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## Team "Translation regulation in normal and pathological conditions"

Director: Stephane BELIN

Understanding how the translational complex and translation regulation can control key processes in neuroprotection and/or central nervous system regeneration

Research themes

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A major challenge in Biology is to understand how genes are expressed and regulated in space and time in order to ensure cell specificity, homeostasis and organism development. Genetic expression is defined by the flow DNA-RNA-Protein. Tremendous amount of work focused on the first step when DNA is transcribed into RNA and provided detailed mechanisms of regulation during **gene transcription** in normal and pathological conditions. Indeed, transcription factors and their regulation in different cellular processes have been characterized as well as the epigenetic phenomenon and chromatin availability. In contrast, the last step consisting of mRNA translation into proteins is still poorly addressed. However, recent work suggests that 1) cells rely on **translation to control the expression of specific sets of mRNA** during critical conditions and 2) translation is directly controlled by specific composition of the **T r a n s l a t i o n a l C o m p l e x .**

This is particularly important in the case of axon regeneration in the Central Nervous System (CNS) as neurons need to rely on specific genes expression to survive and regrow axons. Numerous studies aimed to unlock neuron survival and axon regeneration programs, mainly by analyzing mRNA content during CNS development and upon injury. Those approaches revealed interesting targets but ultimately failed to expose all the programs necessary to stimulate sufficient axonal growth in order to build functional circuits after injury.

**In our group, we hypothesize that translation is a key step during development and injury in order to control the expression of specific sets of mRNA involved in axonal growth and/or survival.** We will use combination of state-of-the-art technics such as in-vivo ribosome immunoprecipitation, proteomics analysis, molecular biology, mice models of development and injury. In particular, the objective of my project is to address the two-following working aims:

Understanding how translation is modified during development and after injury and which cellular programs are directly controlled by translation.

Targeting translation will induce neuroprotection and/or regeneration in CNS after injury

Technics used

In-vivo model of CNS injury  
Molecular biology (cloning, PCR...)  
Virus production and handling (AAV, lenti...)  
Biochemistry (proteomic and transcriptomic, western blot...)  
Cell culture (primary neuronal culture and cell lines)  
Microscopy (confocal, light sheet...)

Publications

[Evidence for rRNA 2'-O-methylation plasticity: Control of intrinsic translational capabilities of human ribosomes.](#)  
Erales J, Marchand V, Panthu B, Gillot S, **Belin S**, Ghayad SE, Garcia M, Laforêts F, Marcel V, Baudin-Baillieu A, Bertin P, Couté Y, Adrait A, Meyer M, Therizols G, Yusupov M, Namy O, Ohlmann T, Motorin Y, Catez F, Diaz JJ. Proc Natl Acad Sci U S A. 2017 Dec 5;114(49):12934-12939. doi: 10.1073/pnas.1707674114. Epub 2017 Nov 20.

[Doublecortin-Like Kinases Promote Neuronal Survival and Induce Growth Cone Reformation via Distinct Mechanisms.](#)

Nawabi\* H, Belin\* S, Cartoni\* R, Williams PR, Wang C, Latremolière A, Wang X, Zhu J, Taub DG, Fu X, Yu B, Gu X, Woolf CJ, Liu JS, Gabel CV, Steen JA, He Z. \*equal contribution Neuron. 2015 Nov 18;88(4):704-19.

[Injury-induced decline of intrinsic regenerative ability revealed by quantitative proteomics.](#) **Belin S\***, **Nawabi\* H**, Wang C, Tang S, Latremoliere A, Warren P, Schorle H, Uncu C, Woolf CJ, He Z, Steen JA. \*equal contribution Neuron. 2015 May 20;86(4):1000-14. Article cited as Editor's choice in Science Signaling 26 May 2015 Vol.8 issue378

[Short hairpin RNA against PTEN enhances regenerative growth of corticospinal tract axons after spinal cord injury.](#) Zukor K, Belin S, Wang C, Keelan N, Wang X, He Z. J Neurosci. 2013 Sep 25;33(39):15350-61.

[p53 acts as a safeguard of translational control by regulating fibrillar and rRNA methylation in cancer.](#) Marce\*I V, Ghayad\* SE, **Belin\* S**, Therizols G, Morel AP, Solano-González E, Vendrell JA, Hacot S, Mertani HC, Albaret MA, Bourdon JC, Jordan L, Thompson A, Tafer Y, Cong R, Bouvet P, Saurin JC, Catez F, Prats AC, Puisieux A, Diaz JJ. \*equal contribution Cancer Cell. 2013 Sep 9;24(3):318-30. \*equal contribution

[>> Complet list of publications](#)

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#### Keywords

Ribosome, Traduction, Regeneration, Neuroprotection, central nervous system

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