**Liposomes as fuel for micromotors**

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**Introduction**

Micromotors are objects capable of autonomous movement in liquid environments. Their applications include environmental decontamination, building blocks for sensors and biomedical delivery vehicles, among others. Micromotors can be driven by a variety of mechanisms including the most commonly used H2O2 or the disintegration of their building blocks (Fernández-Medina *et al.* (2019)). Complementarily, we developed a micromotor fuelled by a non-toxic material, liposomes (Mazur *et al.* (2017)), where self-propulsion is triggered via membrane solubilization by surfactants (Triton X-100 (TX) or bile) or membrane hydrolysis using enzymes (phospholipase A2 (PLA2)). Further development could lead to a method for targeted cargo-delivery in biomedical applications.

**Aims**

We aimed to: (i) compare micromotor mobility when triggered by TX, bile and PLA2, (ii) explore liposome-liposome fusion as a trigger for self-propulsion, and (iii) assess micromotor mobility when increasing fuel availability.

**Methods**

The locomotion of micromotors was tested using microfluidic chips mounted on an inverted microscope. Movies were recorded following addition of the trigger, from which trajectories could be extracted and a Mean Square Displacement analysis carried out.

**Results**

Micromotor directional motion with average velocities of 1.0 and 1.7 μm s-1 was observed when using TX (Fig. 1) and bile, respectively. PLA2 and liposome fusion led to a reduction in random motion of the micromotor. None of the triggers resulted in directional motion when increasing fuel availability.

**Discussion**

Self-propulsion using TX as a trigger is believed to be caused by an asymmetry in the environment close to the micromotor. Locomotion using bile as a trigger was attributed to liposome shrinkage due to osmotically driven water efflux. The reduced motion using PLA2 is believed to be caused by the lag-burst behaviour of the enzyme. The mobility decrease via liposome-liposome fusion was attributed to the increase in surface roughness of the micromotor.

Fig. 1 – Micromotor trajectories using TX as a trigger

**Conclusion**

A non-toxic fuelled micromotor has been proposed, which could open new avenues for cargo-delivery applications in the biomedical field.

**References**

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