Phase-separated proteinous glues as self-organizer of microfilament networks

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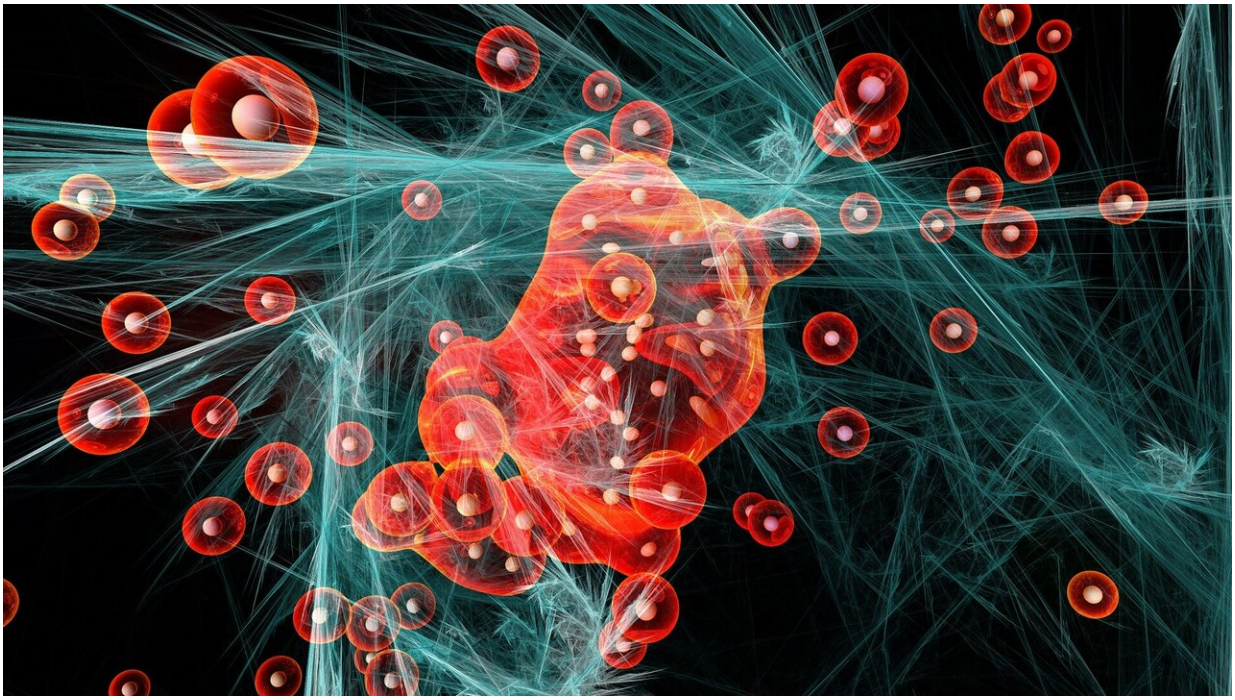

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In a study published in *Proceedings of the National Academy of Sciences*, researchers from Dr. Zhu Xueliang's lab at Shanghai Institute of Biochemistry and Cell Biology, Center for Excellence in Molecular Cell Science of the Chinese Academy of Sciences, found that abLIM1, a microfilament-binding and bundling protein, functions as a phase separation-dependent actin nucleator and microfilament crosslinker

capable of self-assembling unique microfilament arrays.

abLIM1, a paralogue of abLIM2, abLIM3, and dematin, is composed of N-terminal LIM domains, a long intrinsically disordered region (IDR), and a short C-terminal villin headpiece (VHP) domain.

The researchers found that abLIM1 forms condensates through liquid-liquid phase separation (LLPS) of its IDR. Furthermore, they found that the abLIM1 condensates can both promote actin nucleation and flow along microfilaments to "glue" them into bundles, leading to formations of discrete, aster-like radial arrays and large-scale, interconnected webs of microfilament bundles. Both the IDR and the VHP are required for the nucleation and network-constructing activities, whereas the LIM domains appear to exert an autoinhibitory function.

These results not only explain why abLIM1 enables the formation of dense cortical actin networks to prevent cells from blebbing under mechanical tension, but also provide insights into how LLPS-induced condensates could self-organize intracellular architectures of high connectivity and plasticity.

More information: Sen Yang et al, Self-construction of actin networks through phase separation–induced abLIM1 condensates, *Proceedings of the National Academy of Sciences* (2022). DOI: 10.1073/pnas.2122420119

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