque, NM. Invited presenter.
- 2008** Keystone meeting on Molecular Evolution as a Driving Force in infectious Diseases, Breckenridge, CO. Invited speaker
12th International Parvovirus Workshop, Cordoba, Spain. Invited speaker, session Chair.
FASEB summer research conference, Virus structure and assembly, Saxton's River, Vermont.
American Society for Virology Annual meeting, Cornell, Ithaca, New York. Local host. 3 presentations from my laboratory.
International Congress of Virology, Istanbul, Turkey. Invited speaker, Chair of Parvovirus session; keynote address.
Department of Microbiology, Otago University, Dunedin, New Zealand.
Cambridge University, Veterinary School, Cambridge, UK. Invited seminar speaker.

University of Texas - Austin. Predictive Evolution & Epidemiology Meeting. Invited speaker.

- 2009** Gordon Research Conference, Lucca Italy, poster.
Ecology and Evolution of Infectious Diseases meeting, Athens Georgia, Invited speaker.
Queenstown Molecular Biology Conference, Queenstown, New Zealand. Invited speaker.
American Society for Virology meeting, Vancouver, BC. Two posters and one talk from laboratory.
New York State High School teachers, introduction to influenza viruses.
Thought Leaders workshop - Advanced Systems and Concepts Office of the Defense Threat Reduction Agency, within the Office of the Secretary of Defense - predicting "species jumps" by undertaking animal surveillance for zoonotic viruses.
American College of Veterinary Pathology Annual Meeting, Monterrey, CA. Invited speaker.
- 2010** University of Rochester, Department of Microbiology and Immunology.
NSF PIs meeting, Albuquerque, NM.
AKC Breeders Symposium. Invited speaker.
NSF Emerging Infectious Diseases meeting, Washington, DC.
International Feline Retrovirus meeting, Charleston, SC. Speaker.
Parvovirus workshop, Helsinki, Finland. Speaker, session Chair.
ASV Annual Meeting, Bozeman, MT.
Options for the control of Influenza, Hong Kong.
Virus Evolution workshop, Ardmore, OK. Speaker.
American Society of Glycobiology, Viruses and glycans, St Petersburg, FL. Speaker.
- 2011** Kavli Institute for Theoretical Physics, "Microbial and Viral Evolution", UC Santa Barbara. Invited speaker.
EID PIs meeting, Madison, WI. Speaker.
ASV Annual Meeting, Minneapolis, Veterinary Satellite meeting, invited speaker.
Jacques Monod Conference, "Coevolutionary arms race between parasite virulence and host immune defense: Challenges from state of the art research", Roscoff, France. Speaker.
Pennsylvania State University Medical Center, Hershey. Seminar speaker.
University of Pennsylvania College of Veterinary Medicine, faculty retreat. Invited speaker.
Institute for Cellular & Molecular Biology, University of Texas, Austin. Seminar speaker.
- 2012** Penn State Center for Infectious Disease Dynamics; State College, PA. Seminar speaker
University of Minnesota, College of Veterinary Medicine, St Paul, MN. Seminar speaker.
University of Minnesota, Institute for Molecular Virology, Minneapolis, MN. Seminar speaker
Innovations in Virus Research Lecture Series.
Local Organizer, International Parvovirus Workshop, June 17 – 21, 2012. Two presentations from my laboratory.
International Workshop for Feline Retrovirus Diseases, Leipzig, Germany; invited speaker.
University of North Carolina, Chapel Hill, Center for Gene Therapy.
Colorado State University, Fort Collins, CO, Department of Microbiology, Immunology and Pathology, Seminar Speaker.
Colorado State University, Fort Collins, CO, Wildlife Diseases program, Seminar Speaker.
International Society for Companion Animal Infectious Diseases, bi-annual meeting, San Francisco, Keynote speaker.
University of Vermont Medical Center, Burlington, VT.

- 2013** University of Alabama, Birmingham, AL, Department of Microbiology and Immunology. Seminar Speaker.
Virginia Tech University, Blacksburg, VA. Department of Biomedical Sciences and Pathobiology, College of Veterinary Medicine. Seminar Speaker.
Viruses and Cells Gordon Conference, Barga, Italy. Invited Chair, session on Virus Evolution.
Indiana University, Bloomington, IN. Department of Biology. Invited Seminar Speaker.
University of California, Irvine, Department of Microbiology, Invited Seminar Speaker.
University of California, San Diego, Cellular & Molecular Medicine, Invited Seminar Speaker.
Department of Homeland Security RAPIDD program, workshop Colorado State, Viral Spillovers.
University of Georgia, Department of Veterinary Pathobiology. Invited speaker.
Department of Homeland Security RAPIDD program, workshop Atlanta, Influenza viruses in animals and zoonoses.
University of Colorado, Boulder. Department of Biology. Invited Seminar Speaker.
- 2014.** University of Texas Medical Branch, Galveston, Department of Microbiology. Invited Seminar Speaker.
University of Illinois, Department of Veterinary Pathobiology, invited speaker.
Keystone Meeting, The Ins and Outs of Viral Infection: Entry, Assembly, Exit and Spread. Speaker and Session Chair.
Institute Pasteur, Paris. IXth Conference Louis Pasteur entitled “Emerging Infectious Diseases”, invited speaker.