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Research Interests and the facilities in Prof. Jian-Zhi Wang' Lab

Research Interests in prof. JZ Wang' Lab

- To explore the mechanisms underlying Alzheimer's neurodegeneration, especially the role of tau and the nature of Neurodegenration.
- To develop methods, cell and animal models for measuring the abnormal tau proteins and the cellular or systemic effects of tau proteins
- To search for new strategies arresting the disease progression.

Research Interests in prof. JZ Wang' Lab (major findings)

- Tau hyperphosphorylation renders the cells more resistant to the chemically induced apoptosis, simultaneously the hyperphosphorylated tau impairs the cell functions.
- Based on these findings, we have proposed that the nature of "AD neurodegeneration" may represent a new type of tau-regulated chronic neuron death, namely "neurodegenerasis".

Research Interests in prof. JZ Wang' Lab (major findings)

- We speculate that transient tau phosphorylation helps cells abort from an acute apoptosis, while persistent tau hyperphosphorylation & accumulation may trigger cell senescence with a destiny of neurodegeneration.

Research Interests in prof. JZ Wang' Lab (major findings)

- We reveal that molecular mechanisms underlie tau-induced cell anti-apoptosis involves substrate competition of tau and β-catenin for GSK-3β; activation of Akt; preservation of Bcl-2 and suppression of Bax, cytosolic cytochrome-c, and caspase-3 activity; and upregulation of unfolded protein response (UPR) during ER stress.

Research Interests in prof. JZ Wang' Lab (major findings)

- Glycogen synthase kinase-3β and protein phosphatase-2A may be the most crucial kinase and phosphatase in Alzheimer-like tau pathologies.
- Tau proteins isolated from the Alzheimer's brain is abnormally glycosylated, and O-glycosylation is negatively correlated with the phosphorylation of tau.

Recent reprehensive papers (from >130)

- Zhang Z, Song M , Liu X, Kang SS, Kwon IS, Duong DM, Seyfried NT, Hu WT, Liu Z, **Wang JZ**, Cheng L, Sun YE, Yu SP, Levey AI and Ye K*. Proteolytic processing of tau by asparagine endopeptidase mediates the neurofibrillary pathology in Alzheimer's disease. ***Nat Med***. Accepted
- Yang Y, Shu X, Liu D, Shang Y, Wu Y, Pei L, Xu X, Tian Q, Zhang J, Qian K, Wang YX, Petralia RS, Tu W, Zhu LQ, **Wang JZ**, Lu Y. EPAC null mutation impairs learning and social interactions via aberrant regulation of miR-124 and Zif268 translation. ***Neuron***. 2012 Feb 23;73(4):774-88.
- Zhu LQ, Zheng HY, Peng CX, Liu D, Li HL, Wang Q and **Wang JZ**. Protein Phosphatase 2A Facilitates Axonogenesis by Dephosphorylating CRMP2. ***J Neurosci.*** 2010, 30:3839-3848.
- Zhu LQ, Liu D, Hu J, Cheng J, Wang SH, Wang Q, Wang F, Chen JG, and **Wang JZ**. GSK-3β inhibits presynaptic vesicle exocytosis by phosphorylating P/Q-type calcium channel and interrupting SNARE complex formation. ***J Neurosci***. 2010, 30:3824-3833.
- Li HL, Wang HH, Liu SJ, Deng YQ, Zhang YJ, Tian Q, Wang XC, Chen XQ, Yang Y, Zhang JY, Wang Q, Xu H, Liao FF, **Wang JZ**. Phosphorylation of tau antagonizes apoptosis by stabilizing beta-catenin, a mechanism involved in Alzheimer's neurodegeneration. ***Proc Natl Acad Sci U S A***. 2007, 104(9):3591-3596.
- Zhu LQ, Wang SH, Yin YY, Liu D, Zheng HY, Shi HR, Tian Q, Wang XC, Wang Q, Chen JG, **Wang JZ**. Activation of glycogen synthase kinase-3 inhibits long term potentiation with synapse-associated impairments. **J Neurosci.** 2007, 27:12211–12220.

Resources and Techniques in prof. JZ Wang' Lab

Plasmids

- wt and site mutated tau40: R406W, V337M, G272V, P301L, S262E, S262A, S199E, S199A, S404D, S396D, S409A
- tau46,tau39,tau24
- wt and swe mutated APP
- wt and site mutated GSK-3, PKC, AKT, p38, CDK5,PP-2A, SET, PTPA
- Mitochondria related proteins: Mito, OPA1, Mfn1, Mfn2
- ER related proteins: Bip, SiL1
- Synaptic proteins: VAMP2, SypI, GluT1, GluT4

Cell Lines & Transgenic Mice

- N2a, N2a/APP, N2a/tau40; HEK293, HEK293/tau; SH-SY5Y, SK-N-SH; PC12; CHO.....
- Tg2576; APP/PS1; htau(ki)/mtau(ko); mtau(ko); 3Xtg AD; TRPC1 ko; GSK-3beta Flox-ko…..
- Sporadic AD model (hHcy rats) …….

Electrophysiology & Imaging

- Patch Clamp (EPSP, AP)
- In-vitro multi-channel electrophysiological recording (LTP in rat and mouse brains……)
- In-vivo multi-channel electrophysiological recording (Spiking recording in rats with photostimulations…….)
- Ca2+ Oscillations
- FRAP
- FRET

Animal Experiments

- Morris water maze
- Barnes circular maze
- Elevated plus maze
- Radial arm maze
- T-maze
- Stereotaxic brain injection
- Contextual fear conditioning
- Active/Passive avoidance
- Forcing swimming
- Step-down test
- Open Field

Biochemistry & Molecular Biology

- Western blot
- Immunohistochemistry
- Immunofluorescence
- Immunoprecipitation
- Flow cytometry
- ELISA
- Site-specific mutagenesis
- q-PCR
- RT-PCR
- RNA/DNA extraction
- ……..

Cell Morphology and Biology

- Nissl staining
- Golgi staining (synapse morphologies)
- Silver staining (neurofibrillary tangles)
- H&E staining
- Cell lines subculture
- Primary neuron culture
- Transfection
- Cell migration
- Single cell injection

Neurological Disorders Related Journals

- Journal of Neurology & Neurophysiology
- Journal of Neuroinfectious Diseases
- International Journal of Neurorehabilitation

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