

Allison Kraus, Ph.D.

Assistant Professor
Case Western Reserve University
School of Medicine
Department of Pathology
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EDUCATION:

- 2005-2011 Ph.D. in Biochemistry.
University of Alberta, Edmonton, Canada.
- 2001-2005 B.Sc., Specialization in Biochemistry with distinction.
University of Alberta, Edmonton, Canada.

ACADEMIC APPOINTMENTS:

- 2019-present Assistant Professor, Department of Pathology, Case Western Reserve University
(CWRU) School of Medicine. Cleveland, OH.

RESEARCH EXPERIENCE:

- 2016-2019 Research Fellow,
Rocky Mountain Laboratories (RML), NIAID, NIH.
Supervisor: Byron Caughey, Ph.D.
Research Focus: Transmissibility of protein misfolding
- 2011-2016 Postdoctoral Fellow (National Institutes of Health Intramural Research Program)
Rocky Mountain Laboratories (RML), NIAID, NIH.
Supervisor: Byron Caughey, Ph.D.
Research Focus: The role of prions and amyloid in disease
- 2005-2011 Doctoral Student, University of Alberta.
Supervisor: Marek Michalak, Ph.D.
Research Focus: The endoplasmic reticulum chaperone calnexin and its role in
myelination
- 2004-2005 Undergraduate Research Student, University of Alberta
Research Focus: Phosphorylation-dependent regulation of the Epidermal Growth
Factor Receptor

RESEARCH FUNDING:

- 2019-2021 Biomarkers Across Neurodegenerative Disease (BAND) initiative [Partnership with Alzheimer's Association, Alzheimer's Research UK (ARUK), The Michael J. Fox Foundation for Parkinson's Research (MJFF), and the Weston Brain Institute (Weston)]
Title: Ultrasensitive assays for tau and α Syn aggregates in Alzheimer's disease (AD) and Parkinson's disease (PD)
PI: Kraus
- 2018-2020 CJD Foundation Research Grant, Creutzfeldt-Jakob Disease Foundation
Title: Investigation of prion inactivation by reactive oxygen species in vivo
PI: Kraus
- 2008-2011 AHFMR Studentship, Alberta Heritage Foundation for Medical Research (presently Alberta Innovates-Health Solutions)
- 2007-2011 MSSOC Research Studentship, Multiple Sclerosis Society of Canada
- 2006-2007 Canada Graduate Scholarships Master's Award, Canadian Institutes of Health Research
- 2005 Undergraduate Student Research Award, Natural Sciences and Engineering Research Council

SCHOLARSHIPS AND AWARDS:

- 2013 endMS 2013 travel award, Alberta endMS Regional Research and Training Centre. For the endMS 2013 Conference, Saint-Saveur, Quebec, Canada
- 2011 Andrew Stewart Memorial Graduate Prize, University of Alberta.
*Recognition of outstanding research accomplishment.
- 2010 Med Star Award for Graduate Students, University of Alberta. *Excellence in research for a first author publication.
- 2010 European Calcium Society School of Molecular Medicine Travel Award, Warsaw, Poland
- 2008 Queen Elizabeth II Doctoral Graduate Award, University of Alberta. *Nominated award for recognition of an exceptional academic record and research potential.
- 2006 Walter H. Johns Graduate Fellowship, University of Alberta
- 2005 Lionel B. Pett Graduate Scholarship, University of Alberta. *Nominated award for academic excellence.
- 2001 Faculty of Science Academic Excellence, University of Alberta

2001 Roland Stansfield Young Memorial Academic, University of Alberta. *Awarded for superior academic achievement.

INVITED SEMINARS:

2019 PRION 2019, Emerging Concepts. Edmonton, AB, Canada

2019 Case Western Reserve University, Cleveland, OH, USA

2018 Neurodegenerative Diseases: Biology and Therapeutics, Cold Spring Harbor Laboratories, NY, USA

2018 CJD Foundation Family Conference, Washington, DC, USA

2017 USDA Agricultural Research Service, Washington State University, Pullman, WA, USA

2016 University of Alberta, Edmonton, AB, Canada

2014 Microscopy of Infectious Disease Agents Symposium, RML, Hamilton, MT, USA

2011 Rocky Mountain Laboratories, Hamilton, MT, USA

2011 Montreal Neurological Institute, McGill, Montreal, QC, Canada

2011 Cleveland Clinic Lerner Research Institute, Cleveland, OH, USA

2011 Hotchkiss Brain Institute, University of Calgary, AB, Canada

2011 Gladstone Institute of Neurological Disease, University of California, San Francisco, USA

2009 8th International Calreticulin Workshop, Vina Del Mar, Chile

TEACHING, MENTORING, AND OUTREACH EXPERIENCE:

2018-2019 Biomedical Research After-School Scholars (BRASS) guest speaker

2014-2019 Mentoring Postbaccalaureate and MD/PhD students, Rocky Mountain Laboratories, National Institutes of Health

2007-2009 Medicine 514, Translational Research Block, University of Alberta Medical School

2007-2010 Trained and mentored undergraduate project and summer students, University of Alberta

2006 Biochemistry 401, Teaching Assistant, Department of Biochemistry, University of Alberta

ADDITIONAL TRAINING AND PROFESSIONAL ACTIVITIES:

2011-present	Ad hoc journal article referee (including PNAS, Journal of Virology, Scientific Reports, PLoS One, BBA)
2010	Alberta Neuroimmunology Course
2001-2008	Naval Combat Information Operator, Canadian Forces Naval Reserve

PATENTS:

Methods for the detection of tau protein aggregates. PCT patent application (PCT/US2017/069024)

PUBLICATIONS:

Peer-reviewed research publications and invited reviews:

1. **Kraus A**, Groenendyk J, Bedard K, Baldwin TA, Krause K-H, Dubois-Dauphin M, Dyck J, Rosenbaum EE, Korngut L, Colley NJ, Gosgnach S, Zochodne D, Todd K, Agellon LB and M Michalak. Calnexin Deficiency Leads to Dysmyelination. *J Biol Chem*, 2010 Jun 11;285 (24): 18928-18938.

-Recommended by the Faculty of 1000 Biology

2. **Kraus A**. and M. Michalak. Endoplasmic Reticulum Quality Control and Dysmyelination. *Biomolecular Concepts*, 2011. Aug 1;2 (4): p. 261-274.

- Invited review

3. **Kraus A**, Groveman BR, and B Caughey. Prions and the Potential Transmissibility of Protein Misfolding Diseases. *Annu Rev Microbiol*. 2013; 67:543-64.

4. Groveman BR, Dolan MA, Taubner LM, **Kraus A**, Wickner RB, Caughey B. Parallel in-register intermolecular beta sheet architectures for prion seeded PrP amyloids. *J Biol Chem*. 2014 Aug 29;289(35):24129-42.

5. Groveman BR*, Kraus A*, Raymond L, Dolan MA, Anson KJ, Dorward DW and B Caughey. Charge neutralization of the central lysine cluster in prion protein promotes PrP^{Sc}-like folding of recombinant PrP amyloids. *J Biol Chem*. 2015 Jan 9;290(2):1119-28.

**co-first authors*

6. Lee D*, Kraus A*, Prins D*, Groenendyk J, Aubrey I, Liu W, Li HD, Julien O, Touret N, Sykes B, Tremblay ML, and M Michalak. UBC9-dependent association between calnexin and protein tyrosine phosphatase 1B (PTP1B) at the endoplasmic reticulum. *J Biol Chem*. 2015 Feb 27;290(9):5725-38.

**co-first authors*

7. **Kraus A**, Anson KJ, Raymond LD, Martens C, Groveman BR, Dorward DW and B Caughey. Prion protein prolines 102 and 105 and the surrounding lysine cluster impede amyloid formation. *J Biol Chem*. 2015 Aug 28;290(35):21510-22.

- highlighted in a special virtual issue on "Amyloids, prions and protein oligomers"
JBC, March 2018.
8. **Kraus A**. Proline and lysine residues provide modulatory switches in amyloid formation: Insights from prion protein. *Prion*. 2016 Jan2;10(1):57-62.

-Invited perspective
9. Orrú C, Hughson AG, Groveman BR, Campbell KJ, Anson KJ, Manca M, **Kraus A** and B Caughey. Factors that improve RT-QuIC detection of prion seeding activity. *Viruses*. 2016. May23; 8(5).
10. Race B, Phillips K, **Kraus A** and B Chesebro. Phosphorylated human tau aggregates associate with mouse amyloid prion protein but not with diffuse non-amyloid prion protein during scrapie infection in mice. *Prion*. 2016. Jul 3;10(4): 319-30.
11. **Kraus A***, Race B, Phillips K, Winkler C, Saturday G, Groveman BR, Kurnellas M, Rothbard J, Steinman L and B Caughey. Genetic background modulates outcome of therapeutic amyloid peptides in treatment of neuroinflammation. *Journal of Neuroimmunology*. 2016. Sep 15; 298:42-50

**corresponding author*
12. Hughson AG, Race B, **Kraus A**, Sangaré LR, Robins L, Groveman BR, Saijo E, Phillips K, Contreras L, Dhaliwal V, Manca M, Zanusso G, Terry D, Williams J and B Caughey. Inactivation of prions and amyloid seeds with hypochlorous acid. *PLoS Path*. 2016. 12(9): e1005914.

- In the top 50 most downloaded PLOS Pathogens articles of 2016.
13. Saijo E, Ghetti B, Zanusso G, Oblak A, Furman J, Diamond M, **Kraus A** and B Caughey. Ultrasensitive and selective detection of 3-repeat tau seeding activity in Pick disease brain and cerebrospinal fluid. *Acta Neuropathologica*. 2017. May;133(5):751-765.
14. **Kraus A**, Raymond G, Race B, Campbell KJ, Hughson A, Anson K, Raymond LD, and B Caughey. PrP P102L and nearby lysine mutations promote spontaneous in vitro formation of transmissible prions. *J Virol*. 2017. Oct 13;91(21).
15. Groveman BR, Raymond GJ, Campbell KJ, Race B, Raymond LD, Hughson AG, Orrú CD, **Kraus A**, Phillips K and B Caughey. Role of the central lysine cluster and scrapie templating on the transmissibility of synthetic prion protein aggregates. *PLoS Path*. 2017. Sep 14;13(9):e1006623.
16. Jung J, Eggleton P, Robinson A, Wang J, Gutowski N, Holley J, Newcombe J, Ikawa M, Dudek E, Paul A, Zochodne D, **Kraus A**, Power C, Agellon LB and M Michalak. Calnexin in brain endothelial cells is necessary for T-cell transmigration into the central nervous system. *JCI Insight*. 2018;3(5):e98410.
17. **Kraus A**, Saijo E, Metrick M, Safar JG, Newell K, Sigurdson C, Ghetti B, Zanusso G, and B Caughey. Seeding selectivity and ultrasensitive detection of tau aggregate conformers of Alzheimer's disease. *Acta Neuropathologica*. 2019. Apr;137(4):585-598.

18. Raymond GJ, Zhao HT, Race B, Raymond LD, Williams K, Swayze EE, Graffam S, Le J, Caron T, Stathopoulos J, O'Keefe R, Lubke LL, Reidenbach AG, **Kraus A**, Schreiber SL, Mazur C, Cabin DE, Carroll JB, Minikel EV, Kordasiewicz H, Caughey B, Vallabh SM. Antisense oligonucleotides extend survival of prion-infected mice. *JCI Insight*. 2019 Jul 30;5.
19. Saijo E, Metrick MA, Koga S, Parchi P, Litvan I, Spina S, Boxer A, Rojas JC, Galasko D, **Kraus A**, Rossi M, Newell K, Grinberg LT, Seeley WW, Ghetti B, Dickson DW, and B Caughey. 4-Repeat tau seeds and templating subtypes as brain and CSF biomarkers of frontotemporal lobar degeneration. *Acta Neuropathologica*. 2020 Jan;139(1):63-77
20. Metrick MA, do Carmo Ferreira N, Saijo E, Hughson A, **Kraus A**, Orrú C, Miller MW, Zanusso G, Ghetti B, Vendruscolo M, and B Caughey. Million-fold sensitivity enhancement in proteopathic seed amplification assays for biospecimens by Hofmeister ion comparisons. *PNAS*. 2019. 2019 116 (46) 23029-23039.
21. Caughey B and **A Kraus**. Transmissibility versus pathogenicity of self-propagating protein aggregates. *Viruses*. 2019. Epub ahead of print.
22. Metrick II MA, do Carmo Ferreira N, Saijo E, **Kraus A**, Newell K, Zanusso G, Vendruscolo M, Ghetti B, and B Caughey. A single ultrasensitive assay for detection and discrimination of tau aggregates of Alzheimer and Pick diseases. *Acta Neuropathologica Communications*. 2020 *In press*

Book Chapters:

23. **Kraus A** and M Michalak. Endoplasmic reticulum dynamics and calcium signalling. In *Calcium: a Matter of Life or Death* (Krebs, J. and Michalak, M., eds.) 2007.
24. Orrú CD, Groveman BR, Hughson AG, Manca M, Raymond LD, Raymond GR, Campbell KJ, Anson KJ, **Kraus A** and B Caughey. RT-QuIC assays for prion disease detection and diagnostics. *Methods in Molecular Biology*. 2017. 1658:185-203
25. Caughey B, Orrú CD, Groveman BR, Bongiani M, Hughson AG, Raymond LD, Manca M, **Kraus A**, Raymond GJ and G Zanusso. Detection and diagnosis of prion diseases using RT-QuIC: an Update. *Prion Diseases* pp 173-181, *NeuroMethods*, volume 129. 2017.
26. Caughey B, Orrú CD, Groveman BR, Hughson AG, Manca M, Raymond LD, Raymond GJ, Race B, Saijo E, and **A Kraus**. Amplified detection of prions and other amyloids by RT-QuIC in diagnostics and the evaluation of therapeutics and disinfectants. *Progress in Molecular Biology and Translational Science Volume 150, Prion Protein*. 2017
27. Saijo E, Groveman BR, **Kraus A**, Metrick M, Orrú CD, Hughson AG and B Caughey. Ultrasensitive RT-QuIC seed amplification assays for disease-associated tau, α -synuclein, and prion aggregates. *Methods in Molecular Biology: Protein Misfolding Diseases (Springer)* (Gomes, C, ed). 2019;1873:19-37.