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Our constant companion: towards a deeper understanding of blood

Like many medical device engineers, we at Sagentia have a lot to do with blood.

Whether considering how to take blood out of a patient with minimal pain, how to ensure it's free from pathogens before inserting blood back into the body, stopping vessels from bleeding during surgery or analysing the contents of cell-free DNA to see what genetic information is carried, blood is a fairly constant companion in the medical device world. Sparing a thought for those engineers and scientists who suffer from haemophobia, consider for a moment how many of these talented product developers know how blood is actually made by the body.

Research published in Science recently by Dr Dick and his team from Toronto's Princess Margaret Cancer Centre has suggested that the conventional view of blood cell development that has been established doctrine since the 1960s is flawed. It had been understood that blood cell lineages follow a hierarchy in development, with several hundred billion cells developed each day from a multipotent stem cell. These stem cells could almost be seen to follow a decision tree, their differentiation potential becoming increasingly restricted through interaction with oligopotent progenitors and finally unipotent progenitors.

Dick's research has investigated the various blood cell lineages and found that while this model broadly holds true in fetal blood development, there is a fundamental development shift in the adult body to a "two-tier" hierarchy dominated by two progenitor classes: multi-potent and uni-potent. Therefore, the multipotent stem cell acts as executive decision maker and the newly

formed blood cell quickly develops into its final unique form.

While interesting in its own right, the consequences could be far-reaching for patient care. The care of patients affected by various anaemias and leukaemias could be improved dramatically by harnessing this new understanding as personalised treatments evolve.

There are also implications in Regenerative Medicine; as new methods of manufacturing mature, blood cells such as red blood cells and platelets could also be developed. The quest for donor-free platelet generation has been underway for some time and a number of technologies are in development. The scientists and engineers involved will surely wish to consider if the "two tier" hierarchy suggested above can simplify the number of process steps they are incorporating in their delicate manufacturing procedures. Furthermore, greater understanding of

how this hierarchy arises in blood could lead to improved control of differentiation in other cell types, potentially solving one of the key challenges of Regenerative Medicine.

The rest of us will no doubt return to being quite happy that the body is a wonderful thing, content to let magic happen inside our skin!

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