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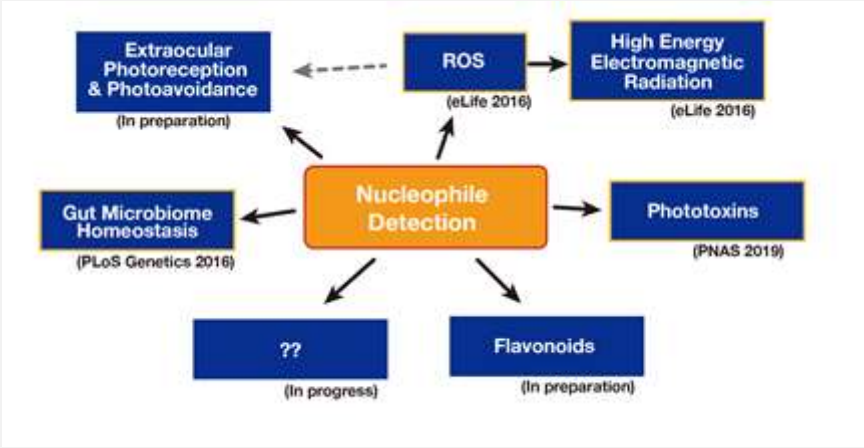
Understanding chemical information processing

Organisms continuously utilize chemical cues not only from the environment but also for internal/external communications. Precise monitoring and proper behavioral and physiological responses to the chemical information are critical for their survival, requiring complex signal processing from sensory detection to circuitry-dependent computation. To help understand this pivotal function, we exploit *Drosophila* sensory systems which offer advanced neurogenetic tools and well-defined physiology and anatomy. The ongoing research topics concern 1) chemical nociception, a chemo-sensory function to detect tissue-damaging chemical reactivity, and 2) atypical inter-neuronal communication in modulation of gustation interaction.

Aim — Understanding chemical information acquisition and processing at the organism level

Tool — *Drosophila* molecular genetics, in vivo/vitro electrophysiology, Ca^{2+} imaging, behavioral assays

TARGET



Curriculum Vitae

2020~Present : Principal Investigator, KBRI
2016~2020 : Associate professor, Sungkyunkwan Univ. ROK
2012~2016 : Assistant professor, Sungkyunkwan Univ. ROK
2006~2012 : Postdoctoral Fellow, Brandeis Univ., MA, USA

Academic Credential

2006 : Ph.D. Medical Sciences, University of Calgary
1999 : M.S. Life Sciences and Biotechnology, Korea Univ.
1997 : B.S. Genetic Engineering, Korea Univ.

Awards/Honors/Memberships

2016: Research excellence award, Sungkyunkwan Univ.
2012~Present, Member, Korean Society for Molecular and Cellular Biology
2012~Present, Member, Korean Society for Brain and Neural Sciences

Research keyword

Chemical nociception, gustation, behavior, ephaptic coupling, nucleophile

Key techniques

Behavioral assays, electrophysiology, Ca^{2+} imaging, biochemistry, molecular genetics/biology

Research Interests/Topics

Nucleophile nociception and natural insights from its implications
Gustatory interaction between primary tastes via atypical interneuronal communication

Research Publications (Selected)

- Du, E.J., Ahn, T.J., Sung, H., Jo, H., Kim, H.-W., Kim, S.-T., and **Kang, K**. (2019). Analysis of phototoxin taste closely correlates nucleophilicity to type 1 phototoxicity. Proc. Natl. Acad. Sci. 116(24):12013-12018
- Du, E.J., Ahn, T.J., Wen, X., Seo, D.-W., Na, D.L., Kwon, J.Y., Choi, M., Kim, H.-W., Cho, H., and **Kang, K.** (2016). Nucleophile sensitivity of Drosophila TRPA1 underlies light-induced feeding deterrence. eLife *5*, e18425.
- Du, E.J., Ahn, T.J., Kwon, I., Lee, J.H., Park, J.-H., Park, S.H. et al. ... **Kang, K**. (2016). TrpA1 Regulates Defecation of Food-Borne Pathogens under the Control of the Duox Pathway. PLoS Genet. *12*, e1005773.
- **Kang, K.** (2016). Exceptionally high thermal sensitivity of rattlesnake TRPA1 correlates with peak current amplitude. Biochim. Biophys. Acta *1858*, 318–325.
- Du, E.J., Ahn, T.J., Choi, M.S., Kwon, I., Kim, H.-W., Kwon, J.Y., and **Kang, K**. (2015). The Mosquito Repellent Citronellal Directly Potentiates Drosophila TRPA1, Facilitating Feeding Suppression. Mol. Cells *38*, 911–917.
- **Kang, K**.*, Panzano, V.*, Chang, E.C., Ni, L., Dainis, A.M., Jenkins, A.M. Regna, K., Muskavitch, M.A.T. and Garrity P.A. (2012) Modulation of TRPA1 thermal sensitivity enables sensory discrimination in *Drosophila*. Nature, *481*, 76-80.
- Panzano, V.*, **Kang, K**.*, and Garrity P.A. (2010) Infrared snake eyes: TRPA1 and the thermal sensitivity of the snake pit organ. Science Signaling, *3*, pe22.
- **Kang K.,** Pulver, S.R., Panzano, V.C., Chang, E.C., Griffith, L.C., Theobald, D.L. and Garrity P.A. (2010) Analysis of *Drosophila* TRPA1 reveals an ancient origin for human chemical nociception. Nature, *464,* 597-600.
- Hamada, F.N., Rosenzweig, M., **Kang, K**., Pulver, S.R., Ghezzi, A., Jegla, T.J., and Garrity, P.A. (2008). An internal thermal sensor controlling temperature preference in *Drosophila*. Nature *454*, 217-220.
- **Kang,K.***, Shibukawa Y.*, Szerencsei,R.T., and Schnetkamp,P.P. (2005). Substitution of a single residue, Asp^{575}, renders the NCKX2 K^+-dependent Na^+/Ca^{2+} exchanger independent of K^+. Journal of Biological Chemistry, *680*, 2834-2839.
- **Kang,K.**, Kinjo,T.G., Szerencsei,R.T., and Schnetkamp,P.P. (2005). Residues contributing to the Ca^{2+} and K^+ binding pocket of the NCKX2 Na^+/Ca^{2+}-K^+ exchanger. Journal of Biological Chemistry, *680,* 2823-2833.