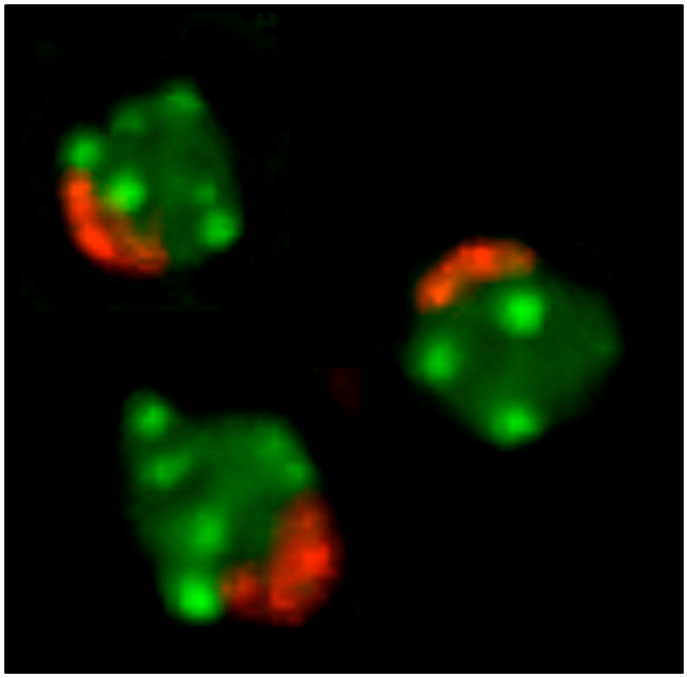
Clustering heterochromatin: Sir3 promotes telomere clustering independently of silencing in budding yeast

Myriam Ruault[1,2], Arnaud De Meyer[1,2], Isabelle Loiodice[1,2] and Angela Taddei[1,2]*

[1]Institut Curie, Centre de Recherche, Paris, F-75248 France; [2]CNRS, UMR 218, Paris, F-75248 France

A general feature in the nucleus of eukaryotic cells is the organization of repetitive DNA in clusters concentrating silencing factors. We investigated, in budding yeast, how telomeres cluster in perinuclear foci associated with the silencing complex Sir2/Sir3/Sir4. Here we show that Sir3 is a limiting factor for telomere clustering that when overexpressed leads to the grouping of telomeric foci into larger foci. These telomere “hyperclusters” are mainly found in the nuclear interior and correlate with more stable silencing in subtelomeric regions. However, we identified alleles of *SIR3* that separate silencing and clustering function of Sir3. This latter function of Sir3 was effective in the absence of Sir2 and Sir4 but required the C-terminal domain of Rap1 responsible for recruiting Sir3 to telomeres. We thus demonstrate that Sir3 promotes telomere clustering in absence of perinuclear anchoring and independently of silencing. Furthermore, arrays of binding sites for Sir3 at telomeres appeared as the only requirement to promote trans-interactions between telomeres. We propose that similar mechanisms involving proteins able to oligomerize account for long-range interactions that impact genomic functions in many organisms.



sur cette image on visualise le nucléole en rouge grâce à l'expression de la protéine Sik1-mRFP et les foyers de télomères en vert grâce à l'expression de la protéine Rap1-GFP.

Références:

1- Gotta, M., Laroche, T., Formenton, A., Maillet, L., Scherthan, H., and Gasser, S.M. (1996). The clustering of telomeres and colocalization with Rap1, Sir3, and Sir4 proteins in wild-type Saccharomyces cerevisiae. J Cell Biol *134*, 1349-1363.

2- Norris, A., and Boeke, J.D. (2010). Silent information regulator 3: the Goldilocks of the silencing complex. Genes Dev *24*, 115-122.