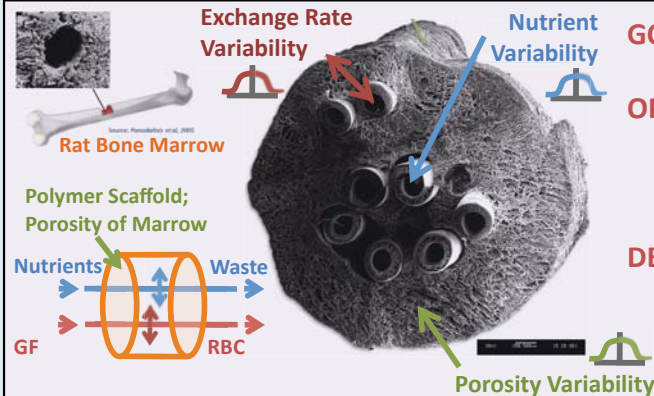




Making and Healing Blood: An Engineer's Approach

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How can we culture and produce blood?



GOAL: Robustly Operating a Bioreactor that Makes Blood

OPPORTUNITIES:

- Bioreactor producing red blood cells with correct: surface markers; oxygen-carrying capacity; shape [1]

DEVELOPMENTS:

- Characterising range and variability of operation
- Optimising design parameters under uncertainty [2]

How can we increase the success rate of leukaemia treatment?

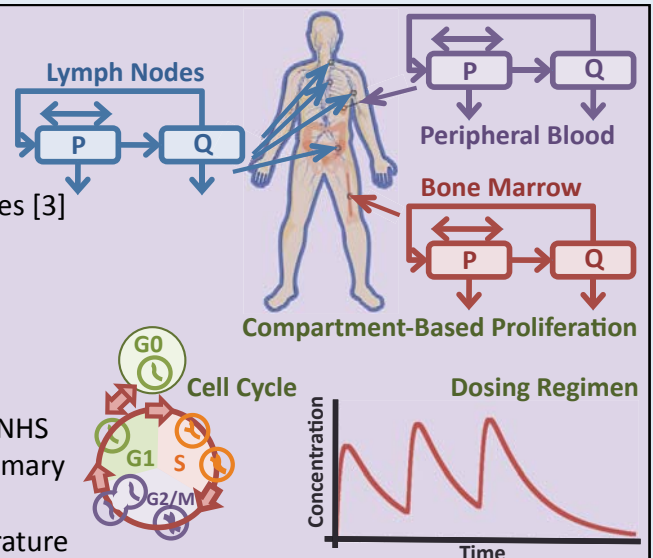
GOAL: Predicting Patient Response to Therapy of Chronic Lymphocytic Leukaemia

OPPORTUNITIES:

- Polymeric scaffolds enables culture of patient samples [3]
- Cell cycle analysis methodology allows correlation between cultured cells and mathematical modeling parameters [4]

DEVELOPMENTS:

- Collaborating with Northwick Park Hospital and the NHS to secure historical anonymised patient data and primary patient samples
- Developing a mathematical model correlated to literature



Collaborators

Prof EN Pistikopoulos, FEng; Prof A Mantalaris; Dr N Panoskaltsis; Dr M Rende; Dr E Velliou; Eleni Pefani; M Fuentes Gari

References

- [1] Macedo H, Mortera Blanco M T, Panoskaltsis N, Livingston A G, Mantalaris A. 3-Dimensional Hollow Fibre Bioreactor Systems for the Maintenance, Expansion, Differentiation and Harvesting of Human Stem Cells and Their Progeny. PCT application filed December 2010.
- [2] Misener R, Floudas C A. GloMIQO: Global Mixed-Integer Quadratic Optimizer. *Journal of Global Optimization*, 2012, Accepted for Publication. DOI: 10.1007/s10898-012-9874-7.
- [3] Mortera-Blanco T, Mantalaris A, Bismarck A, Aqel N, Panoskaltsis N. Long-term cytokine-free expansion of cord blood mononuclear cells in three-dimensional scaffolds. *Biomaterials*, 2011, V32, 9263-9270.
- [4] García Münzer D G, Mantalaris A, Pistikopoulos E N. Developing a Cyclin Blueprint as a Tool for Mapping the Cell Cycle in GS-NS0. Submitted, 2013.



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