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MBoC 20TH ANNIVERSARY FAVORITES

An MBoC Favorite: Cytokinesis and midzone microtubule organization in Caenorhabditis elegans require the kinesin-like protein ZEN-4
J. Hardin

An MBoC Favorite: TOR controls translation initiation and early G1 progression in yeast
M. P. Ashe

ARTICLES

Biosynthesis and Biodegradation

NAC functions as a modulator of SRP during the early steps of protein targeting to the endoplasmic reticulum

NAC acts as a modulator of SRP function. It can bind to signal sequences directly. SRP initially displaces NAC from RNCs; however, when the signal sequence emerges, trimeric NAC-RNC-SRP complexes form. Upon docking NAC-RNC-SRP complexes to the ER, NAC remains bound, allowing NAC to shield cytosolically exposed nascent chain domains.

Molecular chaperones and stress-inducible protein-sorting factors coordinate the spatiotemporal distribution of protein aggregates
L. Malinovska, S. Kroschwitz, M. C. Munder, D. Richter, and S. Alberti

The deposition of misfolded proteins in cytoplasmic protein bodies requires the concerted action of stress-inducible protein-sorting factors and molecular chaperones. Protein sequestration during acute stress is a cellular strategy that adjusts the flux of misfolded proteins to the capacities of the protein quality control system.

Cell Biology of Disease

Oxidized LDL/CD36 interaction induces loss of cell polarity and inhibits macrophage locomotion

Oxidized low-density lipoprotein (oxLDL) via CD36 regulates signals for cell polarization and inhibits macrophage migration. The suggested mechanism is nonmuscle myosin II inhibited by Vav/Rac. This indicates that activated Rac induces retraction of cell front and suggests a mechanism of macrophage trapping in atherosclerotic plaque.

Knockdown of ttc26 disrupts ciliogenesis of the photoreceptor cells and the pronephros in zebrafish
Q. Zhang, Q. Liu, C. Austin, I. Drummond, and E. A. Pierce

The article describes characterization of the cilia protein Ttc26. The data show that Ttc26 is localized in the transition zone of primary cilia and photoreceptor cells. Knockdown of Ttc26 produced defective cilia in murine inner medullary collecting duct 3 cells and ciliogenesis defects in retinal photoreceptor and motile cilia in the pronephros in zebrafish.

Cell Cycle

Live-cell monitoring of periodic gene expression in synchronous human cells identifies Forkhead genes involved in cell cycle control

A periodic luciferase reporter system from cell cycle–regulated promoters in synchronous U2OS cells measures periodic, cell cycle–regulated gene expression in live cells. This assay is used to identify Forkhead transcription factors that control periodic gene expression, and it identifies FOXK1 as an activator of key cell cycle genes.
α-Actinin and fimbrin cooperate with myosin II to organize actomyosin bundles during contractile-ring assembly
D. Laporte, N. Ojkic, D. Vavylonis, and J.-Q. Wu
During cytokinesis in Schizosaccharomyces pombe, the transient connections between nodes allow them to condense into the contractile ring. We find that α-actinin and fimbrin, two actin cross-linking proteins, are critical for node condensation as they stabilize transient linear actomyosin structures and thus modulate the morphology of the actomyosin network.

A Highlights from MBoC Selection
The nucleoporin Nup205/NPP-3 is lost near centrosomes at mitotic onset and can modulate the timing of this process in Caenorhabditis elegans embryos
V. Hachet, C. Busso, M. Toya, A. Sugimoto, P. Askjaer, and P. Gönczy
Through an RNAi-based modifier screen, we identified the nucleoporin Nup205/NPP-3 as a negative regulator of mitotic onset in Caenorhabditis elegans. Strikingly, NPP-3 is lost from the nuclear envelope at mitotic onset in an AIR-1– and centrosome-dependent manner. We propose a model whereby centrosomes and AIR-1 promote timely mitosis by locally removing NPP-3.

Control of the mitotic exit network during meiosis
M. A. Attner and A. Amon
The mitotic exit network (MEN), a pathway essential for vegetative growth, is largely dispensable for the specialized meiotic divisions, contributing only to timely exit from meiosis II. MEN activity is restricted to meiosis II by multiple regulatory mechanisms distinct from those operative in mitosis.

Pac-man motility of kinetochores unleashed by laser microsurgery
J. R. LaFountain, Jr., C. S. Cohan, and R. Oldenbourg
Experiments reveal pac-man motility in kinetochores of X-Y chromosomes, even though their normal behavior is dominated by traction fiber mechanics. A laser microbeam is used to release kinetochores in anaphase from tension. There is a poleward motion of released kinetochores twice as fast as normal and faster than tubulin flux.

Cell Motility
A Highlights from MBoC Selection
The CSC connects three major axonemal complexes involved in dynein regulation
T. Heuser, E. E. Dymek, J. Lin, E. F. Smith, and D. Nicastro
This study reveals the 3D structure of the CSC and its connections to three major axonemal complexes involved in dynein regulation, including the distal radial spoke and the nexin-DRC. The findings corroborate radial spoke heterogeneity and suggest a unique role for the distal spoke in calcium-mediated signal transduction and flagellar motility.

Cytoskeleton
Characterization of an apical ceramide-enriched compartment regulating ciliogenesis
Q. He, G. Wang, S. Dasgupta, M. Dinkins, G. Zhu, and E. Bieberich
The sphingolipid ceramide is essential for the formation, elongation, or maintenance of primary cilia. A novel, apical ceramide-enriched compartment induces formation of a ciliogenic protein complex with Rab11a, which sustains formation and maintenance of primary cilia by preventing deacetylation of microtubules.

Polarization of actin cytoskeleton is reduced in dendritic protrusions during early spine development in hippocampal neuron
V. Tatavarty, S. Das, and J. Yu
This is the first measurement of F-actin retrograde flow rate in dendritic filopodia (1.20 µm/min), the precursor of dendritic spines, and in newly formed spines (0.03 µm/min). The difference indicates a remodeling of the force-generation mechanism during spinogenesis. It is also found that myosin II plays a role in regulating F-actin flow.

Membrane Trafficking
A Highlights from MBoC Selection
Differential recognition of a dileucine-based sorting signal by AP-1 and AP-3 reveals a requirement for both BLOC-1 and AP-3 in delivery of OCA2 to melanosomes
OCA2 is used as a model melanosome cargo protein to define primary sequence elements required for acidic dileucine–motif binding to adaptors AP-1 and AP-3. OCA2 must bind to AP-3 for melanosome localization. BLOC-1 is also required and thus can cooperate with either adaptor for cargo delivery to lysosome-related organelles.
Atg16L1, an essential factor for canonical autophagy, participates in hormone secretion from PC12 cells independently of autophagic activity

K. Ishibashi, T. Uemura, S. Waguri, and M. Fukuda

Atg16L1, a protein essential for autophagy, is localized on dense-core vesicles in PC12 cells, and knockdown of Atg16L1 inhibits hormone secretion independently of autophagy. In addition, Atg16L1 interacts with the small GTPase Rab33A, and this interaction is required for the dense-core vesicle localization of Atg16L1.

cis-Golgi proteins accumulate near the ER exit sites and act as the scaffold for Golgi regeneration after brefeldin A treatment in tobacco BY-2 cells

Y. Ito, T. Uemura, K. Shoda, M. Fujimoto, T. Ueda, and A. Nakano

Particular cis-Golgi proteins accumulate in novel punctate structures close to ERES by BFA treatment in tobacco BY-2 cells. These structures reassemble first to form cis-Golgi after BFA removal, and the Golgi stacks regenerate in the cis-to-trans order. This indicates that the punctate structures act as the scaffold for Golgi regeneration.

A Highlights from MBoC Selection

Trafficking defects in WASH-knockout fibroblasts originate from collapsed endosomal and lysosomal networks


WASH regulates endosomal sorting, but its roles are ill defined. WASH-knockout MEFs display enlarged yet ordered endosomes without aberrant tubulation and a collapsed lysosomal network. Without WASH, EGFR is basally degraded, whereas TfnR is not, which supports discrete receptor trafficking via WASH-dependent and WASH-independent mechanisms.

Rab27 effector Slp2-a transports the apical signaling molecule podocalyxin to the apical surface of MDCK II cells and regulates claudin-2 expression

T. Yasuda, C. Saegusa, S. Kamakura, H. Sumimoto, and M. Fukuda

Slp2-a is required for targeting of the signaling molecule podocalyxin to the apical membrane in MDCK II cells in a Rab27A-dependent manner. Apical membrane localization of podocalyxin is required for expression of the tight junction protein claudin-2 through modulation of intracellular signals, including MAPK signals.

Nuclear Functions

DNA polymerization-independent functions of DNA polymerase epsilon in assembly and progression of the replisome in fission yeast

T. Handa, M. Kanke, T. S. Takahashi, T. Nakagawa, and H. Masukata

DNA Pol ε synthesizes the leading strands, following the CMG (Cdc45/Mcm2-7/GINS) helicase, although the N-terminal polymerase domain of the catalytic subunit, Cdc20 in fission yeast, is dispensable for viability. We show that the C-terminal domain of Cdc20 plays the noncatalytic essential roles in both the assembly and progression of CMG helicase.

Signaling

The TAM-family receptor Mer mediates production of HGF through the RhoA-dependent pathway in response to apoptotic cells

H.-J. Park, J.-Y. Baen, Y.-J. Lee, Y.-H. Choia, and J. L. Kang

The receptor protein tyrosine kinases Tyro3, Axl, and Mer play important roles in macrophage function. Study of the induction of HGF during the interaction of macrophages with apoptotic cells shows that only Mer is responsible for mediating transcriptional HGF production through a RhoA-dependent pathway.

A Highlights from MBoC Selection

A balance of FGF and BMP signals regulates cell cycle exit and Equarir expression in lens cells

M. Jarrin, T. Pandit, and L. Gunhaga

The roles of BMP and FGF during the transition of proliferating lens epithelial cells to differentiated primary lens fiber cells are examined. The results show that proliferation, cell cycle exit, and early differentiation of primary lens fiber cells are regulated by counterbalancing BMP and FGF signals.

CORRECTION

Analysis of yeast endocytic site formation and maturation through a regulatory transition point

S. Y. Carroll, H. E. M. Stimpson, J. Weinberg, C. P. Toret, Y. Sun, and D. G. Drubin

The CMG (Cdc45/Mcm2-7/GINS) helicase, although the N-terminal polymerase domain of the catalytic subunit, Cdc20 in fission yeast, is dispensable for viability. We show that the C-terminal domain of Cdc20 plays the noncatalytic essential roles in both the assembly and progression of CMG helicase.