Nature Reviews Molecular Cell Biology | Published online 22 Aug 2016

IN BRIEF

RNA DECAY

The exosome TRAMPs on viral RNA

Performing RNAi screens for factors that restrict several RNA viruses in fruit flies, Molleston *et al.* discovered that depletion of the 3′ to 5′ exonucleases dRrp6 or dDis3, which are the catalytic subunits of the RNA exosome complex, or depletion of dMtr4 or dZcchc7, which are subunits of the exosome RNA-binding co-factor TRAMP complex, greatly increased the levels of viral RNA in cells and in the fat body tissue. This was recapitulated upon depletion of RRP6, DIS3, MTR4 or ZCCHC7 in the virus-permissive human U2OS cells. In these cells, MTR4 and ZCCHC7 were exported from the nucleus to the cytoplasm following infection by the nuclear export protein CRM1, where they interacted with RRP6. Viral mRNAs were then selectively bound by ZCCHC7 and degraded at their 3′ ends in an exosome-dependent and ZCCHC7-dependent manner.

ORIGINAL ARTICLE Molleston, J. M. *et al.* A conserved virus-induced cytoplasmic TRAMP-like complex recruits the exosome to target viral RNA for degradation. *Genes Dev.* **30**, 1658–1670 (2016)

PROTEIN METABOLISM

Ceramide switches membrane protein topology

Chen *et al.* report that the lipid ceramide inverts the membrane orientation of the endoplasmic reticulum (ER) transmembrane protein TM4SF20, thereby changing its function. Without ceramide, the amino terminus of TM4SF20 was exposed to the ER lumen, and insertion in this orientation required the first TM4SF20 transmembrane helix and TRAM2 (translocating chain-associated membrane protein 2). Ceramide altered the direction through which transmembrane helices are inserted into the ER during translation and the amino terminus became cytosolic. As opposite-orientation insertion was induced by TRAM2 knockdown, the authors propose that ceramide may induce such an orientation switch by blocking TRAM2–TM4SF20 interactions. In the amino terminus cytosol-facing orientation, TM4SF20 promotes the cleavage of the membrane-bound precursor of CREB3L1 (a transcription factor that inhibits the cell cycle and promotes collagen synthesis) rather than inhibiting it, thus enabling CREB3L1 to enter the nucleus.

ORIGINAL ARTICLE Chen, Q. *et al.* Inverting the topology of a transmembrane protein by regulating the translocation of the first transmembrane helix. *Mol. Cell* http://dx.doi.org/10.1016/j.molcel.2016.06.032 (2016)

NUCLEAR ORGANIZATION

The plant nucleolus arranges chromosomes

The nucleolus — the site of rRNA gene transcription and ribosome biogenesis — is the largest nuclear body. Pontvianne *et al.* identified nucleolus-associated chromatin domains (NADs) in plants. Nucleoli were purified from *Arabidopsis thaliana* leaves and DNA sequencing revealed that, in addition to actively transcribed rRNA genes, NADs contain heterochromatic regions and include transposable elements, sub-telomeric regions, silenced protein-coding genes, tRNA genes and pseudogenes. In *nucleolin 1* mutants, in which the nucleolar structure is disrupted, NAD composition was altered. rRNA genes on chromosome 2 became abnormally activated and associated with the nucleolus and nucleolar clustering of telomeres was affected. Moreover, telomeres were shorter. This work suggests a functional role for the nucleolus in genome organization and telomere maintenance.

ORIGINAL ARTICLE Pontvianne, F. *et al.* Identification of nucleolus-associated chromatin domains reveals a role for the nucleolus in 3D organization of the *A. thaliana* genome. *Cell Rep.* **16**, 1574–1587 (2016)