Telomeres and Cancer
UMR3244 - Dynamics of Genetic Information

Tumorigenesis is a multistep process in which chromosomal instability plays an important role.

We have shown that telomere instability due to excessive shortening is the main driving force of chromosome aberrations during the early stages of cell transformation. Our work has shown that this chromosome instability is associated with genome-wide changes in the chromatin landscape, which are directly correlated with transcriptome changes mainly affecting the non-coding genome, including microRNAs.

We have discovered that the deregulation of microRNAs following chromosome instability is responsible for the acquisition of tumor-related phenotypes and the induction of a metastable state of cell differentiation in which epithelial cells respond to a senescence microenvironment by engaging in transitions deemed to be important for different steps in the metastatic progression of carcinomas. During this process, transformed epithelial cells acquire stem cell characteristics with renewal capacity, become cell-autonomous tumor initiating cells and are endowed of mesenchymal differentiation potential. Our laboratory is interested in exploring the molecular mechanisms that drive the production of cancer stem cells and specifically in dissecting the microRNA/transcription factor circuitry that connects such differentiation metastability to tumor aggressiveness. Identifying key actors in this circuitry will open the possibilities for drug development.

Our laboratory is also interested in understanding the molecular bases of telomerase-independent telomere maintenance mechanisms (ALT). Indeed, a non-negligible proportion of cancer cells use recombination instead of telomerase to maintain telomere length. On the other hand, there is increasing evidence that anti-telomerase therapies may favor the
emergence of ALT mechanisms, thus allowing the tumor cell to escape. We have shown that recombination between telomeres occur in specialized PML bodies specifically found in ALT cells. We are currently studying the mechanisms by which telomeres are recruited to these structures and how recombination reactions, which are normally suppressed at telomeres, are allowed in the ALT context. Understanding how ALT mechanisms work will open a new path in anti-tumour strategies.

Finally, we are interested in understanding the role of RTEL1, a helicase whose gene is found associated with severe forms of Hoyeraal-Hreidarsson syndrome. Although the protein has been involved in telomere and genome instability in the mouse, we have found that it plays an
important role in non-coding RNA trafficking and RNP biogenesis in human cells. One major aim of our work is to define the contribution of RNA-related defects to the disease manifestations.

Key publications

Year of publication 2018


**Human RTEL1 stabilizes long G-overhangs allowing telomerase-dependent over-extension**
*Nucleic Acids Research* : DOI : 10.1093/nar/gky173

Year of publication 2015


**Human regulator of telomere elongation helicase 1 (RTEL1) is required for the nuclear and cytoplasmic trafficking of pre-U2 RNA.**
*Nucleic acids research* : 1834-47 : DOI : 10.1093/nar/gku1402

Year of publication 2014


**CRIPTO overexpression promotes mesenchymal differentiation in prostate carcinoma cells through parallel regulation of AKT and FGFR activities.**
*Oncotarget* : 11994-2008

Maya Jeitany, Jose Ramon Pineda, Qingyuan Liu, Rosa Maria Porreca, Françoise Hoffschir, Chantal Desmaze, David C Silvestre, Patrick Mailliet, Marie-Pierre Junier, Arturo Londoño-Vallejo, Evelyne Ségal-Bendirjadian, Hervé Chneiweiss, François D Boussin (2014 Apr 30)

**A preclinical mouse model of glioma with an alternative mechanism of telomere maintenance (ALT).**

Harikleia Episkopou, Irena Draskovic, Amandine Van Beneden, Gaëlle Tilman, Marina Mattiussi, Matthieu Gobin, Nausica Arnoult, Arturo Londoño-Vallejo, Anabelle Decottignies (2014 Feb 5)
Alternative Lengthening of Telomeres is characterized by reduced compaction of telomeric chromatin.

_Nucleic acids research_ : 4391-405 : [DOI]: 10.1093/nar/gku114