**Goal:** Identifying the yield stress for sickle blood samples as a function of varying Hemoglobin concentration (different variants present in the RBC) and O2 concentration.

**Methodology:**

1. Run the sample through the microfluidic channel (not too sure about what dimensions/geometry might be appropriate) under a specific pressure head (P =1 psi?) and in the fully oxygenated condition.
2. Make a step change in the pressure head such that the P = 0 (pressure at inlet=outlet).
3. After about 3-4 mins, turn the oxygen conc=0% (complete hypoxia).
4. Gently increase the P across the sample. Make small step changes (0.1-0.2 psi?) in the pressure head (keep the P constant for about 4-5 mins) to figure out what P leads to the onset of a bulk velocity>0. That can be considered to be the yield stress of that sample at 0% O2 concentration.
5. Increase the O2 concentration (fully oxygenated) and P just to let the blood flow for sometime (4-5 mins), so that there is reduced fouling in the channel.
6. Repeat 2.
7. Change the O2 concentration to about 1% or 2% (not sure what is the resolution for changing the O2 concentration) and repeat steps 3-5. If the resolution of making changes to the O2 is small enough, it might be possible to define the lower bound for the intermediate O2 dependent phase.
8. Keep repeating steps 6-7 and increase the O2 concentration by 1 or 2% during each cycle.
9. This approach could also enable us to identify the upper bound for the O2 dependent phase. The O2 concentration at which a small increment in the P (from 0) results in the sample to flow can be considered the upper bound.

**Remarks:**

Just to test the reliability of the numbers obtained from the experiment, maybe the same blood sample (fresh) can be run through the microfluidic channel and the same cycles (of P and O2 concentration) be repeated.

Or

Some of the cycles can be repeated in the same “experimental run”, but I fear fouling or dehydration might affect the results? Also, there might be some hysteresis affect when the sample is run for too long, which could make the RBCs change some characteristics due to the alternating oxy-deoxy state.

This procedure should help us identify the trajectory of 0 vs O2 conc for a particular sample (so fixed Hb concentration and fraction of each Hb variant in the RBCs).