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Sonoporation: The hurdles that need to be surpassed.

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Sonoporation, the transient formation of pores in cellular membranes is being investigated for multiple purposes such as enhanced localised drug or gene delivery.

The concept of sonoporation dates back to the early 80's^[1] but has yet to see the light in common day clinical practice. This is partially due to the lack of understanding of how sonoporation truly occurs and in consequence how we can improve its efficacy. There have been numerous studies^[2-6] investigating the mechanisms behind sonoporation but there is still a lot to be understood. These mechanisms are shown in Figure 1.

A large majority of studies simply investigate if sonoporation is possible and rarely try to understand the underlying mechanisms and the variance of efficacy when translating into a clinical setting.

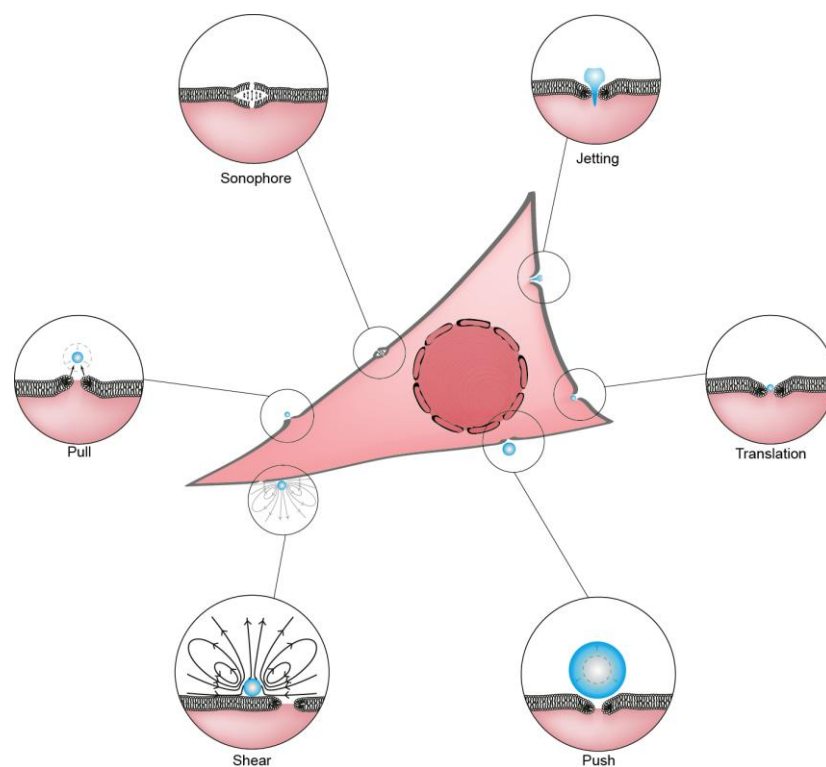
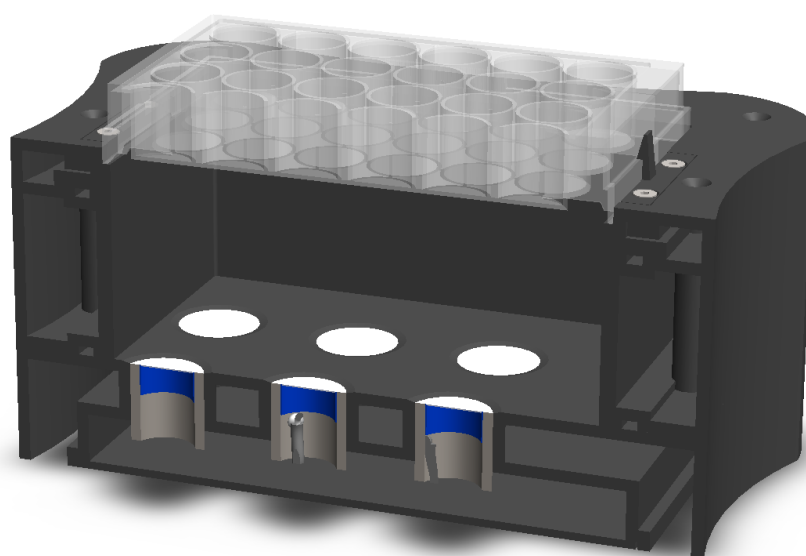


Figure 1- Sonoporation mechanisms.

We hypothesize that different acoustic conditions and microbubbles are necessary depending on the cell line that we desire to sonoporate. Our studies aim at understanding the ideal acoustic settings for a variety of cell lines, translating this into preclinical tests and finally moving into clinical trials. In order to investigate such a broad range of conditions we have designed a modular sonication chamber that allows bulk evaluation cell sonoporation. This design is shown in Figure 2.



*Dimetric

Figure 2 – Modular custom-made sonoporation evaluation chamber.

A further setup will be to design custom microbubbles designed to enhance sonoporation. To be able to accurately manufacture monodispersed microbubbles with a narrow band property distribution we will attempt to manufacture flow focusing microbubble generation chambers using E-beam technology with nanometre accuracy.

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