

Title: Electrical Stimulation of *Arabidopsis thaliana*

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Abstract

Plants respond to their environment in a multitude of ways. In our first report, we described a rapid movement response that occurred in plants without any physical contact with the seedlings based on electric charge. Experiments with genetically altered seedlings followed to isolate the pathway required for movement. Three varieties of seeds were planted in the laboratory under sterile conditions. After 5-10 days the seedlings were tested for their response to electric field stimuli, and video responses were recorded with the fluctuation in the electric field measured with an oscilloscope. Mutants of *A. thaliana* from ABRC tested included Jasmonate Resistant 1 (JAR1), which lack a functional synthetase in the jasmonate signaling pathway, and NHX7/SOS1, which contain homozygous mutagenized alleles for the Na⁺/H⁺ antiporter. Wild type (wt) (Col-1) from ABRC and mutant seeds were grown on low K⁺ media to support the growth of the hypersensitive NHX7/SOS1. Plant seedlings of wt *Thymus vulgaris*, *Arabidopsis thaliana* and *Mentha spicata*, starting at the 2-3 leaf stage, were capable of msec movement responses to objects that conveyed an electric charge. Movement responses were observed in 50% of wt Col-1 seedlings plated in low K⁺ media compared to 87% response of wt in regular salt media. The response rate was 18% for NHX7/SOS1 and 24% for JAR1. Both types of genetically altered seedlings had a lower level of responsiveness compared to wt *A. thaliana*. Reduced responsiveness in JAR1 and SOS1 seedlings may be the result of seed genotype mixing, or crossover required between signaling pathways.

Biography

Diane Krill completed her Ph.D. in Developmental & Molecular Biology from Case Western Reserve University in Cleveland, Ohio. Her postdoctoral studies and an M.P.H. were completed at the University of Pittsburgh Graduate School of Public Health. She is currently a professor of biology at Point Park University in Pittsburgh, USA. The majority of her research publications involve the tumor microenvironment and angiogenesis as it relates to cancer. She successfully isolated a plant compound with therapeutic potential that prevents new blood vessel development *in vivo* in zebrafish, and in human stem cells. The plant assay system used to establish the effects of the plant compound on vascular tissue led to the study of electrical stimulation in the plant model, *Arabidopsis thaliana*. Diane is a member of the American Association for Cancer

Research, the MS Society, and serves as a reviewer for the *Journal of Cancer & Nutrition*, *Ethnopharmacology* and other journals.

Selected Publications:

1. Reggia, L; Hupman, K; Johnson, GA; Keller, D; and **Krill, D**. Arabidopsis Rapid Movement Response to Electrical Stimulation. *J Plant Physiol Pathol* 2016, 4:2 <http://dx.doi.org/10.4172/2329-955X.1000146>.
2. **Krill, D**; Madden, J; Huncik, K; and Moeller, PD. Induced Thyme Product Prevents VEGF-Induced Migration in Human Umbilical Vein Endothelial Cells. *Biochem Biophys Res Commun*. 2010 Dec 17;403(3-4):275-81.
3. Yu, YP; Lin, F; **Krill, D**; Dhir, R; Becich, MJ; and Luo, J-H. Identification of a Novel Gene with Increasing Rate of Suppression in High Grade Prostate Cancers. *Am. J. Path* 158(1):19-24, 2001.
4. **Krill, D**; Wu, SP; Thomas, A; Dhir, R; and Becich, MJ. E-cadherin Expression and PSA Secretion in Human Prostate Epithelial Cells. *Urol Res* 2001 Aug;29(4):287-92.
5. Yu, Y-P; Lin, F; Dhir, R; **Krill, D**; Becich, MJ. and Luo, J-H. Linear Amplification of Gene specific cDNA Ends to Isolate Full Length of a cDNA. *Anal Biochem*. 2001 May 15;292(2):297-301.
6. **Krill, D**; DeFlavia, P.; Dhir, R; Luo, J.; Becich, MJ., Lehman, E; and Getzenberg, RH. Expression patterns of vitamin D receptor in human prostate. *J Cell Biochem*. 2001;82(4):566-72.
7. Lin F; Yu YP; Woods J; Cieply K; Gooding B; Finkelstein P; Dhir R; **Krill D**; Becich MJ; Michalopoulos G; Finkelstein S; Luo JH. Myopodin, a synaptopodin homologue, is frequently deleted in invasive prostate cancers. *Am J Pathol*. 2001 Nov;159 (5):1603-12.

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Plant Signaling

