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Animal Parasitic Diseases Laboratory (APDL)
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Educational History

B.S., Microbiology, University of Maryland at College Park, 1979
M.S., Chemistry/Microbiology, UMCP, 1981
Ph.D., Microbiology, UMCP, 1985

Employment History

March 2007-Present

USDA, ARS, Animal Parasitic Diseases Laboratory
Microbiologist

Conducting studies on molecular biology, immunology, and biochemistry of coccidiosis, cryptosporidiosis, and neosporosis in domestic animals with the goal of developing diagnostic assays and vaccines.

September 2001- March 2007

USDA, ARS, Animal Parasitic Diseases Laboratory
Research Leader

Conducting studies on molecular biology, immunology, and biochemistry of coccidiosis, cryptosporidiosis, and neosporosis in domestic animals with the goal of developing diagnostic assays and vaccines. Act as Research Leader for 12 scientists that are studying a diverse set of parasitic diseases affecting man and animals.

December 1987-September 2001

USDA, ARS, Immunology and Disease Resistance Laboratory
Microbiologist

Conducting studies on molecular biology, immunology, and biochemistry of coccidiosis, cryptosporidiosis, and neosporosis in domestic animals with the goal of developing diagnostic assays and vaccines.

January 1986-December 1987

USDA, ARS, Animal Parasitology Unit
Post-Doctoral Research Associate

Carried out molecular and immunological studies on avian coccidia toward the goal of identify targets for vaccination or chemotherapy.

October 1983-January 1986

National Institutes of Health

Conducted dissertation research on immunological aspects of insulin-dependent diabetes mellitus with emphasis on autoimmune responses.

Awards

Horn Point Environmental Laboratories Graduate Fellowship, 1979-1981
Chesapeake Biological Laboratory Graduate Fellowship, 1982-1983
USDA Certificate of Merit for Coccidiosis Vaccine Research, 1988
USDA Certificate of Merit for Recombinant Coccidiosis, Cryptosporidiosis, and Neosporosis Antigen Gene Patents, 1989, 1993, 1996, 1999, 2001, 2005
USDA Certificate of Merit for Outstanding Performance, 1990-2012
Beltsville Area Early Career Scientist of the Year Award, 1992
Funding for 4 Administrator Post-Doctoral Research Associates- 1988, 1990, 1993, 1998
Federal Laboratory Consortium Technology Transfer Award- 2001.
Beltsville Area Scientist of the Year Award, 2012

Peer Reviewed Publications

1. Boynton, W.R., Kemp, W.M., Osborne, C.G., Kaumeyer, K.R., and Jenkins, M.C. (1981) Influence of water circulation rate on in situ measurement of benthic community respiration. *Mar. Biol.* 62:77-86.
2. Jenkins, M.C. and Kemp, W.M. (1984) Coupling of nitrification and denitrification in the estuarine environment. *Limnol. Oceanogr.* 29:103-109.
3. Garzelli, C., Taub, F.E., Jenkins, M.C., Drell, D.W., Ginsberg-Fellner, F., and Notkins, A.L. (1986) Human monoclonal autoantibodies that react with both pancreatic islets and thyroid. *J. Clin. Invest.* 77:1627-1631.
4. Jenkins, M.C. (1986) Serum and monoclonal anti-T lymphocyte antibodies: Possible relevance to insulin-dependent diabetes mellitus (IDDM). Ph.D. dissertation. University of Maryland, College Park, MD.
5. Jenkins, M.C. and Dame, J.B. (1987) Identification of immunodominant surface antigens of *Eimeria acervulina* sporozoites and merozoites. *Mol. Biochem. Parasitol.* 25: 155-164.
6. Jenkins, M.C., Lillehoj, H.S., and Dame, J.B. (1988) *Eimeria acervulina*: DNA cloning and characterization of recombinant sporozoite and merozoite antigens. *Exp. Parasitol.* 66: 96-107.
7. Lillehoj, H.S., Jenkins, M.C., Bacon, L.D., Fetterer, R.H., and Briles, W.E. (1988) Protection against *Eimeria acervulina* correlates with the T cell response to the recombinant surface merozoite antigen, p150. *Exp. Parasitol.* 67: 148-158.
8. Jenkins, M.C. (1988) A cDNA encoding a merozoite surface protein of the protozoan *Eimeria acervulina* contains tandem-repeated sequences. *Nucl. Acids Res.* 16: 9863.

9. Jenkins, M.C., Danforth, H.D., Lillehoj, H.S., and R.H. Fetterer (1989) cDNA encoding an immunogenic region of a 22 kDa surface protein of *Eimeria acervulina* sporozoites. *Mol. Biochem. Parasitol.* 32: 153-162.
10. Kim, K.S., Lillehoj, H.S., and Jenkins, M.C. (1989) Evaluation of serum and secretory antibody responses to an immunodominant recombinant merozoite surface antigen, p150, using a sensitive enzyme-linked Immunosorbent assay. *Avian Dis.* 33: 431-437.
11. Kim, K.S., Jenkins, M.C., Lillehoj, H.S. (1989) Immunization of chickens with live *Escherichia coli* expressing *Eimeria acervulina* merozoite recombinant antigen induces partial protection against coccidiosis. *Infect. Immun.* 57: 2434-2440.
12. Jenkins, M., Kim, K., Castle, M., Lillehoj, H., and Danforth, H. (1989) Recombinant *Eimeria* antigens that elicit cellular immune responses and confer partial protection against disease when expressed in vivo by live bacterial transformants. *Proc. Vth Int. Coccidiosis Conf., Tours, France.*
13. Lillehoj, H. and Jenkins, M. (1989) Effects of MHC genes and various antigen presentations on protective host immunity following Eimerian infections and immunization with a recombinant coccidial antigen: a review. *Proc. Vth Int. Coccidiosis Conf., Tours, France.*
14. Jenkins, M.C., Strohle, D.A., Lillehoj, H.S., and Danforth, H.D. (1990) *Eimeria acervulina*: Cloning of a cDNA encoding an immunogenic region of several related merozoite surface proteins and rhoptry proteins. *Exp. Parasitol.* 70: 353-362.
15. Barta, J.R., Jenkins, M.C., and Danforth, H.D. (1990) Evolutionary relationships of avian *Eimeria* species among other Apicomplexan protozoa based on partial small subunit ribosomal RNA sequences: Monophyly of the Apicomplexa is supported. *Mol. Biol. Evol.* 8: 345-355.
16. Jenkins, M.C., Castle, M.D., and Danforth, H.D. (1990) Protective immunization against the intestinal parasite *Eimeria acervulina* with recombinant coccidial antigen. *Poult. Sci.* 70: 539-547.
17. Castle, M.D., Jenkins, M.C., Danforth, H.D., and Lillehoj, H.S. (1990) Characterization of a recombinant *Eimeria acervulina* antigen expressed on both sporozoite and merozoite developmental stages. *J. Parasitol.* 77: 384-390.
18. Lillehoj, H.S., Jenkins, M.C., and Bacon, L.D. (1990) Effects of major histocompatibility genes in antigen delivery on induction of protective mucosal immunity to *Eimeria acervulina* following immunization with recombinant merozoite antigen. *Immunol.* 60: 136-145

19. Chung, K.S., Lillehoj, H.S., and Jenkins, M.C. (1990) Avian leukocyte common antigen: Biochemical and flow cytometric analysis using new monoclonal antibody. *Vet. Immunol. Immunopathol.* 28: 259-273.
20. Jenkins, M.C., Dougherty, E.M., and Braun, S.K. (1990) Protection against coccidiosis with recombinant *Eimeria acervulina* merozoite antigen expressed in baculovirus. *Proc. Int. Comp. Virol. Org.*, pp.127-139.
21. Jenkins, M.C., Augustine, P.C., Barta, J.R., Castle, M.D., Danforth, H.D. (1991) Development of resistance to coccidiosis in the absence of merogonic development using X-irradiated *Eimeria acervulina* oocysts. *Exp. Parasitol.* 72: 285-293.
22. Jenkins, M.C., Augustine, P.C., Danforth, H.D., and Barta, J.R. (1991) X-irradiation of *Eimeria tenella* oocysts provides direct evidence that sporozoite invasion and early schizont development induce a protective immune response(s). *Infect. Immun.* 59: 4042-4048.
23. Fayer, R. and Jenkins, M.C. (1992) Colostrum from cows immunized with *Eimeria acervulina* antigens reduces parasite development in vivo and in vitro. *Poult. Sci.* 71: 1637-1645.
24. Jenkins, M.C., Seferian, P.G., Augustine, P.C., and Danforth, H.D. (1993) Protective immunity against coccidiosis elicited by radiation-attenuated *Eimeria maxima* sporozoites that are incapable of asexual development. *Avian Dis.* 37: 74-82.
25. Augustine, P.C., Danforth, H.D., and Jenkins, M.C. (1993) Avian *Eimeria*: Effects of gamma irradiation on development of cross-species immunity in foreign and natural host birds. *Avian Dis.* 37: 349-357.
26. Jenkins, M.C., Fayer, R., Tilley, M., and Upton, S. (1993) Cloning and expression of a cDNA encoding epitopes shared by 15- and 60-kilodalton proteins of *Cryptosporidium parvum* sporozoites. *Infect. Immun.* 61: 2377-2382.
27. Augustine, P.C., Danforth, H.D., and Jenkins, M.C. (1993) Cross-species protection elicited in chickens by the turkey coccidium *Eimeria adenoides* is destroyed by gamma irradiation. *Poult. Sci.* 72: 21-25.
28. Jenkins, M.C., Augustine, P.C., Danforth, H.D., Seferian, P.G., and Barta, J.R. (1993) *Eimeria* oocysts exposed to gamma irradiation induce protective immunity in the absence of merogony: Relevance to Vaccine Development. *Proc. VIth Int. Coccidiosis Conf.*, Guelph, Ontario, Canada. pg. 109-117.
29. Danforth, H.D., Augustine, P.C., and Jenkins, M.C. (1993) A review of progress in coccidial vaccine development. *Proc. VIth Int. Coccidiosis Conf.*, Guelph, Ontario, Canada. pg. 49-60.

30. Augustine, P.C., Danforth, H.D., Jenkins, M.C., and Barta, J.R. (1993) Avian *Eimeria*: Ability of sporozoites to elicit cross species protection in foreign host birds. Proc. VIth Int. Coccidiosis Conf., Guelph, Ontario, Canada., pg. 105-108.
31. Bjerkas, I., Jenkins, M.C., and Dubey, J.P. (1994) Analysis of *Neospora caninum* antigens by Western immunoblotting and immunogold electron microscopy. Clin. Diagn. Lab. Immunol. 1: 214-221.
32. Jenkins, M.C. and Fayer, R. (1994) Cloning and expression of cDNA encoding a 15 kDa *Cryptosporidium parvum* sporozoite protein. Mol. Biochem. Parasitol. 71: 149-152.
33. Jenkins, M.C., Chute, B.C., Danforth, H.D., and Lillehoj, H.S. (1994) Gamma-irradiated and non-irradiated *Eimeria tenella* sporozoites exhibit differential uracil uptake and expression of a 7-10 kDa metabolic antigen. Exp. Parasitol. 80: 645-653.
34. Danforth, H.D., Augustine, P.C., Barta, J.R., and Jenkins, M.C. (1994) In vitro and in vivo immunolabeling of sporozoites, schizonts, and sexual stages of *Eimeria acervulina* and *E. tenella* by a species and stage cross-reactive monoclonal antibody. Parasitol. Res. 80: 588-593.
35. Danforth, H.D., Augustine, P.C., and Jenkins, M.C. (1994) Vaccine Development: Current Position and Perspectives. Proc. Sipsio Int. Coccidiose., pg. 125-140.
36. Dubey, J.P., Jenkins, M.C., Thayer, D.W., Kwok, O., and Shen, S.K. (1996) Killing of *Toxoplasma gondii* oocysts by irradiation. J. Parasitol. 82: 724-727.
37. Dubey, J.P., Jenkins, M.C., and Thayer, D.W. (1996) Irradiation killing of *Toxoplasma gondii* oocysts. J. Euk. Micro. 43:123.
38. Kaspers, B., Lillehoj, H., Jenkins, M.C., and Pharr, G.T. (1995) Chicken interferon-mediated induction of major histocompatibility complex Class II antigens on peripheral blood monocytes. Vet. Immunol. Immunopathol. 44: 71-84.
39. Augustine, P.C. and Jenkins, M.C. (1995) Effect of conditioned media from several cell types on invasion by *Eimeria adenoeides* sporozoites. J. Euk. Microbiol. 43: 327-330.
40. Jenkins, M., Kerr, D., Fayer, R., and Wall, R. (1996) Serum and colostrum antibody responses induced by jet-injection of sheep with DNA encoding a *Cryptosporidium parvum* antigen. Vaccine. 14: 1658-1664.
41. Jenkins, M.C., Lally, N.C., and Dubey, J.P. (1996) Applying molecular techniques for controlling neosporosis. Proc. Int. Neospora Workshop. Kansas City, MO.

42. Lally, N., Jenkins, M.C., and Dubey, J.P. (1996) Development of a polymerase chain reaction assay for diagnosis of neosporosis using the *Neospora caninum* 14-3-3 gene. *Mol. Biochem. Parasitol.* 75: 169-178.
43. Lally, N., Jenkins, M.C., and Dubey, J.P. (1996) Evaluation of two *Neospora caninum* recombinant antigens for use in an ELISA for the diagnosis of bovine neosporosis. *Clin. Diag. Immunol. Lab.* 3: 275-279.
44. Jenkins, M.C. and Petersen, C. (1997) Molecular biology of *Cryptosporidium*. In: *Cryptosporidium and cryptosporidiosis*. R. Fayer (ed.). CRC Press, pp. 225-232.
45. Jenkins, M.C., Trout, J., and Fayer, R. (1997) A semi-quantitative method for measuring *Cryptosporidium parvum* infection using polymerase chain reaction. *J. Micro. Method.* 28: 99-107.
46. Jenkins, M.C., Chute, M.B., and Danforth, H.D. (1997) Protection against coccidiosis in outbred chickens elicited by gamma-irradiated *Eimeria maxima*. *Avian Dis.* 41:702-708.
47. Lally, N., Jenkins, M.C., Liddell, S., and Dubey, J.P. (1997) A dense granule protein (NCDG1) gene from *Neospora caninum*. *Mol. Biochem. Parasitol.* 87: 239-243.
48. Jenkins, M.C., Wouda, W., and Dubey, J.P. (1997) Serological response over time to recombinant *Neospora caninum* antigens in cattle after a neosporosis-induced abortion. *Clin. Diag. Lab. Immunol.* 4: 270-274.
49. Wouda, W., Dubey, J.P., and Jenkins, M.C. (1997) Serological diagnosis of bovine fetal neosporosis. *J. Parasitol.* 83: 545-547.
50. Barta, J.R., Martin, D.S., Liberator, P.A., Dashkevich, M., Anderson, J.W., Feighner, S.D., Elbrecht, A., Perkins-Barrow, A., Jenkins, M., Danforth, H.D., Ruff, M.D., and Profous-Juchelka, H. (1997) Phylogenetic relationships among eight *Eimeria* species infecting domestic fowl inferred using complete small subunit ribosomal DNA sequences. *J. Parasitol.* 83: 262-271.
51. Dubey, J.P., Jenkins, M.C., Adams, D.S., McAllister, M., Anderson-Sprecher, R., Baszler, T.V., Kwok, O.C.H., Lally, N.C., Bjorkman, C., and Uggl, A. (1997) Antibody responses of cows during an outbreak of neosporosis evaluated by indirect fluorescent antibody test and different enzyme-linked immunosorbent assays. *J. Parasitol.* 83: 1063-1069.
52. Jenkins, M.C., Trout, J., and Fayer, R. (1998) Development and application of an

improved semi-quantitative technique for detecting low level *Cryptosporidium parvum* infections in mouse tissue using polymerase chain reaction. *J. Parasitol.* 84: 182-186.

53. Jenkins, M.C. (1998) Progress on developing a recombinant coccidiosis vaccine. *Int. J. Parasitol.* 28: 1111-1119.
54. Liddell, S., Lally, N.C., Jenkins, M.C., and Dubey, J.P. (1998) Isolation of the cDNA encoding a dense granule associated antigen (NCDG2) of *Neospora caninum*. *Mol. Biochem. Parasitol.* 93: 153-158.
55. Hemphill, A., Gadjendran, N., Sonda, S., Fuchs, N., Gottstein, B., Hentrich, B., and Jenkins, M. (1998) Identification and characterization of dense granule-associated protein in *Neospora caninum* tachyzoites. *Int. J. Parasitol.* 28:429-438.
56. Dubey, J.P., Dorough, K.R., Jenkins, M.C., Liddell, S., Speer, C.A., Kwok, O.C.H., and Shen, S.K. (1998) Canine neosporosis: Clinical signs, diagnosis, treatment and isolation of *Neospora caninum* in mice and cell culture. *Int. J. Parasitol.* 28: 1293-1304.
57. Fayer, R., Trout, J.M., and Jenkins, M.C. (1998) Infectivity of *Cryptosporidium parvum* oocysts stored in water at environmental temperatures. *J. Parasitol.* 84:1165-1169.
58. Jenkins, M.C., O'Brien, C., Trout, J., Guidry, A., and Fayer, R. (1999) Hyperimmune bovine colostrum specific for recombinant *Cryptosporidium parvum* antigen confers partial protection against cryptosporidiosis in immunosuppressed adult mice. *Vaccine* 17:2453-2460.
59. Ellis, J., Morrison, D.A., Liddell, S., Jenkins, M.C., Mohammed, O.B., Ryce, C., Holmdahl, O.J.M. and Dubey, J.P. (1999) The genus *Hammondia* is paraphyletic. *Parasitology* 118:357-362.
60. Jenkins, M.C., Ellis, J.T., Liddell, S., Ryce, C., Munday, B.L., Morrison, D.A., and Dubey, J.P. (1999) The relationship of *Hammondia hammondi* and *Sarcocystis mucosa* to other heteroxenous cyst-forming coccidia as inferred by phylogenetic analysis of the 18S SSU ribosomal DNA sequence. *Parasitology* 119:135-142.
61. Dyer, R.M., Jenkins, M.C., Kwok, O.C., Douglas, L.W., and Dubey, J.P. (2000) Serologic survey of *Neospora caninum* infection in a closed dairy cattle herd in Maryland: risk of serologic reactivity by production groups. *Vet. Parasitol.* 90:171-181.
62. Liddell, S., Jenkins, M.C., and Dubey, J.P. (1999) Vertical transmission of *Neospora caninum* in BALB/c mice using PCR detection. *J. Parasitol.* 85:550-555.

63. Liddell, S., Jenkins, M.C., Collica, C., and Dubey, J.P. (1999) Prevention of vertical transmission of *Neospora caninum* in BALB/c mice by vaccination. *J. Parasitol.* 85:1072-1075.
64. Jenkins, M.C., Trout, J.M., Murphy, C., Harp, J., Higgins, J., Wergin, W., and Fayer, R. (1999) Cloning and expression of a DNA sequence encoding a 41-kilodalton *Cryptosporidium parvum* oocyst wall protein. *Clin. Diagn. Lab. Immunol.* 6: 912-920.
65. Liddell, S., Jenkins, M.C., and Dubey, J.P. (1999) A competitive PCR assay for quantitative detection of *Neospora caninum*. *Int. J. Parasitol.* 29: 1583-1587.
66. DeMarez T, Liddell S, Dubey JP, Jenkins MC, Gasbarre L. (1999) Oral infection of calves with *Neospora caninum* oocysts from dogs: Humoral and cellular immune responses. *Int. J. Parasitol.* 29:1647-57.
67. Augustine, P.C., Jenkins, M.C. and Dubey, J.P. (1999) Effect of polyclonal antisera developed against dense granule-associated *Neospora caninum* proteins on cell invasion and development in vitro by *N. caninum* tachyzoites. *Parasitology.* 119: 441-445.
68. Fayer, R., Lewis, E.J., Trout, J.M., Graczyk, T.K., Jenkins, M.C., Higgins, J., Xiao, L., and Lal, A.A. (1999) *Cryptosporidium parvum* in oysters from commercial harvesting sites in the Chesapeake Bay. *Emerg. Infect. Dis.* 5:706-710.
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71. Jenkins, M.C., Trout, J., Abrahamsen, M., Lancto, C.A., Higgins, J., and Fayer, R. (2000) Development of an RT-PCR assay for estimating the viability of *Cryptosporidium parvum* oocysts. *J. Microbiol. Meth.* 43:97-106.
72. Graczyk, T., Fayer, R., Trout, J.M., Jenkins, M.C., Higgins, J., Lewis, E.J., and Farley, C.A. (2000) Susceptibility of the Chesapeake Bay to environmental contamination with *Cryptosporidium parvum*. *Environ. Res. Sect. A* 82:106-112.
73. Lillehoj, H.S., Choi, K.D., Jenkins, M.C., Vakharia, V.N., Song, K.D., Han, J.Y., and

- Lillehoj, E.P. (2000) A recombinant *Eimeria* protein inducing interferon-gamma production: comparison of different gene expression systems and immunization strategies for vaccination against coccidiosis. *Avian Dis.* 44:379-389.
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75. Jenkins, M.C. (2001) Advances and prospects for subunit vaccines against protozoa of veterinary importance. *Vet. Parasitol.* 101:291-301.
76. Li, X., Fayer, R., Trout, J.M., Jenkins, M.C., and Palmer, R.C. (2001) Effects of gamma irradiation on survival of *Encephalitozoon intestinalis* spores. *J. Euk. Microbiol.* 91S
77. Higgins, J.A., Fayer, R., Trout, J.M., Xiao, L., Lal, A., Kerby, S., and Jenkins, M.C. (2001) Real time PCR for the detection of *Cryptosporidium parvum*. *J. Microbiol. Methods.* 47:323-337.
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89. Liddell, S., Parker, C., Vinyard, B., Jenkins, M.C., and Dubey, J.P. (2003) Immunization of mice with plasmid DNA coding for NcGRA7 or NcsHSP33 confers partial protection against congenital neosporosis. *J. Parasitol.* 89: 496-500.
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93. Kniel K.E., Higgins, J.A., Trout, J.M., Fayer, R., and Jenkins, M.C. (2004) Characterization and potential use of a *Cryptosporidium parvum* virus (CPV) antigen for detecting *C. parvum* oocysts. *J Microbiol Methods.* 58:189-195.
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against cryptosporidiosis by oral inoculation with gamma-irradiated *Cryptosporidium parvum* oocysts. J. Parasitol. 90:1178-1180

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