Exploring Experimental Hematology: August 2018 (Volume 64)

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You can view this review in Experimental Hematology at https://www.exphem.org/article/S0301-472X(18)30265-0/fulltext.

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We are beginning a new blog series on SimplyBlood called “Exploring *Experimental Hematology*.” Here we will highlight and deconstruct some our favorite manuscripts from the ISEH society journal. Welcome to entry 1.

If you are a millennial or are raising a post-millennial you must be familiar with unboxing YouTube videos where you can watch someone open a new item and then explain the item in detail. While I might not fully understand why my kids enjoy watching other kids open toys, I do get the excitement of sharing my thoughts and deconstructing a new and exciting *Experimental Hematology* article for the community.

In this blog, I'll be exploring the review “Hematopoietic stem cell fate through metabolic control” by Kyoko Ito and Keisuke Ito.

My reason for reading the paper:

> They have provided us with an excellent review on HSC and metabolism that is a must read for anyone in the HSC field.

I still remember the first time I heard a Toshio Suda talk about hematopoietic stem cells (HSC) and metabolism, wishing I had my Lehninger biochemistry book with me. I know this feeling is shared by some of you that wish you had paid a little more attention in your undergraduate biochemistry course. I have to admit that after his talk, I promised myself to look for my dusty “Lenhinger” book and re-learn biochemistry, but I failed. If you shared a similar story and are looking for the best literature to finally keep up with this amazing field, Kyoko Ito and Keisuke Ito just put an end to that quest (https://www.exphem.org/article/S0301-472X(18)30265-0/pdf). They have provided us with an excellent review on HSC and metabolism that is a must read for anyone in the HSC field.

Three reasons you should read this paper:

1. It has an amazing up-to-date diagram of the metabolic pathways that are important for stem cells, including glycolysis, fatty acid metabolism, epigenetic regulation and more (Figure 1).
2. It provides a great picture of the field and points out challenges and open questions.
3. This review gives you solid basic knowledge that will help you start exploring the metabolism field or just help you understand the next paper or conference about HSC metabolism.

What to expect from this review:

Kyoko Ito and Keisuke Ito highlight the most recent literature on cellular metabolism, mitochondrial quality and their role in HSC fate decisions, and the interplay of different metabolic pathways. They also put the connection between HSC metabolism and aging in context.

There are 3 figures in the review. Figure 1, as I mentioned, is a very useful diagram of the metabolic pathways that are important for HSCs. In Figure 2, they explain the different modes of HSC division− symmetric divisions (SD), asymmetric divisions (AD) and symmetric commitment (SC)− and discuss the relevance of HSC purity on cell fate experiments. I found the figure quite helpful to aid interpretation of results from other publications. Figure 3 shows, on a very didactic way, the machinery of quality control in HSC division and the role of mitochondria. One interesting take-away message from figure 3 is how during AD older mitochondria are pushed into differentiating daughter cells as a mechanism of damaged mitochondria clearance.

Hypoxia is reviewed within the perspective of metabolism, and different experimental approaches to study this phenomenon are discussed. Novel roles of mitochondria on intracellular calcium homeostasis, lipid metabolism and mitochondrial DNA are explored within the review. Finally, key open questions and technical challenges to study HSC division balance are discussed and put in perspective, including the challenge of low number of HSCs for metabolic and epigenetic studies, the relevance of working with purified populations and the role of metabolic requirements of leukemic stem cells.

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