**Nanoescapology: Understanding nanoparticle trafficking in cells**

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Efficient delivery of siRNA, DNA and proteins has the potential to significantly improve the treatment of many diseases. These biological molecules are highly susceptible to degradation by the body, and current treatments are limited by high doses. Immobilizing these therapeutics inside a nanoparticle can prevent the molecules from being degraded by the body and also improves their bioavailability. However, a significant challenge remains to control where the therapeutics are trafficked to once they are taken up into the cell.1 Nanoparticles are typically taken up by endocytosis into endosomes and then trafficked into acidic lysosomal compartments. The highly degradative environment of the lysosome can result in significant degradation of the therapeutic cargo.

We have developed a new tool (SNAPSwitch) to understanding how nanopartilces and their cargo are trafficked in cells. Using SNAPSwitch we can quantify the trafficking of DNA from endosomes into the cytosol and to the nucleus. We have also demonstrated how targeting different surface receptors results in trafficking to different cellular compartment. These results demonstrate SNAPSwitch is a high-throughput and broadly applicable tool to quantitatively track the localization of materials in cells

1 Selby, L. et. al *WIREs Nanomed Nanobiotechnol,* **2017***,* e1452