

## Virginia Walker's Lab

*molecular genetics/ environmental microbiology/ stress tolerance/ low temperature resistance/ astrobiology / with model systems from microbes to fish to insects to plants to mammals and beyond!*

Note: As Professor Emerita, I am no longer accepting new students or staff



*Our lab: left to right, Erin, Collin, Virginia, Pranab, Aaron, and Kristy (and to the right of Kristy we have goldenrod, which have antifreeze proteins so they can be part of the lab too)*

Our research interests concern stress genes and the molecular basis of resistance. This is a central question for scientific goals as diverse as predicting the impact of nanoparticle-containing food on our gut microbiota, the consequence of climate change on Arctic organisms, the impact of microgravity, or the production of ice-binding proteins in environmentally-stressed overwintering plants, insects, fish or microbes.

### **Recent Journal Articles (only current NSERC granting period listed)**

*(\*of course, students and other trainees are marked by stars because they are!)*

1. \*Martin TA, \*Juurakko CL, Harrison T, Arnott SE, **Walker VK**. (2024) Differential impacts of road de-icers on freshwater bacterial communities. *Water*. 2024 Jan 28;16(3):426.
2. Tomalty HE, Graham LA, **Walker VK**, Davies PL (2023) Chilling injury in human kidney tubule cells after subzero storage is not mitigated by antifreeze protein addition.

*Cryobiology*. Jun 1;111:113-20.

3. \*Hamilton, EF, \*Juurakko CL, Engel K, Neufeld JD, Casselman JM, Greer CW, **Walker VK** (2023) Environmental impacts on skin microbiomes of sympatric high Arctic salmonids. *Fishes*, 8, 214. <https://doi.org/10.3390/fishes8040214>
4. \*Hamilton, EF, \*Juurakko CL, Engel K, van C. de Groot P, Casselman JM, Greer CW, Neufeld JD, **Walker VK** (2023) Characterization of skin- and intestine microbial communities in migrating High Arctic lake whitefish and cisco. *Arctic Science*. 10(1): 125-139. <https://doi.org/10.1139/as-2023-0022>.

#### 2022:

5. Forbes, J., Bissoyi, A., Eickhoff, L...**Walker VK**.. Davies P.L et al. (2022) Water-organizing motif continuity is critical for potent ice nucleation protein activity. *Nature Commun* 13, 5019. <https://doi.org/10.1038/s41467-022-32469-9>
6. \*Juurakko, CL, diCenzo, GC and **Walker, VK** (2022) *Brachypodium* antifreeze protein gene products inhibit ice recrystallisation, attenuate ice nucleation, and reduce immune response. *Plants* 11: 1475. [doi.org/10.3390/plants11111475](https://doi.org/10.3390/plants11111475)
7. Houde, M, Krümmel, EM, Mustonen, T...**Walker, VK** and Whiting, A. (2022) Contributions and perspectives of Indigenous Peoples to the study of mercury in the Arctic, *Science of The Total Environment*, 841:156566 [doi.org/10.1016/j.scitotenv.2022.156566](https://doi.org/10.1016/j.scitotenv.2022.156566).
8. Duan Y, Grogan P, **Walker VK**, diCenzo GC (2022) Whole genome sequencing of mesorhizobia isolated from northern Canada. *Canadian J. Microbiology* Nov 1;68(11):661-673. [doi: 10.1139/cjm-2022-0102](https://doi.org/10.1139/cjm-2022-0102)
9. \*Juurakko CL, \*Bredow M, diCenzo GC and **Walker VK** (2022) Cold-inducible promoter-driven knockdown of *Brachypodium* antifreeze proteins confers freezing and phytopathogen susceptibility. *Plant Direct* Sep 12;6(9):e449. [doi: 10.1002/pld3.449](https://doi.org/10.1002/pld3.449).
10. Lennert AE, Houde M, Krümmel EM, Brammer J, Brown TM, Chételat J, Dahl PE, Dietz R, Evans M, Gamberg M, Gauthier MJ...**Walker VK** (2022). Contributions and perspectives of Indigenous Peoples to the study of mercury in the Arctic. *UiT Munin* <https://doi.org/10.1016/j.scitotenv.2022.156566>.

#### 2021:

11. \*Juurakko, C, DiCenzo, GC and **Walker VK** (2021) Cold acclimation and prospects for cold-resistant crops. *Plant Stress* 2, 100028 [doi:10.1016/j.stress.2021.100028](https://doi.org/10.1016/j.stress.2021.100028)
12. \*Rosenstein, AH and **Walker, VK** (2021) Fidelity of a bacterial DNA polymerase in microgravity, a model for human DNA health in space. *Frontiers Cell and Developmental Biology*. Nov 29;9:702849. [doi: 10.3389/fcell.2021.702849](https://doi.org/10.3389/fcell.2021.702849)
13. \*Moniz K, **Walker VK**, Shah V (2021) Antibiotic resistance in mucosal bacteria from high Arctic migratory salmonids. *Environ Microbiol Rep*. [doi: 10.1111/1758-2229.12975](https://doi.org/10.1111/1758-2229.12975).
14. \*Juurakko CL, \*Bredow M, Nakayama T, Imai H., Kawamura Y, diCenzo GC, Uemura M and **Walker VK** (2021) The *Brachypodium distachyon* cold-acclimated plasma membrane proteome is primed for stress resistance. *Genes, Genomes and Genetics (G3)* 11(9):kab198 [doi: https://doi.org/10.1093/g3journal/jkab198](https://doi.org/10.1093/g3journal/jkab198).
15. Koch I, \*Das P, \*McPhedran BE, Casselman JM, \*Moniz KL, van Coeverden de Groot P, Qitsualik J, Muir D, Schott S, **Walker VK** (2021) Correlation of mercury occurrence with age, elemental composition, and life history in sea-run food fish from the Canadian arctic archipelago's lower Northwest Passage. *Foods* 10(11):2621. <https://doi.org/10.3390/foods10112621>

16. Houde, M. *et al.* multiple authors including **Walker VK** (2021) What are Indigenous Peoples' contributions to the study of mercury in the Arctic, and what are their perspectives on contaminant research and monitoring? Chapter 9, *Indigenous Perspectives - AMAP Mercury Assessment* (available at <https://policycommons.net/artifacts/2331863/9/3092488/>)
17. \*McKnight MM, Grogan P and **Walker VK** (2021) Impact of long-term fertilizer and summer warming treatments on bulk soil and birch rhizosphere microbial communities in mesic Arctic tundra. *Arctic, Antarctic, and Alpine Research*, 53:1,196-211, doi: 10.1080/15230430.2021.1951949

**2020:**

18. **Walker VK**, \*Das P, Li P, Lougheed SC, \*Moniz K, Schott S, Qitsualik J, Koch I. (2020) Identification of Arctic food fish species for anthropogenic contaminant testing using geography and genetics. *Foods* 9. doi: 10.3390/foods9121824
19. \*Bredow M, \*Tomalty HE, Graham LA, Gruneberg AK, \*Middleton AJ, \*Vanderbeld B, Davies PL and **Walker VK**. (2020) Isolation and characterization of ice-binding proteins from higher plants. *Methods in Molecular Biology* **2156**: 303-332.
20. \*McKnight MM, Qu Z, Copeland JK, Guttman DS and **Walker, VK** (2020) A practical assessment of nano-phosphate on soybean (*Glycine max*) growth and microbiome establishment. *Scientific Reports* **10** (1), 1-17
21. Schott S, Qitsualik J, van Coeverden de Groot P, Okpakok S, Chapman JM, Lougheed S and **Walker VK** (2020) Operationalizing knowledge coevolution: towards a sustainable fishery for Nunavummiut. *Arctic Science* 6:208-288 dx.doi.org/10.1139/as-2019-0011
22. \*Element G, Engel K, Neufeld JD, Casselman JM, van Coeverden de Groot P and **Walker VK** (2020) Differences in intestinal microbial communities of two sympatric anadromous Arctic salmonids and the effects of migration and feeding. *Arctic Science* 7(3) <https://doi.org/10.1139/as-2020-0011>
23. \*Element G, Engel K, Neufeld JD, Casselman JM, van Coeverden de Groot P, Greer CW and **Walker VK**. (2020) Seasonal habitat drives intestinal microbiome composition in anadromous Arctic char *Salvelinus alpinus*. *Environmental Microbiology*. doi: 10.1111/1462-2920.15049
24. Wu Y, Lougheed DR, Lougheed SC, \*Moniz K, **Walker VK** and Colautti RI (2020) baRcodeR: An open-source R package for sample labelling. *Methods in Ecology and Evolution* **11** (8), 980-985

**2019:**

25. \*Affleck JG and **Walker VK**. (2019) *Drosophila* as a model for developmental toxicology: using and extending the Drosophotoxicology model. *Methods in Molecular Biology* **1965**: 139-153. doi: 10.1007/978-1-4939-9182-2\_10
26. \*Hamilton EF, \*Element G, van Coeverden de Groot P, Engel K, Neufeld JD, Shah V and **Walker VK**. (2019) Anadromous Arctic char microbiomes: Bioprospecting in the high Arctic. *Frontiers in Bioengineering and Biotechnology*. **7**: 32. doi: 10.3389/fbioe.2019.00032

**2018:**

27. Tomalty, HE, Eves R, Graham, LA, **Walker VK** and Davies PL (2018) Supercooled renal graft preservation using hyperactive ice-binding proteins. *Cryobiology* **81**, 233-234

28. \*Bredow M, \*Tomalty HE, \*Smith L and **Walker VK** (2018) Ice and anti-nucleating activities of an ice-binding protein from the annual grass, *Brachypodium distachyon*. *Plant Cell Environ.* **41**(5):983-992. doi: 10.1111/pce.12889.
29. Udegbunam LU, \*DuQuesnay JR, Osorio L, **Walker VK**, and Beltran JG. (2018) Phase equilibria, kinetics and morphology of methane hydrate inhibited by antifreeze proteins: application of a novel 3-in-1 method. *J. Chemical Thermodynamics* **17**:155-163. <http://dx.doi.org/10.1016/j.jct..2017.08.015>

#### **2017:**

30. Pontefract A, Zhu TF, **Walker VK**, Hepburn H, Lui C, Zuber MT, Ruvkun G, and Carr CE. (2017) Microbial diversity in a hypersaline sulfate lake: a terrestrial analog of ancient Mars. *Frontiers in Microbiology* **8**:1819.
31. \*Bredow M, **Walker VK** (2017). Ice-binding proteins in plants. *Frontiers in Plant Science.* **8**: 2153. DOI: 10.3389/fpls.2017.02153
32. \*Qadeer S, Khan MA, Ansari MS, Rakha BA, Ejaz R, Husna AU, Azam A, Ullah N, **Walker VK**, and Akhter S. (2017) Cryopreservation of Nili-Ravi buffalo bull sperm in cryodilutant supplemented with *Lolium perenne* protein preparations. *CryoLetters* **38**:43-50.
33. \*Dudefoi W, \*Moniz K, Allen-Vercoe E, Ropers, M-H, and **Walker VK**. (2017) Impact of food grade and nanoTiO<sub>2</sub> particles on a human intestinal community. *Food and Chemical Toxicology* **106**:242-249.
34. \*Bredow M, \*Tomalty H, and **Walker VK**. (2017) Identification of plant ice-binding proteins through the assessment of ice-recrystallization inhibition activity and isolation using ice-affinity purification. *Journal of Visual Experiments* (**123**):e55302.
35. \*Tomalty, H, \*Hamilton EF, Hamilton A, Kukal O, Allen T, and **Walker VK**. (2017) Kidney preservation at subzero temperatures using a novel storage solution and insect ice-binding proteins. *CryoLetters* **38**:100-107.
36. \*Inglese C, Christiansen CT, Lamhonwah D, \*Moniz K, \*Montross S, Lamoureux S, Lafrenière M, Grogan P, and **Walker VK**. (2017) Examination of soil microbial communities after permafrost thaw subsequent to an active layer detachment in the High Arctic. *Arctic, Antarctic and Alpine Research* **49**:455-472.

#### **2016:**

37. \*Bredow M, \*Vanderbeld B, and **Walker VK**. (2016) Ice-binding proteins confer freezing tolerance in transgenic *Arabidopsis thaliana*. *Plant Biotechnology Journal* **15**:68-81. doi:10.1111/pbi.12592.
38. Shah V, Luxton T, **Walker VK**, Brumfield T, Yost, J, Shah S, Wilkinson JE, and Kambhampati M. (2016) Fate and impact of zero-valent copper nanoparticles on geographically distinct soils. *Science of the Total Environment* **573**:661-670.
39. \*Das P, \*Saulnier E, Carlucci C, Allen-Vercoe E, Shah V, and **Walker VK**. (2016) Interactions between a broad-spectrum antibiotic and silver nanoparticles in a human gut ecosystem. *Nanomedicine and Nanotechnology* **7**:408. doi: 10.4172/2157-7439.1000408
40. \*Bredow M, \*Vanderbeld B, and **Walker VK**. (2016) Knockdown of ice-binding proteins in *Brachypodium distachyon* demonstrates their role in freeze protection. *PLoS ONE* e-access: PONE-D-16-38249