

UNIVERSITY OF COLORADO SCHOOL OF MEDICINE

CURRICULUM VITAE

MARIA ACENA NAGEL

Associate Professor
Department of Neurology
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Education

1991 B.A., University of Chicago, Chicago, IL
2002 M.D., University of Illinois at Urbana-Champaign, Urbana, IL
2002-2003 Internship, Medicine, University of Colorado School of Medicine (SOM),
Denver, CO
2003-2006 Residency, Neurology, University of Colorado SOM, Denver, CO
2006-2009 Postdoctoral NIH Fellowship (Neurovirology), Instructor, University of Colorado
SOM, Denver, CO

Academic Appointments

2009-2015 Assistant Professor, Department of Neurology, University of Colorado SOM,
Denver, CO
2015-present Associate Professor, Department of Neurology, University of Colorado SOM,
Denver, CO
2017-present Associate Professor, Department of Ophthalmology, University of Colorado
SOM, Denver, CO

Hospital, Government or Other Professional Positions

2009-2015 Assistant Professor, Department of Neurology, University of Colorado SOM,
Denver, CO
2015-present Associate Professor, Department of Neurology, University of Colorado SOM,
Denver, CO
2017-present Associate Professor, Department of Ophthalmology, University of Colorado
SOM, Denver, CO

Honors, Special Recognitions and Awards

1987-1991 University of Chicago Scholar, Chicago, IL
1987-1991 George M. Pullman Educational Foundation Scholar, Chicago, IL
1991 Sigma Xi Award for Excellence in Science, University of Chicago, Chicago, IL
1991 Special Honors in Biological Sciences, University of Chicago, Chicago, IL
1993, 1998 Outstanding Teaching Award, Biochemistry, University of Illinois, Urbana, IL
2001 Johnson Endowment Fellowship, Medical Scholars Program, University of
Illinois, Urbana, IL
2006 Award for Most Outstanding Research by a Neurology Resident, Neurology,
University of Colorado SOM, Denver, CO
2006 MBA Oldstone Pioneer Lectureship Award for an Investigator in Training,
International Society for Neurovirology

2011 Grateful Patient and Family Award, University of Colorado Hospital, Denver
2013 Fellow (elected), American Neurological Association
2018 Induction into the Hall of Fame, Bloom Trail High School, Chicago Heights, IL

Membership in Professional Organizations

American Academy of Neurology
American Heart Association
American Neurological Association
American Society of Microbiology
International Society for NeuroVirology
Rocky Mountain Virology Club
Royal Society of Medicine

Major Committee and Service Responsibilities

2010-2014 Admissions Committee, Medical School, University of Colorado SOM
2010-2014 Mentor, NIH LABCOATS Program, University of Colorado SOM
2012-present Neurology Grand Round Committee, University of Colorado SOM
2012-present Mentor, Denver STARS Program, Office of Inclusion and Outreach, University of Colorado SOM
2013-present Co-organizer, Odyssey Elementary School Health Visit Day, Office of Inclusion and Outreach, University of Colorado SOM
2015 Founder, Young Entrepreneurs Club, Odyssey Elementary School, Denver, CO
2016-present Data Safety Monitoring Committee Member, Zoster in Eye Disease Multi-Center Clinical Trial, National Eye Institute
2016-present Editorial Board, Journal of Neurovirology
2017-present Vice President, Colorado Alpha herpesvirus Latency Society
2018 Panel Chair, CNS Herpes Infections Panel, American Academy of Neurology, Los Angeles, CA
2018 Session Chair, Keynote & Symposium VI: Immunity & Pathogenesis, International Herpesvirus Workshop, Vancouver, British Columbia

Licensure and Board Certification

2006-present State of Colorado

Inventions, Intellectual Property and Patents Held or Pending

P2Y12 Antagonist for Treatment of Viral Infections, provisional patent
Neurokinin-1 Receptor (NK-1R) Antagonists Prevent Spread of Varicella Zoster Virus (VZV) Infection

Review and Referee Work

Ad hoc reviewer for journals: Archives of Medical Research, BMC Infectious Diseases, International Journal of STD & AIDS, Journal of Medical Virology, Journal of Neuroimmunology, Journal of Neurosciences in Rural Practice, Neurology, PLOS ONE, and The Journal of Infectious Diseases
Ad hoc reviewer for the Medical Research Council (U.K.)
Ad hoc reviewer for the Wellcome Trust (U.K.)
Ad hoc reviewer for Clinical Research and Development Committee (University College of London)
Ad hoc reviewer for the National Eye Institute
Editorial Board, Journal of NeuroVirology

Invited Extramural Lectures, Presentations, Visiting Professorships, and Major Presentations to Medical and Undergraduate Students and House Officers

- 2008 "VZV transcription in latently-infected human ganglia", International Herpes Virus Workshop, Estoril, Portugal
- 2010 "Varicella zoster virus vasculopathy: pathological and immunological analysis of virus-infected arteries", International Herpesvirus Workshop, Salt Lake City, UT
- 2010 "VZV transcription in latently-infected human ganglia", International Herpesvirus Workshop, Salt Lake City, UT
- 2010 "Varicella zoster virus vasculopathy", Grand Rounds, Neurology, National Jewish Medical Center, Denver, CO
- 2011 "Neurological complications of varicella zoster virus", Grand Rounds, Infectious Disease, National Jewish Medical Center, Denver, CO
- 2011 "Neurological complications of varicella zoster virus" and "Diagnosis of VZV vasculopathy", 100th Anniversary of the Dutch Microbiology Society, Arnhem, The Netherlands
- 2012 "VZV pain – it's all the same", Grand Rounds, Neurology, University of Colorado SOM, Denver, CO
- 2012 "VZV and ischemic optic neuropathy", Grand Rounds, Ophthalmology, University of Colorado SOM, Denver, CO
- 2012 "Purinergic signaling and matrix metalloproteases in VZV vasculopathy", Infectious Disease Research Seminar, University of Colorado SOM, Denver, CO
- 2012 "VZV Vasculopathy", International Stroke Conference, New Orleans, LA
- 2012 "Purinergic signaling in VZV vasculopathy", Colorado Alphaherpesvirus Latency Symposium, Vail CO
- 2013 "Purinergic signaling in VZV-infected brain vascular adventitial fibroblasts", International Herpesvirus Workshop, Grand Rapids, MI
- 2013 "Neurological complications of varicella zoster virus", Grand Rounds, Rose Medical Center, Denver, CO
- 2013 "Shingles and postherpetic neuralgia", Grand Rounds, Geriatrics, University of Colorado SOM, Denver, CO
- 2014 "Neurovirology", Student Interest Group in Neurology, University of Colorado SOM, Denver, CO
- 2015 "Shingles and stroke", Cafe Scientifique, Sigma Xi Society, Boulder, CO
- 2015 "VZV vasculopathy", Grand Rounds, Neurology, University of New Mexico
- 2016 "Multisystem disease caused by VZV", Grand Rounds, NASA, Houston, TX
- 2016 "Space weather and human health", Grand Rounds, NASA, Houston, TX
- 2016 "VZV – the new great pretender", Grand Rounds, Immunology and Microbiology, University of Colorado SOM, Denver, CO
- 2017 "Mechanisms of VZV vasculopathy", Grand Rounds, Neurology, University of Colorado SOM, Denver, CO
- 2017 "VZV vasculopathy", Grand Rounds, Neurology, Temple University, Philadelphia, PA
- 2017 "Pathophysiology of varicella zoster virus related vascular disease", Advances and Controversies in Our Understanding of Herpes Zoster, Royal Society of Medicine, London
- 2017 "VZV vasculopathy: past, present and future", 42nd Annual International Herpesvirus Workshop, Ghent, Belgium
- 2018 "Clinical manifestations of varicella zoster virus", Pathfinders, Evergreen, CO
- 2018 "Life as a brain detective", 21st Expanding Your Horizons Workshop, American Association of University Women (Boulder Branch), Boulder, CO
- 2018 "VZV disruption of perineurial cells via IL-6", Neurology Research Retreat, University of Colorado SOM, Denver, CO
- 2018 "Nuclear neurokinin-1 receptor promotes varicella zoster virus spread in human spinal astrocytes", American Society for Neurochemistry, Riverside, CA

- 2018 “VZV-induced disruption of perineurial cells via IL-6: implications in neurotropic viral infections and peripheral nerve injury”, Colorado Alpha herpesvirus Latency Symposium, Vail, CO
- 2018 “VZV-induced disruption of perineurial cells via IL-6: implications in neurotropic viral infections and peripheral nerve injury”, Translational Neuroimmunology, FASEB Science Research Conference, Snowmass, CO

Grant Awards and Additional Support

Active

1. Federal NIH/NIA PPG, AG032958
The Molecular Pathogenesis of Varicella Zoster Virus Infection
Program Director; PI, Project 1
03-01-2014 to 02-29-2019
\$9,842,645 (total direct and indirect costs/5 years)
(competitive renewal submitted, reviewed by NIH in 2017, and funding awarded for an additional 5-year period)
2. Federal NIH/NINDS R01, NS094758
Purinergic Signaling in Varicella Zoster Virus Vasculopathy
PI
09-1-2015 to 08-31-2019
\$1,360,624 (total direct and indirect costs/4 years)
3. Contrafect Corporation Industry Grant
Characterization of Human Pulmonary Arterial Advential and Aortic Advential Fibroblasts
Response of CF-301 Treatment *In Vitro*
PI and Project Manager, CVP Research Lab (Kurt Stenmark, PI)
05-6-2016 to 05-31-2019
\$139,283 (total direct and indirect costs/1 year)
4. Skaggs School of Pharmacy and Pharmaceutical Sciences Therapeutic Innovation Grant
Nucleic Acid-based Therapies for Blood-borne Viruses
Co-PI
02-01-2017 to 01-31-2020
\$750,000 (total costs/3 years)
5. Colorado Clinical and Translational Sciences Institute (CCTSI)
Novel Method Development (NMD) Grant, NIH-NCATS CTSA
Induced Pluripotent Stem Cell-derived Human Motor Neurons for Modeling and Treatment of Amyotrophic Lateral Sclerosis and Other Human Motor Neuron Diseases
Co-PI (Holger Russ, PI)
05-01-2018 to 04-30-2019
\$20,000 (total direct costs/1 year)

Inactive

1. Research to Prevent Blindness, Challenge Grant (pilot grant), Department of Ophthalmology
Varicella Zoster Virus Infection of the Cornea
Co-PI (Niklaus Mueller, PI)
02-22-2017 to 10-31-2017
\$10,000 (direct costs/1 year)

2. University of Colorado Department of Neurology Intramural Grant for Assistant Professors
The Role of Alphaherpesvirus Infection in Head and Face Pain
Mentor for PI Marius Birlea
07-1-2016 to 06-30-2017
\$40,000 (direct costs/1 year)
3. NASA, Department of Microbiology Intramural Support
Development of a Multiplex PCR Assay for Human Herpesviruses
PI
10-30-2015 to 01-31-2017
\$40,000 (total direct costs/year)
4. Federal NIH/NINDS K08, NS067070
Mechanisms by which VZV IE Proteins Interact with Cell Antiviral Proteins
PI
09-30-2009 to 08-31-2014
\$866,700 (total direct and indirect costs)
5. CCTSI/CNS Junior Faculty Pilot Award
The Role of Purinergic Signaling in VZV Vasculopathy
PI
01-1-2012 to 12-31-2012
\$30,000
6. University of Colorado Department of Neurology AEF Research Support
Purinergic Signaling in VZV Vasculopathy
01-1-2012 to 12-31-2012
\$30,000

Bibliography

1. Singh, S., Ross, S.R., **Acena, M.**, Rowley, D.A., Schreiber, H.: Stroma is critical for preventing or permitting immunological destruction of antigenic cancer cells. *J. Exp. Med.* 175:139-146, 1992.
2. Koeppen, H., **Acena, M.**, Drolet, A., Rowley, D.A., Schreiber, H.: Tumors with reduced expression of a cytotoxic T lymphocyte recognized antigen lack immunogenicity but retain sensitivity to lysis by cytotoxic T lymphocytes. *Eur. J. Immunol.* 23:2770-2776, 1993.
3. Dodson, R.E., **Acena, M.R.**, Shapiro, D.J.: Tissue distribution, hormone regulation and evidence for a human homologue of the estrogen-inducible *Xenopus laevis* vitellogenin mRNA binding protein. *J. Steroid Biochem. Mol. Biol.* 52:505-515, 1995.
4. Cunningham, K.S., Dodson, R.E., **Nagel, M.A.**, Shapiro, D.J., Schoenberg, D.R.: Vigilin binding selectively inhibits cleavage of the vitellogenin mRNA 3'-untranslated region by the mRNA endonuclease polysomal ribonuclease 1. *Proc. Natl. Acad. Sci. U.S.A.* 97:12498-12502, 2000.
5. Dodson, R.E., Goolsby, K.M., **Acena-Nagel, M.**, Mao, C., Shapiro, D.J.: RNA gel shift assays for analysis of hormone control of mRNA stability. *Methods Enzymol.* 364:350-361, 2003.
6. Moses, H., **Nagel, M.A.**, Gilden, D.H.: Acute cerebellar ataxia in a 41-year-old woman. *Lancet Neurol.* 5:984-988, 2006.
7. **Nagel, M.A.**, Forghani, B., Mahalingam, R., Wellish, M.C., Cohrs, R.J., Russman, A.N., Katzan, I., Lin, R., Gardner, C.J., Gilden, D.H.: The value of detecting anti-VZV IgG antibody in CSF to diagnose VZV vasculopathy. *Neurology* 68:1069-1073, 2007.
8. **Nagel, M.A.**, Gilden, D.H.: The protean neurologic manifestations of varicella zoster virus infection. *Cleve. Clin. J. Med.* 74:489-504, 2007.
9. Orme, H.T., Smith, G., **Nagel, M.A.**, Bert, R.J., Mickelson, T.S., Gilden, D.H.: VZV spinal cord infarction identified by diffusion-weighted MRI (DWI). *Neurology* 69:398-400, 2007.
10. **Nagel, M.A.**, Corboy, J.R.: Viral illnesses of the nervous system of the elderly. *In: Clinical Neurology of the Older Adult* (J.I. Sirven, B.L. Malamut, eds.), Lippincott Williams & Wilkins, Philadelphia, pp. 448-456, 2008.
11. **Nagel, M.A.**, Cohrs, R.J., Mahalingam, R., Wellish, M.C., Forghani, F., Schiller, A., Safdieh, J.E., Kamenkovich, E., Ostrow, L.W., Levy, M., Greenberg, B., Russman, A.N., Katzan, I., Gardner, C.J., Häusler, M., Nau, R., Saraya, T., Wada, H., Goto, H., de Martino, M., Ueno, M., Brown, W.D., Terborg, C., Gilden, D.H.: The varicella zoster virus vasculopathies: clinical, CSF, imaging and virological features. *Neurology* 70:853-860, 2008.
12. Mueller, N.H., Gilden, D.H., Cohrs, R.J., Mahalingam, R., **Nagel, M.A.**: VZV infection: clinical features, molecular pathogenesis of disease and latency. *Neurol. Clin.* 26:675-697, 2008.
13. Gilden, D., **Nagel, M.A.**, Ransohoff, R.M., Cohrs, R.J., Mahalingam, R., Tanabe, J.L.: Recurrent varicella zoster virus myelopathy. *J. Neurol. Sci.* 276:196-198, 2009.
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15. **Nagel, M.A.**, Gilden, D., Shade, T., Gao, B., Cohrs, R.J.: Rapid and sensitive detection of 68 unique VZV gene transcripts in five multiplex reverse transcription-polymerase chain reactions. *J. Virol. Methods* 157:62-68, 2009.
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17. Umbach, J.L., **Nagel, M.A.**, Cohrs, R.J., Gilden, D.H., Cullen, B.R.: Analysis of human α -herpesvirus microRNA expression in latently infected human trigeminal ganglia. *J. Virol.* 83:10677-10683, 2009.
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29. **Nagel, M.A.**, Traktinskiy, I., Azarkh, Y., Kleinschmidt-DeMasters, B., Hedley-Whyte, T., Russman, A., VanEgmond, E.M., Stenmark, K., Frid, M., Mahalingam, R., Wellish, M., Choe, A., Cordery-Cotter, R., Cohrs, R.J., Gilden, D.: Varicella zoster virus vasculopathy: Analysis of virus-infected arteries. *Neurology* 77:364-370, 2011.

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40. **Nagel, M.A.**, Russman, A.N., Feit, H., Traktinskiy, I., Khmeleva, N., Schmid, D.S., Skarf, B., Gilden, D.: VZV ischemic optic neuropathy and subclinical temporal artery infection without rash. *Neurology* 80:220-222, 2013.
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