

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!



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 (2016-21 portion of the current NSERC granting period)
*(*of course, students and other trainees are marked by stars because they are!)*

1. *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
2. *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*. In final revision.

3. *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.
4. *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>.
5. 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 in press*
6. *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
7. **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
8. *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.
9. *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
10. 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
11. *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>
12. *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
13. 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
14. *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
15. *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

16. 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
17. *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.
18. 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>
19. 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.
20. *Bredow M, **Walker VK** (2017). Ice-Binding Proteins in Plants. *Frontiers in Plant Science*. **8**: 2153. DOI: 10.3389/fpls.2017.02153
21. *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.
22. *Dudefoi W, *Moniz K, Allen-Vercoe E, Ropers, M-H, and **Walker VK**. (2017) Impact of food grade and nanoTiO₂ particles on a human intestinal community. *Food and Chemical Toxicology* **106**:242-249.
23. *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.
24. *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.
25. *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.
26. *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.
27. 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.
28. *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
29. *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