PNAS Plus Significance Statements

Dynamic gradients of an intermediate filament-like cytoskeleton are recruited by a polarity landmark during apical growth

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Here (pp. E1889–E1897), we show that FilP, a bacterial cytoskeletal protein related to metazoan intermediate filament (IF) proteins, can self-assemble into a regular network structure. This finding offers a possible explanation for its previously characterized role in cellular rigidity and elasticity and might offer insights into the mechanical role of human IFs. The assembly of FilP cytoskeleton is coupled to the function of the polarisome, a protein complex orchestrating the polar growth characteristic of *Streptomyces*. These results suggest that apical assembly of a stress-bearing cytoskeleton is a common strategy in tip-growing walled cells, such as filamentous fungi, pollen tubes, and mycelial bacteria.

Kif7 is required for the patterning and differentiation of the diaphragm in a model of syndromic congenital diaphragmatic hernia

Garry L. Coles and Kate G. Ackerman

Human congenital diaphragmatic defects are almost as common as cystic fibrosis, cause neonatal mortality, and often result in multisystem morbidity throughout childhood. Research investigating mechanisms of development is needed to understand the pathogenesis of disease. In this report (pp. E1898–E1905), we identified a model caused by a mutation in kinesin motor family gene *kinesin family member 7*. We determined that this gene is required to regulate cell proliferation, patterning, and differentiation in the embryonic diaphragm. We ascertained several functions of retinoid signaling in diaphragm development and gained insight into how perturbations in this signaling network promote the pathogenesis of congenital diaphragmatic hernia.

Robust measurement of telomere length in single cells

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Telomeres are the structures at the ends of chromosomes that protect these ends from degradation or joining to one another. Telomeres consist of repeat DNA sequences and the length is gradually eroded as the cell ages. The ability to measure telomere length in individual cells would be important for studies of cell senescence, malignancy, stem cell renewal, and human fertility. We have developed a robust and practical method for estimating the telomere length of single cells (pp. E1906–E1912), and used this method to demonstrate the heterogeneity or changes of telomere length in several systems.

Motile invaded neutrophils in the small intestine of *Toxoplasma gondii*-infected mice reveal a potential mechanism for parasite spread

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Toxoplasma gondii infection occurs following consumption of infected meat or contaminated water and produce. As a result, the parasite first enters the body in the intestine, but we understand surprisingly little about how it behaves there. In this study (pp. E1913–E1922), we show that *T. gondii* can invade neutrophils in the intestine directly, hitching a ride in these cells as they migrate out of the intestinal tissue into the lumen. Our findings implicate neutrophils and other immune cells in a surprising luminal pathway for the spread of infection and suggest new targets for therapeutic intervention in oral infection.

Farnesylation of lamin B1 is important for retention of nuclear chromatin during neuronal migration

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Both lamin B1 and lamin B2 have farnesyl lipid anchors, but the importance of this lipid modification has been unclear. We addressed that issue (pp. E1923–E1932) with knock-in mouse models. Mice expressing nonfarnesylated lamin B2 developed normally and were healthy. In contrast, mice expressing nonfarnesylated lamin B1 exhibited a severe neurodevelopmental abnormality accompanied by a striking defect in the cell nucleus. During the migration of neurons, the nuclear lamina was pulled free of the chromatin. Thus, farnesylation of lamin B1—but not lamin B2—is crucial for neuronal migration in the brain and for the retention of chromatin within the nuclear lamina.

Human amnesia and the medial temporal lobe illuminated by neuropsychological and neurohistological findings for patient E.P.

Ricardo Insausti, Jacopo Annese, David G. Amaral, and Larry R. Squire

Patient E.P. developed profound amnesia from encephalitis and then was studied for 14 years before his death in 2008. He had no capacity for acquiring new knowledge about facts and events and had retrograde amnesia covering several decades. This report (pp. E1953–E1962) presents detailed neurohistological findings for this case and relates these findings to his neuropsychological data. The damage included all the structures of the medial temporal lobe bilaterally. In addition, the lateral temporal cortex was shrunken and gliotic. The findings illuminate a number of issues about memory, perception, and cognition and about the functions of medial and lateral temporal lobe.

WRKY8 transcription factor functions in the TMV-cg defense response by mediating both abscisic acid and ethylene signaling in *Arabidopsis*

Ligang Chen, Liping Zhang, Daibo Li, Fang Wang, and Diqiu Yu

Previous studies have shown that abscisic acid (ABA) has a positive effect on virus infection, and ethylene has a negative effect. However, the possible crosstalk between ABA and ethylene signaling during plants–virus interaction remains unclear. Our current results (pp. E1963–E1971) demonstrate that WRKY8 is involved in the defense response against crucifer-infecting tobacco mosaic virus (TMV-cg) through the direct regulation of the expression of *ABI4*, *ACS6*, and *ERF104* and thus may mediate the crosstalk between ABA and ethylene signaling during the TMV-cg–Arabidopsis interaction.