

## 脑与认知科学国家重点实验室学术报告: **Neuronal architecture of cytoneme-mediated paracrine signaling**

时间地点: 2019年4月10日 下午14:00-16:00, 图书馆二层

报 告 题 目 : **Neuronal architecture of cytoneme-mediated paracrine signaling**

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主持人: 刘力研究员

摘要:

While virtually all cells in an animal's body communicate with their neighbors, many scientists thought that only neurons — the specialized cells that comprise much of the brain and nervous system — produced the structures that allowed them to transmit and receive signals directly over long distances. Most scientists believed then that non-neural cells communicated by releasing molecules that waft around the extracellular fluid until they were taken up by neighboring cells. But our group discovered wire-like projections, cytonemes, and show that these structures function like cellular railways, precisely delivering molecular messages to faraway cells. Non-neural cells send out cytonemes and form synapses that resemble those that neurons make. Cytonemes facilitate cell-cell communication using neurotransmitters, the same molecular signals that neurons use to convey sensory information. Molecular complexes responsible for sending and receiving the signal on either side of the cytoneme synapse are the same as those found on the equivalent sides of neural synapses. Thus, cytoneme signaling has many of the remarkable attributes of neuronal signaling, such as quantitative, temporal and spatial specificity.

# Curriculum Vitae

## Hai Huang

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### Education

2006-2011 Institute of Biophysics, Chinese Academy of Sciences Ph.D., Cell Biology  
2002-2006 Wuhan University, Hubei, P.R.China B.S., Biology

### Research experience

2011-present Postdoctoral training, Cardiovascular Research Institute, University of California, San Francisco. Mentored by Dr. Thomas Kornberg  
Mechanism of tubulogenesis and filopodia formation.  
2006-2011 Doctoral dissertation, Institute of Biophysics. Mentored by Dr. Renjie Jiao  
Epigenetic regulation of chromatin plasticity and signaling transduction.  
2006 Undergraduate thesis, Institute of Biophysics.  
Mentored by Dr. Hongyu Deng  
Histone acetylation in the promoters of RTA regulates murine  
gammaherpesvirus 68 to enter the lytic phase.  
2004-2005 Undergraduate research, State Key Laboratory of Virology, Wuhan  
University. Mentored by Prof. Yuanyang Hu  
Tracking and controlling microorganisms and construction of recombinant  
virus that contain exogenous toxin gene.

### Awards and Honors

2016-2017 NIH T32 award in Molecular and Cellular Basis of Cardiovascular Disease  
2011 the Special Prize of President Scholarship for Postgraduate Students, Chinese  
Academy of Sciences (中国科学院院长特别奖)  
2011 Outstanding Student Award, Graduate School of the Chinese Academy of  
Sciences  
2010 Merit Student Award, Graduate School of the Chinese Academy of Sciences  
2010 Dean's Scholarship, Institute of Biophysics, Chinese Academy of Sciences  
2010 1<sup>st</sup> class scholarship in State Key Laboratory of Brain and Cognitive Science,  
Institute of Biophysics  
2009 1<sup>st</sup> class scholarship in State Key Laboratory of Brain and Cognitive Science,  
Institute of Biophysics  
2009 Merit Student Award, Graduate School of the Chinese Academy of Sciences  
2004 Excellent Student Award, Wuhan University  
2003 Excellent Student Award, Wuhan University

### Publication

1. **Huang H**, Liu S, Kornberg TB. 2019. Glutamate signaling at cytoneme synapses. *Science*, 363, 948–955.

2. Zhang Q, Schepis A, **Huang H**, Yang J, Ma W, Torra J, Zhang SQ, Yang L, Wu H, Nonell S, Dong Z, Kornberg TB, Coughlin S, Shu X. 2019. Designing a green fluorogenic protease reporter by flipping a beta strand of GFP for imaging apoptosis in animals. *J Am Chem Soc*, 141(11):4526-4530
3. Zhang Q<sup>#</sup>, **Huang H<sup>#</sup>**, Zhang L, Wu R, Chung CI, Zhang SQ, Torra J, Schepis A, Coughlin SR, Kornberg TB, Shu X. 2018. Visualizing Dynamics of Cell Signaling In Vivo with a Phase Separation-Based Kinase Reporter. *Mol Cell*, 69(2):347. (# co-first authors)
4. Zhang SQ, **Huang H**, Yang J, Kratochvil H, Lolicato M, Liu Y, Shu X, Liu L, DeGrado WF. 2018. Designed peptides that assemble into cross- $\alpha$ -amyloid-like structures. *Nat Chem Biol*, 14(9):870-875.
5. Chen W, **Huang H**, Hatori R, and Kornberg TB. 2017. Essential basal cytonemes take up Hedgehog in the Drosophila wing imaginal disc. *Development*, 144(17):3134-3144.
6. **Huang H**, Kornberg TB. 2016. Cells must express components of the planar cell polarity system and extracellular matrix to support cytonemes. *eLife*, 2016;5:e18979.
7. Rao PR<sup>#</sup>, Li Lin<sup>#</sup>, **Huang H**, Guha A, Roy S, Kornberg TB. 2015. Developmental compartments in the larval trachea of Drosophila. *eLife*, 2015;4:e08666.
8. **Huang H**, Kornberg TB. 2015. Myoblast cytonemes mediate Wg signaling from the wing imaginal disc and Delta-Notch signaling to the air sac primordium. *eLife*, 2015;4:e06114. (Recommended by "Faculty of 1000 Biology" : <http://f1000.com/prime/725478175>)
9. Roy S, **Huang H**, Liu S, Kornberg TB. 2014. Cytoneme-Mediated Contact-Dependent Transport of the Drosophila Decapentaplegic Signaling Protein. *Science*, 343, 1244624.
10. Yu D, Gustafson WC, Han C, Lafaye C, Noirclerc-Savoye M, Ge WP, Thayer DA, **Huang H**, Kornberg TB, Royant A, Jan LY, Jan YN, Weiss WA, Shu X. 2014. An improved monomeric infrared fluorescent protein for neuronal and tumour brain imaging. *Nat Commun*, 5:3626.
11. Zhou C<sup>#</sup>, **Huang H<sup>#</sup>**, Kim S<sup>#</sup>, Lin H, Meng X, Chiang AS, Wang J, Jiao R, Rao Y. 2012. Molecular genetic analysis of sexual rejection: roles of octopamine and its receptor OAMB in *Drosophila* courtship conditioning. *J Neurosci*, 32(41):14281-14287. (# co-first authors)
12. **Huang H**, Jiao R. 2012. Roles of chromatin assembly factor 1 in the epigenetic control of chromatin plasticity. *Sci China Life Sci*, 55(1):15-19.
13. **Huang H**, Du G, Chen H, Liang X, Li C, Xue L, Ma J, Jiao R. 2011. *Drosophila* Smt3 negatively regulates JNK signaling through sequestering Hipk in the nucleus. *Development*, 138(12):2477-2485.
14. **Huang H**, Yu Z, Zhang S, Liang X, Chen J, Li C, Ma J, Jiao R. 2010. *Drosophila* CAF-1 regulates HP1-mediated epigenetic silencing and pericentric heterochromatin stability. *J Cell Sci*, 123(16):2853-2861.
15. Xu Y, Lei Z, **Huang H**, Dui W, Liang X, Ma J, Jiao R. 2009. dRecQ4 is required for DNA synthesis and essential for cell proliferation in *Drosophila*. *PLoS ONE*, 4(7):e6107.
16. Yang Z, Tang H, **Huang H**, Deng H. 2009. RTA promoter demethylation and histone acetylation regulation of murine gammaherpesvirus 68 reactivation. *PLoS ONE*, 4(2):e4556.
17. Dong C, Zhang J, **Huang H**, Chen W, Hu Y. 2009. Pathogenicity of a new China variety of *Metarhizium anisopliae* (M. *Anisopliae* var. *Dcjhylum*) to subterranean termite *Odontotermes formosanus*. *Microbiol Res*, 164(1):27-35.

18. Dong C, Zhang J, Chen W, **Huang H**, Hu Y. 2007. Characterization of a newly discovered China variety of *Metarhizium anisopliae* (*M. anisopliae* var. *dcjhyium*) for virulence to termites, isoenzyme, and phylogenic analysis. *Microbiol Res*, 162(1):53-61.

### **Presentations and posters in conferences**

1. **Huang H**, Kornberg T. Synaptic, planar polarity and ECM proteins are required for cytoneme-mediated paracrine signaling. *American Society for Cell Biology annual meeting. December 2016, San Francisco, CA, USA.*
2. **Huang H**, Roy S, Kornberg T. Cytoneme-mediated Notch signaling between wing disc myoblasts and trachea. *55<sup>th</sup> Annual Drosophila Research Conference. March 2014, San Diego, CA, USA. (Poster)*
3. Roy S, **Huang H**, Kornberg T. Cytoneme-mediated contact-dependent transport of the *Drosophila* Decapentaplegic signaling protein. *55<sup>th</sup> Annual Drosophila Research Conference. March 2014, San Diego, CA, USA.*
4. **Huang H**, Chen H, Li C, Wu Q, Liang X, Jiao R. Acetylation of histone H4 by Chameau is required for proper expression of Notch target genes. *52<sup>nd</sup> Annual Drosophila Research Conference. March 2011, San Diego, CA, USA. (Poster)*
5. Renjie Jiao, **Hai Huang**, Hanqing Chen, Xuehong Liang, Changqing Li, Lei Xue, Jun Ma. The sumoylation pathway regulates JNK pathway through the action of Hipk. *52<sup>nd</sup> Annual Drosophila Research Conference. March 2011, San Diego, CA, USA. (Poster)*
6. **Huang H**, Zhou C, Guo X, Rao Y and Jiao R. Investigation of the potential functions of octopamine receptors in *Drosophila melanogaster*. *3<sup>rd</sup> National Conference on Brain and Cognitive Science, November 2007, Yunnan, China.*

### **Professional Associations**

Genetic Society of America (Membership)  
American Heart Association (Membership)  
American Society for Cell Biology (Membership)

### **Ad hoc reviewer**

Molecular and Cellular Biochemistry; International Journal of Nanomedicine; Heart & Lung; Biomaterials Science; Yale Journal of Biology and Medicine; Journal of Cardiovascular Disease Research; Chinese Journal of Natural Medicines