Filling of highly concentrated mAbs into prefilled syringes

A recent study using mAb formulated at 180 mg/mL investigated the key parameters for successful filling of the mAb into a prefilled syringe (Shieu et al., 2014). The key parameters investigated were solution viscosity, concentration, and surface tension. A benchtop filling unit driven with a peristaltic pump and glass nozzles to visualize the liquid flow with a high speed camera was used to determine optimal filling parameters. The key objectives were to create a filling process with no splashes, bubble, and foaming coupled with a process that minimized risk of fill nozzle clogging during nozzle idle time due to formulation drying at or near the nozzle tip. The nozzle size, airflow around the nozzle tip, pump suck-back, fluid viscosity, and protein concentration were key variables, whereas pump velocity, acceleration, and fluid/nozzle interphase properties were shown to have smaller impact.

At this point, several strategies for dealing with highly viscous mAb solutions for SC delivery and processing have been discussed. These include process, formulation, and delivery device design. Another approach is to explore the root causes of high viscosity, and the protein–protein interactions that govern such properties. A basic understanding of the rheological behavior of highly concentrated mAb solutions should enable better design of the mAbs as well as more rational formulation approaches, and this will be discussed in the next chapter.

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