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The immune system is composed of diverse, functionally distinct cell types that each contributes uniquely to immune responses. During adulthood, these diverse cell types originate from hematopoietic stem cells though a process called hematopoiesis.

Our research interest lies in understanding quantitatively how this diversity is produced and maintained during homeostasis and infection. To tangle this question, we combine experimental and computational approaches of single cell analysis. In particular, we use a lineage tracing method called cellular barcoding that tracks the descendants of individual cells. In addition, our research aims at developing new lineage tracing methodologies to study hematopoiesis not only in mice but also in humans.

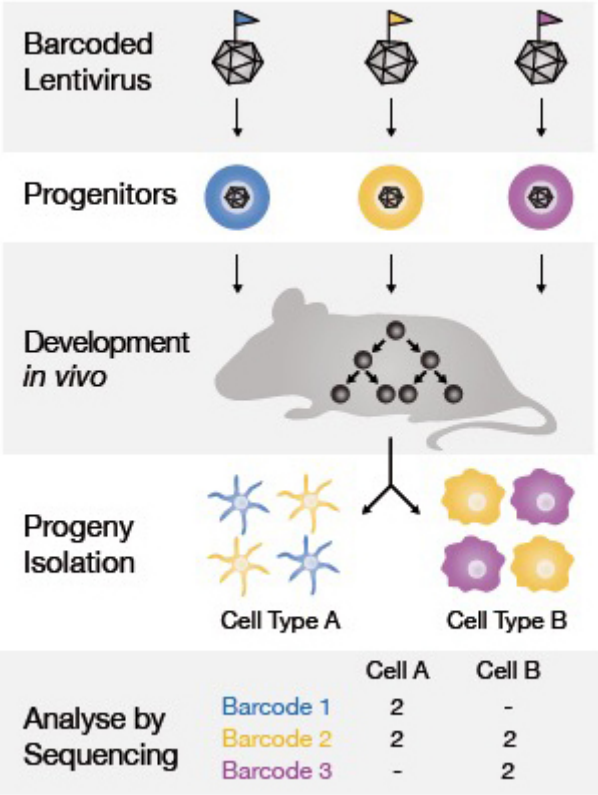

Figure 1 : Principle of lentiviral cellular barcoding

Previously, We have showed that individual lymphoid-primed multi-potent progenitors (LMPPs) are generally not multi-outcome; instead, they produce heterogeneous patterns of limited types of blood cells (Naik S, Perié L et al, Nature 2013). Interestingly, contrary to the already known lymphoid and myeloid origin of dendritic cells (DCs), we found that many LMPPs produce several types of DCs without producing any lymphoid and myeloid cells. We then developed a new mathematical framework to infer the nature of the hematopoietic tree and proposed a revised model where hematopoiesis follows a loss of potential mechanism (Perié L et al, Cell Reports, 2014).

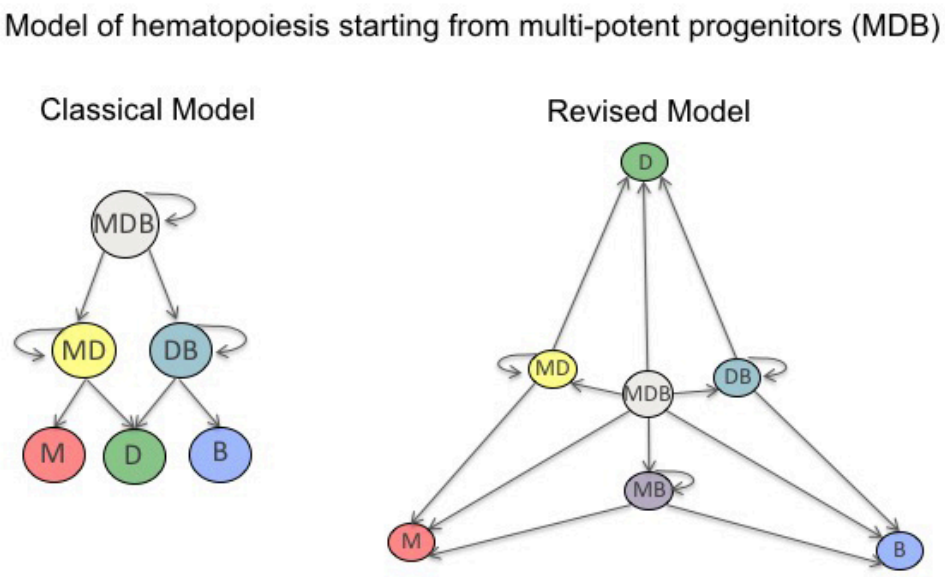

Figure 2: Probabilistic models of hematopoiesis

Key publications

Year of publication 2016

Tom S Weber, Leïla Perié, Ken R Duffy (2016 Jan 7)
Inferring average generation via division-linked labeling.
Journal of mathematical biology

Year of publication 2015

Leïla Perié, Ken R Duffy, Lianne Kok, Rob J de Boer, Ton N Schumacher (2015 Jul 20)
The Branching Point in Erythro-Myeloid Differentiation.
Cell : 1655-62 : DOI : 10.1016/j.cell.2015.11.059

Year of publication 2014

Leïla Perié, Shalin H Naik (2014 Nov 11)
Toward defining a 'lineage'–The case for dendritic cells.
Seminars in cell & developmental biology : 3-8 : DOI : 10.1016/j.semcdb.2015.02.004

Shalin H Naik, Ton N Schumacher, Leïla Perié (2014 Apr 15)
Cellular barcoding: a technical appraisal.
Experimental hematology : 598-608 : DOI : 10.1016/j.exphem.2014.05.003

Year of publication 2013

Leïla Perié, Philip D Hodgkin, Shalin H Naik, Ton N Schumacher, Rob J de Boer, Ken R Duffy (2013 Oct 14)
Determining lineage pathways from cellular barcoding experiments.
Cell reports : 617-24 : DOI : 10.1016/j.celrep.2014.01.016

Year of publication 2012

Shalin H Naik, Leïla Perié, Erwin Swart, Carmen Gerlach, Nienke van Rooij, Rob J de Boer, Ton N Schumacher (2012 Apr 2)
Diverse and heritable lineage imprinting of early haematopoietic progenitors.
Nature : 229-32 : DOI : 10.1038/nature12013