Body and organ size are intrinsic properties of living organisms and are intimately linked to the developmental program to produce fit individuals with proper proportions. The regulation of organ size integrates both systemic and organ-specific processes and deregulation of these processes leads to severe medical conditions including cancer. We study these regulations in the context of Drosophila development, where the merge between genetic and physiological approaches allows deciphering the principles of organ growth with a high level of sophistication.

During the development of multicellular organisms, the precise control of growth is essential for ensuring the emergence of adults with correct body size and proper organ proportions. These species-specific features condition many traits of adult life such as fitness and survival. They rely on an intricate series of both short range (morphogens) and long range (hormones) signals. While short range-acting morphogens control organ shapes and relative sizes, long range signalling molecules, mostly hormones, act as relays to adjust body growth in response to environmental changes.
We use the development of Drosophila to decipher some of the mechanisms adapting organ and body growth to nutritional environment. We are particularly interested in understanding cross-talks between metabolic organs like the liver/fat and the brain that allow precise adaptation of organ and body growth to nutrients availability.

We also study how organ growth is coupled to the developmental transitions, in particular to the termination of growth at the end of the juvenile period. Our previous work has illustrated the importance of a novel hormonal checkpoint ensuring that organs complete their growth program before exiting the juvenile period. This work opens toward the exploration of novel mechanisms of organ growth coordination in condition of normal tissue growth, as well as tissue injury and repair.

It is also relevant to apply these general principles of cross-organ communication to our understanding of tumor physiology. Although tumors initially develop surrounded by healthy tissues, they can exert a systemic modification of the host physiology. Conversely, the physiology of the host can influence the ability of a tumor to develop and acquire malignant features. We use Drosophila as a paradigm to explore the mechanisms of tumor-host interactions.
Publications clés

Année de publication : 2018

MaryJane Shimell, Xueyang Pan, Francisco A Martín, Arpan C Ghosh, Pierre Leopold, Michael B O’Connor, Nuria M Romero (2018 Feb 23)
Prothoracicotropic hormone modulates environmental adaptive plasticity through the control of developmental timing.
*Development* (Cambridge, England) : DOI : dev159699

Année de publication : 2016

Drosophila insulin release is triggered by adipose Stunted ligand to brain Methuselah receptor.
*Science* (New York, N.Y.) : 1553-1556

Neha Agrawal, Renald Delanoue, Alessandra Mauri, Davide Basco, Matthieu Pasco, Bernard Thorens, Pierre Léopold (2016 Apr 15)
*Cell metabolism* : 675-84 : DOI : 10.1016/j.cmet.2016.03.003
Année de publication : 2015

**Drosophila Lgr3 Couples Organ Growth with Maturation and Ensures Developmental Stability.**

Ditte S Andersen, Julien Colombani, Valentina Palmerini, Krittalak Chakrabandhu, Emilie Boone, Michael Röthlisberger, Janine Toggweiler, Konrad Basler, Marina Mapelli, Anne-Odile Hueber, Pierre Léopold (2015 Apr 16)
**The Drosophila TNF receptor Grindelwald couples loss of cell polarity and neoplastic growth.**
*Nature : 482-6 : DOI : 10.1038/nature14298*

Année de publication : 2014

Marianne Bjordal, Nathalie Arquier, Julie Kniazeff, Jean Philippe Pin, Pierre Léopold (2014 Feb 4)
**Sensing of amino acids in a dopaminergic circuitry promotes rejection of an incomplete diet in Drosophila.**