

CURRICULUM VITAE**ROY CURTISS III**

Professor of Life Sciences
Arizona State University, Tempe, AZ 85287

BIRTHDATE: May 27, 1934**BIRTHPLACE:** New York, NY**NATIONALITY:** USA**EDUCATION:**

B.S.	Cornell University, Ithaca NY	1956
Ph.D.	University of Chicago, Chicago IL	1962

PROFESSIONAL CAREER:

2007-	Director, Center for Infectious Diseases and Vaccinology, Arizona State University, Tempe, AZ
2004-2006	Co-Director, Center for Infectious Diseases and Vaccinology, Arizona State University, Tempe, AZ
2004-Present	Professor of Life Sciences, School of Life Sciences, Arizona State University, Tempe, AZ
2005-Present	George William and Irene Koechig Freiberg Professor of Biology Emeritus, Washington University, St. Louis, MO
1984-2005	George William and Irene Koechig Freiberg Professor of Biology, Washington University, St. Louis, MO
1983-2005	Professor, Department of Biology, Washington University, St. Louis, MO
1993-2000	Founder, Member Board of Directors, MEGAN Health, Inc., St. Louis, MO
1998-1999	Vice President of Research, MEGAN Health, Inc., St. Louis, MO
1991-1994	Professor/Collaborator, Iowa State University, Ames, IA
1991-1994	Director, Center for Plant Science & Biotechnology, Washington University, St. Louis, MO
1983-1993	Chairman, Department of Biology, Washington University, St. Louis, MO
1983-1991	Professor, Cellular and Molecular Biology, Washington University School of Dental Medicine, St. Louis, MO
1983-1987	Adjunct Professor, Department of Microbiology, University of Alabama at Birmingham, Birmingham, AL
1982-1983	Acting Chairman, Department of Microbiology, University of Alabama at Birmingham, Birmingham, AL
1981-1982	Vice Chairman, Department of Microbiology, University of Alabama at Birmingham, Birmingham, AL
1981-1983	Director & Senior Scientist, Cystic Fibrosis Research Center, University of Alabama at Birmingham, Birmingham, AL
1978-1983	Charles H. McCauley Professor of Microbiology, University of Alabama at Birmingham, Birmingham, AL
1972-1983	Senior Scientist, Institute of Dental Research, University of Alabama at Birmingham, Birmingham, AL
1972-1983	Senior Scientist, Comprehensive Cancer Center, University of Alabama at Birmingham, Birmingham, AL
1972-1983	Professor, Department of Microbiology, University of Alabama at Birmingham, Birmingham, AL
1971-1972	Interim Director, University of Tennessee - Oak Ridge Graduate School of Biomedical Sciences, Oak Ridge, TN
1970-1971	Associate Director, University of Tennessee - Oak Ridge Graduate School of Biomedical Sciences, Oak Ridge, TN
1969-1972	Professor, University of Tennessee - Oak Ridge Graduate School of Biomedical Sciences, Oak Ridge, TN
1969-1972	Group Leader, Microbial Genetics and Radiation Microbiology Group, Biology Division, Oak Ridge National Laboratory, Oak Ridge, TN
1967-1969	Lecturer, University of Tennessee - Oak Ridge Graduate School of Biomedical Sciences, Oak Ridge, TN
1965-1972	Lecturer, Department of Microbiology, University of Tennessee, Knoxville, TN
1963-1972	Biologist, Biology Division, Oak Ridge National Laboratory, Oak Ridge, TN
1960-1962	US Public Health Service Predoctoral Fellow, Department of Microbiology, University of Chicago, Chicago, IL
1958-1960	University Fellow, Department of Microbiology, University of Chicago, Chicago, IL
1956-1958	Junior Technical Specialist, Biology Division, Brookhaven National Laboratory, Upton, NY
1955-1956	Laboratory Instructor and Research Assistant, Department of Poultry Husbandry, Cornell University, Ithaca, NY

PROFESSIONAL ACTIVITIES:**Arizona State University, Tempe, AZ**

2006-	Member, Graduate School Committee on Interdepartmental Transdisciplinary Graduate Education
2005-Present	Member, School of Life Sciences Executive Committee
2006-Present	Member, Board of Governors, Arizona Arts, Science and Technology Academy
2005	Member, Neurosciences Search Committee
2005	Chairman, Bacterial Pathogenesis Search Committee

ROY CURTISS
2004

Member, Mycobacterial Pathogenesis Search Committee

2

Washington University, St. Louis, MO

1998-2004 Member, Center for Infectious Disease Research Advisory Board
1994-1998 Member, Department of Biology Advisory Committee
1991-1992 Member, Division Comparative Medicine Chairman Search Committee
1991-1993 Member, Animal Studies Committee
1989-1993 Member, Biotechnology Advisory Board
1989-1991 Member, Committee to Prepare for the 21st Century
1989-1991 Member, Psychology Chairman Search Committee
1988-1993 Member, Washington University Committee on AIDS
1988-1994 Member, Executive Committee, Center for Plant Science and Biotechnology
1985-1988 Chancellor's Representative to Board of Directors of the Missouri Botanical Garden
1985-1991 Member, Biosafety Committee
1984-1986 Member-at-Large, Senate Council
1984-1993 Chairman, Tyson Research Center Advisory Committee
1983-1993 Member, Executive Council, Division of Biology and Biomedical Sciences
1983-1984 Member, Faculty of Arts and Sciences Dean Search Committee

MRCE Scientific Advisory Committee

2003-2004 Member

American Type Culture Collection, Manassas, VA

2003-Present Presidential Advisor

Missouri Seed Capital Investment Board, Jefferson City, MO

2000-2003 Member

Apovia (EVAX) Technologies, Inc., Munich, Germany

1999-2002 Science Advisor

Whitfield School, St. Louis, MO

2002-2005 Executive Committee of the Board of Directors
1997-2005 Board of Directors

Ajinomoto Company, Inc., Tokyo, Japan

1997-1998 Science Advisor

MEGAN Health Inc., St. Louis, MO

1998-1999 Vice President of Research
1992-1999 Science Advisor
1989-2000 Board of Directors
1989 Founder

Immuno A.G., Vienna, Austria

1991-1994 Science Advisor

Vicam, Cambridge, MA

1991-1993 Science Advisor

Agrigenetics, Madison, WI

1989-1991 Science Advisor

Mycogen Corporation, La Jolla, CA

1988-1989 Science Advisor

Crop Genetics International, Hanover, MD

ROY CURTISS
1987-1990

Science Advisor

3

Sungene Technologies Corporation, San Jose, CA

1987-1989 Board of Directors
1982-1989 Science Advisor

Praxis Biologics, Inc., Rochester, NY

1985-1988 Science Advisor

Molecular Engineering Associates, Inc., Birmingham, AL

1983-1987 Science Advisor
1981-1984 Board of Directors
1981 Founder

University of Alabama at Birmingham, Birmingham, AL

1981-1982 Member, Biochemistry Chairman Search Committee
1980-1983 Member, Joint Health Sciences Faculty Status Committee
1979-1983 Member, Graduate School Advisory Committee
1979-1981 Member, Comprehensive Cancer Center Review Committee
1977 Member, Graduate School Dean Search Committee
1976-1983 Program Director, Infectious Diseases Postdoctoral Training Program
1976-1983 Member, Promotions Committee, Department of Microbiology
1975-1983 Program Director, Molecular, Cellular and Medical Genetics Postdoctoral Training Program
1974-1983 Member, Biosafety Committee
1973-1982 Program Director, Molecular Cell Biology Graduate Program
1973-1982 Chairman, Molecular Cell Biology Graduate Committee
1973-1975;
1976-1978 Member, Cancer Research and Training Center Review Committee
1973-1983 Member, Graduate School Council
1973-1975 Chairman, Graduate Committee, Department of Microbiology
1972-1975 Member, Graduate Committee, Department of Microbiology
1972-1975 Member, Coordinating Council, Department of Microbiology

University of Tennessee, Knoxville, TN

1971-1972 Member, Biomedical Engineering Institute Committee

University of Tennessee-Oak Ridge Graduate School of Biomedical Sciences, Oak Ridge, TN

1971-1972 Program Director, NIGMS Cellular and Molecular Biology Training Grant
1969-1971 Chairman, Genetics Curriculum Committee
1969-1971 Member, Postdoctoral Investigatorship Review Committee

Biology Division, Oak Ridge National Laboratory, Oak Ridge, TN

1966-1969 Chairman, Genetics Seminar and Journal Club Committee

NATIONAL AND INTERNATIONAL ACTIVITIES:

2006-2007 Member, International Congress of Mucosal Immunology Steering Committee
2006 Member, FDA Site Visit, Center for Biologics Evaluation and Research
2005-Present Alternate, Committee on Election to Fellowship, American Academy of Microbiology
2004 Member, NIH Vaccine Study Section
2003 Chairman, NIH Bacterial BioDefense Study Section
2003-2004 Member, American Society for Microbiology Finance Committee
2003 Ad hoc Member, NIH BM-2 Vaccine Study Section
2002-2003 Member, American Society for Microbiology Nominating Committee
2002 Member, NIDCR Scientific Advisory Panel
2001-Present Member, National Academy of Sciences
2001-2004 Division Councilor at Large, Council Policy Committee and Council, American Society for Microbiology
2001-2003 Member, NIH Vaccine Research Study Section

2000-Present	Member, Board of Executive Editors, <i>Escherichia coli</i> & <i>Salmonella</i> : Cellular and Molecular Biology, The Electronic Edition, ASM Press
2000-2005	Editor-in-Chief and Chairman Board of Executive Editors, <i>Escherichia coli</i> & <i>Salmonella</i> : Cellular and Molecular Biology, The Electronic Edition, ASM Press
1998-2003	Member, Advisory Committee-Bacteriology Program, American Type Culture Collection
1996-2004	Heiser Trust, Scientific Advisory Board
1999-2001	Division Z Councilor at Large, American Society for Microbiology Council
1999	Chairman, NIH Panel on Leprosy Research in the Post-Genome Era
1998-1999	Member, Compensation Committee, American Type Culture Collection
1996-1999	Member, Molecular Biology Advisory Committee, American Type Culture Collection
1995-1999	Member, Board of Trustees, American Type Culture Collection
1995-1999	Member, Executive Committee of Board of Trustees, American Type Culture Collection
1995-1997	Member, Development and Public Affairs Committee, American Type Culture Collection
1995-1997	Member, Trustees Nominating Committee, American Type Culture Collection
1993-1996	Editor, <i>Escherichia coli</i> & <i>Salmonella</i> : Cellular & Molecular Biology, 2nd ed., ASM Press
1992-1995	Member, Executive Committee of Board of Directors, American Type Culture Collection
1993-1995	Chairman, Science Committee, American Type Culture Collection
1989-1995	Member, Board of Directors, American Type Culture Collection
1993-1994	Member, American Society for Microbiology Nominating Committee
1991-1994	Division Councilor at Large, Council Policy Committee and Council, American Society for Microbiology
1991	Member, Review Panel, Undergraduate Biological Sciences Education, Howard Hughes Medical Institute
1989-1991	Division B Councilor, American Society for Microbiology Council
1988	Organizer, Workshop on Computerization of Data Bases for Genetic Stock Collections
1987-1999	Member, Editorial Board, <u>ASM News</u>
1987	Member, NIH Research Centers for Oral Biology Review Committee
1987	Ad hoc Member, National Institute of General Medical Sciences Council
1986	Co-organizer, ASM Conference on Streptococcal Genetics
1985-1992	Editor, <u>Infection and Immunity</u>
1984-1989	Member, Cystic Fibrosis Foundation Research Development Program Review Committee
1983-1986	Member, WHO Steering Committee on the Immunology of Tuberculosis
1982	Visiting Professor, University of Oklahoma
1980-1983	Member, NIH Genetic Basis of Disease Review Committee (Chairman 1981-1983)
1978-1981	Vice President, Council for Advancement of Scientific Writing
1977-1980	Branch Councilor at Large, Council Policy Committee and Council, American Society for Microbiology
1977	Southeastern Branch Councilor, Council American Society for Microbiology Council
1976-1981	Member, Board of Directors, Council for Advancement of Scientific Writing
1976	Member, International Council of Scientific Unions Ad Hoc Committee on Recombinant DNA
1975-1978	Member, NSF Genetic Biology Advisory Panel
1974-1977	Member, NIH Recombinant DNA Molecule Advisory Committee
1973	Visiting Professor, Universidad Catolica de Chile, Santiago, Chile
1972	Visiting Professor, University of Puerto Rico, San Juan, PR
1970-1976	Editor, <u>Journal of Bacteriology</u>
1969	Visiting Professor, Instituto Venezolano de Investigaciones Cientificas, Caracas, Venezuela
1966-1970	Editorial Board Member, <u>Journal of Bacteriology</u>

HONORS:

2006	Distinguished Lecturer, Centers for Disease Control and Prevention
2006	Invited Speaker, Arizona State University Chapter of Sigma Xi Annual Banquet
2006	Keynote Speaker, 2 nd ASM Conference on <i>Salmonella</i> : From Pathogenesis to Therapeutics
2005	Recipient of Grant Award from the Bill and Melinda Gates Foundation for the Grand Challenges in Global Health Initiative
2005	Keynote Speaker, Annual Meeting Arizona-Nevada Branch ASM
2005	Fellow, Arizona Arts, Science and Technology Academy
2003	Ellison Medical Foundation Global Infectious Disease Senior Scholar
2003	Sardinia Science Award, University of Sassari, Alghero, Italy
2003	Honorary Doctor of Science, Southern Illinois University, Edwardsville
2002	David J. Hentges Lecture on Infectious Disease, Texas Tech
2002	Robert P. Williams Memorial Lecturer, Baylor College of Medicine
2001	Member, National Academy of Sciences

2001 Fellow, The Academy of Science of St. Louis
 2001 Graduate Research Day Colloquium Lecture, Uniformed Services University of the Health Sciences
 2001 Chancellor's Distinguished Lecturer, Louisiana State University
 2000 Animal Health Microbiology Division Lecturer, American Society for Microbiology General Meeting
 2000 Education Division Lecturer, American Society for Microbiology General Meeting
 1997 Missouri Inventor of the Year, Bar Association of Metropolitan St. Louis
 1996 Elaine and Arthur Brown Distinguished Lecturer, University of Tennessee-Knoxville
 1994 Chairman, Gordon Research Conference on Microbial Toxins and Pathogenesis
 1994 A. L. Bortree Lecturer, Pennsylvania State University
 1993 Co-Chairman, Gordon Research Conference on Molecular Mechanisms of Microbial Adhesion
 1993 Edwin H. Beachey Memorial Lecturer, Univ. Tenn.-Memphis
 1992 Vice Chairman, Gordon Research Conference on Microbial Toxins and Pathogenesis
 1991 Recipient of \$500,000 Grant Award from Bristol-Myers Squibb to support infectious diseases research
 1990 Fellow, American Association for the Advancement of Science
 1990 Smiley Lecture, Department of Microbiology, University of Kansas
 1990 Distinguished Lecturer in Molecular Biology, Louisiana State University Medical Center
 1990 Stuart Mudd Memorial Lecture, Eastern Pennsylvania Branch of the American Society for Microbiology
 1988 MERIT Award, National Institute of Dental Research
 1988 Herman C. Lichstein Distinguished Lecturer, University of Cincinnati
 1986 Keynote Lecturer, Fiftieth Anniversary of Graduate Dental Education at The University of Rochester
 1984 Seymour J. Kreshover Award, National Institute of Dental Research
 1984-2005 George William and Irene Koechig Freiberg Professor of Biology, Washington University
 1983 Scholar-Leadership Enrichment Program Scholar, University of Oklahoma
 1982 M. F. Shaffer Alumni Lecturer, Tulane University
 1978-1983 Charles H. McCauley Professor of Microbiology, University of Alabama at Birmingham
 1975 Recipient, P. R. Edwards Award of the Southeastern Branch of the American Society for Microbiology
 1974 Fellow, American Academy of Microbiology
 1973 Honorary Member, Asociacion Chilena de Microbiologia
 1969-1970;
 1979-1980;
 1981-1982 Lecturer, American Foundation for Microbiology
 1962 Sigma Xi
 1960-1962 US Public Health Service Predoctoral Fellow, University of Chicago
 1958-1960 University Fellow, University of Chicago
 1955 Danforth Fellowship, Cornell University
 1952-1956 New York State Regents Scholarship, Cornell University
 1952-1956 Esso 4-H Scholarship, Cornell University

BIOGRAPHICAL RESUMES

American Men and Women of Science
 Who's Who in the World
 Who's Who in America
 Who's Who in Medicine and Health Care
 Who's Who in Frontier Science and Technology
 Who's Who in American Education
 Who's Who in the Midwest

PROFESSIONAL SOCIETY MEMBERSHIPS:

2005-Present Arizona Arts, Science and Technology Academy
 Member, Board of Governors 2006
 2001-Present The National Academy of Sciences
 1998-Present The Academy of Science of St. Louis, Fellow 2001
 1997-Present International Society for Vaccines
 1990-Present American Association of Avian Pathologists
 1988-Present Conference of Research Workers on Animal Diseases
 1988-Present International Society of Mucosal Immunology

ROY CURTISS
1970-Present

American Association for the Advancement of Science
Fellow 1990

1960-Present

Society for General Microbiology

1960-Present

American Society for Microbiology

Committee on Elections, American Academy of Microbiology, Alternate 2005-Present

Finance Committee, 2003-2004

Editor-in-Chief and Chairman, Board of Executive Editors, *Escherichia coli* and *Salmonella*: Cellular and Molecular Biology, 2000-2005

Member, Board of Executive Editors, *Escherichia coli* and *Salmonella*: Cellular and Molecular Biology 2000-Present

Counselor, Division of Animal Health Microbiology, 1999-2001

Organizing Committee for Division of Animal Health Microbiology, 1998-1999

Finance Committee, 1992-1994

Committee on Governance, 1991-1994

Division Councilor At Large to the Council Policy Committee and Council, 1991-1994; 2001-2004

Steering Committee for Undergraduate Faculty-Mentor Enhancement Program, 1989-1992

Representative to the American Type Culture Collection Board of Directors, 1989-1995

Committee on Genetics and Molecular Biology, PSAB, 1988-1993

Counselor, Division of Microbial Pathogenesis, 1989-1991

Alternate Counselor, Division of Microbial Pathogenesis, 1987-1989

Select Committee to Review Governance of ASM, 1981-1983

Headquarters Building Subcommittee, 1979-1980

Constitution and By Laws Committee, 1979

Investment Subcommittee, 1978-1981

Nominating Committee, 1978; 1993-1994; 2002-2003

Ad Hoc Committee on Public and Scientific Affairs, 1978-1979

Committee on Committees, 1977

Branch Counselor At Large to the Council Policy Committee and Council, 1977-1980

Counselor, Southeastern Branch, 1977

Latin American Visiting Professor Program Committee, 1973-1978

Chairman, Division of Genetics and Molecular Biology Nominating Committee, 1973

Membership Committee, 1971-1976

Parliamentarian, 1970-1975

President, Kentucky and Tennessee Branch, 1968-1969

Vice President, Kentucky and Tennessee Branch, 1967-1968

1970-1991

New York Academy of Sciences

1960-1991

Genetics Society of America

Nominating Committee, 1983

Committee on Preservation of Germplasm, 1983-1989; Chairman, 1987-1989

TEACHING:

Arizona State University, Tempe, AZ

MIC 191 Freshman Microbiology Seminar 2006

BIO 194 Freshman Microbiology Seminar 2006

MIC 495 Undergraduate Research 2006

Washington University, St. Louis, MO

Bio 3920 Global Impact of Biotechnology 2002, 2003, 2004

Bio 5011 Ethics and Research Science 2001

Bio 349 Microbiology 1995, 1996, 1997

Bio 349 Microbiology Laboratory 1996, 1997

Bio 445 Microbial Genetics 1984-1987

Bio 181 Freshman Biology Seminar 1983, 1985-1987, 1989-1993

Bio 500 Undergraduate Independent Research 1983-2005

University of Alabama at Birmingham

Molecular Cell Biology	1974-1978, 1979-1983
Medical Microbiology	1973-1978, 1979-1982
Dental Microbiology	1973-1978, 1979-1982
Microbial Genetics	1973
Graduate Seminar	1972, 1974, 1978

University of Tennessee Graduate School of Biomedical Sciences

Advanced Genetics 1967-1972

University of Tennessee at Knoxville

Virology 1965

CURRENT MAIN AREA OF RESEARCH:

Design, construction and evaluation of vaccines to elicit protective host immune responses in agriculturally important animals and humans, mechanisms of bacterial pathogenesis and host immune responses to infections and vaccines.

PUBLICATIONS:

1. Baker, R. C., and R. Curtiss III. 1957. Individual hen differences in eggshell mottling and the relationship of shell mottling to clutch size, internal quality and weight loss. *Poultry Sci.* **36**:904-908
2. Levine, M., and R. Curtiss III. 1958. A genetic test for side-chains in a phage chromosome. *Nature* **182**:126-127.
3. Baker, R.C., and R. Curtiss III. 1958. Strain difference in eggshell mottling, internal quality, shell thickness, specific gravity, and the interrelationships between these factors. *Poultry Sci.* **37**:1086-1090.
4. Levine, M., and R. Curtiss III. 1960. An effect of chloramphenicol on genetic recombination and selection in phage. *Virology* **10**:370-371.
5. Levine, M., and R. Curtiss III. 1961. Genetic fine structure of the *c* region and the linkage map of phage P22. *Genetics* **46**:1573-1580.
6. Curtiss, R. III. 1964. A stable partial diploid strain of *Escherichia coli*. *Genetics* **50**:679-694.
7. Curtiss, R. III. 1965. Chromosomal aberrations associated with mutations to bacteriophage resistance in *Escherichia coli*. *J. Bacteriol.* **89**:28-40.
8. Curtiss, R. III., L.J. Charamella, C.M. Berg, and P.E. Harris. 1965. Kinetic and genetic analyses of D-cycloserine inhibition and resistance in *Escherichia coli*. *J. Bacteriol.* **90**:1238-1250.
9. Berg, C.M. and R. Curtiss III. 1967. Transposition derivatives of an Hfr strain of *Escherichia coli* K-12. *Genetics* **56**:503-525.
10. Curtiss, R. III, and D.R. Stallions. 1967. Energy requirement for specific pair formation during conjugation in *Escherichia coli* K-12. *J. Bacteriol.* **94**:490-492.
11. Curtiss, R. III. 1968. Ultraviolet-induced genetic recombination in a partially diploid strain of *Escherichia coli*. *Genetics* **58**:9-54.
12. Cohen, A., W.D. Fisher, R. Curtiss III, and H.I. Adler. 1968. DNA isolated from *Escherichia coli* minicells mated with F⁺ cells. *Proc. Natl. Acad. Sci. USA* **61**:61-68.
13. Curtiss, R. III, L.J. Charamella D.R. Stallions, and J.A. Mays. 1968. Parental functions during conjugation in *Escherichia coli* K-12. *Bacteriol. Rev.* **32**:320-348.
14. Cohen, A., W.D. Fisher, R. Curtiss III, and H.I. Adler. 1968. The properties of DNA transferred to minicells during conjugation. *Cold Spring Harbor Symp. Quant. Biol.* **33**:635-641.

15. Curtiss, R. III, and J. Renshaw. 1969. F⁺ strains of *Escherichia coli* K-12 defective in Hfr formation. *Genetics* **63**:7-26.
16. Curtiss, R. III, and D.R. Stallions. 1969. Probability of F integration and frequency of stable Hfr donors in F⁺ populations of *Escherichia coli* K-12. *Genetics* **63**:27-38.
17. Curtiss, R. III, and J. Renshaw. 1969. Kinetics of F transfer and recombinant production in F⁺ X F⁻ matings in *Escherichia coli* K-12. *Genetics* **63**:39-52.
18. Curtiss, R. III. 1969. Bacterial conjugation. *Annu. Rev. Microbiol.* **23**:69-136.
19. Curtiss, R. III, L.G. Caro, D.P. Allison, and D.R. Stallions. 1969. Early stages of conjugation in *Escherichia coli* K-12. *J. Bacteriol.* **100**:1091-1104.
20. Jones, R.T., and R. Curtiss III. 1970. Genetic exchange between *Escherichia coli* strains in the mouse intestine. *J. Bacteriol.* **103**:71-80.
21. Roozen, K.J., R.G. Fenwick, Jr., and R. Curtiss III. 1971. Isolation of plasmids and specific chromosomal segments from *Escherichia coli* K-12, p. 249-264. In L. Ledoux (ed.), *Informative Molecules in Biological Systems*. North Holland, Amsterdam.
22. Stallions, D.R., and R. Curtiss III. 1971. Chromosome transfer and recombinant formation with deoxyribonucleic acid temperature-sensitive strains of *Escherichia coli*. *J. Bacteriol.* **105**:886-895.
23. Roozen, K.J., R.G. Fenwick, Jr., and R. Curtiss III. 1971. Synthesis of ribonucleic acid and protein in plasmid-containing minicells of *Escherichia coli* K-12. *J. Bacteriol.* **107**:21-33.
24. Stallions, D.R., and R. Curtiss III. 1972. Bacterial conjugation under anaerobic conditions. *J. Bacteriol.* **111**:294-295.
25. Sheehy, R.J., C. Orr, and R. Curtiss III. 1972. Molecular studies on entry exclusion in *Escherichia coli* minicells. *J. Bacteriol.* **112**:861-869.
26. Sheehy, R.J., D.P. Allison, and R. Curtiss III. 1973. Cryptic plasmids in a minicell-producing strain of *Salmonella typhimurium*. *J. Bacteriol.* **114**:439-442.
27. Sheehy, R.J., A. Perry, D.P. Allison, and R. Curtiss III. 1973. Molecular nature of R-factor DNA isolated from *Salmonella typhimurium* minicells. *J. Bacteriol.* **114**:1328-1335.
28. Frazer, A.C., and R. Curtiss III. 1973. Derepression of anthranilate synthase in purified minicells of *Escherichia coli* containing the Col-trp plasmid. *J. Bacteriol.* **114**:615-622.
29. Fenwick, R.G., Jr., and R. Curtiss III. 1973. Conjugal DNA replication by *Escherichia coli* K-12: stimulation in *dnaB*(TS) donors by minicells. *J. Bacteriol.* **116**:1212-1223.
30. Fenwick, R.G., Jr., and R. Curtiss III. 1973. Conjugal DNA replication by *Escherichia coli* K-12: effect of chloramphenicol and rifampin. *J. Bacteriol.* **116**:1124-1235.
31. Fenwick, R.G., Jr., and R. Curtiss III. 1973. Conjugal DNA replication by *Escherichia coli* K-12: effect of nalidixic acid. *J. Bacteriol.* **116**:1236-1246.
32. Curtiss, R. III, F.L. Macrina, and J.O. Falkinham III. 1974. *Escherichia coli* - An overview, p. 115-133. In R. C. King (ed.), *Handbook of Genetics*, Vol. I. Plenum Publishing Corp., NY.
33. Khachatourians, G.G., R.J. Sheehy, and R. Curtiss III. 1974. Fate of conjugally transferred DNA in minicells of *Escherichia coli* K-12. *Molec. Gen. Genet.* **128**:23-42.
34. Macrina, F.L., G.C. Weatherly, and R. Curtiss III. 1974. R6K plasmid replication: influence of chromosomal genotype in minicell-producing strains of *Escherichia coli* K-12. *J. Bacteriol.* **120**:1387-1400.

35. Frazer, A.C., and R. Curtiss III. 1975. Production, properties and utility of bacterial minicells. *Curr. Top. Microbiol. Immunol.* **69**:1-84.
36. Curtiss, R. III, and R.G. Fenwick, Jr. 1975. Mechanism of conjugal plasmid transfer, p. 156-165. *In* D. Schlessinger (ed.), *Microbiology - 1974*. American Society for Microbiology, Washington, D.C.
37. Curtiss, R. III. 1975. Research on bacterial conjugation with minicells and minicell-producing *E. coli* strains, p. 169-183. *In* S. Mitsuhashi and H. Hashimoto (eds.), *Microbial Drug Resistance*. University of Tokyo Press, Tokyo.
38. Curtiss, R. III, W. Szybalski, D.R. Helsinki, and S. Falkow. 1976. Workshop on design and testing of safer prokaryotic vehicles and bacterial hosts for research on recombinant DNA molecules. *ASM News* **42**:134-138.
39. Novick, R.P., R.C. Clowes, S.N. Cohen, R. Curtiss III, N. Datta, and S. Falkow. 1976. A proposed uniform nomenclature for bacterial plasmids. *Bacteriol. Rev.* **40**:168-189.
40. Falkinham, J.O. III, and R. Curtiss III. 1976. Isolation and characterization of conjugation-deficient mutants of *Escherichia coli* K-12. *J. Bacteriol.* **126**:1194-1206.
41. Curtiss, R. III. 1976. Genetic manipulation of microorganisms: potential benefits and biohazards. *Annu. Rev. Microbiol.* **30**:507-533.
42. Curtiss, R. III, D.A. Pereira, J.C. Hsu, S.C. Hull, J.E. Clark, L.J. Maturin, Sr., R. Goldschmidt, R. Moody, M. Inoue, and L. Alexander. 1976. Biological containment: the subordination of *Escherichia coli* K-12, p. 45-56. *In* R.F. Beers, Jr. and E.G. Bassett (eds.), *Recombinant Molecules: Impact on Science and Society*. Raven Press, New York.
43. Curtiss, R. III, R.G. Fenwick, Jr., R. Goldschmidt, and J.O. Falkinham, III. 1977. Mechanism of conjugation, p. 109-134. *In* S. Mitsuhashi (ed.), *R. Factor Drug Resistance Plasmid*. University of Tokyo Press, Tokyo.
44. Curtiss, R. III, J.E. Clark, R. Goldschmidt, J.C. Hsu, S.C. Hull, M. Inoue, L.J. Maturin, Sr., R. Moody, and D.A. Pereira. 1977. Biohazard assessment of recombinant DNA molecule research, p. 375-387. *In* S. Mitsuhashi, L. Rosival, and V. Krcmery (eds.), *Plasmids - Medical and Theoretical Aspects*. Avicenum, Czechoslovak Medical Press, Prague.
45. Maturin, L. Sr., and R. Curtiss III. 1977. Degradation of DNA by nucleases in intestinal tracts of rats. *Science* **196**:216-218.
46. Curtiss, R. III, M. Inoue, D. Pereira, J.C. Hsu, L. Alexander, and L. Rock. 1977. Construction and use of safer bacterial host strains for recombinant DNA research, p. 99-114. *In* W.A. Scott and R.A. Werner (eds.), *Molecular Cloning of Recombinant DNA*. Academic Press, Inc., New York.
47. Curtiss, R. III, and J. Clark-Curtiss. 1977. Effectiveness of physical and biological containment, p. 198-202. *In* *Research with Recombinant DNA*. National Academy of Sciences, Washington, D.C.
48. Curtiss, R. III. 1978. Biological containment and cloning vector transmissibility. *J. Infect. Dis.* **137**:668-675.
49. Hull, R.A., G.S. Gill, and R. Curtiss III. 1978. Genetic characterization of the Mu-like bacteriophage D108. *J. Virol.* **27**:513-518.
50. Curtiss, R. III. 1978. A scientist's perspective on regulation of recombinant DNA activities, pp. 242-250. *In* O.K. Sebek and A.I. Laskin (eds.), *Genetics of Industrial Microorganisms*. American Society for Microbiology, Washington D.C.
51. Curtiss, R. III. 1978. Comments on Callahan, p. 149-155. *In* John Richards (ed.), *Recombinant DNA: Science, Ethics, and Politics*. Academic Press, Inc., New York.
52. Robeson, J.P., R.M. Goldschmidt, and R. Curtiss III. 1980. Potential of *Escherichia coli* isolated from nature to propagate cloning vectors. *Nature* **283**:104-106.
53. Hirasawa, M., H. Kiyono, T. Shiota, R. Hull, R. Curtiss III, S.M. Michalek, and J. McGhee. 1980. Virulence of *Streptococcus mutans*: restoration of pathogenesis of a glucosyltransferase (GTF) defective mutant (C4). *Infect. Immun.* **287**:915-921.

54. Alexander, W.J., L.S. Alexander, and R. Curtiss III. 1980. Bactericidal activity of human serum against *Escherichia coli* χ 1776. *Infect. Immun.* **28**:837-841.
55. Alexander, W.J., C.G. Cobbs, and R. Curtiss III. 1980. Modification of bacterial serum susceptibility by rifampicin. *Infect. Immun.* **28**:923-926.
56. Curtiss, R. III. 1980. Recombinant DNA: technology, application, ethics. *Ala. J. Med. Sci.* **17**:191-196.
57. Gill, G.S., R.C. Hull, and R. Curtiss III. 1981. Mutator bacteriophage D108 and its DNA: an electron microscopic characterization. *J. Virol.* **37**:420-430.
58. Hansen, J.B., Y. Abiko, and R. Curtiss III. 1981. Characterization of the *Streptococcus mutans* plasmid pVA318 cloned into *Escherichia coli*. *Infect. Immun.* **31**:1034-1043.
59. Curtiss, R. III. 1981. Gene transfer, p. 243-265. *In* P. Gerhardt, R.G.E. Murray, R.N. Costilow, E.W. Nester, W.A. Wood, N.R. Krieg, and G.B. Phillips (eds.), *Manual of Methods for General Microbiology*. American Society for Microbiology, Washington D.C.
60. Maturin, L.J. Sr., and R. Curtiss III. 1981. Role of ribonucleic acid synthesis in conjugational transfer of chromosomal and plasmid deoxyribonucleic acids. *J. Bacteriol.* **146**:552-563.
61. Murchison, H., S. Larrimore, and R. Curtiss III. 1981. Isolation and characterization of *Streptococcus mutans* mutants defective in adherence and aggregation. *Infect. Immun.* **34**:1044-1055.
62. Jagusztyn-Krynicka, E.K., M. Smorawska, and R. Curtiss III. 1982. Expression of *Streptococcus mutans* aspartate semialdehyde dehydrogenase gene cloned into plasmid pBR322. *J. Gen. Microbiol.* **128**:1135-1145.
63. Curtiss, R. III, J.P. Robeson, R. Barletta, Y. Abiko, and M. Smorawska. 1982. Synthesis and function of *Streptococcus mutans* cell-surface proteins in *Escherichia coli*, p. 253-257. *In* D. Schlessinger (ed.), *Microbiology-1982*. American Society for Microbiology, Washington D.C.
64. Curtiss, R. III, E.K. Jagusztyn-Krynicka, J.B. Hansen, M. Smorawska, Y. Abiko, and G. Cardineau. 1982. Expression of *Streptococcus mutans* plasmid and chromosomal genes in *Escherichia coli* K-12, Vol. 3, p. 15-27. *In* S. Mitsuhashi (ed.), *Microbial Drug Resistance*. University Park Press, Baltimore.
65. Shaw, D.R., A.T. Maurelli, J.D. Goguen, S.C. Straley, and R. Curtiss III. 1982. Use of UV-irradiated bacteriophage T6 to kill extracellular bacteria in tissue culture infectivity assays. *J. Immunol. Methods* **56**:75-83.
66. Holt, R.G., Y. Abiko, S. Saito, M. Smorawska, J.B. Hansen, and R. Curtiss III. 1982. *Streptococcus mutans* genes that code for extra-cellular proteins in *Escherichia coli* K-12. *Infect. Immun.* **38**:147-156.
67. Murchison, H., S. Larrimore, S. Hull, and R. Curtiss III. 1982. Isolation and characterization of *Streptococcus mutans* mutants with altered cellular morphology or chain length. *Infect. Immun.* **38**:282-291.
68. Curtiss, R. III, R.G. Holt, R.G. Barletta, J.P. Robeson, and S. Saito. 1983. *Escherichia coli* strains producing *Streptococcus mutans* proteins responsible for colonization and virulence. *In* J.R. McGhee and J. Mestecky (eds.), *The Secretory Immune System*. Ann. N.Y. Acad. Sci. **409**:688-696.
69. Clark-Curtiss, J.E., and R. Curtiss III. 1983. Analysis of recombinant DNA using *Escherichia coli* minicells. *Meth. Enzymol.* **101**:347-362.
70. Robeson, J.P., R.G. Barletta, and R. Curtiss III. 1983. Expression of a *Streptococcus mutans* glucosyltransferase gene in *Escherichia coli*. *J. Bacteriol.* **153**:211-221.
71. Smorawska, M., J.C. Hsu, J.B. Hansen, E.K. Jagusztyn-Krynicka, Y. Abiko, and R. Curtiss III. 1983. Clustered genes for galactose metabolism from *Streptococcus mutans* cloned in *Escherichia coli* K-12. *J. Bacteriol.* **153**:1095-1097.

72. Curtiss, R. III, S.A. Larrimore, R.G. Holt, J.F. Barrett, R. Barletta, H.H. Murchison, S.M. Michalek, and S. Saito. 1983. Analysis of *Streptococcus mutans* virulence attributes using recombinant DNA and immunological techniques, p. 95-104. In R.J. Doyle and J.E. Ciardi (eds.), *Glucosyltransferases, Glucans, Sucrose and Dental Caries*. Sp. Supp. Chemical Senses.
73. Curtiss, R. III. 1983. Technology of recombinant DNA techniques. *Ala. J. Med. Sci.* **20**:60-63.
74. Curtiss, R. III. 1983. The creation of the cystic fibrosis research center - from research lab to the clinic. *Ala. J. Med. Sci.* **20**:219-222.
75. Larrimore, S., H. Murchison, T. Shiota, S. Michalek, and R. Curtiss III. 1983. *In vitro* and *in vivo* complementation of *Streptococcus mutans* mutants defective in adherence. *Infect. Immun.* **42**:558-566.
76. Jacobs, W.R., J.E. Clark-Curtiss, L.R. Ritchie, and R. Curtiss III. 1983. Construction and partial characterization of *Mycobacterium leprae* genomic libraries using an *in vivo* cosmid cloning system. *Int. J. Lepr.* **51**:667-668.
77. Maurelli, A.T., B. Blackmon, and R. Curtiss III. 1984. Temperature-dependent expression of virulence genes in *Shigella* species. *Infect. Immun.* **43**:195-201.
78. Maurelli, A.T., B. Blackmon, and R. Curtiss III. 1984. Loss of pigmentation in *Shigella flexneri* 2a is correlated with loss of virulence and virulence-associated plasmid. *Infect. Immun.* **43**:397-401.
79. Maurelli, A.T., and R. Curtiss III. 1984. Bacteriophage Mud(Ap^rlac) generates *vir-lac* operon fusions in *Shigella flexneri* 2a. *Infect. Immun.* **45**:642-648.
80. Michalek, S.M., R.L. Gregory, M. Scholler-Guinard, S. Kimura, J. Mestecky, R. Curtiss III, and J.R. McGhee. 1984. Immunity to dental caries: induction of protective salivary IgA antibodies to *Streptococcus mutans*, p. 99-105. In J.-P. Revillard, C. Voisin, and N. Wierzbicki (eds.), *Mucosal Immunity IgA and Polymorphonuclear Neutrophils*. Fondation Franco-Allemande, Suresnes, France.
81. Curtiss, R. III, H.H. Murchison, W.E. Nesbitt, J.F. Barrett, and S.M. Michalek. 1985. Use of mutants and gene cloning to identify and characterize colonization mechanisms of *Streptococcus mutans*, p. 187-193. In S. Mergenhagen and B. Rosan (eds.), *Molecular Basis for Oral Microbial Adhesion*. American Society for Microbiology, Washington, D.C.
82. Murchison, H., S. Larrimore, and R. Curtiss III. 1985. *In vitro* inhibition of adherence of *Streptococcus mutans* strains by nonadherent mutants of *S. mutans* 6715. *Infect. Immun.* **50**:826-832.
83. Curtiss, R. III. 1985. Genetic analysis of *Streptococcus mutans* virulence. *Curr. Top. Microbiol. Immun.* **118**:253-277.
84. Clark-Curtiss, J.E., W.R. Jacobs, M.A. Docherty, L.R. Ritchie, and R. Curtiss III. 1985. Molecular analysis of DNA and construction of genomic libraries of *Mycobacterium leprae*. *J. Bacteriol.* **161**:1093-1102.
85. Takada, K., T. Shiota, R. Curtiss III, and S.M. Michalek. 1985. Inhibition of plaque and caries formation by a glucan produced by *Streptococcus mutans* mutant UAB108. *Infect. Immun.* **50**:833-843.
86. Jacobs, W.R., J.F. Barrett, J.E. Clark-Curtiss, and R. Curtiss III. 1986. *In vivo* repackaging of recombinant cosmid molecules for analyses of *Salmonella typhimurium*, *Streptococcus mutans* and mycobacterial genomic libraries. *Infect. Immun.* **52**:101-109.
87. Jacobs, W.R., M.A. Docherty, R. Curtiss III, and J.E. Clark-Curtiss. 1986. Expression of *Mycobacterium leprae* genes from a *Streptococcus mutans* promoter in *Escherichia coli* K-12. *Proc. Natl. Acad. Sci. USA* **83**:1926-1930.
88. Curtiss, R. III, R. Goldschmidt, R. Pastian, M. Lyons, S.M. Michalek, and J. Mestecky. 1986. Cloning virulence determinants from *Streptococcus mutans* and the use of recombinant clones to construct bivalent oral vaccine strains to confer protective immunity against *S. mutans*-induced dental caries, p. 173-180. In S. Hamada, S.M. Michalek, H. Kiyono, L. Menaker, and J.R. McGhee (eds.), *Molecular Microbiology and Immunobiology of Streptococcus mutans*. Elsevier Science Publishing, Inc., NY.

89. Barrett, J.F., T.A. Barrett, and R. Curtiss III. 1986. Biochemistry and genetics of dextranase from *Streptococcus mutans* 6715, p. 205-215. In S. Hamada, S.M. Michalek, H. Kiyono, L. Menaker, and J.R. McGhee (eds.), *Molecular Microbiology and Immunobiology of Streptococcus mutans*. Elsevier Science Publishing, Inc., NY.
90. Michalek, S.M., I. Morisaki, S. Kimura, S. Hamada, R. Curtiss III, and J.R. McGhee. 1986. Effective immunity to *Streptococcus mutans*-induced dental caries, p. 269-278. In S. Hamada, S.M. Michalek, H. Kiyono, L. Menaker, and J.R. McGhee (eds.), *Molecular Microbiology and Immunobiology of Streptococcus mutans*. Elsevier Science Publishing, Inc., NY.
91. Curtiss, R. III. 1986. Genetic analysis of *Streptococcus mutans* virulence and prospects for an anticaries vaccine. *J. Dent. Res.* **65**:1034-1045.
92. Murchison, H.H., J.F. Barrett, G.A. Cardineau, and R. Curtiss III. 1986. Transformation of *Streptococcus mutans* with chromosomal and shuttle plasmid (pYA629) DNAs. *Infect. Immun.* **54**:273-282.
93. Barrett, J.F., and R. Curtiss III. 1986. Renaturation of dextranase activity from culture supernatant fluids of *Streptococcus sobrinus* after sodium dodecyl sulfate polyacrylamide gel electrophoresis. *Anal. Biochem.* **158**:365-370.
94. Barrett, J.F., T.A. Barrett, and R. Curtiss III. 1987. Purification and partial characterization of the multicomponent dextranase complex of *Streptococcus sobrinus* and cloning of the dextranase gene. *Infect. Immun.* **55**:792-802.
95. Switalski, L.M., H. Murchison, R. Timpl, R. Curtiss III, and M. Hook. 1987. Binding of laminin to oral and endocarditis strains of viridans streptococci. *J. Bacteriol.* **169**:1095-1101.
96. Cardineau, G.A., and R. Curtiss III. 1987. Nucleotide sequence of the *asd* gene of *Streptococcus mutans*: identification of the promoter region and evidence for attenuator like sequences preceding the structural gene. *J. Biol. Chem.* **262**:3344-3353.
97. Ferretti, J.J., and R. Curtiss III. 1987. *Streptococcal Genetics*. American Society for Microbiology, Washington D.C.
98. Curtiss, R. III, R. Goldschmidt, J. Barrett, M. Thoren-Gordon, D.J. Salzberg, H.H. Murchison, and S.M. Michalek. 1987. Genetic analysis of surface proteins essential for virulence of *Streptococcus sobrinus*, p. 212-216. In J.J. Ferretti and R. Curtiss III (eds.), *Streptococcal Genetics*. American Society for Microbiology, Washington D.C.
99. Curtiss, R. III, R. Goldschmidt, S. Kelly, M. Lyons, S.M. Michalek, R. Pastian, and S. Stein. 1987. Recombinant avirulent *Salmonella* for oral immunization to induce mucosal immunity to bacterial pathogens, p. 261-271. In H. Kohler and P.T. LoVerde (eds.), *Vaccines: New Concepts and Developments - Proceedings of the Tenth International Convocation on Immunology*. Longman Scientific and Technical, Harlow, Essex, Great Britain.
100. Gulig, P.A., and R. Curtiss III. 1987. Plasmid-associated virulence of *Salmonella typhimurium*. *Infect. Immun.* **55**:2891-2901.
101. Curtiss, R. III, and S.M. Kelly. 1987. *Salmonella typhimurium* deletion mutants lacking adenylate cyclase and cyclic AMP receptor protein are avirulent and immunogenic. *Infect. Immun.* **55**:3035-3043.
102. Curtiss, R. III, C. Pearce, J. Pollack, and H.M. Murchison. 1987. Isolation and characterization of mutants of *Streptococcus mutans* using selective removal of wild-type cells by agglutination with an agglutinin from *Persea americana*. *Acta Microbiol. Polonica* **36**:3-15.
103. Katz, J., S.M. Michalek, R. Curtiss III, C. Harmon, G. Richardson, and J. Mestecky. 1987. Novel oral vaccines: The effectiveness of cloned gene products on inducing secretory immune responses, p. 1741-1747. In J. Mestecky, J.R. McGhee, J. Bienenstock, and P.L. Orga (eds.), *Recent Advances in Mucosal Immunology, Part B*.
104. Michalek, S.M., N.K. Childers, J. Katz, and R. Curtiss III. 1987. Oral vaccines and the secretory immune system. *Clin. Immunol. News.* **8**:158-159.
105. Barletta, R.G., S.M. Michalek, and R. Curtiss III. 1988. Analysis of the virulence of *Streptococcus mutans* serotype *c gtfA* mutants in the rat model system. *Infect. Immun.* **56**:322-330.

106. Curtiss, R. III, S.M. Kelly, P.A. Gulig, C.R. Gentry-Weeks, and J.E. Galan. 1988. Avirulent *Salmonella* expressing virulence antigens from other pathogens for use as orally-administered vaccines, p. 311-328. In J.A. Roth (ed.), *Virulence Mechanisms of Bacterial Pathogens*. American Society for Microbiology, Washington, DC.
107. Curtiss, R. III, R.M. Goldschmidt, N.B. Fletchall, and S.M. Kelly. 1988. Avirulent *Salmonella typhimurium* Δ *cya* Δ *crp* oral vaccine strains expressing a streptococcal colonization and virulence antigen. *Vaccine* **6**:155-160.
108. Nakayama, K., S.M. Kelly, and R. Curtiss III. 1988. Construction of an Asd⁺ expression-cloning vector: Stable maintenance and high level expression of cloned genes in a *Salmonella* vaccine strain. *Bio/Tech.* **6**:693-697.
109. Gentry-Weeks, C.R., B.T. Cookson, W.E. Goldman, R.B. Rimler, S. Porter, and R. Curtiss III. 1988. Dermonecrotic toxin and tracheal cytotoxin - putative virulence factors of *Bordetella avium*. *Infect. Immun.* **56**:1698-1707.
110. Curtiss, R. III. 1988. Engineering organisms for safety: What is necessary?, p. 7-20. In M. Sussman, C.H. Collins, F.A. Skinner, and D.E. Stewart-Tull (eds.), *The Release of Genetically-Engineered Micro-Organisms*. Academic Press, London.
111. Curtiss, R. III, A.T. Maurelli, and P.A. Gulig. 1988. Genetic analysis of pathogenesis of enteric bacteria, p. 69-84. In P. Owen and T.J. Foster (eds.), *Immunochemical and Molecular Genetic Analysis of Bacterial Pathogens*. Elsevier Science Publishing, Inc., NY.
112. Gulig, P.A., and R. Curtiss III. 1988. Cloning and transposon insertion mutagenesis of virulence genes of the 100-kilobase plasmid of *Salmonella typhimurium*. *Infect. Immun.* **56**:3262-3271.
113. Curtiss, R. III. 1988. Use of genetically-engineered microorganisms and viruses as vaccines, p. 72-88. In P. DeForest, M.S. Frankel, J. Poindexter, and V. Weil (eds.), *Biotechnology: Professional Issues & Social Concerns*. American Association for the Advancement of Science, Washington, D. C.
114. James, L.C., T.A. Hughes, and R. Curtiss III. 1988. Nucleotide sequence of the *gtfA* gene from *S. mutans* GS-5. *Nucleic Acids Res.* **16**:10398.
115. Galan, J. E., J.F. Timoney, and R. Curtiss III. 1989. Expression and localization of the *Streptococcus equi* M protein in *Escherichia coli* and *Salmonella typhimurium*, p. 34-40. In D.G. Powell (ed.), *Equine Infectious Diseases V, Proceedings of the Fifth International Congress*. The University Press of Kentucky, Lexington, KY.
116. Barletta, R.G., and R. Curtiss III. 1989. Impairment of melibiose utilization in *Streptococcus mutans* serotype c *gtfA* mutants. *Infect. Immun.* **57**:992-995.
117. Curtiss, R. III, S.M. Kelly, P.A. Gulig, and K. Nakayama. 1989. Selective delivery of antigens by recombinant bacteria. *Curr. Top. Microbiol. Immun.* **146**:35-49.
118. Michalek, S.M., N.K. Childers, J. Katz, F.R. Denys, A.K. Berry, J.H. Eldridge, J.R. McGhee, and R. Curtiss III. 1989. Liposomes as oral adjuvants. *Curr. Top. Microbiol. Immun.* **146**:51-58.
119. Curtiss, R. III, K. Nakayama, and S.M. Kelly. 1989. Recombinant avirulent *Salmonella* vaccine strains with stable maintenance and high level expression of cloned genes *in vivo*. *Immunol. Invest.* **18**:583-596.
120. Galan, J.E., and R. Curtiss III. 1989. Cloning and molecular characterization of genes whose products allow *Salmonella typhimurium* to penetrate tissue culture cells. *Proc. Natl. Acad. Sci. USA* **86**:6383-6387.
121. Galan, J.E., and R. Curtiss III. 1989. Virulence and vaccine potential of *phoP* mutants of *Salmonella typhimurium*. *Microb. Pathog.* **6**:433-443.
122. Curtiss, R. III, S.M. Kelly, P.A. Gulig, and K. Nakayama. 1989. Stable recombinant avirulent *Salmonella* vaccine strains. *Adv. Exp. Med. Biol.* **251**:33-47.
123. Poppe, C., R. Curtiss III, P.A. Gulig, and C.L. Gyles. 1989. Hybridization studies with a DNA probe derived from the virulence region of the 60 Mdal plasmid of *Salmonella typhimurium*. *Can. J. Vet. Res.* **53**:378-384.

124. Curtiss, R. III. 1989. Computerization of data bases for genetic stock collections. *Genome* **31**:1102-1103.
125. Lockman, H.A., and R. Curtiss III. 1990. *Salmonella typhimurium* mutants lacking flagella or motility remain virulent in BALB/c mice. *Infect. Immun.* **58**:137-143.
126. Hudson, M.C., and R. Curtiss III. 1990. Regulation of expression of *Streptococcus mutans* genes important to virulence. *Infect. Immun.* **58**:464-470.
127. Galan, J.E., and R. Curtiss III. 1990. Expression of *Salmonella typhimurium* genes required for invasion is regulated by changes in DNA supercoiling. *Infect. Immun.* **58**:1879-1885.
128. Goldschmidt, R.M., and R. Curtiss III. 1990. Cross-reactivity between the immunodominant determinant of the antigen I component of *Streptococcus sobrinus* SpaA protein and surface antigens from other members of the *Streptococcus mutans* group. *Infect. Immun.* **58**:2276-2282.
129. Goldschmidt, R.M., M. Thoren-Gordon, and R. Curtiss III. 1990. Regions of the *Streptococcus sobrinus spaA* gene encoding major determinants of antigen I. *J. Bacteriol.* **172**:3988-4001.
130. Tinge, S.A., and R. Curtiss III. 1990. Isolation of the replication and partitioning regions of the *Salmonella typhimurium* virulence plasmid and stabilization of heterologous replicons. *J. Bacteriol.* **172**:5266-5277.
131. Tinge, S.A., and R. Curtiss III. 1990. Conservation of *Salmonella typhimurium* virulence plasmid maintenance regions among *Salmonella* serovars as a basis for plasmid curing. *Infect. Immun.* **58**:3084-3092.
132. Galan, J.E., K. Nakayama, and R. Curtiss III. 1990. Cloning and characterization of the *asd* gene of *Salmonella typhimurium*: use in stable maintenance of recombinant plasmids in *Salmonella* vaccine strains. *Gene* **94**:29-35.
133. Lockman, H.A., and R. Curtiss III. 1990. Occurrence of secondary attenuating mutations in avirulent *Salmonella typhimurium* vaccine strains. *J. Infect. Dis.* **162**:1397-1400.
134. Curtiss, R. III. 1990. Attenuated *Salmonella* strains as live vectors for the expression of foreign antigens, pp. 161-188. In G.C. Woodrow and M.M. Levine (eds.), *New Generation Vaccines*. Marcel Dekker, Inc., New York.
135. Curtiss, R. III, and S.M. Michalek. 1990. Vaccines against dental caries due to *Streptococcus mutans*, p. 715-740. In G.C. Woodrow and M.M. Levine (eds.), *New Generation Vaccines*. Marcel Dekker, Inc., New York.
136. Curtiss, R. III. 1990. Antigen delivery systems for analyzing host immune responses and for vaccine development. *Trends Biotechnol.* **8**:237-240.
137. Curtiss, R. III, S.B. Porter, M. Munson, S.A. Tinge, J.O. Hassan, C. Gentry-Weeks, and S.M. Kelly. 1991. Nonrecombinant and recombinant avirulent *Salmonella* live vaccines for poultry, p. 169-198. In L.C. Blankenship, J.S. Bailey, N.A. Cox, N.J. Stern, and R.J. Meinersmann (eds.), *Colonization Control of Human Bacterial Enteropathogens in Poultry*. Academic Press, NY.
138. Curtiss, R. III, J.E. Galan, K. Nakayama, and S.M. Kelly. 1990. Stabilization of recombinant avirulent vaccine strains *in vivo*. *Res. Microbiol.* **141**:797-805.
139. Hassan, J.O., and R. Curtiss III. 1990. Control of colonization by virulent *Salmonella typhimurium* by oral immunization of chickens with avirulent $\Delta cya \Delta crp$ *S. typhimurium*. *Res. Microbiol.* **141**:839-850.
140. Parker, C., N.C. Molina, S.M. Kelly, R. Curtiss III, and J. Yu. 1990. Live oral attenuated *Salmonella typhimurium* vaccine vectors which induce formation of antibody to *Bordetella pertussis*, p. 189-195. In C.R. Manclark (ed.), *Proceedings of the Sixth International Symposium on Pertussis*, Department of Health and Human Service, Bethesda, MD. DHHS Publication No. (FDA) 90-1164.

141. Hudson, M.C., and R. Curtiss III. 1991. Use of operon fusions to study gene expression in *Streptococcus mutans*. p. 261-266. In G.M. Dunny, P.P. Cleary, and L. McKay (eds.), *Genetics and Molecular Biology of Streptococci, Lactococci and Enterococci*. American Society for Microbiology, Washington, D.C.
142. Gentry-Weeks, C.R., D. L. Provence, J. M. Keith, and R. Curtiss III. 1991. Isolation and characterization of *Bordetella avium* phase variants. *Infect. Immun.* **59**:4026-4033.
143. Galan, J.E., and R. Curtiss III. 1991. Distribution of the *InvA*, *-B*, *-C*, and *-D* genes of *Salmonella typhimurium* among other *Salmonella* serovars: *invA* mutants of *Salmonella typhi* are deficient for entry into mammalian cells. *Infect. Immun.* **59**:2901-2908.
144. Curtiss, R. III, and J. Galan. 1991. Colonization of the murine gastrointestinal tract by *Salmonella typhimurium*, p. 197-206. In T. Wädström, P.H. Mäkelä, A-M. Svennerholm, and H. Wolf-Watz (eds.), *Molecular Pathogenesis of Gastrointestinal Infections*. Plenum Publishing Corporation, London, England.
145. Singh, V., and R. Curtiss III. 1991. Hormonotoxins: abrogation of ribosome inactivating property of gelonin in the disulfide linked ovine luteinizing hormone-gelonin conjugates. *Biochem. Int.* **25**:531-536.
146. Lockman, H.A., and R. Curtiss III. 1992. Virulence of non-type 1-fimbriated and nonfimbriated nonflagellated *Salmonella typhimurium* mutants in murine typhoid fever. *Infect. Immun.* **60**:491-496.
147. Tacket, C.O., D. Hone, R. Curtiss III, S. Kelly, G. Losonsky, L. Guers, A.M. Harris, R. Edelman, and M. Levine, 1992. Comparison of the safety and immunogenicity of $\Delta aroC \Delta aroD$ and $\Delta cya \Delta crp$ *Salmonella typhi* strains in adult volunteers. *Infect. Immun.* **60**:536-541.
148. Toth, T.E., R. Curtiss III, H. Veit, R.H. Pyle, and P.B. Siegel. 1992. Reaction of the avian respiratory system to intratracheally administered avirulent *Salmonella typhimurium*. *Avian Dis.* **36**:24-29.
149. Honeyman, A.L., and R. Curtiss III. 1992. Isolation, characterization, and nucleotide sequence of the *Streptococcus mutans* mannitol-phosphate dehydrogenase gene and the mannitol-specific factor III gene of the phosphoenolpyruvate phosphotransferase system. *Infect. Immun.* **60**:3369-3375.
150. Lottenberg, R, C.C. Broder, M.D.P. Boyle, S.J. Kain, B.L. Schroeder, and R. Curtiss III. 1992. Cloning, sequence analysis, and expression in *Escherichia coli* of a streptococcal plasmin receptor. *J. Bacteriol.* **174**: 5204-5210.
151. Rahn, K., S.A. DeGrandis, R.C. Clarke, S.A. McEwen, J.E. Galan, C. Ginocchio, R. Curtiss III, and C.L. Gyles. 1992. Amplification of an *invA* gene sequence of *Salmonella typhimurium* by polymerase chain reaction as a specific method of detection of *Salmonella*. *Mol. Cell. Probes* **6**:271-279.
152. Lockman, H.A., and R. Curtiss III. 1992. Isolation and characterization of conditional adherent and non-type 1 fimbriated *Salmonella typhimurium* mutants. *Mol. Microbiol.* **6**:933-945.
153. Spatafora-Harris, G., S.M. Michalek, and R. Curtiss III. 1992. Cloning of a locus involved in *Streptococcus mutans* intracellular polysaccharide accumulation and virulence-testing of an intracellular polysaccharide-deficient mutant. *Infect. Immun.* **60**:3175-3185.
154. Kelly, S.M., B.A. Bosecker, and R. Curtiss III. 1992. Characterization and protective properties of attenuated mutants of *Salmonella choleraesuis*. *Infect. Immun.* **60**:4881-4890.
155. Gentry-Weeks, C.R., A-L Hultsch, S.M. Kelly, J.M. Keith, and R. Curtiss III. 1992. Cloning and sequencing of a 21 kDa outer membrane protein gene from *Bordetella avium*: expression in *Salmonella typhimurium*. *J. Bacteriol.* **174**:7729-7742.
156. Jagusztyn-Krynicka, E.K., J.B. Hansen, V.L. Crow, T.D. Thomas, A.L. Honeyman, and R. Curtiss III. 1992. *Streptococcus mutans* serotype c tagatose 6-phosphate pathway gene cluster. *J. Bacteriol.* **174**:6152-6158.
157. Doggett, T., and R. Curtiss III. 1992. Delivery of antigens by recombinant avirulent *Salmonella* strains, p. 165-173, In J. E. Ciardi, J. R. McGhee, and Jerry M. Keith (eds.), *Genetically engineered vaccines*. Plenum Press, N.Y.

158. Provence, D.L., and R. Curtiss III. 1992. Role of *crl* in avian pathogenic *Escherichia coli*: a knock-out mutation of *crl* does not affect hemagglutination activity, fibronectin binding, or curli production. *Infect. Immun.* **60**:4460-4467.
159. Curtiss, R. III, and S.A. Tinge. 1993. Recombinant avirulent *Salmonella* vaccines and prospects for an antifertility vaccine, p. 459-476, *In* P.D. Griffin & P.M. Johnson (eds.), Proceedings of the Symposium on Local Immunity in Reproduction Tract Tissues, New Delhi, India, Nov. 1990. Oxford University Press.
160. Hassan, O., S. Porter, and R. Curtiss III. 1993. Effect of infective dose on humoral immune responses and colonization in chickens experimentally infected with *Salmonella typhimurium*. *Avian Dis.* **37**:19-26.
161. Jagusztyn-Krynicka, E.K., J.E. Clark-Curtiss, and R. Curtiss III. 1993. *Escherichia coli* heat-labile toxin subunit B fusions with *Streptococcus sobrinus* antigens expressed by *Salmonella typhimurium* oral vaccine strain: importance of the linker for antigenicity and biological activities of the hybrid proteins. *Infect. Immun.* **61**:1004-1015.
162. Doggett, T., E.K. Jagusztyn-Krynicka, and R. Curtiss III. 1993. Immune responses to *Streptococcus sobrinus* surface protein antigen A expressed by recombinant *Salmonella typhimurium*. *Infect. Immun.* **61**:1859-1866.
163. Porter, S.B., S.A. Tinge, and R. Curtiss III. 1993. Virulence of *Salmonella typhimurium* mutants for white leghorn chicks. *Avian Dis.* **37**:265-273.
164. Curtiss, R. III, S.M. Kelly, and J.O. Hassan. 1993. Live oral avirulent *Salmonella* vaccines. *Vet. Microbiol.* **37**:397-405.
165. Provence, D.L., and R. Curtiss III. 1993. Gene transfer in gram negative bacteria, p 317-347, *In* P. Gerhardt, (ed.), Methods for General and Molecular Bacteriology. American Society for Microbiology, Washington D.C.
166. Curtiss, R. III, D.L. MacLeod, H.A. Lockman, J.E. Galan, S.M. Kelly, and G.G. Mahairas. 1993. Colonization and invasion of the intestinal tract by *Salmonella*, p. 191-198, *In* F. Cabello (ed.), Biology of *Salmonella*. Plenum Press, N.Y.
167. Singh, V., and R. Curtiss III. 1993. Disulfide linked α LH-gelolin conjugate failed to recombine with β LH subunit to generate bioeffective hormonotoxin. *Molec. Cell. Biochem.* **120**:95-102.
168. Levine, M.M., D.M. Hone, C.O. Tacket, M. Sztein, G. Losonsky, J.P. Nataro, C. Gonzalez, G. Dougan, S. Chatfield, S. Cryz, R. Curtiss III and S. Kelley (sic). 1993. Attenuated *Salmonella typhi* as live oral vaccines to prevent typhoid fever and as carrier vaccines to express foreign antigens, p. 191-198, *In* F. Cabello (ed.), Biology of *Salmonella*. Plenum Press, N.Y.
169. Honeyman, A.L., and R. Curtiss III. 1993. Isolation, characterization, and nucleotide sequence of the *Streptococcus mutans* lactose-specific enzyme II (*lacE*) gene of the PTS and the phospho-beta-galactosidase (*lacG*) gene. *J. Gen. Microbiol.* **139**:2685-2694.
170. Michalek, S.M., J.H. Eldridge, R. Curtiss III, and K.L. Rosenthal. 1994. Antigen delivery systems: new approaches to mucosal immunization, p. 373-390, *In* P.L. Ogra, J. Mestecky, M. Lamm, W. Strober, J. McGhee, and J. Bienenstock (eds.), Handbook of Mucosal Immunology. Academic Press, San Diego, CA.
171. Wanda, S.-Y., and R. Curtiss III. 1994. Purification and characterization of *Streptococcus sobrinus* dextranase produced in recombinant *Escherichia coli* and sequence analysis of the dextranase gene. *J. Bacteriol.* **176**:3839-3850.
172. Singh, V., and R. Curtiss III. 1994. Effect of amino group modification of ovine luteinizing hormone (oLH) by M-succinimidyl 6-[3-(2-pyridyldithio)propionate]hexanoate, a long chain M-succinimidyl-3-(2-pyridyldithio) propionate (SPDP) on immunological and biological properties: a comparative study with SPDP modified oLH. *Molec. Cell. Biochem.* **130**:83-90.
173. Singh, V., and R. Curtiss III. 1994. Hormonotoxins: The role of positive charge of lysine residue on the immunological, biological and cytotoxic properties of ovine lutropin-S-S-gelolin conjugates. *Molec. Cell. Biochem.* **130**:91-101.
174. Curtiss, R. III, J.O. Hassan, J. Herr, S.M. Kelly, M. Levine, G.G. Mahairas, D. Milich, D. Peterson, F. Schodel, J. Srinivasan, C. Tacket, S.A. Tinge, and R. Wright. 1994. Nonrecombinant and recombinant avirulent *Salmonella* vaccines, p. 340-351, *In* G.P. Talwar, K.V.S. Rao, and V.S. Chauhan (eds.), Recombinant and Synthetic Vaccines. Narosa Publishing House, New Delhi, India.

175. Hassan, J.O., and R. Curtiss III. 1994. Virulent *Salmonella typhimurium* induced lymphocyte depletion and immunosuppression in chickens. *Infect. Immun.* **62**:2027-2036.
176. Provence, D.L., and R. Curtiss III. 1994. Isolation and characterization of a gene involved in hemagglutination by an avian pathogenic *Escherichia coli* strain. *Infect. Immun.* **62**:1369-1380.
177. Hassan, J.O., and R. Curtiss III. 1994. Development and evaluation of an experimental vaccination program using live avirulent *Salmonella typhimurium* to protect immunized chickens against challenge with homologous and heterologous *Salmonella* serotypes. *Infect. Immun.* **62**:5519-5527.
178. Curtiss, R. III, S.M. Kelly, S.A. Tinge, C.O. Tacket, M. Levine, J. Srinivasan, and M. Koopman. 1994. Recombinant *Salmonella* vectors in vaccine development, p. 23-33, Vol. 82, *In F. Brown (ed.), Recombinant Vectors in Vaccine Development.* Dev. Biol. Stand. Basel, Switzerland.
179. Schodel, F., S.M. Kelly, D. Peterson, D. Milich, J. Hughes, S. Tinge, R. Wirtz, and R. Curtiss III. 1994. Development of recombinant *Salmonellae* expressing hybrid hepatitis B virus core particles as candidate oral vaccines, p. 151-158, Vol. 82, *In F. Brown (ed.), Recombinant Vectors in Vaccine Development.* Dev. Biol. Stand. Basel, Switzerland.
180. Schodel, F., S.M. Kelly, D.L. Peterson, D.R. Milich, and R. Curtiss III. 1994. Hybrid hepatitis B virus core/pre-S proteins synthesized in avirulent *Salmonella typhimurium* and *Salmonella typhi* for oral vaccination. *Infect. Immun.* **62**:1669-1676.
181. Wanda, S.-Y., A. Camilli, H.M. Murchison, and R. Curtiss III. 1994. Overproduction of a dextranase inhibitor by *Streptococcus sobrinus* mutants. *J. Bacteriol.* **176**:7206-7212.
182. Sun, J.-W., S.-Y. Wanda, A. Camilli, and R. Curtiss III. 1994. Cloning and DNA sequencing of the dextranase inhibitor gene (*dei*) from *Streptococcus sobrinus*. *J. Bacteriol.* **176**:7213-7222.
183. Sun, J.-W., S.-Y. Wanda, and R. Curtiss III. 1995. Purification, characterization and function of dextranase inhibitor (Dei) expressed from *Streptococcus sobrinus* UAB108 gene cloned in *Escherichia coli*. *J. Bacteriol.* **177**:1703-1711.
184. Srinivasan, J., A. Nayak, R. Curtiss III, and S. Rubino. 1995. Effect of the route of immunization using recombinant *Salmonella* on mucosal and humoral immune responses, p. 273-280, *In R.M. Chanock, F. Brown, H.S. Ginsberg, and E. Norrby (eds.), Vaccines 95,* Cold Spring Harbor Laboratory Press, Plainview, N.Y.
185. Srinivasan, J., S. Tinge, R. Wright, J.C. Herr, and R. Curtiss III. 1995. Oral immunization with attenuated *Salmonella* expressing human sperm antigen induces antibodies in serum and the reproductive tract. *Biol. Reprod.* **53**:462-471.
186. Stone, G.G., R. D. Oberst, M.P. Hays, S. McVey, J.C. Galland, R. Curtiss III, S.M. Kelly, and M.M. Chengappa. 1995. Detection of *Salmonella typhimurium* from rectal swabs of experimentally infected beagles by short cultivation and PCR-hybridization. *J. Clin. Microbiol.* **33**:1292-1295.
187. Zhang, X., and R. Curtiss III. 1995. Contraceptive vaccine development: attenuated *Salmonella* vaccine expressing a sperm-specific antigen induced antibody response. (Manuscript in Chinese.) p. 444-450, *In Proceedings of the Second Academic Conference of Young Scientists.* China Association for Science and Technology, Beijing, China.
188. Schodel, F. and R. Curtiss III. 1995. *Salmonella* as oral vaccine carriers. *Dev. Biol. Stand.* **84**:245-253.
189. Honeyman, A.L., and R. Curtiss III. 1995. Analysis of the promoter region of the *S. mutans* mannitol PTS operon, p. 383-386, *In J.J. Ferretti, M.S. Gilmore, T.R. Klaenhammer, and F. Brown, (eds.), Genetics of Streptococci, Enterococci and Lactococci.* Dev. Biol. Stand. Basel, Switzerland.
190. Curtiss, R. III, and J.O. Hassan. 1996. Nonrecombinant and recombinant avirulent *Salmonella* vaccines for poultry. *Vet. Immunol. Immunopath.* **54**:365-372.
191. Lee, M.D., R. Curtiss III, and T. Peay. 1996. The effect of bacterial surface structures on the pathogenesis of *Salmonella typhimurium* infection in chickens. *Avian Dis.* **40**:28-36.

192. Wilmes-Riesenberg, M.R., J.W. Foster, B. Bearson, and R. Curtiss III. 1996. The role of the acid tolerance response in the virulence of *Salmonella typhimurium*. *Infect. Immun.* **64**:1085-1092.
193. Hassan, J.O., and R. Curtiss III. 1996. Effect of vaccination of hens with an avirulent strain of *Salmonella typhimurium* on immunity of progeny challenged with wild-type *Salmonella* strains. *Infect. Immun.* **64**:938-944.
194. Curtiss, R. III, T. Doggett, A. Nayak, and J. Srinivasan. 1996. Strategies for the use of live recombinant avirulent bacterial vaccines for mucosal immunization, p. 499-511, *In* H. Kiyono and M.F. Kagnoff, (eds.), *Essentials of Mucosal Immunology*. Academic Press, San Diego, CA.
195. F.C. Neidhardt, R. Curtiss III, J.L. Ingraham, E.C.C. Lin, K.B. Low, B. Magasanik, W.S. Reznikoff, M. Riley, M. Schaechter, and H.E. Umbarger. 1996. *Escherichia coli* and *Salmonella*. Cellular and Molecular Biology, Second Edition, ASM Press, Washington, D.C.
196. Schaechter, M., R. Curtiss III, J.L. Ingraham, E.C.C. Lin, K.B. Low, B. Magasanik, F. C. Neidhardt, W.S. Reznikoff, M. Riley, and H.E. Umbarger. 1996. Epilog: The view from here, p. 2817-2822, *In* F.C. Neidhardt et al., (ed.) *Escherichia coli* and *Salmonella*. Cellular and Molecular Biology, Second Edition, ASM Press, Washington, D.C.
197. Smerdou C., A. Urniza, R. Curtiss III, and L. Enjuanes. 1996. Characterization of transmissible gastroenteritis coronavirus S protein expression products in virulent *S. typhimurium* $\Delta cya \Delta crp$: persistence, stability and immune response in swine. *Vet. Microbiol.* **48**:87-100.
198. Smerdou, C., I.M. Anton, J. Plana, R. Curtiss III, and L. Enjuanes. 1996. A continuous epitope from transmissible gastroenteritis virus S protein fused to *E. coli* heat-labile toxin B subunit expressed by attenuated *Salmonella* induces serum and secretory immunity. *Virus Res.* **41**:1-9.
199. Brown, P.K., and R. Curtiss III. 1996. Unique chromosomal regions associated with virulence of an avian pathogenic *Escherichia coli* strain. *Proc. Natl. Acad. Sci. USA* **93**:11149-11154.
200. Saltzman, D.A., C.P. Heise, D.E. Hasz, M. Zebede, S.M. Kelly, R. Curtiss III, A.S. Leonard, and P.M. Anderson. 1996. Attenuated *Salmonella typhimurium* containing interleukin-2 decreases MC-38 hepatic metastases: a novel anti-tumor agent. *Cancer Biother. Radiopharm.* **11**:145-153.
201. Nardelli-Haefliger, D., J.-P. Kraehenbuhl, R. Curtiss III, F. Schodel, A. Potts, S. Kelly, and P. De Grandi. 1996. Oral and rectal immunization of adult female volunteers with a recombinant attenuated *Salmonella typhi* vaccine strain. *Infect. Immun.* **64**:5219-5224.
202. Schodel, F., S. Kelly, S. Tinge, S. Hopkins, D. Peterson, D. Milich, and R. Curtiss III. 1996. Hybrid hepatitis B virus core antigen as a vaccine carrier moiety II. Expression in avirulent *Salmonella spp* for mucosal immunization. p.15-21 *In* S. Cohen and A. Shafferman (eds.) *Novel Strategies in Design and Production of Vaccines*. Plenum Press, N.Y.
203. Curtiss, R. III, L.L. Burns-Kelihier, B.J. Morrow, C.A. Nickerson, and M.R. Wilmes-Riesenberg. 1996. Toward an understanding of *Salmonella* pathogenicity. *Acta. Microbiol. Polonica* **44**:189-203.
204. Zhang, X., Y. Lou, M. Koopman, T. Doggett, K.S.K. Tung, and R. Curtiss III. 1997. Antibody responses and infertility in mice following oral immunization with attenuated *Salmonella typhimurium* expressing recombinant murine ZP3. *Biol. Reprod.* **56**:33-41.
205. Wilmes-Riesenberg, M.R., J.W. Foster, and R. Curtiss III. 1997. An altered *rpoS* allele contributes to the avirulence of *Salmonella typhimurium* LT2. *Infect. Immun.* **65**:203-210.
206. Georgiou, G., C. Stathopoulos, P. S. Daugherty, A. R. Nayak, B. L. Iverson, and R. Curtiss III. 1997. Display of heterologous proteins on the surface of microorganisms: from the screening of combinatorial libraries to live recombinant vaccines. *Nature Biotech.* **15**:29-34.
207. Porter, S.B., and R. Curtiss III. 1997. Effect of *inv* mutations on *Salmonella* virulence and colonization in one-day-old white leghorn chicks. *Avian Dis.* **41**:45-57.

208. Nickerson, C. A., and R. Curtiss III. 1997. Role of sigma factor RpoS in initial stages of *Salmonella typhimurium* infection. *Infect. Immun.* **65**:1814-1823.
209. Grey, W.T., R. Curtiss III, and M.C. Hudson. 1997. Expression of the *Streptococcus mutans* fructosyltransferase gene within a mammalian host. *Infect. Immun.* **65**:2488-2490.
210. Burns-Keliher, L., A. Portteus, and R. Curtiss III. 1997. Specific detection of *Salmonella typhimurium* proteins synthesized intracellularly. *J. Bacteriol.* **179**:3604-3612.
211. Tacket, C.O., S.M. Kelly, F. Schodel, G. Losonsky, J.P. Nataro, R. Edelman, M.M. Levine, and R. Curtiss III. 1997. Safety and immunogenicity in humans of an attenuated *Salmonella typhi* vaccine vector strain expressing plasmid-encoded Hepatitis B antigens stabilized by the Asd-balanced lethal vector system. *Infect. Immun.* **65**:3381-3385.
212. Saltzman, D.A., E. Katsanis, C.P. Heise, D.E. Hasz, V. Vigdorovich, S.M. Kelly, R. Curtiss III, A.S. Leonard, and P. M. Anderson. 1997. Antitumor mechanisms of attenuated *Salmonella typhimurium* containing the gene for human interleukin-2: a novel antitumor agent? *J. Pediatr. Surg.* **32**:301-306.
213. Zhang, X., S.M. Kelly, W.S. Bollen, and R. Curtiss III. 1997. Characterization and immunogenicity of *Salmonella typhimurium* SL1344 and UK-1 Δ *crp* and Δ *cdt* deletion mutants. *Infect. Immun.* **65**:5381-5387.
214. Hassan, J.O., and R. Curtiss III. 1997. Efficacy of a live avirulent *Salmonella typhimurium* vaccine in preventing colonization and invasion of laying hens by *Salmonella typhimurium* and *Salmonella enteritidis*. *Avian Dis.* **41**:783-791.
215. Meyer, P.N., M.R. Wilmes-Riesenberg, C. Stathopoulos, and R. Curtiss III. 1998. Virulence of a *Salmonella typhimurium* OmpD mutant. *Infect. Immun.* **66**:387-390.
216. Burns-Keliher, L.L., C.A. Nickerson, B. Morrow, and R. Curtiss III. 1998. Cell-specific proteins synthesized by *Salmonella typhimurium*. *Infect. Immun.* **66**:856-861.
217. Nayak, A.R., S.A. Tinge, R.C. Tart, L.S. McDaniel, D.E. Briles, and R. Curtiss III. 1998. A live recombinant avirulent oral *Salmonella* vaccine expressing pneumococcal surface protein A (PspA) induced protective responses against *Streptococcus pneumoniae*. *Infect. Immun.* **66**:3744-3751.
218. Kaniga, K., M.S. Compton, R. Curtiss III, and P. Sundaram. 1998. Molecular and functional characterization of *Salmonella enterica* serovar Typhimurium *poxA* gene: effect on attenuation of virulence and protection. *Infect. Immun.* **66**:5599-5606.
219. Grey, W.T., J.D. Lasker, R. Curtiss III, and M.C. Hudson. 1998. Examination of streptococcal gene expression in the mammalian environment. *Meth. Cell Sci.* **20**:137-142.
220. Zhang, X., S.M. Kelly, W. Bollen, and R. Curtiss III. 1999. Protection and immune responses induced by attenuated *Salmonella typhimurium* UK-1 strains. *Microb. Pathog.* **26**:121-130.
221. Stathopoulos, C., D.L. Provence, and R. Curtiss III. 1999. Characterization of the avian pathogenic *Escherichia coli* hemagglutinin Tsh, a member of the immunoglobulin A protease-type family of autotransporters. *Infect. Immun.* **67**:772-781.
222. Thankavel, K., A.H. Shah, M.S. Cohen, T. Ikeda, R.G. Lorenz, R. Curtiss III, and S. N. Abraham. 1999. Molecular basis for the enterocyte tropism exhibited by *Salmonella typhimurium* type 1 fimbriae. *J. Biol. Chem.* **274**:5797-5809.
223. Dozois, C.M., and R. Curtiss III. 1999. Pathogenic diversity of *Escherichia coli* and the emergence of 'exotic' islands in the gene stream. *Vet. Res.* **30**:157-179.
224. Curtiss, R. III. 1999. Genetically modified plants for use as oral immunogens. *Mucosal Immunol. Update* **7**:10-12.
225. Hassan, J.O. and R. Curtiss III. 1999. Control of *Salmonella enterica* serovar Enteritidis infection in chickens by using live avirulent *Salmonella typhimurium* vaccine strain, p. 405-412, *In* A. M. Saeed, R. K. Gast, M. E. Potter, and P. G. Wall (eds.), *Salmonella enterica* Serovar Enteritidis in Humans and Animals. Iowa State University Press, Ames, IA.

226. Kennedy, M.J., R.J. Yancey, Jr., M.S. Sanchez, R.A. Rzepkowski, S.M. Kelly, and R. Curtiss III. 1999. Attenuation and immunogenicity of $\Delta cya \Delta crp$ derivatives of *Salmonella choleraesuis* in pigs. *Infect. Immun.* **67**:4628-4636.
227. Roland, K., R. Curtiss III, and D. Sizemore. 1999. Construction and evaluation of a $\Delta cya \Delta crp$ *Salmonella typhimurium* strain expressing avian pathogenic *Escherichia coli* O78 LPS as a vaccine to prevent air sacculitis in chickens. "Received the P. P. Levine Award from American Association of Avian Pathologists for best manuscript published in 1999." *Avian Dis.* **43**:429-441.
228. Morrow, B.J., J.E. Graham, and R. Curtiss III. 1999. Genomic subtractive hybridization and selective capture of transcribed sequences identify a novel *Salmonella typhimurium* fimbrial operon and putative transcriptional regulator that are absent from the *Salmonella typhi* genome. *Infect. Immun.* **67**:5106-5116.
229. Webb, C., M. Moreno, M. Wilmes-Riesenberg, R. Curtiss III, and J. W. Foster. 1999. Effects of DksA and ClpP protease on sigma S production and virulence in *Salmonella typhimurium*. *Mol. Microbiol.* **34**:112-123.
230. Benyacoub, J., S. Hopkins, A. Potts, S. Kelly, J. P. Kraehenbuhl, R. Curtiss III, P. DeGrandi, and D. Nardelli-Haeffliger. 1999. The nature of the attenuation of *Salmonella typhimurium* strains expressing human papillomavirus type 16 virus-like particles determines the systemic and mucosal antibody responses in nasally immunized mice. *Infect. Immun.* **67**:3674-3679.
231. Honeyman, A.L., and R. Curtiss III. 2000. The mannitol-specific enzyme II (*mtIA*) gene and the *mtIR* gene of the PTS of *Streptococcus mutans*. *Microbiology* **146**:1565-1572.
232. Dozois, C.M., M. Dho-Moulin, A. Brée, J.M. Fairbrother, C. Desautels, and R. Curtiss III. 2000. Relationship between the Tsh autotransporter and pathogenicity of avian *Escherichia coli*, and localization and analysis of the *tsh* genetic region. *Infect. Immun.* **68**:4145-4154.
233. Stathopoulos, C., D.R. Hendrixson, D.G. Thanassi, S.J. Hultgren, J.W. St. Geme III, and R. Curtiss III. 2000. Secretion of virulence determinants by the general secretory pathway in Gram-negative pathogens: an evolving story. *Microbes Infect.* **2**:1061-1072.
234. Maurer, J.J., T.A. Doggett, L. Burns-Keliher, and R. Curtiss III. 2000. Expression of the *rfa*, LPS biosynthesis promoter in *Salmonella typhimurium* during invasion of intestinal epithelial cells. *Curr. Microbiol.* **41**:172-176.
235. Curtiss, R. III, S. Blower, K. Cooper, D. Russell, S. Silverstein, and L. Young. 2000. Leprosy research in the post-genome era: Workshop. *Int. J. Lepr.* **68**:492-503.
236. Schaechter, M., and The View From Here Group (J. Beckwith, R. Curtiss III, W. Hatfield, J. Ingraham, K.B. Low, B. Magasanik, F. Neidhardt, W. Reznikoff, and M. Riley). 2001. *Escherichia coli* and *Salmonella* 2000: The view from here. *Microbiol. Mol. Biol. Rev.* **65**:119-130.
237. Sheoran, A.S., J.F. Timoney, S.A. Tinge, P. Sundaram, and R. Curtiss III. 2001. Intranasal immunogenicity of a $\Delta cya \Delta crp$ -*pabA* mutant of *Salmonella enterica* serovar Typhimurium for the horse. *Vaccine.* **19**:3591-3599
238. Sheoran, A.S., J.F. Timoney, S.S. Tinge, P. Sundaram, and R. Curtiss III. 2001. Intranasal immunogenicity of a $\Delta cya \Delta crp$ -*pabA* mutant of *Salmonella enterica* serovar Typhimurium for the horse. *Vaccine.* **19**:3787-3795.
239. Brown, P.K., C.M. Dozois, C.A. Nickerson, A. Zuppardo, J. Terlonge, and R. Curtiss III. 2001. MrA a novel regulator of curli (Agf) synthesis and aggregation by *Escherichia coli* and *Salmonella enterica* serovar Typhimurium. *Mol. Microbiol.* **41**:349-363.
240. Curtiss, R. III, S. Blower, K. Cooper, D. Russell, S. Silverstein, and L. Young. 2001. Leprosy research in the post-genome era. *Lepr. Rev.* **72**:8-22.
241. Daigle, F., J.E. Graham, and R. Curtiss III. 2001. Identification of *Salmonella typhi* genes expressed within macrophages by selective capture of transcribed sequences (SCOTS). *Mol. Microbiol.* **41**:1211-1222.
242. Frey, S.E., W. Bollen, D. Sizemore, M. Campbell, and R. Curtiss III. 2001. Bacteremia associated with live attenuated χ 8110 *Salmonella enterica* serovar Typhi ISP1820 in healthy adult volunteers. *Clin. Immunol.* **101**:32-37.

243. Curtiss, R. III. 2001. Vaccines and vaccine technology to prevent typhoid and *Salmonella* diarrheal diseases, p. 1-24. *In* Typhoid Fever and other Salmonellosis. Proceedings of the 4th International Symposium. Jeou-Chou Book Co., LTD, Taipei, Taiwan, R.O.C.
244. Kang, H.Y., C.M. Dozois, S.A. Tinge, T.H. Lee, and R. Curtiss III. 2002. Transduction-mediated transfer of unmarked deletion and point mutations through use of counterselectable suicide vectors. *J. Bacteriol.* **184**:307-312.
245. Kang, H.Y., J. Srinivasan, and R. Curtiss III. 2002. Immune responses to recombinant pneumococcal PspA antigen delivered by live attenuated *Salmonella enterica* serovar typhimurium vaccine. *Infect. Immun.* **70**:1739-1749.
246. Honeyman, A.L., C.K. Cote, and R. Curtiss III. 2002. Construction of transcriptional and translational *lacZ* gene reporter plasmids for use in *Streptococcus mutans*. *J. Microbiol. Meth.* **49**:163-171.
247. McVey, D.S., M.M. Chengappa, D.E. Mosier, G.G. Stone, R.D. Oberst, M.J. Sylte, N.M. Gabbert, S.M. Kelly-Aehle, and R. Curtiss III. 2002. Immunogenicity of χ^{4127} *phoP* – *Salmonella enterica* serovar Typhimurium in dogs. *Vaccine.* **20**:1618-1623.
248. Schnapp, A. R., C. S. Eickhoff, D. Sizemore, R. Curtiss III, and D. F. Hoft. 2002. Cruzipain induces both mucosal and systemic protection against *Trypanosoma cruzi* in mice. *Infect. Immun.* **70**:5065-5074.
249. Curtiss, R. III. 2002. Perspective: Bacterial infectious disease control by vaccine development. *J. Clin. Invest.* **110**:1061-1066.
250. Curtiss, R. III. 2002. Bacterial biotechnology and development of recombinant attenuated vaccines, p. 21-38. *In* Proceedings of the International Conference "Genetically Modified Organisms: Doubts and certainties", Porto Conte Ricerche Center, Alghero, Italy. Vol. 3.
251. Mellata, M., M. Dho-Moulin, C.M. Dozois, R. Curtiss III, B. Lehoux, and J.M. Fairbrother. 2003. Role of avian pathogenic *Escherichia coli* virulence factors in bacterial interaction with chicken heterophils and macrophages. *Infect. Immun.* **71**:494-503.
252. Mellata, M., M. Dho-Moulin, C.M. Dozois, R. Curtiss III, P. Brown, P. Arne, A. Bree, C. Desautels, and J.M. Fairbrother. 2003. Role of virulence factors in resistance of avian pathogenic *Escherichia coli* to serum and in pathogenicity. *Infect. Immun.* **71**:536-540.
253. Dozois, C. M, F. Daigle, and R. Curtiss III. 2003. Identification of pathogen-specific and conserved genes expressed *in vivo* by an avian pathogenic *Escherichia coli* strain. *Proc. Natl. Acad. Sci. USA.* **100**:247-252.
254. Kang, H. Y. and R. Curtiss III. 2003. Immune responses dependent on antigen location in recombinant attenuated *Salmonella typhimurium* vaccines following oral immunization. *FEMS Immunol. Med. Microbiol. Lett.* **37**:99-104
255. Baud, D., J. Benyacoub, M. Kok, F. Ponci, M. Bobst, R. Curtiss III, P. De Grandi, and D. Nardhelli-Haefliger. 2004. Immunogenicity against human papillomavirus type 16 virus like particles is strongly enhanced by the PhoP^c phenotype in *Salmonella typhimurium*. *Infect. Immun.* **72**:750-756.
256. Abromaitis, S., S. Faucher, M. Beland, R. Curtiss III, F. Daigle. 2005. The presence of the *tet* gene from cloning vectors impairs *Salmonella* survival in macrophages. *FEMS Microbiol. Lett.* **242**:305-312.
257. Curtiss, R. III. 2005. Antigen delivery systems: Development of live recombinant attenuated bacterial antigen and DNA vaccine delivery vector vaccines, p. 1009-1037. *In* J. Mestecky, M.E. Lamm, W. Strober, J. Bienenstock, J.R. McGhee, and L. Mayer (eds.). *Mucosal Immunology*, 3rd edition, Elsevier Academic Press.
258. Lamarche, M. G., C. M. Dozois, F. Daigle, M. Caza, R. Curtiss III, J. D. Dubreuil, and J. Harel. 2005. Inactivation of the Pst system reduces the virulence of an avian pathogenic *Escherichia coli* O78 strain. *Infect. Immun.* **73**:4138-4145.
259. Uzzau, S., G. Marogna, G.S. Leori, R. Curtiss III, G. Schianchi, B.A.D. Stocker, and S. Rubino. 2005. Virulence attenuation and live vaccine potential of *aroA*, *crp* *cdt* *cya*, and plasmid-cured mutants of *Salmonella enterica* serovar Abortusovis in mice and sheep. *Infect. Immun.* **73**:4302-4308.
260. Faucher, S.P., R. Curtiss III, and F. Daigle. 2005. Selective capture of *Salmonella enterica* serovar typhi genes expressed in macrophages that are absent from the *Salmonella enterica* serovar Typhimurium genome. *Infect. Immun.* **73**:5217-5221.
261. Konjufca, V., S. Y. Wanda, M. C. Jenkins, and R. Curtiss III. 2006. Recombinant attenuated *Salmonella typhimurium* vaccine encoding *Eimeria acervulina* antigen offers protection against *Eimeria acervulina* challenge. *Infect Immun.* **74**:6785-6796.

262. Loessner, H., A. Endmann, M. Rhode, R. Curtiss III, and S. Weiss. 2006. Differential effect of auxotrophies on the release of macromolecules by *Salmonella enterica* vaccine strains. *FEMS Microbiol. Lett.* **265**:81-88.

Publications in Press

- Curtiss, R.III., Zhang, X., S.Y. Wanda, H.Y. Kang, V. Konjufca, Y. Li, B. Gunn, S. Wang, G. Scarpellini, and I.S. Lee. 2007. Induction of host immune responses using *Salmonella*-vectored vaccines. *In* K.A. Brogden, F.C. Minion, T.B. Stanton, Q. Zhang, L. Nolan, and M.J. Wannemuehler (eds.). *Virulence Mechanisms of Bacterial Pathogens*, 4th edition, ASM Press, Washington D.C. In press
- Santander, J. M., S. Y. Wanda, C. Nickerson, and R. Curtiss III. 2007. Role of RpoS in fine-tuning the synthesis of Vi capsular polysaccharide in *Salmonella enterica* serotype Typhi. *Infect Immun.* In press
- Branger, C., J. Fetherston, R. Perry, and R. Curtiss III. 2007. Oral Vaccination with different antigens from *Yersinia pestis* KIM delivered by live attenuated *Salmonella* Typhimurium elicits a protective immune response against plague. *Adv. Exp. Med. Biol.* In press

Publications Submitted

- Krattiger, A., R.T. Mahoney, J.D. Clemens, and R. Curtiss III. The introduction of new vaccines into developing countries IV: global access strategies. *Vaccine.* Submitted

PATENTS:

1. Curtiss, R. III. Modified Microorganisms and Method of Preparing and Using Same. Filed Sep. 30, 1976. (Patent on biological containment and EK2 host-vector systems.)

COUNTRY	STATUS	PAT. NO.	ISSUE DATE	APPL. NO./ SERIAL NO.	EXPIRATION	DOCKET NO.
Germany	Issued	2,644,432	12/29/88			
Great Britain	Issued	1,146,458	9/30/78			
United States	Issued	4,190,495	2/26/80			
United States	Issued	4,968,619	11/27/90			

2. Curtiss, R. III. Vaccines Obtained From Antigenic Gene Products of Recombinant Genes. Filed Oct. 22, 1981. (Patent on use of recombinant avirulent *Salmonella*, *Escherichia* and *Salmonella-Escherichia* hybrids as antigen delivery vectors to induce mucosal, systemic and cellular immunity.)

COUNTRY	STATUS	PAT. NO.	ISSUE DATE	APPL. NO./ SERIAL NO.	EXPIRATION	DOCKET NO.
Greece	Issued	76,769	9/03/84		10/22/97	
Canada	Issued	1,338,705	11/12/96		11/12/13	
Germany	Issued	P3279824.5	7/19/89		10/22/02	
Ireland	Issued	55478	1/09/91		10/21/98	
Japan, 10/22/82	Pending			57-185912		
Japan, 5/25/93	Pending			5-144230		
EPO, July 19, 1989, entitled "Live Vaccine and Its Method of Production"						
Austria	Issued	080,806	7/19/89		10/22/02	
Belgium	Issued	080,806	7/19/89		10/22/02	
France	Issued	080,806	7/19/89		10/22/02	
Great Britain	Issued	080,806	7/19/89		10/22/02	
Italy	Issued	080,806	7/19/89		10/22/02	
Luxembourg	Issued	080,806	7/19/89		10/22/02	
Netherlands	Issued	080,806	7/19/89		10/22/02	
Sweden	Issued	080,806	7/19/89		10/22/02	
Switzerland	Issued	080,806	7/19/89		10/22/02	

CIP filed Sep. 9, 1985, refiled Nov. 13, 1989 and Dec. 6, 1991

United States Issued 4,888,170 12/19/89 12/19/06

Continuation Filed 5/2/94

Curtiss, R. III. Recombinant Avirulent Bacterial Antigen Delivery System.

United States Issued 5,888,799 3/30/99 3/30/16

3. Curtiss, R. III. Avirulent Microbes and Uses Therefor. Filed Jun. 4, 1987; First CIP filed Jun. 1, 1988. (Patent on Δcya and Δcrp attenuation mutations.)

COUNTRY	STATUS	PAT. NO.	ISSUE DATE	APPL. NO./ SERIAL NO.	EXPIRATION	DOCKET NO.
Australia	Issued	623599	9/22/92		6/01/04	
Canada	Issued	1,338,957			3/04/14	
China	Issued	88104317.6			6/04/03	
Denmark	Pending					937950
Ireland	Issued	63905	5/31/95		1/06/08	
Israel	Issued	86583			5/31/08	
Japan	Issued	2640525	5/02/97		6/01/08	
New Zealand,	Issued	224884			6/02/04	
Rep. of South Korea	Issued	139950	3/07/98		3/07/13	
Singapore	Pending					
South Africa	Issued	88/3954	2/22/89		6/03/08	
United States	Issued	5,389,368	2/14/95		2/07/12	
EPO 0 315 682 B1, 6/1/08						
Austria	Issued	E98870	12/22/93		6/01/08	
Belgium	Issued	BE0315682	12/22/93		6/01/08	
France	Issued	FR0315682	12/22/93		6/01/08	
Germany	Issued	DE3886506 T2	12/22/93		6/01/08	
Great Britain	Issued	GB0315682	12/22/93		6/01/08	
Italy	Issued	IT0315682	12/22/93		6/01/08	
Luxembourg	Issued	2U0315682	12/22/93		6/01/08	
Netherlands	Issued	NL0315682	12/22/93		6/01/08	
Sweden	Issued	88905542.2	12/22/93		6/01/08	
Switzerland	Issued	CH0315682	12/22/93		6/01/08	

4. Curtiss, R. III. Avirulent Microbes and Uses Therefor: *Salmonella choleraesuis*. Second CIP filed Mar. 31, 1989. (Patent on Δcya and Δcrp attenuation mutations in *S. choleraesuis*.)

COUNTRY	STATUS	PAT. NO.	ISSUE DATE	APPL. NO./ SERIAL NO.	EXPIRATION	DOCKET NO.
Canada	Pending					937960
Japan	Pending					937965
United States	Issued	5,468,485	11/21/95		11/21/12	

5. Curtiss, R. III, and S. M. Kelly. Avirulent Microbes and Uses Therefor: *cdt*. Third CIP filed Nov. 7, 1990. (Patent on Δcdt attenuation mutation alone and in combination with *cya* and *crp* mutations.) Divisional patent EP0556333

COUNTRY	STATUS	PAT. NO.	ISSUE DATE	APPL. NO./ SERIAL NO.	EXPIRATION	DOCKET NO.
EPO		92901722.6-210	3/19/03	938419/		3116-8419
Austria	Issued	03006123.8	9/05/03			
Belgium	Issued	03006123.8	9/05/03			
Denmark	Issued	03006123.8	9/05/03			
France	Issued	03006123.8	9/05/03			
Germany	Issued	03006123.8	9/05/03			
Great Britain	Issued	03006123.8	9/05/03			
Italy	Issued	03006123.8	9/05/03			
Luxembourg	Issued	03006123.8	9/05/03			
Liechtenstein	Issued	03006123.8	9/05/03			
Netherlands	Issued	03006123.8	9/05/03			
Spain	Issued	03006123.8	9/05/03			
Sweden	Issued	03006123.8	9/05/03			

Switzerland	Issued	03006123.8	9/05/03			
Australia	Issued	666108	5/20/96		11/08/11	
Canada, 11/8/91	Issued	2,095,534	9/17/02		11/08/11	53116-8421
Ireland	Pending					937955
Israel	Issued	100010	5/18/98		11/08/11	
Japan	Issued	502265/1992	10/1/04		11/08/11	MEG-200.49JP
New Zealand	Issued	240538	6/14/94		11/11/07	
South Africa	Issued	91/8876	11/08/91		11/08/11	
United States	Issued	5,387,744	2/07/95		2/07/12	

6. Curtiss, R. III. Avirulent Microbes and Uses Therefor: *Salmonella typhi*. Fourth CIP filed Nov. 7, 1991. (Patent on Δcya and Δcrp attenuation mutations in *S. typhi*.)

COUNTRY	STATUS	PAT. NO.	ISSUE DATE	APPL. NO./ SERIAL NO.	EXPIRATION	DOCKET NO.
United States	Issued	5,294,441	3/15/94		3/15/11	

7. Curtiss, R. III. Avirulent Microbes and Uses Therefor: *crp*. Continuation and divisional filed Jul. 7, 1993. (Patent on Δcrp attenuation mutation.)

COUNTRY	STATUS	PAT. NO.	ISSUE DATE	APPL. NO./ SERIAL NO.	EXPIRATION	DOCKET NO.
United States	Issued	5,855,879	1/5/99		1/05/16	

8. Curtiss, R. III. Avirulent Microbes and Uses Therefor: *cya*. Divisional filed Feb. 6, 1996. filed 1/4/99. (Patent on Δcya attenuation mutation.)

COUNTRY	STATUS	PAT. NO.	ISSUE DATE	APPL. NO./ SERIAL NO.	EXPIRATION	DOCKET NO.
United States	Issued	5,855,880	1/5/99		10/07/07	

9. Curtiss, R. III. A Method of Maintaining a Desired Recombinant Gene in a Genetic Population of Cells. Filed Oct. 7, 1987; CIP Filed Oct. 3, 1988. Continuation filed 3/10/95, 6/7/95, and 11/20/98. (Patent on balanced-lethal host-vector systems for stable high-level expression of foreign antigens.)

COUNTRY	STATUS	PAT. NO.	ISSUE DATE	APPL. NO./ SERIAL NO.	EXPIRATION	DOCKET NO.
Australia	Issued	637969	10/6/88		10/06/04	
Canada	Issued	1,339,412	9/2/97		9/02/14	
Japan, 10/6/88	Pending			1-500124		937932 3116-7932
Japan (Divisional filed)	Pending	10-358165				3116-6480
United States	Issued	5,672,345	9/30/97	10/35865	9/30/14	
United States	Pending	09/196,057				3116-7655
EPO	Issued	0381706 B1			10/06/08	
Austria	Issued	E 121785	4/26/95		10/06/08	
Belgium	Issued	0381706	4/26/95		10/06/08	
France	Issued	0381706	4/26/95		10/06/08	
Germany	Issued	DE 3853683.8	4/26/95		10/06/08	
Italy	Issued	0381706	4/26/95		10/06/08	
Luxembourg-Abandoned	Issued	0381706	4/26/95		10/06/08	
Netherlands	Issued	0381706	4/26/95		10/06/08	
Sweden	Issued	0381706	4/26/95		10/06/08	
Switzerland	Issued	0381706	4/26/95		10/06/08	
United Kingdom	Issued	0381706	4/26/95		10/06/08	
United States	Issued	5,840,483	11/24/98		11/24/15	

(patent on vector claims)

10. Curtiss, R. III, and G. A. Cardineau. Oral Immunization by Transgenic Plants. Filed Sep. 6, 1988; CIP filed Aug. 29, 1989; continuation and two divisionals filed Jun. 1, 1995. (Patent on immunization by oral feeding of transgenic plants expressing colonization and virulence antigens of microbial pathogens.)

PCT, 9/5/89, PCT/US89/03799, 3/22/90 WO 90/02484. Filed nationally in Australia, Denmark, EPO, Japan, and Korea.

COUNTRY	STATUS	PAT. NO.	ISSUE DATE	APPL. NO./ SERIAL NO.	EXPIRATION	DOCKET NO.
Australia	Issued	634178	6/25/93	43172/89		MPS (2570)
Brazil, 5/14/97	Pending			PI 1101003-7		MPS (2570)
Canada	Issued	1,339,307	8/19/97	610,249		MPS SG-59
Hong Kong, 12/22/98,	Pending			98114604.2		
Japan, 9/5/89	Pending	4-501801	(Pub. 4/2/92)	1-509842		MPS SG-59 (2570)
Japan, 9/5/89	Pending	11-200841				
Mexico, 9/6/89	Pending	17593				
New Zealand	Issued	230,576	9/22/92			
United States, 8/29/89	Pending	Appeal #93-4341	07/398,520	MPS SG-59 C1		
United States	Issued	5,686,079	11/11/97		11/11/14	
United States	Issued	5,679,880	10/21/97		10/21/14	
United States	Issued	5,654,184	8/5/97		8/5/14	
EPO, 9/5/89, filed		0433372	6/12/03	89910552.2	09/15/09	MPS SG-59 (2570)
Austria	Issued	AT218797				
Belgium	Issued	BE433372				
France	Issued	FR433372				
Germany	Issued	6892405.0				
Great Britain	Issued	GB433372				
Greece	Pending					
Italy	Issued	IT433372				
Luxembourg	Issued	LU433372				
Netherlands	Issued	NL433372				
Spain	Pending					
Sweden	Issued	SE433372				
Switzerland	Issued	P433372				
(Liechtenstein)						

PCT, 9/5/89, WO 90/02484, 3/22/90

US89/03799

11. Curtiss, R. III, and J.E. Galan. Vaccines Containing Avirulent *phoP* Microorganisms. Filed Mar. 31, 1989. (Patent on *phoP* mutation rendering bacteria avirulent and immunogenic.) European Patent Filed Mar. 23, 1990.

COUNTRY	STATUS	PAT. NO.	ISSUE DATE	APPL. NO./ SERIAL NO.	EXPIRATION	DOCKET NO.
Australia	Issued	645,489	5/6/94		3/23/06	
Canada	Issued	0500699	6/10/98		3/20/10	
Finland	Pending					
Hungary	Pending					
Japan	Issued	3004049	11/19/99		3/23/10	
Norway	Pending					
United States	Issued	5,424,065	6/13/95		6/13/12	
EPO, 3/23/90	Issued	0 465 560B1	6/5/96		3/23/10	
(opposition filed and rejected)						
Austria	Issued	AT E 138784	6/5/96		3/23/10	
Belgium	Issued	0 465 560	6/5/96		3/23/10	
Denmark	Issued	0 465 560	6/5/96		3/23/10	
France	Issued	0 465 560	6/5/96		3/23/10	
Germany	Issued	DE69027313 T2	6/5/96		3/23/10	
Great Britain	Issued	0 465 560	6/5/96		3/23/10	

Italy	Issued	0 465 560	6/5/96	3/23/10
Luxembourg	Issued	0 465 560	6/5/96	3/23/10
Netherlands	Issued	0 465 560	6/5/96	3/23/10
Spain	Issued	0 465 560	6/5/96	3/23/10
Sweden	Issued	0 465 560	6/5/96	3/23/10
Switzerland	Issued	0 465 560	6/5/96	3/23/10

12. Curtiss, R. III. Cross Protective *Salmonella* Vaccines. Filed Nov. 3, 1989. (Patent on using *pmi*, *galE* and *fur* mutations in conjunction with other attenuating mutations to enhance induction of cross protective immunity.)

COUNTRY	STATUS	PAT. NO.	ISSUE DATE	APPL. NO./ SERIAL NO.	EXPIRATION	DOCKET NO.
Europe	Issued	0500699	6/10/98		11/20/10	
Austria	Issued	0500699	6/10/98		11/20/10	
Belgium	Issued	0500699	6/10/98		11/20/10	
Denmark	Issued	0500699	6/10/98		11/20/10	
France	Issued	0500699	6/10/98		11/20/10	
Germany	Issued	DE69032408T2	6/10/98		11/20/10	
Greece	Issued	0500699	6/10/98		11/20/10	
Italy	Issued	0500699	6/10/98		11/20/10	
Luxembourg	Issued	0500699	6/10/98		11/20/10	
Netherlands	Issued	0500699	6/10/98		11/20/10	
Spain	Issued	0500699	6/10/98		11/20/10	
Sweden	Issued	0500699	6/10/98		11/20/10	
Switzerland	Issued	0500699	6/10/98		11/20/10	
United Kingdom	Issued	0500699	6/10/98		11/20/10	

13. Curtiss, R. III. Recombinant Avirulent *Salmonella* Antifertility Vaccines. Filed Nov. 21, 1990; CIP filed Nov. 20, 1991 with R. Curtiss III and K. S. K. Tung as inventors. (Patent on using recombinant avirulent *Salmonella* expressing gamete-specific antigens to induce immunity to prevent fertilization.)

COUNTRY	STATUS	PAT. NO.	ISSUE DATE	APPL. NO./ SERIAL NO.	EXPIRATION	DOCKET NO.
Canada	Pending			2,096,529		938461
Israel	Pending	100121	11/21/11			937967 3116-7967
South Africa	Issued	91/9213	11/21/91			
United States	Issued	5,656,488	8/12/97		8/12/14	
United States, 6/7/95	Pending			08/478,504		952997
Europe	Issued	0558631	3/17/99	92901072.6	11/20/11	
Belgium	Issued	0558631	3/17/99	92901072.6	11/20/11	
France	Issued	0558631	3/17/99	92901072.6	11/20/11	
Germany	Issued	69131014.9-08	3/17/99	92901072.6	11/20/11	
Great Britain	Issued	0558631	3/17/99	92901072.6	11/20/11	
Netherlands	Issued	0558631	3/17/99	92901072.6	11/20/11	
Spain	Issued	0558631	3/17/99	92901072.6	11/20/11	
Switzerland	Issued	0558631	3/17/99	92901072.6	11/20/11	

14. Curtiss, R. III, and S. A. Tinge. Recombinant Bacterial Vaccine System with Environmentally Limited Viability. Filed Jun. 7, 1995. (Patent on methods to cause viability of live bacterial vaccines to be restricted to specific environments or to temperatures of immunized warm-blooded vertebrate hosts with death of such vaccines resulting from exposure to defined environments or to temperatures for growth below body temperatures.)

COUNTRY	STATUS	PAT. NO.	ISSUE DATE	APPL. NO./ SERIAL NO.	EXPIRATION	DOCKET NO.
United States	Pending	08/473,789				3116-1780

PCT filed 6/7/96,

PCT/US96/09774, Pub. No. WO 96/40947, Dec. 19, 1996, Doc. 21400/2.

ROY CURTISS

27

Europe	Pending					3116-1761
Australia	Issued	711618	2/3/00	61664/96	6/7/16	
Japan	Issued	11-507532	7/6/99	S/N 9-501998		
Canada	Pending					3116-1760
CIP filed 12/6/96						3116-1763
United States	Issued	6,610,529B1	8/26/03	08/761,769		53116-1772

15. Curtiss, R. III, and C. A. Nickerson. Recombinant Vaccines Comprising Avirulent Immunogenic *S. typhi* Having RpoS Positive Phenotype. Filed November 14, 1997. (Patent on novel avirulent *Salmonella enterica* serotype Typhi having an RpoS⁺ phenotype for use as vaccines and delivery vehicles for gene products and to methods for their preparation.)

COUNTRY	STATUS	PAT. NO.	ISSUE DATE	APPL. NO./ SERIAL NO.	EXPIRATION	DOCKET NO.
United States	Issued	6,024,961	2/15/00	08/970,789	11/14/17	3116-6059
PCT filed 11/13/98	WO99/25387		PCT/US98/24295	987471		3116-7471
Australia, 11/13/98	14595/99	3116-4685				
Canada						3116-4686
Europe	Issued	EP1030690	7/03/02		11/13/18	3116-4687
Israel, 5/14/00				136131		3116-4688
Japan						3116-4689
S. Korea, 5/15/00		7005297/2000				3116-4690

CIP filed 5/18/99

Recombinant Vaccines Comprising Immunogenic Attenuated Bacteria Having RpoS Positive Phenotype. Continuation filed 5/3/02

United States	Issued	6,383,496	5/7/02	09/314,062		53116-9419
Continuation			3/16/06	10/138,329		53116-33076

16. Curtiss, R. III, and Steven Tinge. Regulated Antigen Delivery System. Filed 4/28/00.

COUNTRY	STATUS	PAT. NO.	ISSUE DATE	APPL. NO./ SERIAL NO.	EXPIRATION	DOCKET NO.
United States	Pending			09/560,539		3116-4355
PCT filed 4/30/01				PCT/US01/13915		53116-7781

17. Curtiss, R. III. Functional Balanced-Lethal Host-Vector Systems. Filed 10/11/00.

COUNTRY	STATUS	PAT. NO.	ISSUE DATE	APPL. NO./ SERIAL NO.	EXPIRATION	DOCKET NO.
United States	Pending			09/868,499	53116-1192	
PCT filed 10/05/2001				PCT/US01/42527		
Guatemala	Pending					3116-8517
Thailand	Pending					3116-8521

18. Curtiss, R. III, and Steven Tinge. Microbes Having an Attenuating Mutation Comprising a Transcription Terminator. Filed 10/12/00.

COUNTRY	STATUS	PAT. NO.	ISSUE DATE	APPL. NO./ SERIAL NO.	EXPIRATION	DOCKET NO.
United States	Pending			09/689,123		15060-00005
PCT filed 11/10/01	WO 02/30457A2			PCT/US01/31606		15060-7
Canada				2,463,482		15060-32
Argentina		010104792				15060-8
Chilean		2442-01				15060-9
Europe				01979646.5		15060-33

19. Curtiss, R. III, and H. Y. Kang. Improved Immunogenic Compositions and Vaccines Comprising Carrier Bacteria that Secrete Antigens. Filed 4/15/02 (Provisional) and 4/15/03 (Formal). **WITHDRAWN**

COUNTRY	STATUS	PAT. NO.	ISSUE DATE	APPL. NO./ SERIAL NO.	EXPIRATION	DOCKET NO.
United States	Provisional			60/372,710		56029-31238

20. Curtiss, R. III. Regulated Attenuation of Live Vaccines to Enhance Cross-Protective Immunogenicity. Provisional filed 4/15/02 and 4/18/02. Formal filed 4/15/03. PCT filed 4/15/03.

COUNTRY	STATUS	PAT. NO.	ISSUE DATE	APPL. NO./ SERIAL NO.	EXPIRATION	DOCKET NO.
United States	Provisional			60/372,616		56029-31335
				60/373,626		56029-32858
PCT filed 4/15/03		WO 03/096812		PCT/US03/11802		56029-40434
Europe filed 4/15/03	Pending			03721711.4-2103		

21. Curtiss, R. III, and H. Y. Kang. Modulation of Immune Responses to Foreign Antigens Expressed by Recombinant Attenuated Bacterial Vectors. Provisional filed 4/15/02 and 4/18/02. Formal filed 4/15/03.

COUNTRY	STATUS	PAT. NO.	ISSUE DATE	APPL. NO./ SERIAL NO.	EXPIRATION	DOCKET NO.
United States	Provisional			60/372,676/		56029-31336
				60/378,669		56029-32859
United States	Pending			10/414,533		56029-40420

22. Curtiss, R. III, and W. Kong. Regulated Bacterial Lysis for Genetic Vector Delivery and Antigen Release. Filed 9/1/02 and PCT filed 8/29/03.

COUNTRY	STATUS	PAT. NO.	ISSUE DATE	APPL. NO./ SERIAL NO.	EXPIRATION	DOCKET NO.
United States	Issued	2006/0140975	6/29/06	10/526,365	08/31/22	
United States	Provisional			60/407,522		56029-35347
PCT filed 8/29/03		WO 2004/020643		PCT/US03/26883		56029-42524

PATENT DISCLOSURES:

Regulated delayed expression of protective antigen synthesis to enhance the vaccine immunogenicity. R. Curtiss, S. Wang, S.-Y. Wanda and W. Kong. Submitted to AZTE July 27, 2006

Development of recombinant attenuated *Salmonella* vaccine strains with multiple balanced-lethal plasmids for expression of multiple protective antigens. R. Curtiss. Submitted to AZTE July 27, 2006

Regulated delayed bacterial lysis system for delivery of recombinant BAC vectors when by recombinant attenuated *Salmonella* vaccine strains. R. Curtiss and S. Wang. Submitted to AZTE July 27, 2006

Stable continuous production of filamentous bacteriophages by *Salmonella* in vivo to display peptide epitopes to an immunized individual, to discover peptide targeting sequences to specify or enhance tissue localization and to target genetically modified *Salmonella* to specific cell types and tissues in an infected individual, including tumor cells. R. Curtiss. Submitted to AZTE July 27, 2006

Improved means for regulated delayed in vivo attenuation strategies for *Salmonella* vaccines. R. Curtiss. Submitted to AZTE July 27, 2006

LICENSED VACCINES

1. Live attenuated *Salmonella choleraesuis* vaccine, Argus SC ; APHIS registration19A1.00., October 23, 1997. Marketed by Intervet. See references 154 and 226 in CV.
2. Live attenuated *Salmonella typhimurium* vaccine for broilers, Megan Vac 1; APHIS registration19C1.01., November 25, 1998. Marketed by Lohmann Animal Health. See references 137, 139, 160, 164, 175, 177, 190, and 193 in CV.
3. Live attenuated *Salmonella typhimurium* vaccine for layers, Megan Egg; APHIS registration19C1.02., November 4, 2003. Marketed by Lohmann Animal Health. See reference 214 in CV.

POSTDOCTORAL FELLOWS:

Former Postdoctoral Fellows and Associates

- Yoshimitsu Abiko, PhD, DDS (1978-1980) - University of Alabama at Birmingham
Associate Professor, Department of Biochemistry, Nihon University
PhD (Biochemistry), 1977, Nihon University, "Studies on Calcium-Stimulated Adenosine Triphosphatase in the Albino Rabbit Dental Pulp. Its Subcellular Distribution and Properties"
- W. James Alexander, MD (1977-1979) - University of Alabama at Birmingham
Senior Vice President, Clinical and Regulatory Operations and Chief Medical Officer, BioCryst Pharmaceuticals, Inc., Birmingham, AL
MD, 1974 - University of Mississippi
- Iqbal Ibn Amin, MD, PhD, CMD (1993-1996) - Washington University
PhD (Microbiology), 1992, University of Birmingham, Birmingham, UK, "Studies on the invasiveness of *Salmonella typhimurium*"
- John F. Barret, PhD (Deceased) Formerly, Executive Director, Anti-Infective Microbiology, Bristol-Myers Squibb, Pharmaceutical Research & Development Division, Wallingford, CT
PhD (1982-1985) - University of Alabama at Birmingham and Washington University
PhD (Microbiology/Immunology), 1982 - Temple University School of Medicine, "Kinetics and Mechanism of Hydrolysis of the N-acetylmuramal-hydrolase of *Streptococcus faecium* 9790"
- James R. Bonner, MD (1974-1976) - University of Alabama at Birmingham
Associate Professor of Internal Medicine, University of Alabama at Birmingham
MD, 1971 - University of Michigan
- Jean-luc Boucaud, DVM (1988-1989) - Washington University
DVM (Veterinary Medicine), 1987, Ecoles Nationales Veterinaire de Lyon
- Peter Brown, PhD (1992-1996) - Washington University
Centre for Immunology, St. Vincent's Hospital, Darlinghurst, New South Wales, Australia
PhD (Microbiology), 1992, University of Sydney, Australia, "Cloning and sequencing of the *rfb* gene cluster of a group C2 *Salmonella*: the evolutionary relationship with other serogroups"
- Lisa Burns-Keliher, PhD (1991-1998) Washington University
Applications/Software Support Scientist, Bioinformatics Group, Monsanto Corporation, St. Louis, MO
PhD (Medical Microbiology), 1990, Texas Tech University Health Sciences Center, "Involvement of lipopolysaccharide in expression of the major outer membrane protein OmpF in *Escherichia coli* K-12"
- Josephine E. Clark-Curtiss, PhD (1973-1976) - University of Alabama at Birmingham
Professor, Arizona State University, School of Life Sciences and The **Error! Contact not defined.**, Tempe, AZ
PhD (Microbiology), 1974, Medical College of Georgia, "A Molecular Characterization of the Genomes of the Compatible Mating Strains of *Nocardia erythropolis*"
- Amiken Cohen, PhD (1966-1968) - Oak Ridge National Laboratories, TN
Professor of Molecular Genetics, Hadassah Medical School, The Hebrew University, Jerusalem, Israel
PhD (Biochemistry), 1966, University of Pittsburgh, PA, "Biosynthesis of Complex Polysaccharides of the Yeast *Czyptococcus laurentii*"
- Laurence Vincent Collins, PhD (1990-1994) - Washington University
Ingenieur de Recherche (PD), INSERM, Lyon, France
PhD (Microbial Pathogenesis), 1990, University of Adelaide, Australia, "The Effect of Mutations in Lipopolysaccharide Biosynthetic Genes on the Virulence of *Salmonella typhimurium* for the Mouse"
- Susan Cook, PhD (2003-2005) - Washington University
Biosafety Fellow, Midwest Center for Excellence, Washington University, St. Louis, MO
PhD (Molecular and Microbiology), 2003 – John Hopkins Bloomberg School of Public Health, Baltimore, MD – "Development of an in vivo imaging system to elucidate mechanisms of attenuation of Sindbis virus"
- Rebecca C. Craven, PhD (1981-1984) - University of Alabama at Birmingham

Res. Asst. Professor, Dept. of Microbiology & Immunology, Milton S. Hershey Medical Center, Hershey, Pennsylvania
PhD (Microbiology), 1981, University of Tennessee

France Daigle, PhD (1998-2001) – Washington University

Professor, Department of Microbiology and Immunology, University of Montreal

PhD (Microbiology & Immunology), 1996 - University of Montreal, Montreal, Canada - "Genetic Studies of Virulence Factors Present in Extraintestinal *Escherichia coli* Strains"

Teresa Ann Doggett, PhD (1989-1997) - Washington University

Dept. of Pharmacological and Physiological Sciences, St. Louis University School of Medicine, St. Louis, MO

PhD (Immunology), 1989, Plymouth Polytechnic, Devon, England, "Peripheral Blood, Intestinal Leucocytes and Antigen Absorption in the Gut of the Cichlid, *Oreochromis-mossambicus*"

Charles Dozois, PhD (1997-2001) – Washington University

Professor, INRS-Institut Armand-Frappier, Laval Québec

PhD (Microbiology & Immunology), 1995, University of Montreal, Montreal, Canada, "Phenotypic and Genetic Analyses of P and Type I Fimbriae of Pathogenic *Escherichia coli* from Poultry"

Joel Dworkin, M.D., Ph.D. (2001-2003) – Washington University

Ph.D. (Microbiology & Immunology) 1995, Vanderbilt University School of Medicine, Nashville, TN,

"Molecular Genetics of Campylobacter Fetus S-Layers: Studies of S-Layer Gene Organization, LPS-Binding Domains, and Expression"

M.D., 1997 Vanderbilt University School of Medicine, Medical Scientist Training Program (MTSB), Nashville, TN

Joseph O. Falkinham III, PhD (1972-1974) - University of Alabama at Birmingham

Associate Professor of Biology, Virginia Polytechnic Institute & State University, Blacksburg, VA

PhD (Microbiology), 1969, University of California-Berkeley, "Analysis of Linkage Relationships in a Double Male Strain of *Escherichia coli* K-12"

Anne Cornish Frazer, PhD (1970-1974) - Oak Ridge National Laboratories and University of Alabama at Birmingham

Research Assistant Professor, Department of Microbiology, New York University Medical Center, New York

PhD (Microbiology/Immunology), 1970, Tulane University, "Regulatory Properties of Pyruvate Kinase and a Preliminary Study of Four Additional Enzymes from the Metabolic Routes Interlocking at 3-Phosphoglycerate in *Thiobacillus neapolitanus*"

Jorge E. Galan, PhD, DVSc, DVM (1986-1989) - Washington University

Associate Professor and PEW Scholar in Biomedical Research, Department of Microbiology, School of Medicine, SUNY Stony Brook, NY

PhD (Bacteriology), 1986, Cornell University, "Studies on the Immune Response of the Horse to the M Protein of *Streptococcus equi*"

DVSc (Veterinary Science), 1982, National University of La Plata

DVM (Veterinary Medicine), 1980, National University of La Plata

Claudia Gentry-Weeks, PhD (1985-1989) - Washington University

Assistant Professor/Head of Bacteriology Section of the Diagnostic Laboratory, College of Veterinary Medicine and Biomedical Sciences, Colorado State University

PhD (Microbiology), 1985, University of Oklahoma Health Science Center, "Cloning and Nucleotide Sequence of the Structural Gene for Type A Streptococcal exotoxin (erythrogenic toxin) from *Streptococcus pyogenes* Bacteriophage T12"

Gurnam S. Gill, PhD (1976-1980) - University of Alabama at Birmingham

Research Scientist, The Upjohn Company, Kalamazoo, MI

PhD (Medical Biophysics), 1976, University of Toronto, Canada, "Studies on Chromosomal Organization and Transcription in the Bacteriophage T1"

Louis Glatzer, PhD (1970 - 1972) - Oak Ridge National Laboratory

Assistant Professor of Biology, University of Toledo, Toledo, OH

PhD (Zoology), 1970, University of Texas in Austin, "Studies on the Acetohydroxy Acid Synthetase of *Neurospora crassa* Mitochondria"

- Jon D. Goguen, PhD (1980-1982) - University of Alabama at Birmingham
Associate Professor of Molecular Genetics & Microbiology, University of Massachusetts Medical School,
Worcester, MA
PhD (Zoology), 1980, University of Massachusetts, "Population Biology of a Conjugative Plasmid: Effects of Surface Populations of Bacteria"
- Raul M. Goldschmidt, PhD (1974-1976) - University of Alabama at Birmingham
R.W. Johnson Pharmaceutical Research Institute, Raritan, NJ
PhD (Biology), 1970, Columbia University, "Degradation of Polypeptides Synthesized by Nonsense Mutants of the *laeZ* gene in *Escherichia coli*"
- Paul A. Gulig, PhD (1985-1988) - Washington University
Associate Professor, Department of Immunology and Medical Microbiology, College of Medicine, University of Florida at Gainesville
PhD (Microbiology), 1985, University of Texas Health Science Center-Dallas, "Studies of Outer Membrane Antigens of *Haemophilus influenzae* type b as Potential Vaccine Candidates"
- John H. Hanlin, PhD (1984-1985) - Washington University
Program Manager, Microbiology, Campbell Soup Co., Camden, NJ
PhD (Biology), 1984, Syracuse University, "The Mechanism of Heat Resistance of Bacterial Spores"
- Jeffrey B. Hansen, PhD (1978-1981) - University of Alabama at Birmingham
Science Writer, The Birmingham News, Birmingham, AL
PhD (Microbiology), 1978, University of Michigan, Ann Arbor MI, "Plasmids of *Pseudomonas*"
- Jubril Olugbenga Hassan, PhD (1989-1994) - Washington University
Research Assistant Professor, Department of Biology, Washington University, St. Louis, MO
PhD (Immunology), 1989, University of Birmingham, England, "Some Aspects of Humoral and Cellular Immune Response to *Salmonella typhimurium* Infection in Chickens"
- Robert G. Holt, PhD (1978-1982) - University of Alabama at Birmingham
Associate Professor, Department of Microbiology, Meharry Medical College, Nashville, TN
PhD (Biomedical Sciences), 1978, University of Tennessee-Oak Ridge Graduate School of Biomedical Sciences,
Oak Ridge National Laboratory, "Studies of the Ribonucleotide Reductase in *Pseudomonas stutzeri*"
- Allen L. Honeyman, PhD (1988-1991) - Washington University
Assistant Professor, Texas A & M Health Science Center, Baylor College of Dentistry, Dallas, TX
PhD (Microbiology), 1987, University of Kansas, "Characterization of the *rodC* Locus of *Bacillus subtilis*"
- Min Charles Hsu, PhD (1975-1979) - University of Alabama at Birmingham
Senior Scientist, Rohm and Haas, Spring House, PA
PhD (Microbiology), 1975, Clemson University, "Microbial Degradation of a Family of Herbicides 4-Hydroxy-3,5-Dihalogeno-4-hydroxybenzotrioles"
- Rui Huang, PhD (2001)
PhD (Microbiology), 2000 - Shanghai Medical University, Shanghai, P. R. China - "Study on the Biological Characteristics Mediated by Drug Resistant *Salmonella typhi* R Plasmid (pR_{ST98})"
- Michael C. Hudson, PhD (1987-1990) - Washington University
Associate Professor of Biology, Department of Biology, University of North Carolina at Charlotte, Charlotte, NC
PhD (Microbiology), 1987, University of Kansas, "Transcription Initiation in *Staphylococcus aureus*"
- Thomas A. Hughes, PhD (1981-1983) - University of Alabama at Birmingham
Associate Professor, Department of Microbiology, Clemson University, Clemson, SC
PhD (Microbiology), 1981, North Carolina State University
- Richard A. Hull, PhD (1976-1978) - University of Alabama at Birmingham
Associate Professor of Microbiology, Baylor College of Medicine, Houston, TX

PhD (Microbiology), 1976, University of Arizona, "Interference of Plasmids upon Bacteriophage Growth"

Sheila I. Hull, PhD (1974-1978) - University of Alabama at Birmingham

Associate Professor of Microbiology, Baylor College of Medicine, Houston, TX

PhD (Microbiology), 1975, University of Arizona, "Cell Division in *Bacillus subtilis*"

Matsuhisa Inoue, PhD (1976-1978) - University of Alabama at Birmingham

Chief Professor, Department of Microbiology, Kitasato University School of Medicine, Sagamihara, Japan

PhD (Microbiology), 1976, Gunma University

Ho Young Kang, PhD (1997-2002) - Washington University

Assistant Professor, Division of Biological Sciences-Microbiology, Pusan National University, Pusan, Korea

PhD (Microbiology & Immunology), 1997, East Carolina University School of Medicine, Greenville, NC, "Identification and Characterization of the *Bordetella pertussis* Alcaligin Siderophore Biosynthesis Operon"

Elizbieta K. Jagusztyn-Krynicka, PhD (1979-1981) - University of Alabama at Birmingham

Assistant Professor, Institute of Microbiology, University of Warsaw, Warsaw, Poland

PhD (Microbiology), 1979, Institute of Microbiology, University of Warsaw, "Repair of Damage in DNA Molecules Caused by Disintegration of Incorporated ³²P DNA Radiophosphorus Atoms"

George G. Khachatourians, PhD (1971-1973) - University of Tennessee-Oak Ridge

Professor, Department of Applied Microbiology and Food Science, College of Agriculture, University of Saskatchewan, Saskatoon, Canada

PhD (Microbiology), 1971, University of British Columbia, "Pleiotrophic Effect of dnaA Gene on Initiation of DNA Replication and Cell Division in *Escherichia coli*"

Marcel Koopman, PhD (1993-1994) - Washington University

Research and Development Manager-Chiron Corporation, Europe

PhD (Biology), 1992, Utrecht University, The Netherlands, "Characterization of *Serpulina hyodysenteriae* periplasmic flagella and hemolysin.

Wayne B. Lanier, Jr., PhD (1966-1967) - University of Tennessee-Oak Ridge

PhD (Biophysics and Theoretical Biology), 1966, University of Chicago, "Recovery of Alleles of Specific Nutritional Markers in Sexual and Parasexual Crosses in *Aspergillus nidulans* as a Function of the Composition of the Recovery Medium"

In Soo Lee, PhD (2001- 2002) – Washington University

Associate Professor, Depart of Microbiology, Han Nam University, Taejon, South Korea

PhD (Microbiology), 1993 - Han Nam University, Taejon, South Korea - "Distribution of Metal Ion-Tolerant Bacteria in Uranium Ores at Ogcheon Basin and Mechanisms of Detoxification for V₂O₅(V) in *Bacillus cereus* LP40"

Margie D. Lee, DVM, PhD (1990-1992) - Washington University

Professor, Department of Population Health, University of Georgia, Athens, GA

PhD (Microbiology), 1990, University of Georgia, "An Evaluation of the Virulence Relationship of Invasiveness, Endotoxin Release, and Complement Resistance of Avian Strains of *Pasteurella multocida*"

DVM (Veterinary Medicine), 1986, Virginia Maryland Regional College of Veterinary Medicine

Tae Ho Lee, PhD (2001-2002) - Washington University

Professor, Division of Biological Sciences-Microbiology, Pusan National University, Pusan, Korea

PhD (Applied Microbiology), 1980 - Osaka Prefecture University, Osaka, Japan - "Study on the Structure of Red Yeast Cell Wall"

David L. MacLeod, PhD (1991-1993) - Washington University

Senior Scientist, PathoGenesis Corp., Seattle, WA

PhD (Veterinary Microbiology), 1990, University of Guelph, "Shiga-like Toxin II Variant: Purification, Characterization, and Role in Edema Disease"

Francis L. Macrina, PhD (1972-1974) - University of Alabama at Birmingham

Vice President for Research, Virginia Commonwealth University, Richmond, VA

PhD (Molecular Biology), 1972, Syracuse University, "Genetic and Physical Characterization of Stable F'/lac Plasmid"

Gregory G. Mahairas, PhD (1990-1993) - Washington University

Associate Director of Hithroughput Sequencing Center, University of Washington, Seattle, WA

PhD (Immunobiology), 1989, Iowa State University, "Molecular Genetic Approaches to Studying *Mycoplasma pulmonis* Virulence"

John J. Maurer, PhD (1990-1993) - Washington University

Professor, Department of Population, The University of Georgia, Athens, GA

PhD (Microbiology), 1990, University of Texas Health Science Center at San Antonio, "Molecular Analysis of Lipoteichoic Acid from *Streptococcus agalactide*"

Brian Morrow, PhD (1994-1999)

Senior Scientist, Infectious Diseases Drug Discovery, Johnson and Johnson Pharmaceutical Research and Development, San Diego, CA

PhD (Biology) 1994, University of Iowa, Iowa City, Iowa, "Cloning and characterization of two genes regulated with phenotype switching in the pathogene yeast *Candida albicans*"

Sathish Mundayoor, PhD (1986 - 1989) - Washington University

Research Scientist, Biotechnology, Godrej Soaps Ltd., Bombay, India

PhD (Microbiology/Immunology), 1984, All India Institute of Medical Sciences, "The Role of Macrophages in the Maintenance of *M. leprae* and in the Modulation of Immune Responses in Leprosy"

C. K. Krishnan Nair, PhD (1978-1979) - University of Alabama at Birmingham

Professor of Radiation Biology, Amala Cancer Research Centre, Trichur, Kerala

PhD (Biochemistry), 1977, University of Bombay, "Some Aspects of DNA Replication and Repair"

Koji Nakayama, DDS, PhD (1986-1988) - Washington University

Professor, Department of Microbiology, School of Dentistry, Nagasaki University, Nagasaki, Japan

PhD (Microbiology), 1984, Kyushu University, "The Genetic Study of the Mechanism for Thymineless Death in *Escherichia coli*"
DDS (Dentistry), 1977, Kyushu University

Amiya R. Nayak, PhD (1991-1996) - Washington University

Wyeth Lederle Vaccines & Pediatrics, New York

PhD (Immunology) 1989, Utkal University, Orissa, India, "Some Fascinating Problems on the Biochemistry and Immunology of the Mycobacteria"

Warren E. Nesbitt, PhD (1982-1985) - University of Alabama at Birmingham and Washington University

Research Associate, College of Dentistry, University of Florida, Gainesville, FL

PhD (Microbiology and Immunology), 1982, University of Louisville, "Adherence of *Streptococcus sanguis*"

Cheryl A. Nickerson, PhD (1994-1998) - Washington University

Associate Professor, Arizona State University, School of Life Sciences and The **Error! Contact not defined.**, Tempe, AZ

PhD (Microbiology) 1994, Louisiana State University, Baton Rouge, LA, "Role of Curved DNA in Promoter Recognition with *Bacillus subtilis* and *Escherichia coli* RNA Polymerase"

Anjana Raina, PhD (1992-1994) - Washington University

PhD (Molecular Biology) 1991, Jawaharlal Nehru University, New Delhi, India, "Purification of seed storage proteins of *Amaranthus hypochondriacus* and cloning of the gene"

Michael Rozinov, PhD (1990-1991) - Washington University

PhD (Molecular Biology), 1980, Institute for Genetics and Selection of Industrial Microorganisms, "Cloning of the Threonin Operon Genes of *E. coli*"

Shigeno Saito, PhD (1980-1983) - University of Alabama at Birmingham

Assistant Professor, Department of Biochemistry, Nihon University School of Dentistry at Matsudo, Japan

PhD (Biochemistry), 1974, Tohoku University, Sendai, Japan, "Mucopolysaccharides of Rat Ascites Hepatoma Cells"

Federico Sebastiani, PhD (1992-1994) - Washington University

Assistant Professor, Universidad Nacional Agraria La Molina, Facultad de Ciencias, Departamento de Biología
PhD (Plant Biology) 1992, Washington University, St. Louis, MO, "Topological signals for sorting the α subunit of β -conglycinin to seed protein bodies of soybean (*Glycine max*) using yeast as heterologous model system"

Shlomo Sela, PhD (1988-1991) - Washington University

Senior Lecturer, Department of Human Microbiology, Tel-Aviv University, Tel-Aviv, Israel
PhD (Microbiology), 1986, Hebrew University, "Classification of *Eubacteria* at the Level of Genus/Family, Using Highly Conserved Genes"

Xiaoying Shen, PhD (2003-2004) - Washington University

Research Associate, Experimental Surgery, Duke University, Durham, NC
PhD (Comparative Pathology), 2004 - University of California, School of Veterinary Medicine, Davis, CA - "Evaluation of an FIV live-attenuated proviral DNA vaccine in newborn kittens"

Maria L. Smorawinska, PhD (1977-1979) - University of Alabama at Birmingham

Research Associate, Department of Microbiology, University of Warsaw, Poland
PhD (Microbiology), 1976, University of Warsaw

Grace S. Spatafora, PhD (1988-1991) - Washington University

Associate Professor, Department of Biology, Middlebury College, Middlebury, VT
PhD, 1988 - St. Louis University, "Characterization and Expression of Tubulin Genes During the Dimorphic Transitions of the Pathogenic Fungus, *Histoplasma capsulatum*"

Jay Srinivasan, PhD (1991-1996) Washington University

Senior Staff Fellow, Laboratory for Tumor Immunology & Biology, National Cancer Institute, Bethesda, MD
PhD 1991, Life Sciences, Jawaharlal Nehru University, New Delhi, India, "Construction and Development of a Vaccinia Based Recombinant Antirfertility Vaccine"

Christos Stathopoulos, PhD (1996-2000) - Washington University

Assistant Professor, Department of Biology and Biochemistry, University of Houston, Houston, TX
PhD (Biology & Microbiology) 1995, The University of Texas at Austin, "Export, topology, and biotechnological applications of *Escherichia coli* outer membrane proteins". 2001, University of Houston, Department of Biology and Biochemistry, Houston Science Center.

Sidney H. Stein, DMD, MS, PhD (1986-1987) - Washington University

Chair, Associate Professor, Undergraduate Clinic Director, College of Dentistry, Periodontology, The University of Tennessee Health Science Center, Memphis, TN
DMD, 1983, Washington University School of Dental Medicine

Gerald J. Stine, PhD (1963-1966) - Oak Ridge National Laboratories

Park University of North Florida, Jacksonville, FL
PhD (Biology), 1965, University of Delaware

Jin-Wu Sun, (1989-1997) - Washington University

Genome Systems, St. Louis, MO
BS/MS Biochemistry, Beijing University, Beijing, China

Rupinder Tewari, PhD (1989-1991) - Washington University

Professor, Department of Biotechnology, Panjab University, Chandigarh, India
PhD (Microbiology), 1986, London University, "Role of Colicin V Plasmids in the Virulence of *E. coli*"

Krishnan Thankavel, PhD (1993-1994) - Washington University

Depts. of Microbiology and Pathology, Duke University Medical Center, Durham, NC
PhD (Biochemistry), 1989, Annamalai University, India, "Larval development, yolk utilization and effect of starvation on the larval development of the estuarine crab *Thalamita crenata*"

Jelle Thole, PhD (1988-1989) - Washington University

Wageningen University and Research Centre, Animal Sciences Group, Lelystad, Netherlands

PhD (Medicine), 1988, Amsterdam University, "A Major Immunogenic Mycobacterial Antigen: Its Molecular Characterization and its Implication in Adjuvant Arthritis"

Caihong Wang, PhD (2003-2004) -Washington University

Postdoctoral Research Associate, Internal Medicine, Washington University, St. Louis, MO

PhD (Veterinary Pathology and Immunology), 1998 – China Agricultural University, P.R. China – “Immune responses of head-associated lymphoid tissue to eye application of Newcastle disease vaccine in chicken.”

Mary Wilmes-Riesenberg PhD (1991-1998) -Washington University

Monsanto, St. Louis, MO

PhD 1991, Purdue University, West Lafayette, IN, “Investigating the Regulation of Bacterial Alkaline Phosphatase (BAP) synthesis in *phoR* mutants of *Escherichia coli*”

Current Postdoctoral Fellows and Associates:

Keith Ameiss, PhD (2005-Present) – Washington University and Arizona State University

PhD (Poultry Sciences) 2005- Texas A&M University, College Station, TX – “Effects of Cytosine-Phosphate-Guanosine Oligodeoxynucleotides (CpG-ODNs) on Oral Immunization with Protein Antigen or Replicating Parasite”

Shamaila Ashraf, PhD (2006-Present) –Arizona State University

PhD (Avian Virology), 2005 – The Ohio State University, Wooster, OH - “Studies on infectious bursal disease virus”

Chang Ho-Baek, PhD (2003-Present) – Washington University and Arizona State University

PhD (Microbiology), 2003 – Sogang University, Seoul, Korea – “Physiological and genetic analyses of the utilization of the opine, deoxyfructosyl glutamine, as a compound mediating relationships between agrobacterium and plant”

Christine Branger, PhD (2004-Present) – Washington University and Arizona State University

PhD (Biology), 2001 – Nantes University, Nantes, France – “Protection against Leptospirosis: Studies of two genes of interest: *hap1* and *ompL1* encoding for respectively haemolysin and porine.

Yakhya Dieye, PhD (2005-Present) – Arizona State University

PhD (Bacterial Genetics), 2002 – Université Paris 11, Orsay, France – “Targeting of heterologous proteins in lactic acid bacteria: toward the use of *Lactococcus lactis* as delivery vehicle of useful molecules in gut of the host”

Maria Dolores Juarez-Rodriguez, PhD (2003-2005; 2006-Present) – Washington University and Arizona State University

PhD (Biomedical Basic Research) 2002 – Universidad Nacional Autónoma de México, Mexico City, Mexico – “Molecular characterization of the gene coding for the Rv2874 (DipZ) protein and its relationship with the mpt83-mpt70 locus of *Mycobacterium tuberculosis*”

Qingke Kong, PhD (2005-Present) Arizona State University

PhD (Microbiology), 2004 – Nankai University, Tianjin, P.R. China - “Sequence of the *E. coli* O-antigen clusters and identification of sugar biosynthesis genes”

Wei Kong, PhD (2001-Present) – Washington University and Arizona State University

PhD (Microbiology and Molecular Genetics), 2000 - Kyushu University, Fukuoka, Japan - "A novel peroxiredoxin of the plant *Sedum lineare* is a homologue of *Escherichia coli* bacterioferritin co-migratory Protein (Bcp)”

Vjollca Konjufca, PhD (2002-Present) – Washington University and Arizona State University

PhD (Avian Immunology), 2002 – University of Arkansas, Fayetteville, AR – “Modulation of immune system development and function in broilers by dietary vitamin E”

Yuhua Li, MD (2005-Present) – Arizona State University

MD (Internal Medicine), 2001 - First Military Medical University, Guangzhou, P.R. China - “Effects of Ly49A transfected lymphocytes on experimental graft versus host disease post allogeneic bone marrow transplantation”

Melha Mellata, PhD (2003-Present) – Washington University and Arizona State University

PhD (Microbiology and Immunology), 2003 – Université de Montréal Faculté de Médecine Vétérinaire (GREMIP), PQ, Canada – “Role of virulence factors of avian pathogenic *Escherichia coli* in colibacillosis”

Error! Contact not defined., PhD (2005-Present) – Arizona State University

PhD (Molecular and Cellular Biology), 2003 - Arizona State University, Tempe, AZ – “The role of the amino terminus of E3L in vaccinia virus pathogenesis”

Zhaoxing Shi, PhD (2005-Present) – Arizona State University

PhD (Genetics), 2002 – Beijing Institute of Biotechnology, Beijing, P.R. China – “Interaction between HeLa cell ad *Shigella flexneri* 2a”

Wei Sun, PhD (2006-Present) – Arizona State University

PhD (Microbiology and Biochemical Pharmacy), 2004 – Shanghai Institute of Pharmaceutical Industry, Shanghai, P.R. China – “Screening β -lactamase inhibitor with yeast two-hybrid system”

Ascención Torres-Escobar, PhD (2004-2005; 2006-Present) – Washington University and Arizona State University

PhD (Biomedical Basic Research) 2001 - Universidad Nacional Autónoma de México, Mexico City, Mexico – “Molecular characterization of the gene coding the 38 kDa and the *Mycobacterium tuberculosis* regulon *pho* in *Mycobacterium smegmatis*”

Shifeng Wang, PhD (2003-Present) – Washington University and Arizona State University

PhD (Microbiology and Immunology), 2003 – Chinese Academy of Preventive Medicine, Beijing, P.R. China – “Characters of codon usage in viruses and its effect on gene expression”

Wei Xin, PhD (2005-Present) –Arizona State University

PhD (Microbiology and Immunology), 2004 – National Institute for Viral Disease Control and Prevention, Beijing, P.R. China – “Expression of multi-antigen of HIV Bostwana strain in vaccinia virus and immunogenicity study of HIV early-express protein in Mice”

Bereket Zekarias, PhD (2004-Present) – Washington University and Arizona State University

PhD (Animal Pathology), 2003 – Utrecht University, Utrecht, The Netherlands - “Pathogenic factors in susceptibility differences to malabsorption syndrome and amyloid arthropathy in chicken”

Error! Contact not defined., PhD (2006-Present) – Arizona State University

PhD (Microbiology and Immunology), 2005 - National Institute for Viral Disease Control and Prevention, Beijing, P.R. China – “The study of effect of codon bias on the gene expression efficiency in vaccinia virus vector”

GRADUATE STUDENTS:

Former Students

Raul Barletta, Associate Professor, Department of Veterinary Science, University of Nebraska, Lincoln, NE

PhD, 1987 - University of Alabama at Birmingham - "Biochemistry, Genetics, and Role in Virulence of Glucosyltransferase A from *Streptococcus mutans*"

Claire M. Berg (Deceased) Formerly, Professor of Genetics, University of Connecticut, Storrs, CT

PhD 1966, Columbia University, “Replication and Genetic Exchange in the Genome of *Escherichia coli* K-12”
Research conducted in the Biology Division, Oak Ridge National Laboratory, Oak Ridge, TN

Guy A. Cardineau, Research Professor, **Error! Contact not defined.**, Center for Infectious Diseases, Arizona State University, Tempe, AZ

PhD, 1986, University of Alabama at Birmingham, "Characterization of the *Streptococcus mutans* Gene for Aspartate β - semialdehyde Dehydrogenase: Identification of Sequences Involved in Gene Expression and Their Use in Vector Construction"

Raymond G. Fenwick, Jr., Associate Professor of Biochemistry, Dalhousie University, Halifax, Nova Scotia, Canada

PhD, 1973, The University of Tennessee, "Conjugal DNA Replication by *Escherichia coli* K-12"

William R. Jacobs, Jr., Professor, Department of Microbiology and Immunology; Professor, Department of Molecular Genetics, and Investigator, Howard Hughes Medical Institute, Albert Einstein College of Medicine, New York
PhD, 1985, University of Alabama at Birmingham, "Construction and Analyses of Genomic Libraries of *Mycobacterium leprae* DNA"

Randall T. Jones (Deceased)

PhD, 1969, The University of Tennessee, "Genetics of Bacteria *in vivo* as Related to Microbial Ecology"
Research conducted in the Biology Division, Oak Ridge National Laboratory, Oak Ridge, TN

Hank A. Lockman, Principal Research Scientist, Battelle Memorial Institute Research, Columbus, OH

PhD, 1991, Washington University, "Motility and Adherence as *Salmonella typhimurium* Virulence Factors: The Pathogenesis of *fla*, *mot*, and *fim* mutants in murine typhoid fever"

Larry J. Maturin, Supervisory Microbiologist, Center for Food Safety and Applied Nutrition, Summit-Argo, IL

PhD, 1979, University of Alabama at Birmingham, "Role of RNA Synthesis in Conjugational Transfer of Chromosomal and Plasmid DNA"

Anthony T. Maurelli, Professor, Department of Microbiology, Uniformed Services University of the Health Sciences, Bethesda, MD

PhD, 1983, University of Alabama at Birmingham, "Studies on the Genetics of Pathogenicity of *Shigella flexneri* 2a"

Dennis A. Pereira, Principal Research Investigator/Applied Biotechnology, Pfizer Research Center, Groton, CT

PhD, 1979, University of Alabama at Birmingham, "Construction of Safer *Escherichia coli* for Use in Recombinant DNA Experimentation"

Stephen R. Petteway, Jr., Director, Department of Anti-Infectives, Trimeris Inc., Durham, NC

PhD, 1981, University of Alabama at Birmingham, "Cloning and Characterization of Procollagen cDNA"

David Provence, Muetting & Raasch, Minneapolis, MN

PhD, 1994, Washington University, "Environmental Control, Genetic Basis, and Post-Translational Processing of a Hemagglutinin Expressed by Avian Pathogenic *Escherichia coli*"

James P. Robeson, Professor, Instituto de Biologia, Universidad Catolica de Valparaiso, Valparaiso, Chile

PhD, 1981, University of Alabama at Birmingham, "Expression of a *Streptococcus mutans* Glucosyltransferase in *Escherichia coli* K-12"

Kenneth J. Roozen, University of South Carolina

PhD, 1971, The University of Tennessee, "Studies Using Plasmid-Containing Minicells of *Escherichia coli* K-12"

Ronald J. Sheehy, Vice President, Office of Academic Affairs, Lincoln University, Lincoln University, PA

PhD, 1972, The University of Tennessee, "Molecular Studies on *Escherichia coli* and *Salmonella typhimurium* Minicells"

RESEARCH AND TRAINING SUPPORT:

PAST SUPPORT UNIVERSITY OF ALABAMA AT BIRMINGHAM (Only Direct Costs Listed):

NIH/NIDR DE02670 - Institute of Dental Research

Subproject: Extrachromosomal Elements in Streptococci

01	Jun. 1, 1972-May 31, 1973	\$25,000
02	Jun. 1, 1973-May 31, 1974	39,956
03	Jun. 1, 1974-May 31, 1975	36,331
04	Jun. 1, 1975-May 31, 1976	46,496
05	Jun. 1, 1976-May 31, 1977	53,849
06	Jun. 1, 1977-Mar. 29, 1978	44,969

Subproject: Genetic and Biochemical Bases for *S. mutans* Virulence

07	Mar. 30, 1978-Feb. 28, 1979	\$89,192
08	Mar. 1, 1979-Feb. 28, 1980	91,230
09	Mar. 1, 1980-Feb. 28, 1981	91,720
10	Mar. 1, 1981-Feb. 28, 1982	84,593

11	Mar. 1, 1982-Feb. 28, 1983	76,853
12	Mar. 1, 1983-Aug. 31, 1983	26,306

NSF GB-37546 - Mechanisms of Genetic Recombination in *Escherichia coli*

	Mar. 15, 1973-Aug. 31, 1975	\$75,000
	Jun. 1, 1975-Nov. 30, 1977	80,000

NSF GMS-73-06837 - Transmission of Genetic Information in *E. coli*

	Jan. 15, 1978-Jun. 30, 1980	\$82,000
--	-----------------------------	----------

Merck & Co., Inc. #Q-0141 -Population Shifts in the Microbial Flora of the Oral Cavity as Affected by Alexidine

	May 15, 1973-Dec. 15, 1973	\$26,921
--	----------------------------	----------

NIH/NIAID R01 AI11456 - Extrachromosomal Elements in Gram-negative Bacteria

01	Jun. 22, 1973-Apr. 30, 1974	\$27,195
01S	May 1, 1974-Oct. 31, 1974	3,000
02	May 1, 1974-Apr. 30, 1975	22,208
03	May 1, 1975-Apr. 30, 1976	23,318
04	May 1, 1976-Apr. 30, 1977	53,500
05	May 1, 1977-Apr. 30, 1978	40,900
06	May 1, 1978-Apr. 30, 1979	43,492
07	May 1, 1979-Apr. 30, 1980	46,291
08	May 1, 1980-Apr. 30, 1981	49,314

NIH/NIGMS T32 GM 07090 - Molecular, Cellular, and Medical Genetics

01	Jul. 1, 1975-Jun. 30, 1976	\$50,833
02	Jul. 1, 1976-Jun. 30, 1977	53,930
03	Jul. 1, 1977-Jun. 30, 1978	55,105
04	Jul. 1, 1978-Jun. 30, 1979	55,861
05	Jul. 1, 1979-Jun. 30, 1980	56,729
06	Jul. 1, 1980-Jun. 30, 1981	80,552
07	Jul. 1, 1981-Jun. 30, 1982	84,552
08	Jul. 1, 1982-Jun. 30, 1983	74,552
09	Jul. 1, 1983-Jun. 30, 1984	57,405
10	Jul. 1, 1984-Jun. 30, 1985	105,690

NIH/NIGMS T32 GM 07164 - Predoctoral Training in Molecular Cell Biology

01	Jul. 1, 1975-Jun. 30, 1976	\$63,781
02	Jul. 1, 1976-Jun. 30, 1977	59,945
03	Jul. 1, 1977-Jun. 30, 1978	82,190
04	Jul. 1, 1978-Jun. 30, 1979	86,026
05	Jul. 1, 1979-Jun. 30, 1980	86,026

NIH/NIAID N01 AI62508 - Construction of Safer *E. coli* Hosts for Phage and Plasmid Vectors

	Jun. 1, 1976-Dec. 29, 1977	\$178,124
	Dec. 30, 1977-Dec. 29, 1978	129,754

NIH/NIDR N01 DE62491 - Use of Mutants of Cariogenic Streptococci to Prevent Dental Caries

01	Jun. 28, 1976-Jun. 27, 1977	\$18,635
02	Jun. 28, 1977-Jun. 27, 1978	20,399
03	Jun. 28, 1978-Jun. 27, 1979	22,127
03S	Jan. 1, 1980-Mar. 31, 1980	5,649
04	Apr. 1, 1980-Mar. 31, 1981	40,681
05	Apr. 1, 1981-Mar. 31, 1982	32,735

NIH/NIAID T32 AI07041 - Infectious Diseases and Basic Microbiology Training

01	Jul. 1, 1976-Jun. 30, 1977	\$51,233
02	Jul. 1, 1977-Jun. 30, 1978	101,095
03	Jul. 1, 1978-Jun. 30, 1979	101,095
04	Jul. 1, 1979-Jun. 30, 1980	101,095
05	Jul. 1, 1980-Jun. 30, 1981	127,526
06	Jul. 1, 1982-Jun. 30, 1983	98,514
07	Jul. 1, 1983-Jun. 30, 1984	112,659
08	Jul. 1, 1984-Jun. 30, 1985	113,919
09	Jul. 1, 1985-Jun. 30, 1986	115,304
10	Jul. 1, 1986-Jun. 30, 1987	116,828

Damien Foundation - Genetic Analysis of *Mycobacterium leprae*

Jun. 1, 1979-May 31, 1980	\$41,200
---------------------------	----------

WHO ID #790 403 - Genetic Analysis of *Mycobacterium leprae*

Jun. 1, 1980-Jun. 30, 1981	\$54,400
Jun. 1, 1981-May 31, 1982	76,000

WHO ID #790 403 - Genetic Analysis of *Mycobacterium leprae*

Jul. 1, 1982-Jun. 30, 1983	\$73,700
----------------------------	----------

NIH/NIDR R01 DE06432 - Use of Mutants to Study *S. mutans* Pathogenicity

01	Aug. 1, 1982-Jul. 31, 1983	\$143,616
----	----------------------------	-----------

Cystic Fibrosis Foundation - Cystic Fibrosis Research Development Grant for CF Research Center

01	Oct. 1, 1982-Sep. 30, 1983	\$300,000
02	Oct. 1, 1983-Sep. 30, 1984	300,000
03	Oct. 1, 1984-Sep. 30, 1985	300,000
04	Oct. 1, 1985-Sep. 30, 1986	300,000
05	Oct. 1, 1986-Sep. 30, 1987	300,000

PAST SUPPORT WASHINGTON UNIVERSITY (Only Direct Costs Listed):NIH R37-DE06673 - Genetic and Biochemical Bases for *S. mutans* Virulence

01	Aug. 1, 1983-Jul. 31, 1984	\$97,279
02	Aug. 1, 1984-Jul. 31, 1985	103,840
03	Aug. 1, 1985-Jul. 31, 1986	111,274
04	Aug. 1, 1986-Jul. 31, 1987	109,226
05	Aug. 1, 1987-Jul. 31, 1988	126,911
06	Aug. 1, 1988-Jul. 31, 1989	138,203
07	Aug. 1, 1989-Jul. 31, 1990	119,556
08	Aug. 1, 1990-Jul. 31, 1991	117,321
09	Aug. 1, 1991-Jul. 31, 1992	121,179
10	Aug. 1, 1992-Jul. 31, 1993	125,922
11	Aug. 1, 1993-Jul. 31, 1994	134,000
12	Aug. 1, 1994-Jul. 31, 1995	146,649
13	Aug. 1, 1995-Jul. 31, 1996	143,338
14	Aug. 1, 1996-Jul. 31, 1997	148,286
15	Aug. 1, 1997-Jul. 31, 1998	153,433

WHO ID #830 249 - Genetic Analysis of *Mycobacterium leprae*

Jul. 1, 1983-Jul. 31, 1984	\$36,811
Aug. 1, 1984-Jul. 31, 1985	39,500

WHO ID #830 100 - Genetic Analysis of *Mycobacterium leprae*

Jul. 1, 1983-Jun. 30, 1984	\$36,811
Jul. 1, 1984-Jun. 30, 1985	43,289
Sep. 1, 1985-Aug. 31, 1986	20,230

Molecular Engineering Associates, Inc. - Construction of Avirulent Mutants of Gram-negative Enteric Pathogens

01	Aug. 1, 1983-Jul. 31, 1984	\$67,175
02	Aug. 1, 1984-Jul. 31, 1985	98,083
03	Nov. 1, 1985-Oct. 31, 1986	88,733
04	Nov. 1, 1986-Aug. 31, 1987	34,841

NIH R01-DE06801 - Use of Mutants to Study *S. mutans* Pathogenicity

01	Aug. 1, 1983-Jul. 31, 1984	\$140,803
02	Aug. 1, 1984-Jul. 31, 1985	147,056
03	Aug. 1, 1985-Jul. 31, 1986	159,100
04	Aug. 1, 1986-Jul. 31, 1987	141,159
05	Aug. 1, 1987-Jul. 31, 1988	147,725
06	Aug. 1, 1988-Jul. 31, 1989	153,704
07	Aug. 1, 1989-Jul. 31, 1990	155,528

Procter and Gamble - Enhancement of the Secretory Immune System

01	Apr. 1, 1984-Mar. 31, 1985	\$89,903
02	Apr. 1, 1985-Mar. 31, 1986	65,555
03	Apr. 1, 1986-Mar. 31, 1987	67,319
04	Apr. 1, 1987-Mar. 31, 1988	70,733
05	Apr. 1, 1988-Mar. 31, 1989	78,769

NSF PCM 83-16440 - Spectrophotometer Facility for Genetic Research

01	Aug. 1, 1984-Jul. 31, 1985	\$32,000
----	----------------------------	----------

NIH R01-AI21548 - Protective Immunity to Pneumococcal Surface Proteins

(subcontract from UAB; Co-PI with David Briles)

01	Aug. 1, 1984-Jul. 31, 1985	\$32,065
02	Aug. 1, 1985-Jul. 31, 1986	35,945
03	Aug. 1, 1986-Jul. 31, 1987	33,307

NIH S10 RR 02424 - Fermentation Equipment

01	Dec. 1, 1984-Nov. 30, 1986	\$87,065
----	----------------------------	----------

USDA 86-CRSR-2-2854 - Genetic Analysis of Virulence of Avian Respiratory Bacterial Pathogens

Sep. 1, 1986-Aug. 31, 1987	\$30,810
Sep. 1, 1987-Aug. 31, 1988	28,793

Sungene Technologies - Plant Biotechnology Collaborative Research

01	Feb. 16, 1987-Feb. 15, 1988	\$35,762
02	Feb. 16, 1988-Feb. 15, 1989	33,962
03	Feb. 16, 1989-Aug. 15, 1989	18,801

NIH R22 AI26186 - Induction of Immunity to *Mycobacterium leprae* (Co-P.I.)

01	Apr. 1, 1988-Mar. 31, 1989	\$83,444
02	Apr. 1, 1989-Mar. 31, 1990	74,508
03	Apr. 1, 1990-Mar. 31, 1991	88,898

NIH S10 RR04117-01 - Instrumentation for An Integrated DNA Chemistry Facility

01	Apr. 11, 1988-Apr. 10, 1991	\$147,000
----	-----------------------------	-----------

Markey Center Support for an Integrated DNA Chemistry Core Facility

Jun. 1, 1988-May 31, 1990	\$25,000
---------------------------	----------

NSF BSR-8817467 - Workshop on Computerization of Data Bases for Genetic Stock Collections; Toronto, Canada		
01	Aug. 1, 1988-Jan. 31, 1989	\$15,169
NSF DIR-8714254 - Facilities Center for Resource Biotechnology		
01	Aug. 15, 1988-Jan. 31, 1991	\$460,000
USDA 88-34116-3792 - <i>Salmonella</i> Infection, Persistence and Prevention		
	Sep. 1, 1988-Aug. 31, 1989	\$24,587
	Sep. 1, 1989-Aug. 31, 1990	25,571
Center for Plant Science and Biotechnology - Genetically Modified Plants for Use as Oral Immunogens		
	Jan. 1, 1989-Jun. 30, 1989	\$14,306
	Jul. 1, 1989-Jun. 30, 1990	28,110
	Jul. 1, 1990-Jun. 30, 1991	28,400
	Jul. 1, 1991-Jun. 30, 1992	42,201
	Jul. 1, 1992-Jun. 30, 1993	33,592
	Jul. 1, 1993-Jun. 30, 1994	57,007
Agrigenetics - Plant Biotechnology Collaborative Research		
01	Aug. 16, 1989-Feb. 15, 1990	\$18,801
02	Feb. 16, 1990-Feb. 15, 1991	40,884
CONRAD CSA-90-071 - Development of Recombinant Avirulent <i>Salmonella</i> Antifertility Vaccines		
01	Feb. 1, 1990-Jan. 31, 1991	\$13,636
02	Feb. 1, 1991-Jan. 31, 1992	85,150
03	Feb. 1, 1992-Jan. 31, 1993	90,258
CONRAD CSA-94-129 - Development of Recombinant Avirulent <i>Salmonella</i> Antifertility Vaccines		
01	Dec. 1, 1993-Nov. 30, 1994	\$89,619
02	Dec. 1, 1994-Feb. 29, 1996	96,288
NIH R01-AI28487 - Genetic Analysis of <i>Bordetella avium</i> Virulence		
01	Apr. 1, 1990-Mar. 31, 1991	\$117,172
02	Apr. 1, 1991-Mar. 31, 1992	114,299
03	Apr. 1, 1992-Mar. 31, 1993	118,870
04	Apr. 1, 1993-Mar. 31, 1994	123,625
NIH 1S15-GM45467 - Small Instrumentation Grant		
01	Jun. 1, 1990-May 31, 1991	\$39,729
USDA GAM 9001702 - Analysis of <i>Salmonella enteritidis</i> Virulence in Chickens		
	Sep. 1, 1990-Aug. 31, 1991	\$77,936
	Sep. 1, 1991-Aug. 31, 1992	82,064
	Sep. 1, 1992-Aug. 31, 1993	91,617
	Sep. 1, 1993-Aug. 31, 1994	101,366
Bristol-Myers Squibb - Infectious Disease Research		
01	Apr. 1, 1991-Mar. 31, 1992	\$100,000
02	Apr. 1, 1992-Mar. 31, 1993	\$100,000
03	Apr. 1, 1993-Mar. 31, 1994	\$100,000
04	Apr. 1, 1994-Mar. 31, 1995	\$100,000
05	Apr. 1, 1995-Mar. 31, 1996	\$100,000
USDA 9102452 - Molecular Genetic Analysis of <i>Salmonella choleraesuis</i> Pathogenesis		
	Sep. 1, 1991-Aug. 31, 1992	\$77,150
	Sep. 1, 1992-Aug. 31, 1993	81,779

	Sep. 1, 1993-Aug. 31, 1994	86,685
NIH U54 HD29099 - Avirulent <i>Salmonella</i> SP10 Vaccine for Secretary Immunity		
01	Sep. 30, 1991-Sep. 29, 1992	\$ 72,899
02	Sep. 30, 1992-Sep. 29, 1993	73,784
NIH U54 HD29099 - Oral Recombinant <i>Salmonella</i> Antifertility Vaccines Core		
03	Sep. 1, 1993-Aug. 31, 1994	\$119,673
04	Sep. 1, 1994-Aug. 31, 1995	119,673
05	Sep. 1, 1995-Aug. 31, 1996	66,956
05A	Sep. 1, 1996-Feb. 28, 1997	47,256
Rockefeller Foundation Biotechnology Career Fellowship - Construction of a Recombinant Vaccine Strain of <i>Salmonella</i> Expressing Immunogenic and Protective Surface Antigen		
	May 1, 1994-Apr. 30, 1997	\$59,900
NSF BIR-9317842 - Instrumentation for Computer-Based Detection and Imaging of Biological Samples		
	May 1, 1994-Oct. 31, 1996	\$56,673
USDA 94-02102-1091 - Genetic Analysis of Avian <i>E. coli</i> Virulence		
	Sep. 1, 1994-Aug. 31, 1995	\$51,348
	Sep. 1, 1995-Mar. 31, 1997	53,915
	Sep. 15, 1997-Sep. 30, 1998	73,960
	Oct. 1, 1998-Sep. 30, 1999	77,400
	Oct. 1, 1999-Sep. 30, 2000	80,840
NIH R41AI36585 Avirulent <i>Salmonella</i> Host-Vector Human Vaccine Systems		
01	Sep. 1, 1994-Nov. 30, 1995	\$ 76,779
02	May 1, 1997-Apr. 30, 1998	247,014
03	May 1, 1998-Apr. 30, 1999	250,952
USDA 97-35204-4512 - Genetic Analysis of Avian <i>E. coli</i> Virulence		
04	Sep. 15, 1997-Sep. 30, 1998	\$73,960
05	Oct. 1, 1998-Sep. 30, 1999	77,400
06	Oct. 1, 1999-Sep. 30, 2000	80,840
VION Pharmaceuticals, Inc. - Collaborative Research Endeavor		
	Jul. 1, 1997-Jun. 30, 1998	\$50,000
USDA 9702552 - Adhesins for Colonization of Chickens & Their Use in Prevention of Salmonellosis		
01	Oct. 1, 1997-Sep. 30, 1998	\$43,000
02	Oct. 1, 1998-Sep. 30, 1999	44,720
03	Oct. 1, 1999-Sep. 30, 2000	46,400
STTR IR41-AI38599 - Biological Containment of Live Bacterial Vaccines		
01	Sep. 1, 1995-Aug. 31, 1996	\$ 68,838
02	Sep. 15, 1999-Aug. 31, 2000	146,064
03	Sep. 1, 2000-Aug. 31, 2001	147,617
USDA 99-35204-8572 - Attenuated <i>Salmonella</i> Antigen and DNA Vaccine Delivery Vaccines Against <i>Eimeria</i>		
	Sep. 1, 1999-Aug. 31, 2000	\$76,611
	Sep. 1, 2000-Aug. 31, 2002	91,062
USDA 00-35204-9224 Genetic Analysis of Avian <i>E. coli</i> Virulence		
07	Sep. 1, 2000-Aug. 31, 2001	\$73,056
08	Sep. 1, 2001-Aug. 31, 2002	76,100
09	Sep. 1, 2002-Aug. 31, 2003	79,144

USDA 2001-02994 Induction of Cross Protective Immunity to *Salmonella* in Chickens

01	Oct. 1, 2001-Sep. 30, 2002	\$79,326
02	Oct. 1, 2002-Sep. 30, 2003	82,790
03	Oct. 1, 2003-Jun. 15, 2004	

NIH R01-DE06669 - Antigen Delivery System Design for Host Defense Analysis

01	Apr. 1, 1983-Mar. 31, 1984	\$189,524
02	Apr. 1, 1984-Mar. 31, 1985	160,545
03	Apr. 1, 1985-Mar. 31, 1986	203,903
04	Apr. 1, 1986-Mar. 31, 1988	210,309
05	Apr. 1, 1988-Mar. 31, 1989	117,048
06	Apr. 1, 1989-Mar. 31, 1990	105,248
07	Apr. 1, 1990-Mar. 31, 1991	104,004
08	Mar. 1, 1992-Feb. 28, 1993	140,000
09	Mar. 1, 1993-Feb. 28, 1994	135,281
10	Mar. 1, 1994-Feb. 28, 1995	141,237
11	Mar. 1, 1995-Feb. 29, 1996	146,885
12	Mar. 1, 1996-Feb. 28, 1997	152,724
13	May 1, 2000-Apr. 30, 2001	212,500
14	May 1, 2001-Apr. 30, 2002	212,500
15	May 1, 2002-Apr. 30, 2003	212,500
16	May 1, 2003-Apr. 30, 2004	212,500
17	May 1, 2004-Apr. 30, 2005	212,500

PAST SUPPORT—Washington University and Arizona State University (Only Direct Costs Listed)

USDA 03-35204-13748 - Attenuated <i>Salmonella</i> Antigen and DNA Vaccine Delivery Vaccines Against <i>Eimeria</i>	Aug. 1, 2003-Jul. 31, 2006	\$218,800
---	----------------------------	-----------

CURRENT SUPPORT (Only Direct Costs Listed):NIH R01-AI24533 - Molecular Genetic Analysis of *Salmonella* Pathogenicity

01	Apr. 1, 1987-Mar. 31, 1988	\$74,189
02	Apr. 1, 1988-Mar. 31, 1989	65,526
03	Apr. 1, 1989-Mar. 31, 1990	65,865
04	Apr. 1, 1990-Mar. 31, 1991	181,148
05	Apr. 1, 1991-Mar. 31, 1992	191,531
06	Apr. 1, 1992-Mar. 31, 1993	161,563
07	Apr. 1, 1993-Mar. 31, 1994	162,336
08	Apr. 1, 1994-Mar. 31, 1995	163,071
09	Sep. 1, 1996-Mar. 31, 1997	179,378
09	Apr. 1, 1997-Mar. 31, 1998	61,530
10	Apr. 1, 1998-Mar. 31, 1999	159,330
11	Apr. 1, 1999-Mar. 31, 2000	164,110
12	Apr. 1, 2000-Mar. 31, 2001	169,033
13	Jun. 15, 2002-May 31, 2003	250,000
14	Jun. 1, 2003-May 31, 2004	225,000
15	Jun. 1, 2004-May 31, 2005	225,000
16	Jun. 1, 2005-May 31, 2006	225,000
17	Jun. 1, 2006-May 31, 2007	225,000

NIH R01-AI056289 – Recombinant Attenuated *Salmonella* Vaccines for Humans

01	Jul. 1, 2003-Dec. 31, 2003	\$149,337
02	Jan. 1, 2004-Dec. 31, 2004	250,000
03	Jan. 1, 2005-Dec. 31, 2005	250,000
04	Jan. 1, 2006-Dec. 31, 2006	250,000
05	Jan. 1, 2007-Dec. 31, 2007	250,000

Ellison Medical Foundation ID-SS-0520-03

Providing an economic benefit to using a vaccine to enhance food safety and to reduce antibiotic use in agriculture

01	Sept. 1, 2003-Aug. 31, 2004	\$149,976
02	Sept. 1, 2004-Aug. 31, 2005	149,976
03	Sept. 1, 2005-Aug. 31, 2006	149,976
04	Sept. 1, 2006-Aug. 31, 2007	149,976

NIH 1 U01 AI60557 - *S. typhimurium* Vaccine Against Bacterial Enteropathogens

01	Sept. 30, 2003-March 31, 2004	\$152,254
02	April 1, 2004-March 31, 2005	200,918
03	April 1, 2005-March 31, 2006	206,327
04	April 1, 2006-March 31, 2007	211,898
05	April 1, 2007-March 31, 2008	217,636

NIH 1 RO1 AI057885 – Attenuated Live and Recombinant *Yersinia pestis* Vaccines

01	Jan. 1, 2004-Dec. 31, 2004	\$437,263
02	Jan. 1, 2005-Dec. 31, 2005	398,601
03	Jan. 1, 2006-Dec. 31, 2006	409,922
04	Jan. 1, 2007-Dec. 31, 2007	421,582
05	Jan. 1, 2008-Dec. 31, 2008	433,594

BMGF 37863 – A Live Recombinant Attenuated *Salmonella* Anti-Pneumococcal Vaccine for Newborns

01	Jul. 1, 2005-Jun. 30, 2006	\$1,108,518
02	Jul. 1, 2006-Jun. 30, 2007	1,347,594
03	Jul. 1, 2007-Jun. 30, 2008	2,740,951
04	Jul. 1, 2008-Jun. 30, 2009	4,341,943
05	Jul. 1, 2009-Jun. 30, 2010	3,294,722

R01 AI065779 *Salmonella* Anti-Influenza DNA and Antigen Delivery Vaccine

01	Aug. 16, 2005-Jan. 31, 2006	\$201,616
02	Feb. 1, 2006-Jan. 31, 2007	\$486,055
03	Feb. 1, 2007-Jan. 31, 2008	\$494,119
04	Feb. 1, 2008-Jan. 31, 2009	\$502,881