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Microfluidic model experiments on the injectability of monoclonal antibody solutions CHARLES DUCHENE, PMMH-ESPCI, Paris, VASCO FILIPE, MOSTAFA NAKACH, SYLVAIN HUILLE, Sanofi, Vitry, ANKE LINDNER, PMMH-ESPCI, Paris — Autoinjection devices that allow patients to self-administer medicine are becoming used more frequently; however, this advance comes with an increased need for precision in the injection process. The rare occurrence of protein aggregates in solutions of monoclonal antibodies constitutes a threat to the reliability of such devices. Here we study the flow of protein solutions containing aggregates in microfluidic model systems, mimicking injection devices, to gain fundamental understanding of the catastrophic clogging of constrictions of given size. We form aggregates by mechanically shaking or heating antibody solutions and then inject these solutions into microfluidic channels with varying types of constrictions. Geometrical clogging occurs when aggregates reach the size of the constriction and can in some cases be undone by increasing the applied pressure. We perform systematic experiments varying the relative aggregate size and the flow rate or applied pressure. The mechanical deformation of aggregates during their passage through constrictions is investigated to gain a better understanding of the clogging and unclogging mechanisms.

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