

DONALD SCOTT SCHMID
CURRICULUM VITAE
January 11, 2023

Personal Information

Institution: University of Colorado Boulder
Independent Contract Consultant

Education

September 1969 to December 1974 - B.A., Kent State University, Kent OH
August 1977 to June 1981 - M.S., Arizona State University, Tempe AZ
September 1979 to December 1982 - Ph.D., University of Tennessee, Knoxville TN

Professional Experience

2022-present – Associate Professor Adjoint, University of Colorado Boulder, Boulder, CO.
2022-present – Independent Contract Consultant, Curevo Vaccines, Seattle, WA
2016-2019 – Acting Deputy Chief, Measles Mumps Rubella and Herpesvirus Laboratory Branch, Division of Viral Diseases, Centers for Disease Control and Prevention, Atlanta, GA.
2004-2021 – Leader, Herpesvirus Team and National VZV Laboratory, Measles Mumps Rubella and Herpesvirus Laboratory Branch, Division of Viral Diseases, Centers for Disease Control and Prevention, Atlanta, GA.
2002-2004 – Acting Chief, Herpesvirus Section, Division of Viral and Rickettsial Diseases, Centers for Disease Control and Prevention, Atlanta, GA.
1998-2004 – Chief, National VZV Laboratory, Division of Viral and Rickettsial Diseases, Centers for Disease Control and Prevention, Atlanta, GA.
1989-2002 - Chief, Viral Immunology Section, Viral Exanthems and Herpesvirus Branch, Centers for Disease Control and Prevention, Atlanta, GA.
1987-1989 – Acting Chief, Viral Immunology Section, Viral Exanthems and Herpesviruses Branch, Division of Viral Diseases, Centers for Disease Control and Prevention, Atlanta, GA.
1986-1987 - Staff fellow, Viral Exanthems and Herpesviruses Branch, Division of Viral Diseases, Centers for Disease Control and Prevention, Atlanta, GA.
1985 - Research associate, Department of Pathology, Yale University School of Medicine, New Haven, CT.
1982-1985 - NIH postdoctoral fellow, Department of Pathology, Yale University School of Medicine, New Haven, CT.
1981-1982 - NIH predoctoral trainee, Department of Microbiology, University of Tennessee, Knoxville, TN.
1980-1981 - Research assistant, Department of Microbiology, University of Tennessee, Knoxville, TN.
1979-1980 - Teaching assistant, Department of Microbiology, University of Tennessee, Knoxville, TN.
1979 - Teaching assistant, Department of Microbiology and Botany, Arizona State University, Tempe, AZ.

Professional Affiliations

American Association for the Advancement of Science (1979-1981)
American Association of Immunologists, elected 1986 (1986-2018)
Federation of American Societies for Experimental Biology (1986-2018)
Faculty of 1000

Honors and Awards

NIH predoctoral traineeship, 1981-1982, University of Tennessee
Visiting Student, Johannes Gutenberg Universität, Mainz, West Germany, Sept – Dec 1981
NIH postdoctoral traineeship, 1983-1985, Yale University
DHHS Group Honor Award, 2002
DHHS Honor Award, 2003
DHHS Secretary's Award, 2005
NCIRD Honor Award, 2014
VZV Foundation Lecturer, 2015, 40th International Herpesvirus Workshop, Boise, ID
Plenary Speaker, 2016, 14th Southeastern Regional Virology Conference, Atlanta, GA
Larry J Anderson Award for Outstanding Public Health Service, 2016
Plenary Speaker, 2019, International Herpesvirus Workshop, Knoxville, TN

Editorial Board Member

Archives of Virology (Editor, 2018 to 2019)
Journal of Clinical Virology (Associate Editor, 2006 to 2020)
Journal of Clinical Microbiology (Editorial Board Member, 2000-2002)

Ad hoc reviewer for:

Archives of Virology
British Journal of Medicine and Medical Research
BMC Infectious Diseases
Clinical Infectious Diseases
Clinical and Vaccine Immunology
Emerging Infectious Diseases
Human Vaccines and Immunotherapeutics
Infection Genetics and Evolution
International Journal of Preventive Medicine
Journal of Adolescent Health
Journal of the American Medical Association
Journal of Clinical Investigation
Journal of Clinical Virology
Journal of the European Academy of Dermatology and Venereology
Journal of Immunological Methods
Journal of Immunology
Journal of Infectious Diseases
Journal of Medical Microbiology
Journal of Medical Virology
Journal of the Royal Medical Society
Journal of Virology
Journal of Virological Methods

Microbes and Infection
Nature Communications
Prenatal Diagnosis
Tropical Medicine and International Health
Vaccine
Virology
Virology Journal
Virus Research

Committees

DVRD Secretarial Load Committee (1987)
NCID Education Committee (1990 – 1992, co-established with Joe McDade)
DVRD Chronic Fatigue Syndrome Steering Committee (1991-1993)
Chronic Fatigue Syndrome Working Group (1993-1997)
DVRD Computer Committee (1994-1996)
DVRD Information Resources Management Committee (1996-2000)
CDC Education Committee (1997-2003)
CDC Radiation Safety Committee (2000-2005)
Congenital CMV Working Group (2002-2011)
ACIP Varicella Working Group (2004-2007)
ACIP Shingles Working Group (2004-present)
Smallpox Working Group (2006-2010)
CDC Peer Review Committee (2011-2013)
CDC Education Committee (2013-2018)
International Committee on Taxonomy of Viruses, Herpesvirales Study Group, 2017-2020

Students/Fellows/Visiting Scientists

Anna Krawczynski, Work Study, 1988
Kim Miller, Work Study, 1990-1991
Dr. Luis Figueroa-Jaurez, Mexican National Institute of Health, Visiting Scientist, 1992
Dr. Carole Hickman, Staff Fellow, 1992-1994
Richard Wright (Ferguson Fellow), 1994
Jonathon Stroudmeyer, Ferguson Fellow, 1995
John Rowe, Work Study, 1995
Dr. Theresa Spehar, Postdoctoral Fellow, 1995-1997
Sabiha Dalwei, Institute of Tropical Medicine, London, Visiting International Student, 2000
Marcus Collins, Ferguson Fellow, 2000
Haley Curtis, Work Study, 2000
Julie Lyle, Work Study, 2001
Nicole Hamlin, Work Study, 2001
Stephanie Liffick, Contractor, 2001
Andy Goodman, Work Study, 2001-2002
Shamie Das, Work Study, 2001-2002
Judith Jarvers, Visiting International Student, 2004
Antonio Gonzalez, ORISE Trainee, 2001-2004
Olga Vankova, Visiting Student, 2004-2005
Oksana Morozova, Visiting Student, 2004-2005
John Rolader, ORISE Trainee, 2002-2004

Dr. Jennifer Folster, ASM Postdoctoral Fellow, (FTE) Associate Service Fellow 2002-2004

Dr. Vanda Bostik, ORISE Postdoctoral Fellow, (FTE) Associate Service Fellow, 2004-2009

Dr. Bryan Shelby, ORISE Postdoctoral Fellow, 2008-2010

Andrew Leader, Summer Student, 2011

Ekemini Orok, Visiting GSU student, 2013

Diana Evans, Carter Associates Fellow, 2014

Christopher Lee, Carter Associates Fellow, 2014

Ryan Place, Carter Associates Fellow, 2014

Congrong Miao, Guest Researcher, 2016-2021

Meetings (as organizer/co-organizer)

1990 Biotechnology in Infectious Diseases Conference, Atlanta, CDC

1992 Biotechnology in Infectious Diseases Conference, Atlanta, CDC

2000 VZV DNA Sequence Workshop, Atlanta, CDC

2000 1st VZV Satellite Workshop, International Herpesvirus Workshop, Portland, OR

2001 2nd VZV Satellite Workshop, International Herpesvirus Workshop, Regensburg, Germany

2002 3rd VZV Satellite Workshop, International Herpesvirus Workshop, Cairns, Australia

2003 4th VZV Satellite Workshop, International Herpesvirus Workshop, Madison, WI

2002 Bioterrorism Smallpox Ruleout DFA Training Workshops (10/28, 11/4, & 11/18), Atlanta, CDC

2004 5th VZV Satellite Workshop, International Herpesvirus Workshop, Reno, NV

2005 6th VZV Satellite Workshop, International Herpesvirus Workshop, Turku, Finland

2006 7th VZV Satellite Workshop, International Herpesvirus Workshop, Seattle, Washington

2006 1st VZV Strain Nomenclature Meeting, Seattle, Washington.

2007 8th VZV Satellite Workshop, International Herpesvirus Workshop, Asheville, NC

2007 2nd VZV Strain Nomenclature Meeting, Asheville, NC

2008 3rd VZV Strain Nomenclature Meeting, London, UK

2008 9th VZV Satellite Workshop, International Herpesvirus Workshop, Estoril, Portugal

2009 10th VZV Satellite Workshop, International Herpesvirus Workshop, Ithaca, NY

2010 11th VZV Satellite Workshop, International Herpesvirus Workshop, Salt Lake City, UT

2011 12th VZV Satellite Workshop, International Herpesvirus Workshop, Gdansk, Poland

2011 International Herpesvirus Workshop, Scientific Advisory Committee, Gdansk, Poland

2012 13th Annual VZV Satellite Workshop, International Herpesvirus Workshop, Calgary, Alberta, Canada.

2012 International Herpesvirus Workshop, Scientific Advisory Committee, Calgary, Alberta

2013 14th VZV Satellite Workshop, International Herpesvirus Workshop, Grand Rapids, MI

2014 15th VZV Satellite Workshop, International Herpesvirus Workshop, Kobe, Japan

2015 16th VZV Satellite Workshop, International Herpesvirus Workshop, Boise, ID

2016 17th VZV Satellite Workshop, International Herpesvirus Workshop, Madison, WI

2017 18th VZV Satellite Workshop, International Herpesvirus Workshop, Ghent, Belgium

2018 19th VZV Satellite Workshop, International Herpesvirus Workshop, Vancouver, BC, Canada (July)

2018 NIAID CMV Workshop, Bethesda, MD (September)

2019 Colorado Alphaherpesvirus Latency Symposium, Vail, CO

2019 20th VZV Satellite Workshop, International Herpesvirus Workshop, Knoxville, TN
2021 21st VZV Satellite Workshop (virtual), International Herpesvirus Workshop
2022 22nd VZV Satellite Workshop (virtual), International Herpesvirus Workshop

Public health workshops (invited participant)

NIAID Herpesvirus Vaccine Workshop, Bethesda, MD 1989
Prevention of Genital Herpes Consultant's Meeting, Atlanta, GA 1998
Varicella Surveillance: Current Status and Future Direction, Atlanta, GA 1998
Bioterrorism Preparedness Workshop. Atlanta, Georgia 2002
APHL Annual Meeting. Bioterrorism Preparedness Workshop. San Diego, California 2002
Colloquium on the Varicella Vaccine: A Decade of Prevention and the Way Forward, New York, NY 2005
3rd VZV Strain Nomenclature Meeting, London, England 2008
1st Colorado Alphaherpesvirus Latency Symposium, Session Moderator, Vail, CO 2011
International Encephalitis Colloquium, Atlanta, GA 2012
2nd Colorado Alphaherpesvirus Latency Symposium, Session Moderator, Vail, CO, 2012
4th Colorado Alphaherpesvirus Latency Symposium, Session Moderator, Vail, CO, 2014
5th Colorado Alphaherpesvirus Latency Symposium, Session Moderator, Vail, CO, 2015
6th Colorado Alphaherpesvirus Latency Symposium, Session Moderator, Vail, CO, 2016
7th Colorado Alphaherpesvirus Latency Symposium, Organizing Committee, Session Moderator, Vail, CO, 2017
8th Colorado Alphaherpesvirus Latency Symposium, Organizing Committee, Session Moderator, Vail, CO, 2018
9th Colorado Alphaherpesvirus Latency Symposium, Organizing Committee, Session Moderator, Vail, CO 2019
NIAID Workshop: Cytomegalovirus Infection: Advancing Strategies for Prevention and Treatment, Organizing Committee, Session chair (Diagnostics), Rockville, MD, 2018
ASM Clinical Virology Symposium, Savannah, GA, 2019
44th International Herpesvirus Workshop, Spotlight Speaker (Vaccines), Knoxville, TN, 2019
Herpes Zoster – New Approaches and New Successes, Montreal, Canada, 2019

Competitive intramural grants

Development of strain surveillance methodology for varicella vaccine impact studies; NVPO grant, 2001-2002
Use of multiplex cytokine-based assays for the evaluation of VZV cell-mediated immunity: development of field assay for epidemiologic studies; NVPO, 2002-2003
Determinants of CMV reactivation, reinfection, and host immune response; NVPO, 2002 (co-investigator)
Molecular characterization of variant substrains in the Oka vaccine; NVPO, 2003
Congenital CMV epidemiology and diagnostics development, NVPO, 2004 (co-investigator)
Prevention of congenital cytomegalovirus (CMV) infection and its sequelae; NVPO, 2004 (co-investigator)
Baseline congenital cytomegalovirus (CMV) infection surveillance for assessing effectiveness of future CMV vaccines, NVPO 2005 (co-investigator)

Enhancement of smallpox rule-out varicella testing capacity in the US, Component of a Poxvirus/Herpesvirus collaborative COTPER grant, 2005-2006
Active surveillance for varicella outbreaks ARRA 2009-11
Pilot study of transcriptome analysis of VZV and rubella in human cells infected with vaccine or wild type strains AMD 2016-2017.
Comparison of the immunological responses to Shingrix and Zostavax shingles vaccines. 317 Vaccines for Children program, 2016-2017 (collaboration with M.J. Levin, U. Colo., Denver).

Competitive extramural grants

Georgia Research Alliance Cooperative Research Initiative Grant (collaboration with Ed Mocarski, Emory University). Role of cell-type-specific neutralizing antibodies in control of cytomegalovirus infection (topical area: Next Generation Vaccines), 2008

National Institutes of Health R01 (PI Hung Fu Tseng, Kaiser Foundation Research Institute, California; Co-PIs: D Scott Schmid, CDC, Philip LaRussa, Columbia University). Zoster vaccine and risk factors of zoster and post-herpetic neuralgia. Grant # 1 R01 AI089930-01A1, 2011-2016 (5-year duration)

Courses at CDC (as organizer/lecturer)

General Immunology 1989, 1990 (organizer and lecturer)
Advanced Topics in Immunology 1991 (organizer and lecturer)
Molecular Biology 1997, 1999, 2001 (course coordinator)
Advances in Biotechnology 1999 (course coordinator)
Immunology 2002 (course coordinator)
EIS Training Course 2001-2004 (lecturer)
General Virology 2003, 2004 (lecturer)
Virology 2022, University of Colorado Denver (lecturer)

CDC Publications (as primary author/developer)

The Facts About CFS, 1994
The NCID CFS Home Page, Internet Web Site, on-line since 1997 (VEHB assumed maintenance responsibility in 2003)
Chronic Fatigue Syndrome, 1998
Macacine Herpesvirus 1 (B Virus) Web Site (on-line 2010)
Epstein-Barr Virus Web Site (on-line 2014)

Publications

h-index score: 53
Citations: 10,800

1. **Schmid DS, Larsen HS, Rouse BT.** The role of accessory cells and T cell growth factor in induction of cytotoxic T lymphocytes against herpes simplex virus antigens. *Immunol* 44: 755, 1981.
2. **Rouse BT, Larsen HS, Schmid DS, Miller L.** Induction of cytotoxic T lymphocytes against herpes simplex virus. Helper cells respond to different forms of virus than do

CTL precursors. In *Mechanisms of Lymphocyte Activation*; K Resch and H Kirchner, eds; Elsevier/North Holland, Amsterdam. p. 618, 1981.

3. **Schmid DS, Larsen HS, Rouse BT.** Role of Ia antigen expression and secretory function of accessory cells in the induction of cytotoxic T lymphocytes against herpes simplex virus. *Infect Immun* 37: 1138, 1982.
4. **Schmid DS, Rouse BT.** Cellular interactions in the cytotoxic T lymphocyte response to herpes simplex virus antigens. Differential antigen activation requirements for the helper T lymphocyte and cytotoxic T lymphocyte precursors. *J Immunol* 131: 479, 1983.
5. **Schmid DS, Powell MB, Katherine Mahoney, Ruddle NH.** Comparison of target cell lysis mediated by TNP-specific T cell lines with that mediated by rapidly internalized lymphotoxin-containing supernatant fluids: Evidence of a role for soluble cytotoxic factors in CTL-mediated killing. *Cell Immunol* 93: 68, 1985.
6. **Schmid DS, Tite JP, Ruddle NH.** DNA fragmentation: A manifestation of target cell destruction mediated by cytotoxic T lymphocytes, LT-secreting helper T cell clones, and cell-free LT-containing supernatant fluids. *Proc Natl Acad Sci (USA)* 80: 6361, 1986.
7. **Ruddle NH, McGrath K, James T, Schmid DS.** Purified lymphotoxin (LT) from class I-restricted CTL's and class II-restricted cytolytic helpers induce target cell DNA fragmentation. In *Membrane-mediated Cytotoxicity*; B Bonavida and RJ Collier, eds; Alan R Liss, Inc, New York; p. 379, 1987.
8. **Ruddle NH, Schmid DS.** The role of lymphotoxin in T cell mediated cytotoxicity. *Ann Inst Pasteur (immunol)* 138: 314, 1987.
9. **Schmid DS, Ruddle NH.** Production and function of lymphotoxin secreted by cytolytic T cells. In *Cytolytic Lymphocyte Clones and Complement As Effectors of the Immune System. Vol 2*; ER Podack, ed; CRC Press, West Palm Beach p61, 1988.
10. **Schmid DS, McGrath KM, Hornung R, Paul N, Ruddle NH.** Target cell DNA fragmentation is mediated by the cytokines lymphotoxin and tumor necrosis factor. *Lymphokine Res* 6: 195, 1987.
11. **Schmid DS.** The human MHC-restricted cellular response to herpes simplex virus type 1 (HSV-1) is mediated by CD4+, CD8- T cells and is restricted to the HLA-DR region of the major histocompatibility complex. *J Immunol* 140: 3610, 1988.
12. **Mawle AC, Thieme ML, Ridgeway MR, McDougal JS, Schmid DS.** Inhibition of the in vitro generation of class II-restricted, HSV-1-specific, CD4⁺ CTL by HIV-1. *AIDS Res Human Retroviruses* 6:229, 1990.
13. **McKolanis JR, Abdelsalam HR, Schmid DS.** In vitro enhancement of natural killer cell activity against herpesvirus-infected targets in patients with acute lymphocytic leukemia. *Arch Virol* 117: 17-28, 1990.
14. **Schmid DS, Mawle AC.** Analysis of the human cell-mediated response to herpes simplex virus type 1. *Rev Infect Dis* 13 (Suppl 11): S946-S949, 1991.
15. **Sanchez-Martinez D, Schmid DS, Whittington W, Brown D, Reeves WC, Chatterjee S, Whitley RJ, Pellett PE.** Comparison of tests based on baculovirus-

expressed and immunoaffinity-purified glycoprotein G for detection of herpes simplex virus type-specific antibodies. *J Infect Dis* 164: 1196-1199, 1991.

16. **Wunderli PS, Shaddock JH, Schmid DS, Miller TJ, Baer GM.** The protective role of humoral neutralizing antibody in the NIH potency test for rabies. *Vaccine* 9: 638-642, 1991.

17. **Schmid DS, Rouse BT.** The role of acquired cellular immunity in control of HSV. In: *Current Topics in Microbiology*; v 79; *Immunobiology of Herpes Simplex Virus*. BT Rouse, ed, Springer-Verlag, Berlin, 57-74, 1992.

18. **Lal RB, Rudolph DL, Schmid DS, Lairmore MP.** Concomitant augmentation of CD4⁺CD45RA⁺ suppressor inducer subset in patients infected with human T cell lymphotropic virus types I or II. *Clin Exp Immunol* 87:293-297, 1992.

19. **Schmid DS, Thieme ML, Ridgeway MR, McDougal JS, Mawle AC.** Inhibition of HSV-1-specific cytotoxic T lymphocytes by recombinant-derived gp120 of HIV-1. *Viral Immunology* 5:249-256, 1992.

20. **Mudido P, Marshall GS, Howell RS, Schmid DS, Steger S, Adams G.** Disseminated herpes simplex virus infection during pregnancy: A Case Report. *J Reprod Med* 38:964-968, 1993.

21. **Mawle AC, Reyes M, Schmid DS.** Is chronic fatigue syndrome an infectious disease? *Infect Agents Dis* 2:333-341, 1994.

22. **Davidson M, Schnitzer PG, Bulkow LR, Parkinson AJ, Schloss ML, Fitzgerald MA, Knight JA, Murphy CM, Kiviat NB, Toomey KE, Reeves WC, Schmid DS, Stamm WE.** The prevalence of cervical infection with human papillomaviruses and cervical dysplasia in Alaska native women. *J Infect Dis* 169:792-800, 1994.

23. **Reeves WC, Gary HE Jr, Johnson PR, Icenogle JP, Brenes MM, de Britton RE, Dobbins JG, Schmid DS.** Risk factors for genital papillomavirus infection in populations at high and low risk for cervical cancer. *J Infect Dis* 170:753-758, 1994.

24. **Wagner H-U, Van Dyck EV, Nunn AJ, Kamali A, Schmid DS, Mulder DW.** Seroprevalence and incidence of sexually-transmitted diseases in a rural Ugandan population. *Int. J. STD AIDS* 5: 332-337, 1994.

25. **Rice RJ, Coston WA, Bhoomkar A, Tambe P, Schmid DS, Knapp JS.** Epidemiology and clinical characteristics of pelvic inflammatory disease in public health practice: implications for prevention and treatment. *Am J Pub Health* 85:874-875, 1995.

26. **Mawle AC, Nisenbaum R, Dobbins JG, Gary HE Jr, Stewart JA, Reyes M Steele L, Schmid DS, Reeves WC.** Seroepidemiology of chronic fatigue syndrome: a case-control study. *Clin Infect Dis* 21:1386-1389, 1995.

27. **Joessoef MR, Sumampouw H, Linnan M, Idajadi A, O'Hanley P, Schmid DS, St. Louis M.** Douching and sexually transmitted diseases among pregnant women in Surabaya, Indonesia. *Am J Obst Gyn* 174:115-119, 1996.

28. **Faruque S, Edlin BR, McCoy CB, Word CO, Larsen SA, Schmid DS, Von Bargen JC, Serrano Y.** Crack cocaine smoking and oral sores in three inner-city neighborhoods. *J AIDS Human Retro* 13:87-92, 1996

29. **Reyes M, Dobbins JG, Mawle AC, Steele L, Gary Jr HE, Malani H, Schmid S, Fukuda K, Stewart J, Nisenbaum R, Reeves WC.** Risk factors for chronic fatigue syndrome. *J CFS* 2:17-33, 1996.
30. **Mawle, AC, Nisenbaum R, Dobbins JG, Gary HE Jr, Stewart JA, Reyes M, Steele L, Schmid DS, Reeves WC.** Immune responses associated with chronic fatigue syndrome: a case-control study. *J Infect Dis* 175: 136-141, 1997.
31. **Reyes M, Gary HE Jr, Dobbins JG, Steele L, Randall B, Fukuda K, Holmes GP, Connell DG, Mawle A, Schmid DS, Stewart JA, Schonberger LB, Gunn WJ, Reeves WC.** CFS surveillance in four cities: descriptive epidemiology. *MMWR Surv* 46:1-13, 1997.
32. **Schmid DS, Thieme ML, Gary HE Jr, Reeves WC.** Characterization of T cell responses to herpes simplex virus type 1 (HSV-1) and herpes simplex virus type 2 (HSV-2) using a TNF- β ELISPOT cytokine assay. *Arch Virol* 142: 1659-71, 1997.
33. **Morse SA, Trees DL, Htun Y, Radebe F, Orle KA, Dangor Y, Beck-Sague CM, Schmid S, Fehler G, Weiss JB, Ballard RC.** Comparison of clinical diagnosis, standard laboratory and molecular methods for the diagnosis of genital ulcer disease in Lesotho: association with HIV infection. *J Infect Dis* 175: 583-9, 1997.
34. **Nopkesorn T, Mock PA, Mastro TD, Sangkharomya S, Sweat M, Limpakarnjanarat K; Laosakkitiboran J, Young NL, Morse SA, Schmid S, Weniger BG.** HIV-1 Subtype E Incidence and Sexually Transmitted Diseases in a Cohort of Military Conscripts in Northern Thailand. *J AIDS Human Retro* 18: 372-379, 1998.
35. **Schmid DS.** Role of HHV-8 in Kaposi sarcoma – abstract and commentary. *J Am Med Assoc* 280: 570-571, 1998.
36. **Schmid DS, Brown DR, Nisenbaum R, Burke RL, Alexander D, Ashley R, Pellett PE, Reeves WC.** Limits in the reliability of glycoprotein G-based type-specific serologic assays for herpes simplex virus types 1 and 2. *J Clin Micro* 37: 376-379, 1999.
37. **Limpakarnjanarat K, Mastro TD, Saisorn S, Uthavivoravit W, Kaewkungwal J, Korattana S, Young NL, Morse SA, Schmid S, Weniger BG, Nieburg P.** HIV-1 and other sexually transmitted infections in a cohort of female sex workers in Chiang Rai, Thailand. *Sex Trans Infect* 75: 30-35, 1999.
38. **Dobbins JG, Mastro TD, Nopkesorn T, Limpakarnjanarat K, Weniger B, Schmid DS.** Herpes in the time of AIDS: A comparison of the epidemiology of HSV-2 and HIV-1 in young men in northern Thailand. *Sex Trans Dis* 26: 67-74, 1999.
39. **Codo-Glez CJ, Juarez-Figueroa L, Uribe-Salas F, Hernandez-Nevarez P, Schmid DS, Calderon E, Hernandez-Avila M.** Determination of prevalence of antibodies for herpes simplex virus type 1 and 2 in women with high risk sexual practices. *Int J Epidem* 28: 571-576, 1999.
40. **Arao Y, Schmid DS, Pellett PE, Inoue N.** Herpesviruses beyond HSV-1 and HSV-2. *Clin Micro Newsletter* 21: 153-160, 1999.

41. **Bunnell R, Dahlberg L, Rolfs R, Ransom R, Gershman K, Farshy C, Newhall J, Schmid S, Stone K, St Louis ME.** High prevalence and incidence of STDs in urban adolescent females despite modest risk behaviors. *J Infect Dis* 180: 1624-1631, 1999.
42. **Seward J, Hall S, Galil K, Schmid S, Wharton M.** Varicella. In: *Manual for the Surveillance of Vaccine-Preventable Diseases*, Wharton M, Roush S, eds., U.S. Dept. Health & Human Services, pp. 14-1 – 14-16, 1999.
43. **Chen CY, Ballard RC, Beck-Sague CM, Dangor Y, Radebe F, Schmid S, Weiss JB, Tshabalala V, Fehler G, Htun Y, Morse SA.** Human immunodeficiency virus infection and genital ulcer disease in South Africa: the herpetic connection. *Sex Trans Dis* 27: 21-29, 2000.
44. **Woerne C, Higginbottom G, Judy R, Natl VZV Laboratory, National Immunization Program.** Varicella outbreaks among Mexican adults – Alabama, 2000. *MMWR* 40 (32): 735-736, 2000.
45. **Rouse BT, Daheshia M, Schmid DS.** Herpes simplex virus and the immune response – a balance of power. In: *Effects of Microbes on the Immune System*, Cunningham MW, Fujinami RS, eds, Lippincott-Raven, Publishers, Philadelphia, PA, pp 387-397, 2000.
46. **Loparev VN, Argaw T, Krause PR, Takayama M, Rollin DC, Schmid DS.** Accurate and reliable PCR method for the discrimination of VZV vaccine strain from closely related VZV wild-type isolates. *J Clin Micro* 38: 3156-3160, 2000.
47. **Loparev VN, McCaustland K, Holloway B, Krause PR, Takayama M, Schmid, DS.** Rapid genotyping of varicella-zoster virus vaccine and wild type strains with fluorophore-labelled hybridization probes on the LightCycler. *J Clin Micro* 38: 4315-4319, 2000.
48. **Seward J, Jumaan A, Schmid S.** Varicella vaccine revisited. *Nature Medicine* 6: 1298-1299, 2000.
49. **Galil K, Seward J, Schmid DS.** Transmitting varicella to a gravida. *J Reproductive Med* 45: 861-861, 2000.
50. **Noell J, Rohde P, Ochs L, Yovanoff P, Alter MJ, Schmid S, Black C, Bullard J, Black C.** Incidence and prevalence of chlamydia, herpes, and viral hepatitis in a homeless adolescent population. *Sex Trans Dis* 28: 4-10, 2001.
51. **Schmid DS, Loparev VN.** Varicella-Zoster Virus. In *Manual of Clinical Laboratory Immunology*, 6th Edition, Rose NR, deMacario EC, Folds JD, Lane HC, Nakamura RM, eds, ASM Press, Washington, DC. 611-614, 2001.
52. **Stewart JA, Schmid, DS.** Herpes Simplex Virus. In *Manual of Clinical Laboratory Immunology*, 6th Edition, Rose NR, deMacario EC, Folds JD, Lane HC, Nakamura RM, eds, ASM Press, Washington, DC. 605-610, 2001.

53. **Zhang M, Schmid S, Carrington M, O'Brien T.** Antibodies to varicella-zoster virus in blood donors with genetic variance in CC-chemokine receptor 5. *Lancet* 359: 1034-1036, 2002.
54. **Gottlieb SL, Douglas Jr JM, Schmid DS, Zenilman J, Foster M, Baron AE, Steiner JF, Bolan G, Rhodes F, Rogers J, Peterman TA, Kamb ML.** Seroprevalence and correlates of herpes simplex virus type 2 infection in five sexually transmitted disease clinics. *J Infect Dis* 186: 1381-1389, 2002.
55. **Behrman A, Schmid DS, Crivaro A, Watson B.** A Cluster of Primary Varicella Cases among healthcare workers with False-Positive varicella-zoster virus titers. *Infection Control and Hospital Epidemiology* 24: 202-206, 2003.
56. **Stover CT, Smith DK, Schmid DS, Klein RS, Mayer K, Vlahov D, Schuman P, Cannon MJ, the HIV Epidemiology Research Study Group.** Viral infections in HIV-infected and high-risk uninfected women: prevalence of and risk factors for infection. *J Infect Dis* 187: 1388-1396, 2003.
57. **Wagenaar TR, Grose C, Loparev VN, Schmid DS, Breuer J.** Genomic analysis of varicella zoster virus: primers for individual open reading frames. *J Clin Virol* 28: 104-110, 2003.
58. **Frey CR, Sharp MA, Min AS, Schmid DS, Loparev V, Arvin AM.** Identification of CD8+ T cell epitopes in the immediate early protein 62 of varicella-zoster virus and evaluation of CD8+ T cell responder frequencies to IE62 peptides after varicella immunization. *J Infect Dis* 188: 40-52, 2003.
59. **Bohlke K, Galil K, Jackson LA, Schmid DS, Starkovich P, Loparev VN, Seward J.** Postpartum varicella vaccination: is the vaccine virus excreted in breast milk? *Obstetrics and Gynecology* 102: 970-977, 2003.
60. **Loparev VN, Gonzalez A, Deleon-Carnes M, Tipples G, Fickenscher H, Torfason EG, and Schmid DS.** Three major genotypes of varicella-zoster virus: geographical clustering and strategies for genotyping. *J Virol* 78: 8349-8358, 2004.
61. **Gottlieb SL, Douglas JM, Foster M, Schmid DS, Newman DR, Barón AE, Bolan G, Iatesta M, Malotte CK, Zenilman J, Fishbein M, Peterman TA, Kamb ML, and the Project RESPECT Study Group.** Incidence of herpes simplex virus type 2 infection in five sexually transmitted disease clinics and the effect of HIV/STD risk-reduction counseling. *J Infect Dis* 190: 1059-1067, 2004.
62. **Jumaan A, Schmid S, Gargiullo P, Seward J.** Scientific Commentary. *Vaccine* 22: 3228-3231, 2004.

63. **Sejvar JJ, Yalamanchali C, Schomogyi M, Stevens J, Patel J, Karem K, Fischer M, Kuehnert MJ, Zaki SR, Paddock CD, Guarner J, Shieh W-J, Patton JL, Bernard N, Li Y, Olsen VA, Kline RL, Loparev VN, Schmid DS, Beard B, Regnery RR, Damon IK.** Human monkeypox infection: a family cluster in the Midwestern United States. *J Infect Dis* 190: 1833-1840, 2004.
64. **Danovaro-Holliday MC, Gordon ER, Jumaan A, Woernle C, Schmid DS, Seward J.** Varicella outbreak among adult Mexican poultry plant workers, Alabama, 2000. *Clin Infect Dis* 39: 1633-1639, 2004.
65. **Seward JF, Galil K, Damon I, Norton SA, Rotz L, Schmid S, Harpaz R, Cono J, Marin M, Hutchins S, Chaves SS, and McCauley MM.** Development and experience with an algorithm to evaluate suspected smallpox cases in the United States, 2002-2004. *Clin Infect Dis* 39: 1477-1483, 2004.
66. **Saubrei A, Rubtcova E, Wutzler P, Schmid DS, Loparev VN.** Genetic profile of an Oka vaccine variant isolated from an infant with zoster. *J Clin Micro* 42: 5604-5608, 2004.
67. **Dayan GH, Panero S, Debbag R, Urquiza A, Molina M, Prieto S, Perego MC, Scagliotti G, Galimberti D, Carroli G, Schmid DS, Loparev V, Jumaan A, Seward J.** Varicella seroprevalence and molecular epidemiology of Varicella-Zoster Virus in Argentina, 2002. *J Clin Microbiol* 42: 5698-5704, 2004.
68. **Schmid DS, Rouse BT.** Respiratory Virus Vaccines. In *Mucosal Immunology*, Third Edition, JR McGhee and JF Mestecky, eds, Academic Press, NY, NY. pp. 923-935, 2005.
69. **Isaacson E, Schmid DS, and Glaser C.** Evidence of human herpesvirus 6 infection in 4 immunocompetent patients with encephalitis. *Clin Infect Dis* 40: 890-893, 2005.
70. **Loparev VL, Schmid DS, Sauerbrei A.** Stable and consistent genetic profile of Oka varicella vaccine virus is not linked with appearance of infrequent breakthrough cases postvaccination. *J Clin Micro* 43: 5416-5417, 2005.
71. **Schmid DS, Loparev VN.** Varicella-Zoster Virus. In *Manual of Molecular and Clinical Laboratory Diagnostics*, 7th Edition, Detrick B, Hamilton RG, Fold JD, eds, ASM Press, Washington, DC. 2006, 631-636.
72. **Schmid, DS.** Herpes Simplex Virus. In *Manual of Molecular and Clinical Laboratory Diagnostics*, 7th Edition, Detrick B, Hamilton RG, fold JD, eds, ASM Press, Washington, DC. 2006, pp626-630.
73. **Lopez AS, Guris D, Zimmerman L, Gladden L, Moore T, Haselow DT, Loparev VN, Schmid DS, Jumaan AO, and Snow SL.** One dose of varicella vaccine does not prevent school outbreaks – is it time for a second dose? *Pediatrics* 117: 1070-1077, 2006.

74. **Grossberg R, Harpaz R, Loparev VN, Schmid DS.** Secondary transmission of varicella vaccine virus in a long-term child care facility. *J. Pediatr.* 148: 842-844, 2006.
75. **Sergeev N, Rubtcova E, Chizikov V, Schmid DS, Loparev VN.** New mosaic subgenotype of varicella-zoster virus in the US: VZV detection and genotyping by oligonucleotide microarray. *J Virol. Meth.* 136: 8-16, 2006.
76. **Wang G-Q, Suzutani T, Yamamoto Y, Fukui Y, Nozawa N, Schmid DS, Kurane I, Inoue N.** Generation of a reporter cell line for the detection of varicella-zoster virus and its applications for antiviral studies. *Antimicrob. Agents Chemother.* 50: 3142-3145, 2006.
77. **Norberg P, Liljevist J-Å, Berström T, Sammons S, Schmid DS, Loparev VN.** Complete-genome phylogenetic approach to varicella-zoster virus evolution: Divergence and evidence for recombination. *J Virol* 80: 9569-9576, 2006.
78. **Loparev VN, Rubtcova E, Seward J, Schmid DS, Levin M.** Genetic profile of the Oka vaccine strains causing zoster or post-vaccination rash illness. *J Infect Dis* 195: 502-510, 2007.
79. **D'Angio CT, Boohene PA, Mowrer A, Audet S, Menegus MA, Schmid DS, Beeler JA.** Measles-Mumps-Rubella and Varicella Vaccine Responses in Extremely Premature Infants. *Pediatrics* 119: e574-e579, 2007.
80. **Loparev V, Martro E, Rubtcova E, Rodrigo C, Piette J-C, Caumes E, Vernant J-P, Schmid DS, Fillet A-M.** Toward universal varicella-zoster virus genotyping: diversity of VZV strains from France and Spain. *J Clin Micro* 45: 559-563, 2007.
81. **Marin M, Guris D, Chaves SS, Schmid S, Seward JF.** Prevention of Varicella. Recommendations of the Advisory Committee on Immunization Practices (ACIP). *MMWR* 56:1-40, 2007.
82. **Watson B, Civen R, Reynolds M, heath K, Perella D, Carbajal T, Mascola L, Jumaan A, Zimmerman L, James A, Quashi C, Schmid S.** Validity of self-reported varicella disease history among pregnant women attending prenatal clinics. *Public Health Rep* 122: 499-506, 2007.
83. **Schmid DS, Levin MJ, Loparev VN.** DNA sequence variability in Oka vaccine isolates. Reply to Breuer, et al. *J Infect Dis* 196: 801-3, 2007.
84. **Koskiniemi M, Lappalainen M, Schmid DS, Rubtcova E, Loparev VN.** Molecular epidemiology and seroprevalence of varicella-zoster virus in Finland. *Clin Vacc Immunol* 14: 1057-61, 2007.

85. **Tang Y-W, Allawi HT, Deleon-Carnes M, Li H, Day SP, Schmid DS.** Detection and differentiation of wild-type and vaccine varicella-zoster viruses using an Invader Plus method. *J Clin Virol* 40: 129-34, 2007.
86. **Loparev VN, Rubtcova E, Bostik V, Govil D, Birch CJ, Druce JD, Schmid DS, Crosson MC.** Identification of five major and two minor genotypes of varicella-zoster virus strains: a practical two-amplicon approach used to genotype clinical isolates in Australia and New Zealand. *J Virol* 81: 12758-65, 2007.
87. **Hutchins SS, Sulamana I, Heilpern KL, Schaffner W, Wax G, Lerner EB, Watson B, Baltimore R, Waltenburg RA, Craig AS, Coffin S, Ng G, Behrman A, Meek J, Sherman E, Dos Santos-Chaves S, Harpaz R, Schmid S.** Performance of an algorithm for assessing smallpox risk among patients with rashes that might be confused with smallpox. *Clin Infect Dis* 46: S195-S203, 2008.
88. **Chaves SS, Haber P, Walton K, Schmid DS.** A decade of post-licensure safety data on varicella vaccine: the US experience. *J Infect Dis [suppl 2]* 197: S170-7, 2008.
89. **Breuer J, Schmid DS.** Vaccine Oka variants and sequence variability in vaccine related skin lesions. *J Infect Dis [suppl 2]* 197: S54-7, 2008.
90. **Civen R, Lopez AS, Zhang J, Garcia-Herrera J, Schmid DS, Chaves SS, Mascola L.** Varicella outbreak epidemiology in an active surveillance site, 1995-2005. *J Infect Dis [suppl 2]* 197: S114-9, 2008.
91. **Breuer J, Schmid DS, Gershon AA.** Use and limitations of varicella-zoster virus-specific serological testing to evaluate breakthrough in vaccinees and to screen for susceptibles. *J Infect Dis [Suppl 2]* 197: S147-51, 2008.
92. **Gershon AA, Arvin AM, Levin MJ, Seward JF, Schmid DS.** Varicella vaccine in the United States: a decade of prevention and the way forward. *J Infect Dis [Suppl 2]* 197: S39-40, 2008.
93. **Weinmann S, Chun C, Mullooly JP, Riedlinger K, Houston H, Loparev VN, Schmid DS, Seward JF.** Characteristics of breakthrough varicella in children. *J Infect Dis [suppl 2]* 197: S132-8, 2008.
94. **Parker AA, Reynolds M, Leung J, Anderson M, Rey A, Ortega-Sánchez IR, Schmid DS, Guris D, Gensheimer KF.** Challenges to Implementing Second Dose Varicella Vaccination during an Outbreak in the Absence of a Routine Two-Dose Vaccination Requirement— Maine, 2006. *J Infect Dis [Suppl 2]* 197: S101-7, 2008.
95. **Lopez AS, Burnett-Hartman A, Nambiar R, Ritz L, Owens P, Loparev VN, Guris D, Schmid DS.** Transmission of a newly characterized strain of the varicella-zoster virus from a herpes zoster patient in a long-term care facility, West Virginia, 2004. *J Infect Dis* 197:646-53, 2008.

96. **Cohrs RJ, Mehta SK, Schmid DS, Gilden DH, Pierson DL.** Asymptomatic reactivation and shed of infectious varicella-zoster virus in astronauts. *J Med Virol* 80: 1116-1122, 2008.
97. **Harpaz R, Ortega-Sanchez LR, Seward JF and the ACIP Shingles Working Group.** Prevention of herpes zoster. Recommendations of the Advisory Committee on Immunization Practices (ACIP). *MMWR RR-5 57*: 1-40, 2008.
98. **Levin MJ, DeBiasi RL, Bostik V, Schmid DS.** Herpes Zoster Meningitis Caused by Vaccine Strain Varicella-Zoster Virus. *JID* 198: 1444-7, 2008.
99. **MacNeil A, Reynolds M, Braden Z, Carroll D, Karem K, Smith S, Davidson W, Li Y, Moundeli O, Mombouli J-V, Schmid DS, Regnery R, Damon I.** Transmission of atypical varicella-zoster virus infections involving palm and sole manifestations in a monkeypox endemic area. *Clin Infect Dis* 48: e6-8, 2009.
100. **Young-Barbee C, Hall DA, LoPresti JJ, Schmid S, Gilden D.** Brown-Sequard Syndrome after herpes zoster. *Neurology* 72: 670-1, 2009.
101. **Habib AA, Gilden D, Schmid DS, Safdieh JE.** Varicella zoster virus meningitis with hypoblycorrhachia in the absence of rash in an immunocompetent woman. *J Neurovirology* 15: 206-8, 2009.
102. **MacNeil A, Reynolds MG, Carroll DS, Karem K, Moundeli A, Mombouli J-V, Jumaan AO, Schmid DS, Damon IK.** Monkeypox or varicella? Lessons learned from a rash outbreak investigation in the Republic of Congo. *Am J Trop Med Hygiene* 80: 503-7, 2009.
103. **Loparev VN, Rubtcova EN, Bostik V, Tzaneva V, Sauerbrei A, Robo A, Sattler-Dornbacher E, Hanovcova I, Stepanova V, Splino M, Eremin V, Koskiniemi M, Vankova OE, Schmid DS.** Distribution of varicella-zoster virus (VZV) wild type genotypes in northern and southern Europe: evidence for high conservation of circulating genotypes. *Virology* 383: 216-25, 2009.
104. **Perella D, Fiks AG, Jumaan A, Robinson D, Pletcher J, Forke CM, Schmid DS, Renwick M, Menkodi F, Watson B, Spain CV.** Validity of reported varicella history as a marker for varicella-zoster virus immunity among unvaccinated children, adolescents, and young adults in the post-vaccine-licensure era. *Pediatrics* 123: e820-8, 2009.
105. **Gould PL, Leung J, Scott C, Schmid DS, Deng H, Lopez A, Chavez SS, Reynolds M, Gladden L, Harpaz R, Snow S.** Outbreak of Varicella In Two-Dose Varicella Vaccine Recipients— Arkansas, 2006. *Pediatr Infect Dis J* 28:678-81, 2009.
106. **Rosenthal, LS, Fowler KB, Boppana SB, Britt WJ, Pass RF, Schmid DS, Stagno S, Cannon MJ.** Cytomegalovirus shedding and delayed sensorineural hearing loss:

Results from a longitudinal study of children born with congenital infection. *Ped Infect Dis J* 28:515-20, 2009.

107. **Jumaan A, Schmid DS.** Impact of varicella vaccine on VZV dynamics. *Clin Microbiol Rev* 23: 202-17, 2010.

108. **Breuer J, Grose C, Norberg P, Tipples G, Schmid DS.** A common nomenclature for viral clades that form the species *varicella-zoster virus*: summary of VZV Nomenclature Meeting 2008, Barts and the London School of Medicine and Dentistry, 24-25 July 2008. *J Gen Virol* 91: 821-8, 2010.

109. **Haug A, Mahalingam R, Cohrs R, Schmid DS, Gilden D.** Recurrent polymorphonuclear pleocytosis with increased red blood cells caused by varicella-zoster virus infection of the central nervous system. *J Neurol Sci* 292: 85-8, 2010.

110. **Schmid DS.** VZV vaccine: molecular genetics. *Curr Top Microbiol Immunol* 900: 323-40, 2010.

111. **Leung J, Baughman AL, Schmid DS, Vázquez M, Watson B, Harpaz R.** Evaluation of laboratory methods for diagnosis of varicella. *Clin Infect Dis* 51: 23-32, 2010.

112. **Cannon MJ, Schmid DS, Hyde TB.** Review of cytomegalovirus (CMV) seroprevalence and factors associated with infection. *Rev Med Virol* 20: 202-13, 2010.

113. **Hyde TB, Schmid DS, Cannon MJ.** Review of cytomegalovirus (CMV) seroconversion rates and risk factors and their implications for congenital CMV. *Rev Med Virol* 20: 311-26, 2010.

114. **Leung J, Kudish K, Wang C, Moore L, Gacek P, Radford K, Lopez A, Sosa L, Schmid DS, Cartter M, Bialek S.** Varicella outbreak in a Connecticut residential facility for adults with intellectual disability. *J Infect Dis* 202: 1486-91, 2010.

115. **Reynolds M, Kruszon-Moran D, Jumaan A, Schmid DS, McQuillan GM.** Varicella seroprevalence in the United States: data from the National Health and Nutrition Examination Survey (NHANES), 1999-2004. *Public Health Rep* 125: 860-9, 2010.

116. **Blumenthal D, Shacham-Shmueli E, Bokstein F, Schmid DS, Cohrs R, Nagel M, Mahalingam, Gilden D.** Zoster sine herpete: virological verification by detection of anti-VZV IgG antibody in CSF. *Neurology* 76:484-5, 2011.

117. **Bostiková V, Bostík P, Chlíbek R, Schmid DS, Salavec M, Smetana J, Splino M.** Molecular epidemiology of varicella-zoster virus. *Epidemiol Mikrobiol Imunol* 59:21-4, 2010.

118. **Pahud BA, Glaser CA, Dekker CL, Ann M. Arvin, Schmid DS.** Wild type and vaccine varicella zoster CNS disease: Epidemiological, clinical and laboratory features of varicella zoster CNS disease 10 years after introduction of the varicella vaccine. *J Infect Dis* 203:316-23, 2011.
119. **Salazar R, Russman AN, Nagel MA, Cohrs RJ, Mahalingam M, Schmid DS, Kleinschmidt-DeMasters BK, VanEgmond EM, Gilden D.** VZV Ischemic Optic Neuropathy and Subclinical Temporal Artery Involvement. *Arch Neurol* 68:517-20, 2011.
120. **Folster JM, Jensen NJ, Ruyechan W, Inoue N, Schmid DS.** The Identification and Regulation of the Varicella-Zoster Virus Open Reading Frame 66 Promoter. *Viral Res* 155: 334-42, 2011.
121. **Birlea M, Arendt G, Orhan E, Schmid DS, Bellini WJ, Schmidt C, Gilden D, Cohrs RJ.** Subclinical reactivation of varicella-zoster virus in all stages of HIV infection. *J Neurol Sci* 304:22-4, 2011.
122. **Pierson DL, Mehta SK, Gilden D, Cohrs RJ, Nagel MA, Schmid DS, Tying SK.** Varicella zoster virus DNA at inoculation sites and in saliva after Zostavax immunization. *J Infect Dis* 203:1542-5, 2011.
123. **Chun C, Weinmann S, Reidlinger K, Mullooly JP, Houston H, Schmid DS, Seward JF.** Laboratory characteristics of herpes zoster in vaccinated children. *Ped Infect Dis J* 30:719-21, 2011.
124. **Cannon MJ, Hyde TB, Schmid DS.** Review of frequency and duration of cytomegalovirus (CMV) shedding among infected children. *Rev Med Virol* 21:240-5, 2011.
125. **Quinlivan M, Breuer J, Schmid DS.** Molecular studies of the Oka varicella vaccine. *Exp Rev Vaccine* 10:1321-36, 2011.
126. **Dollard SC, Staras SAS, Amin MM, Schmid DS, Cannon MJ.** National prevalence estimates for cytomegalovirus IgM and IgG avidity and association between high IgM antibody titer and low IgG avidity. *Clin Vacc Immunol* 18:1895-9, 2011.
127. **Stowell JD, Forlin-Passoni D, Din E, Radford K, Brown D, White A, Bate SL, Dollard SC, Bialek SR, Cannon MJ, Schmid DS.** Cytomegalovirus survival on common environmental surfaces: opportunities for viral transmission. *J Infect Dis* 205:211-4, 2012.
128. **Tsai J, Cohrs RJ, Nagel MA, Mahalingam R, Schmid DS, Gilden D.** Reactivation of both type 1 herpes simplex virus and varicella-zoster virus in a patient taking azathioprine who developed acute peripheral facial weakness. *J Neurol Sci J Neurol Sci* 313:193-5, 2012.

129. **Quinlivan M, Jensen NJ, Radford KW, Schmid DS.** Novel genetic variation identified at fixed loci in ORF62 of the Oka varicella vaccine and in a case of vaccine-associated herpes zoster. *J Clin Microbiol* 50:1533-8, 2012.
130. **Kluthe M, Herrera A, Blanca H, Leung J, Bialek SR, Schmid DS.** Transmission of Oka vaccine varicella-zoster virus to an infant from a vaccinated mother in the absence of post-vaccination rash. *Pediatr Infect Dis J* 31:977-9, 2012.
131. **Wolf JS, Nagel MA, Mahalingam R, Cohrs RJ, Schmid DS, Gilden DH.** Chronic active varicella zoster infection. *Neurology* 79:828-9, 2012.
132. **Mahamud A, Leung J, Masunu-Faleafaga Y, Teshale E, Williams R, Dulski T, Garcia P, Schmid DS, Bialek SR.** Varicella-zoster virus in a tropical island: seroprevalence and predictive value of varicella history. *Vaccine* 30:6935-9, 2012
133. **Silver B, Nagel MA, Mahalingam R, Cohrs R, Schmid DS, Gilden D.** Varicella-zoster virus vasculopathy: a treatable form of rapidly progressive multi-infarct dementia after 2 years' duration. *J Neurol Sci* 323:245-7, 2012.
134. **Ibraheem M, Marin M, Leung J, Bryce CH, Schmid DS, Zaki SR, Drew C, Liu L, Smelser C.** Fatal varicella-zoster virus encephalitis without rash in a previously immunized and immunocompetent child. *Pediatr Infect Dis J* 32:183-5, 2013.
135. **Nagel MA, Russman AN, Feit H, Traktinskiy I, Khmeleva N, Schmid DS, Skarf B, Gilden D.** VZV Ischemic optic neuropathy and subclinical temporal artery infection without rash. *Neurology* 80:220-2, 2013.
136. **Behrman A, Lopez AS, Chaves SS, Watson BM, Schmid DS.** Varicella immunity in healthcare workers *J Clin Virol* 57:109-14, 2013.
137. **Lanzieri TM, Dollard SC, Josephson CD, Schmid DS, Bialek SR.** A systematic review and meta-analysis to estimate the rates of breast milk-acquired cytomegalovirus infection and disease in very low birth weight and premature infants in the United States. *Pediatrics* 131:e1937-45, 2013.
138. **Mohanty S, Perella D, Jumaan A, Robinson D, Forke C, Schmid DS, Renwick M, Mankodi F, Watson B, Fiks AG.** Medical record documentation of varicella history as evidence of immunity among unvaccinated children and adolescents in the post-vaccine era. *Human Vaccine Immunother* 9:1735-8, 2013.
139. **Barskey AE, Juieng P, Whitaker BL, Erdman DD, Oberste MS, Chern S-WW, Schmid DS, Radford KW, McNall RJ, Rota PA, Hickman CJ, Bellini WJ, Wallace GS.** Viruses detected among sporadic cases of parotitis, United States, 2009-2011. *J Infect Dis* 208:1979-86, 2013.

140. **Weinmann S, Chun C, Schmid DS, Roberts M, Vandermeer M, Riedlinger K, Bialek S, Marin M.** Incidence and clinical characteristics of herpes zoster among children in the varicella vaccine era, 2005-2009. *J Infect Dis* 208: 1859-68, 2013.
141. **Leung J, Lopez A, Mitchell T, Weinberg M, Lee D, Thieme M, Schmid DS, Bialek SR.** Seroprevalence of varicella-zoster virus in five US-bound refugee populations. *J Immigr Minor Health* Epub ahead of print, Nov 23, 2013.
142. **Venkatesan A, Tunkel AR, Bloch KC, Lauring AS, Sejvar J, Bitnun A, Stahl JP, Mailles A, Drebot M, Rupprecht CE, Yoder J, Cope JR, Wilson MR, Whitley RJ, Sullivan J, Granerod J, Jones C, Eastwood K, Ward KN, Durrheim DN, Solbrig MV, Guo-Dong L, Glaser CA, International Encephalitis Consortium.** Case definitions, diagnostic algorithms, and priorities in encephalitis: consensus statement of the International Encephalitis Consortium. *Clin Infect Dis* 57:1114-28, 2013.
143. **Mahamud A, Leung J, Masanu-Faleafaga Y, Teshale E, Williams R, Dulski T, Thieme M, Garcia P, Schmid DS, Bialek SR.** Varicella-zoster virus in American Samoa: Seroprevalence and predictive value of varicella disease history among elementary and college students. *Epidemiol Infect* 142:1002-7, 2014.
144. **Leung J, Marin M, Siegel S, Pozzouli M, Shulte C, Blog D, Schmid DS, Bialek S.** Fatal varicella due to the vaccine strain varicella-zoster virus. *Human Vaccine Immunother* 10:146-9, 2014.
145. **Depledge DP, Kundu S, Jensen N, Gray ER, Jones M, Steinberg S, Gershon A, Kinchington P, Schmid DS, Balloux F, Nichols R, Breuer J.** Deep sequencing of viral genomes provides insight into the pathogenesis of varicella-zoster virus and its vaccine in humans. *Molec Biol Evol* 31:397-409, 2014.
146. **Sabry A, Huak PJ, Su HC, Stence MD, Nagel MA, Armstrong-Wells J, Curtis DJ, Cohrs RJ, Schmid DS, Gilden D, Gelfand EW.** Vaccine strain varicella-zoster virus induced central nervous system vasculopathy as the presenting feature of DOCK8 deficiency. *J Allergy Clin Immunol* 133:1225-7, 2014.
147. **Stowell JD, Forlin-Passoni D, Radford K, Bate SL, Dollard SC, Bialek SR, Cannon MJ, Schmid DS.** Cytomegalovirus viability, transferability and the effectiveness of common handwashing agents against cytomegalovirus on live human hands *Appl Environ Microbiol* 80:455-61, 2014.
148. **Tseng H-F, Schmid DS, Radford KW, Jensen NJ, Folster J, Rivaller P, Harpaz R, LaRussa P, Jacobsen SJ.** Herpes zoster caused by vaccine strain varicella-zoster virus in an immunocompetent woman vaccinated with zoster vaccine. *Clin Infect Dis* 58:1125-8, 2014.
149. **To TM, Soldatos A, Sheriff H, Schmid DS, Espinosa N, Cosentino G, Preas CP, Glaser CA.** Herpes simplex encephalitis: a 12-year retrospective study on the pediatric

cohort in the California Encephalitis Project. *Pediatric Infect Dis J* Epub ahead of print, June 6, 2014.

150. **Khandelwal P, Marsh R, Schmid DS, Folster J, Radford KW, Davies S, Bleesing J, Jordan MB, Filipovich A.** Vaccine associated varicella zoster infection in an immune compromised patient. *J Clin Virol* 60:81-3, 2014.
151. **Dollard SC, Keyserling H, Radford K, Stowell J, Winter J, Schmid DS, Cannon MJ, Hyde T.** Cytomegalovirus viral and antibody correlates in young children. *BMC Notes* Nov 3;7(1):776, 2014.
152. **Nandhagopal R, Khmeleva N, Jayakrishnan B, White T, George J, Heintzman A, Al-Zeedy K, Rorke-Adamas L, Guijar AR, Schmid DS, Al-Asmi A, Nagel M, Jacob PC, Gilden D.** Varicella zoster virus pneumonitis and brains stem encephalitis without skin rash in an immunocompetent adult. *Open Forum Infect Dis* 1(2):1-4, 2014.
153. **Lopez AS, Lichtenstein M, Schmid DS, Bialek S.** Assessment of varicella surveillance and outbreak control practices – United States, 2012. *Morbidity and Mortality Weekly Report* 63:785-8, 2014.
154. **Leung J, Lopez A, Mitchell T, Weinberg M, Lee D, Thieme M, Schmid DS, Bialek SR.** Seroprevalence of varicella-zoster virus in five US-bound refugee populations. *J Immigr Minor Health* 17:310-3, 2015.
155. **Olsen SJ, Campbell AP, Supawat K, Liamsuwan S, Chotpittayasunon T, Lupthikulthum S, Viriyavejakal A, Tassanee T, Tunlayadechanont S, Visudtibhan A, Vasiknanonte P, Janjindamai S, Boonluksiri P, Rajborirug K Watanaveeradej V, Kjetsuriani N, Dowell SF, and the Thailand Encephalitis Surveillance Team.** Infectious causes and clinical features of encephalitis in Thailand. *Emerg Infect Dis* 21:280-9, 2015.
156. **Laing KJ, Russell RM, Dong L, Schmid DS, Stern M, Amalia M, has J, Davies DH, Johnson C, Wald A, Koelle DM.** Zoster vaccination increases the breadth of CD4+ T cells responsive to varicella-zoster virus. *J Infect Dis* 212:1022-31, 2015. Doi: 10.1093/ingdis/jiv164.
157. **Cannon MJ, Stowell JD, Clark R, Dollard P, Johnson D, Mask K, Stover C, Wu K, Amin A, Hendley W, Schmid DS, Dollard SC.** Repeated measures of weekly and daily cytomegalovirus shedding patterns in urine and saliva of healthy CMV-positive children. *BMC Infect Dis* 14:569, 2014.
158. **Lebo EJ, Kruszon-Moran DM, Marin M, Bellini WJ, Schmid S, Bialek SR, Wallace GS, McLean HQ.** Seroprevalence of measles, mumps, rubella and varicella antibodies in the United States population, 2009-2010. *Open Forum Infect Dis* 2:ofv006, 2015.

159. **Schmid DS**. Herpes B. 2016 Yellow Book. GW Brunette, ed., Oxford University Press, New York, NY, p 155-6 2016.
160. **Schmid DS**. Herpes Simplex Virus. In *Manual of Molecular and Clinical Laboratory Immunology*, Richard Hodinka, ed., 8th edition, ASM Press. (in press).
161. **Schmid DS**. Varicella-Zoster Virus. In *Manual of Molecular and Clinical Laboratory Immunology*, Richard Hodinka, ed., 8th edition, ASM Press.
162. **Smith C, Dutmer C, Schmid DS, Dishop MK, Bellini WJ, Gelfand E, Asturias EJ**. A toddler with rash, encephalopathy and hemolytic anemia. *J Pediatr Infect Dis Soc* 4:376-80, 2015.
163. **Dutmer CM, Asturias EJ, Smith C, Dishop MK, Schmid DS, Bellini WJ, Tirosh I, Lee YN, Nortarangelo L, Gelfand EW**. Late onset hypomorphic RAG2 deficiency presentation with fatal vaccine-strain VZV infection. *J Clin Immunol* 35:754-60, 2015.
164. **Purswani MU, Karalius B, Schmid DS, Burchett S, Siberry G, Patel K, Van Dyke RB, Yogev R**. Predictors of humoral responses to the varicella vaccine in children and youth with perinatal HIV-1 infection. *Clin Infect Dis* 62:106-14, 2016.
165. **Schmid DS**. Boosting immunity in recipients of live-attenuated zoster vaccine.[Editorial]. *J Infect Dis* 213:1-2, 2016.
166. **Levin MJ, Schmid DS, Weinberg A**. Herpes Simplex Virus and Varicella-Zoster Virus. In: *Diagnostic Microbiology for Immunocompromised Hosts*. *Microbiol Spectr* 4:1-20, 2016.
167. **Perella D, Wang C, Civen R, Viner K, Kuguru K, Daskalaki I, Schmid DS, Lopez AS, Tseng HF, Newbern EC, Mascola L, Bialek SR**. Varicella vaccine effectiveness in preventing community transmission among children and adolescents from the active surveillance project areas in the 2-dose era. *Pediatrics* 137:e20152802, 2016.
168. **Sejvar JJ, Lopez A, Leshem E, Cortese M, Pastula D, Miller L, Kambhampati A, Shioda K, Aliabadi N, Erdman D, Fischer M, Gregoricus N, Lanciotti R, Nix A, Schmid DS, Seward J, Tong S, Oberste S, Pallansch M, Felkin D**. Acute flaccid myelitis in the United States – August – December 2014. Results of nationwide surveillance. *Clin Infect Dis* 63:737-45, 2016.
169. **Shaw J, Halsey N, Weinberg A, Schmid DS, St George K, Weldon WC, Jordan M, Bryant P, LaRussa P, Bradshaw DY, Harrington T, Gershon A**. Arm paralysis after childhood vaccinations: application of advanced molecular methods to the causality assessment of an adverse event following immunization (AEFI). *J Ped Infect Dis Soc* 6:e161-4, 2017.

170. **Schmid DS**. Herpes B. The Yellow Book: CDC Health Information for International Travel, Oxford University Press.

171. **Schmid DS**. Varicella-zoster virus and Herpes Simplex Virus. *In: Control of Communicable Diseases Manual Lab*; R Ewers, ed., Association of Public Health Laboratories, 2017.

172. **Schmid DS, Chapman LE, Cohen JI**. Herpes B Virus. *Br Med J Best Prac*, Dec 2016. <http://bestpractice.bmj.com/best-practice/monograph/1608.html>.

173. **Onyango CO, Loparev V, Lidechi S, Bhullar V, Posey J, Schmid S, Radford K, Lo M, Meyer L, Schmink SE, Rota P, Johnson BW, Munoz J, Beall B, Carvalho MG, Oneko M, Burton D, Pohl J, Black C, Neatherlin J, Montgomery J, Fields B**. Evaluation of TaqMan Array Card (TAC) for the detection of central nervous system infections in Kenya. *J Clin Microbiol* 55:2035-44, 2017.

174. **Tseng HF, Chi M, Hung P, Harpaz R, Schmid DS, LaRussa P, Sy LS, Luo Y, Holmquist K, Takhar H, Jacobsen SJ**. Family history of zoster and risk of developing herpes zoster. *Int J Infect Dis* 66:99-106, 2018.

175. **Jensen NJ, Rivaller P, Tseng HF, Radford K, Folster J, Harpaz, R, LaRussa PS, Jacobsen SJ, and Schmid DS**. Revisiting the genotyping scheme for varicella-zoster virus strains based on whole genome comparisons. *J Gen Virol* 98:1434-8, 2017.

176. **Dollard SC, Douglas D, Basavaraju V, Schmid DS, Kuehnert M, Aqel B**. Donor derived Kaposi's sarcoma in a liver-kidney transplant recipient. *Am J Transplant* 18:510-13, 2018.

177. **Schmid DS, Downes F**. Diseases of the family Herpesviridae. *Control of Communicable Diseases Manual*. Wilcke B, ed., APHA Press, Washington, DC (in press).

178. **Amin MM, Stowell JD, Hendley W, Garcia P, Schmid DS, Cannon MJ, Dollard SC**. CMV on surfaces in homes with young children: results of PCR and viral culture testing. *BMC Infect Dis* 18:391, 2019.

179. **Leung J, McCollum AM, Radford K, Hughes C, Lopez AS, Guagliardo SAJ, Nguete B, Likafi T, Kabamba J, Malekani J, Shongo Lushima R, Pukuta E, Karhemere S, Muyembe Tamfum JJ, Reynolds MG, Wemakoy Okitolonda E, Schmid DS, Marin M**. Varicella in Tsuapa Province, Democratic Republic of Congo, 2009-2014. *Trop Med Int Health* 24:839-48, 2019.

180. **Bruxvoort KJ, Liang AS, Harpaz R, Qian L, Sy S, LaRussa P, Schmid DS, Luo Y, Takhar H, Tseng HF**. Patient report of herpes zoster pain: incremental benefits of zoster vaccine live. *Vaccine* 37:3478-84, 2019.

181. **Bastos MS, Folster J, Alvarenga OP, Sampaio DA, Rabelo RMP, João GAP, Schmid DS.** Genotypes of clinical varicella-zoster virus isolates from Manaus, Brazil. *52:e20180166*, 2019.
182. **Harrington WE, Mato S, Burroughs L, Carpenter PA, Gershon A, Schmid DS, Englund J.** Vaccine Oka varicella meningitis in two adolescents. *Pediatrics* 144:e20191522, 2019.
183. **Schmid DS.** Mixing it up: new insights into interspecies recombination between herpes simplex virus type 1 and 2. *J Infect Dis* 221:1208-9, 2020.
184. **Jensen NJ, Depledge DP, Ng TFF, Quinlivan M, Radford KW, Tseng HF, LaRussa P, Jacobsen S, Breuer J, Schmid DS.** Analysis of the reiteration (R1 to R5) regions of varicella-zoster virus. *Virology* 546:38-50, 2020.
185. **Razonable R, Inoue N, Pinninti SG, Boppana SB, Lazzarotto T, Gabrielli L, Simonazzi G, Pellett PE, Schmid DS.** Clinical diagnostic testing for human cytomegalovirus infections. *J Infect Dis* 221 (Suppl 1):574-85, 2020.
186. **Harbecke R, Jensen, NJ, Depledge DP, Johnson GR, Ashbaugh ME, Schmid DS, Breuer J, Levin M, Oxman MN, and the Shingles Prevention Study Group.** Recurrent zoster in the Shingles Prevention Study: are second episodes due to the same varicella-zoster virus strain? *Vaccine* 38:150-7, 2020.
187. **Wu AC, Rekant SI, Baca ER, Jenkins RM, Perelygina LM, Hilliard JK, Schmid DS, Leman RF.** Monkey bite in a public park and possible exposure to herpes B virus (macacine alphaherpesvirus 1) – Thailand, 2018 *MMWR* 69:247-8, 2020.
188. **Eberhardt CS, Wieland A, Nasti TH, Grifoni A, Wilson E, Schmid DS, Pulendran B, Sette A, Waller EK, Roupheal N, Ahmed R.** Persistence of varicella zoster virus specific plasma cells in adult human bone marrow following childhood VZV vaccination. *J Virol* 94:e02127-19, 2020.
189. **Babuk AN, Beseler C, Como CN, Coughlan CM, Johnson NR, Hassell JE, Burnet AM, Mescher T, Schmid DS, Coleman C, Mahalingham R, Cohrs RJ, Boyd TD, Potter H, Shilleh AH, Russ HA, Nagel MA.** Amylin, A β 42, and amyloid in VZV vasculopathy cerebrospinal fluid and infected vascular cells. *J Infect Dis* 223:1284-1294, 2020;Epub ahead of print doi: 10.1092/infdis/jiaa513.
190. **Schmid DS, Miao C, Johnson M, Weinberg A, Levin MJ.** Comparative antibody responses to the live-attenuated and recombinant herpes zoster vaccines. *J Virol* 2021;95:e00240-21, 2021. Doi: 10.1128/JVI.00240-21.
191. **Hughes CM, Liu L, Davidson WB, Radford KW, Wilkins K, Monroe B, Metcalfe MG, Likafi T, Lushima SR, Kabamba M, Nguete B, Malekani J, Pukuta E, Karhemere S, Tamfun J-JM, Wemakoy EO, Reynolds MG, Schmid DS, McCollum**

AM. A tale of two viruses: Coinfections of monkeypox and varicella zoster virus in the Democratic Republic of Congo. *Am J Trop Med Hyg* 104:604-11, 2021. [Soi: 10.4269/ajtmh.20-0589](https://doi.org/10.4269/ajtmh.20-0589).

192. **L’Huillier AG, Hirzel C, Ferreira VH, Ierullo M, Ku T, Selzner N, Schiff J, Juvet S, Miao C, Schmid DS, Humar A, Kumar D.** Evaluation of recombinant herpes zoster vaccine for primary immunization of seronegative transplant recipients. *Transplantation* 105:2316-23. 2021. [Doi: 10.1097/TP.0000000000003621](https://doi.org/10.1097/TP.0000000000003621).

193. **Whitehouse ER, Bonwitt J, Hughes CM, Lushima RS, Likafi T, Nguete B, Kabamba J, Monroe B, Doty JB, Nakazawa Y, Damon I, Malekani J, Davidson W, Wilkins K, Li Y, Radford KW, Schmid DS, Pukuta E, Muyamuna S, Tamfun J-JM, Okitolonda EW, McCollum A, Reynolds MG.** Clinical and epidemiological findings from enhanced monkeypox surveillance in Tshuapa Province, Democratic Republic of the Congo during 2011-2015. *J Infect Dis* 223:1870-8, 2021. [Doi: 10.1093/infdis/jiab133](https://doi.org/10.1093/infdis/jiab133).

194. **Hirzil C, L’Huillier AGL, Ferreira VH, Marinelli T, Ku T, Ierullo M, Miao C, Schmid DS, Juvet S, Humar A, Kumar D.** Safety and immunogenicity of adjuvanted recombinant subunit herpes zoster vaccine in lung transplant recipients. *Am J Transplant* 21:2246-53, 2021. [Doi: 10.1111/ajt.16531](https://doi.org/10.1111/ajt.16531).

195. **Marin M, Leung J, Lopez AS, Shepersky L, Schmid DS, Gershon AA.** Communicability of varicella before rash onset: a literature review. *Epidemiol Infect* 149:e131, 2021. [doi: 10.1017/S0950268821001102](https://doi.org/10.1017/S0950268821001102).

196. **Gatherer D, Depledge DP, Hartley CA, Szpara MI, Vzz PK, Benkó, Brandt CR, Bryant NA, Dasjerdi A, Doszpoly A, Gompels UA, Inoue N, Jarosinski KW, Kaul R, LaCoste V, Norberg P, Origgi FC, Orton RJ, Pellett PE, Schmid DS, Spatz SJ, Stewart JP, Trimpert J, Waltzek TB, Davison AJ.** ICTV Virus Taxonomy Profile: *Herpesviridae* 2021. *J Gen Virol* 102:001673, 2021. [doi: 10.1099/jgv.0.001673](https://doi.org/10.1099/jgv.0.001673).

197. **Muchtar E, Koehler AB, Johnson MJ, Rabe KG, Ding W, Call TG, Leis JF, Kenderian SS, Hayman SR, Wang Y, Hampel PJ, Holets MA, Darby HC, Slager SL, Kay NE, Miao C, Canniff J, Whitaker JA, Levin MJ, Schmid DS, Kennedy RB, Weinberg A, Parikh SA.** Humoral and cellular immune responses to recombinant herpes zoster vaccine in patients with chronic lymphocytic leukemia and monoclonal B cell lymphocytosis *Am J Hematol* 97:90-98, 2022. [doi: 10.1002/ajh.26388](https://doi.org/10.1002/ajh.26388)

198. **Rouse T, Schmid DS.** Fraternal twins: The enigmatic role of the immune system in alphaherpesvirus pathogenesis and latency and its impacts on vaccine efficacy. *Viruses* 14:862, 2022. [Doi: 10.3390/v14050862](https://doi.org/10.3390/v14050862).

199. **Bakradze E, Esenwa CC, Schmid DS, Kirchoff-Torres F, Antonello D, Mabie PC, Labovitz DL, Miao C, Liberman AL.** Cross-sectional retrospective study to identify clinical and radiographic features associated with VZV reactivation in

cryptogenic stroke patients with CSF testing. *Neurohospitalist* 12:437-443, 2022
Doi:10.1177/19418733221075123.

200. **Laing KJ, Ouwendijk WJD, Campbell VL, McClurkan CL, Mortazavi S, Waters ME, Krist MP, Tu R, Nguyen N, Basu K, Miao C, Schmid DS, Johnston C, Verjans GMGM, Koelle DM.** Selective retention of virus-specific tissue resident T cells in healed skin after recovery from herpes zoster. *Nature Comm* 13:6957, 2022
doi.org/10.1038/s41467-022-34698-4.

201. **Sehrawat S, Osterrieder N, Schmid DS, Rouse BT.** Can the triumph of mRNA vaccines against COVID-19 be extended to other viral infections of humans and domesticated animals? *Microbes Infect* 25 (1-2):105078, 2023. Doi: 10.1016/j.micinf.2022.105078.

In preparation:

202. **Weinberg A, Jessica Leung, Johnson M, Miao C, Schmid DS, Levin MJ.** Factors associated with the persistence of antibody responses to zoster vaccines. (in preparation).

203. **Schmid DS, Marin M, Gershon A, LaRussa P, Yockey B.** Comparison of 11 commercial varicella-zoster virus serologic methods and CDC in-house whole cell ELISA with VZV gpELISA (in preparation).

204. **Perella D, Watson B, Spain CV, Bialek S, Daskalaki I, Heath K, Robinson D, Newbern EC, Schmid DS.** Laboratory testing and clinical case definitions to confirm breakthrough varicella in children aged 1-14 years (in preparation).