Investigating the Role of JIPs, DLK, and PHD3 in Cellular Osmotic Stress Responses

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Introduction

JIPs (JNK induced proteins) are scaffold proteins that interact with DLK (Dual Leucine Zipper Kinase) to respond to environmental stress. PHD3 senses intracellular oxygen concentrations. This study investigates the roles and interactions of JIPs (JNK induced proteins) 1, 2, and 3, DLK (Dual Leucine Zipper Kinase), and PHD3 (Prolyl Hydroxylase Domain 3) under osmotic stress conditions. The research aims to understand the mechanism of actin formation and maintenance, a critical component of the cell's cytoskeleton.

Experiment

Fluorescent proteins were transfected to HeLa cells and incubated for 24 hours. Cells were treated with 500 mM sorbitol to induce osmotic stress, observed with fluorescent microscopy, and deconvoluted images of proteins, actin, and nuclei were obtained.

Results and Discussion

The study reveals extensive colocalization between PHD3 and JIP1 (Fig.1), suggesting a potential signaling network. The increased nuclear concentration of PHD3, likely due to its control of HIF-1α (Hypoxia-Inducible Factor 1-alpha) transcriptional activity, indicates its active role in the osmotic stress response. DLK, under osmotic stress localizes to the Golgi apparatus and lysosomes (Fig.3), and it primarily interacts with JIP2 and JIP3 (Fig.2), indicating its role in expressing the c-Jun pathway via these proteins. The exchange of fluorescent proteins showed concurring information from these results in repeated experiments.

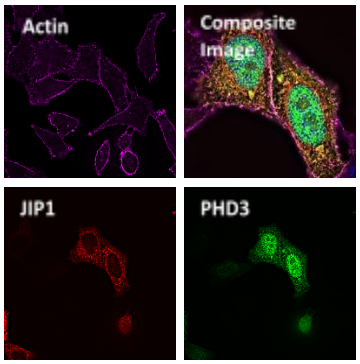

Fig.1 Colocalization between JIP1 and PHD3 under osmotic stress represented by peak yellow signals in the perinuclear region.

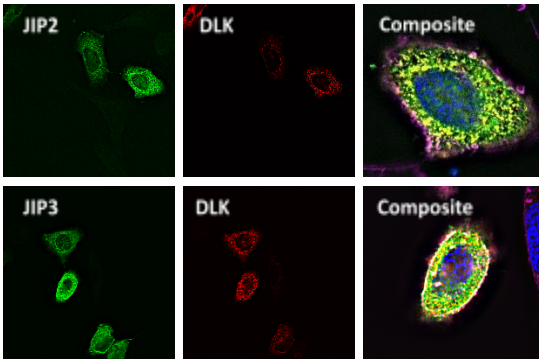

Fig.2 Extensive colocalized yellow signal between JIP2 and JIP3 with DLK under osmotic stress.

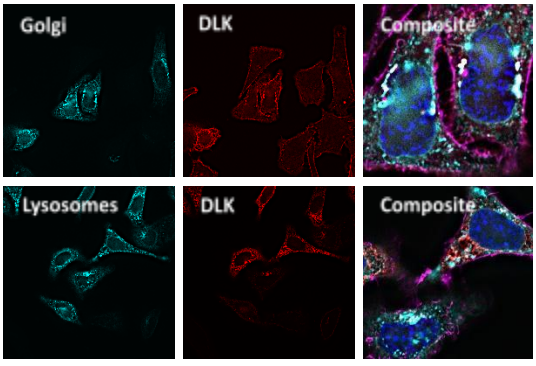

Fig.3 DLK is observed from white signal peaks strongly in the Golgi apparatus and in the lysosomes.

Conclusion

The research provides novel information on the mechanisms and nature of these proteins' interactions and roles under osmotic stress.