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OTHER PROGRAM AFFILIATIONS

Cancer

Cardiovascular Disease

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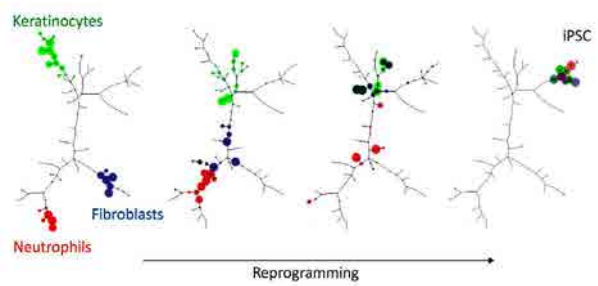
Our laboratory is interested in the transcriptional and epigenetic mechanisms that govern cell identity, in particular pluripotency and the reprogramming of somatic cells into induced pluripotent stem (iPS) cells. Being able to reprogram any specific mature cellular program into a pluripotent state and from there back into any other particular cellular program provides a unique tool to dissect the molecular events that permit the conversion of one cell type to another. The reprogramming technology and iPS cells can be applied to generate animal and cellular models for the study of various diseases as well as in future cellular replacement therapies. Understanding the epigenetic changes occurring during these processes is necessary to ultimately use iPS cell technology for therapeutic purposes.

We use mouse models and a combination of different molecular, biochemical, cellular techniques and genome wide approaches to dissect the nature and dynamics of such events.

Research Projects

1. **The kinetics and universality of the epigenetic and genomic changes occurring during reprogramming**
2. **The composition and assembly kinetics of transcriptional regulation complexes at pluripotency genes**
3. **How the cell of origin influences the *in vitro* and *in vivo* plasticity potential of cells generated during the reprogramming process**



Neurons obtained from the differentiation of human iPS cells

Selected significant publications:

1. Rackham OJ, Firas J, Fang H, Oates ME, Holmes ML, Knaupp AS; FANTOM Consortium, Suzuki H, Nefzger CM, Daub CO, Shin JW, Petretto E, Forrest AR , Hayashizaki Y, **Polo JM**, Gough J. 2016. A predictive computational framework for direct reprogramming between human cell types. *Nat Genet* 48(3):331-5.
2. Nefzger CM, Jardé T, Rossello FJ, Horvay K, Knaupp AS, Powell DR, Chen J, Abud HE#, **Polo JM#**. 2016. A versatile strategy for isolating a highly enriched population of intestinal stem cells. *Stem Cell Reports* 6(3): 321-9.
3. **Polo JM**, Anderssen E, Walsh RM, Schwarz BA, Nefzger CM, Lim SM, Borkent M, Apostolou E, Alaei S, Cloutier J, Bar-Nur O, Cheloufi S, Stadtfeld M, Figueroa ME, Robinton D, Natesan S, Melnick A, Zhu J, Ramaswamy S, Hochedlinger K. 2012. A molecular roadmap of reprogramming somatic cells into iPS cells. *Cell* 151(7):1617-32.
4. **Polo JM**, Liu S, Figueroa ME, Kulalert W, Eminli S, Tan KY, Apostolou E, Stadtfeld M, Li Y, Shioda T, Natesan S, Wagers AJ, Melnick A, Evans T, Hochedlinger K. 2010. Cell type of origin influences the molecular and functional properties of mouse induced pluripotent stem cells. *Nat Biotechnol* 28(8): 848-55.
5. Utikal J, **Polo JM**, Stadtfeld M, Maherali N, Kulalert W, Walsh RM, Khalil A, Rheinwald JG, Hochedlinger K. 2009. Immortalization eliminates a roadblock during cellular reprogramming into iPS cells. *Nature* 460(7259):1145-8.