Homeostasis

- Your body is constantly trying to maintain homeostasis - maintaining cell populations and rebuilding what is wounded. The natural function of your tissues/organ keeps the body balanced on this point. You've hatched a scheme with some grad school peers to design an artificial tissue/organ which will function in a superior or augmented way. Perhaps you design a skeletal muscle that never fatigues, a skin graft that resists abrasion, or an eye that doesn't need to blink. What do you need to consider when integrating this super-tissue with the host? Do you think the body will automatically re-adjust to accommodate this new capacity?
- Respond to at least two of your classmates.

Cells and organ in human body function in homeostasis, they have a specific function within a larger system of our body, multiple positive and negative feedback loops exist to maintain in steady-state our whole organism. This tight control allows precise control of different function in the body (for example cardiac control of the sympathetic and parasympathetic branches of the autonomic nervous system). Various processes achieve this steady-state by maintaining key variables within a range of nominal values. Tissue or organ with enhanced characteristics will override these preferred values and trigger regulation mechanisms; like chronic inflammation; which then cascade in more preventive actions. In this situation different “emergency” pathways are activated and over stimulated releasing by products which saturate the body and lead to various dysfunctions or diseases. In the example given, blinking is essential for eyes lubrification and dust or other undesirable particles protection. Integration of a super-tissue will need to intrinsically auto-control itself or signal to the body that it is working in a normal range so not to trigger the anti-inflammation response.

[1] N. I. Callaghan, L. J. Durland, R. G. Ireland, J. P. Santerre, C. A. Simmons, and L. Davenport Huyer, “Harnessing conserved signaling and metabolic pathways to enhance the maturation of functional engineered tissues,” *npj Regen Med*, vol. 7, no. 1, p. 44, Sep. 2022, doi: 10.1038/s41536-022-00246-3.

[2] J. F. Eichinger, L. J. Haeusel, D. Paukner, R. C. Aydin, J. D. Humphrey, and C. J. Cyron, “Mechanical homeostasis in tissue equivalents: a review,” *Biomech Model Mechanobiol*, vol. 20, no. 3, pp. 833–850, Jun. 2021, doi: 10.1007/s10237-021-01433-9.

[3] P. Sousa-Victor, L. García-Prat, and P. Muñoz-Cánoves, “Control of satellite cell function in muscle regeneration and its disruption in ageing,” *Nat Rev Mol Cell Biol*, vol. 23, no. 3, Art. no. 3, Mar. 2022, doi: 10.1038/s41580-021-00421-2.

Recent Approaches for Angiogenesis in Search of Successful Tissue. Engineering and Regeneration

The Role of Mechanical Regulation in Cartilage Tissue Engineering