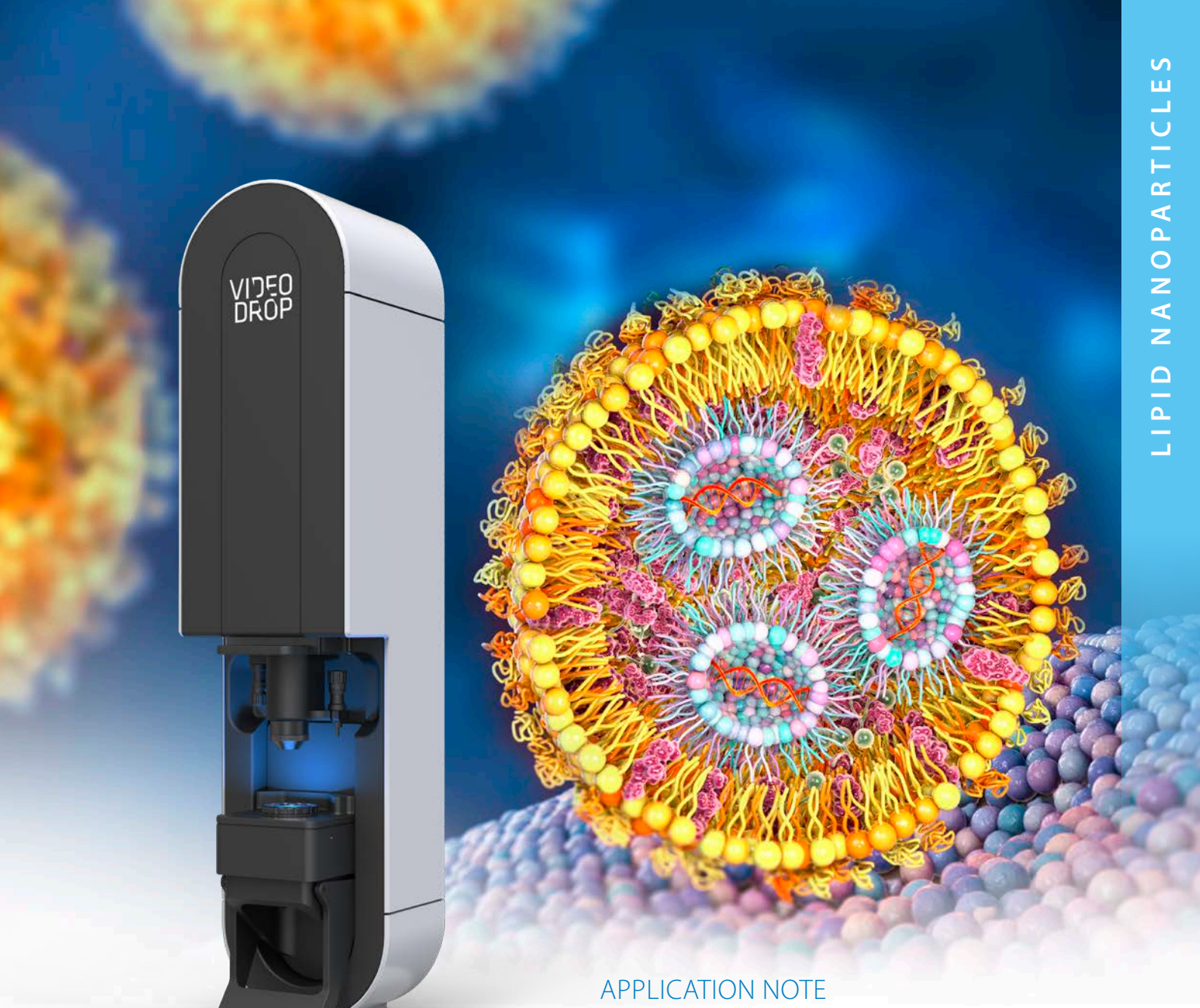


LIPID NANOPARTICLES

APPLICATION NOTE

Assessing the particle concentration of mRNA-LNP using Videodrop

A new metric for LNP manufacturing, optimization & standardization

CBM and University of Orléans and CNRS
Ivan Ciganek, Christophe Delehedde, Claire Counil, Thomas Ador, Anthony Delalande, Chantal Pichon

Myriade
Marie Berger

VIDEO DROP

myriade

Presentation

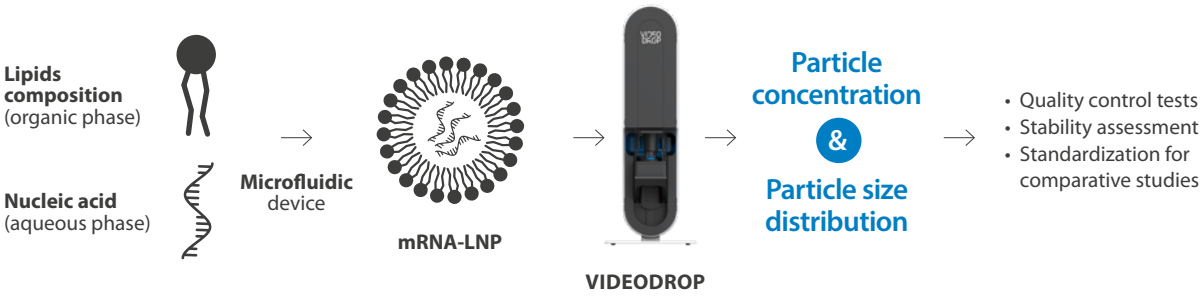
Videodrop is an innovative nanoscale imaging technology. Based on the principle of interferometry, Videodrop makes it possible to measure the size and concentration of nanoparticles:

- In real-time (40 s)
- In a single drop (7 µL)
- Between 80 nm to 500 nm
- Within a concentration range of 1E8 to 1E10 part/mL
- Without labeling

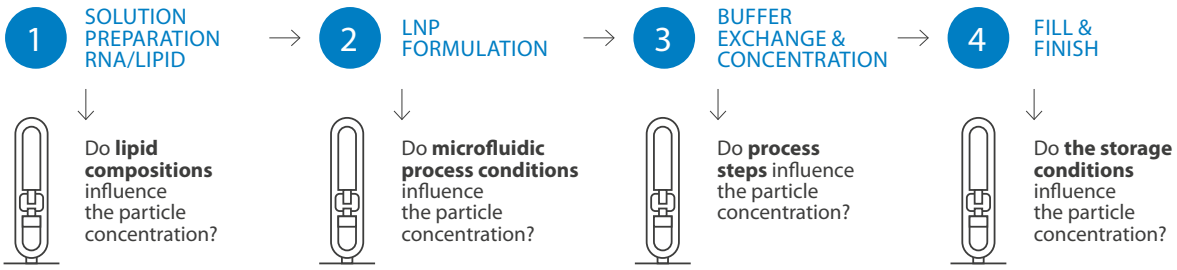
Here, we propose to use Videodrop for the analysis of mRNA-LNP and highlight the interest of measuring the particle concentration of mRNA-LNP. The current analytical strategies employed for mRNA-LNP characterization lie primarily on size, polydispersity, and zeta-potential measurements. However, particle concentration, evaluated through a single particle measurement technique, is an important parameter to monitor for several reasons:

- Quality control tests
- Stability assessment
- Standardization for comparative studies

When developing new formulations, manufacturing processes, or different storage conditions, quantifying the number of particles enables efficient comparison studies. By comparing particle numbers under different conditions, researchers can assess the impact of the process or composition on transfection activity.



Why is LNP particle concentration important?



Conclusion

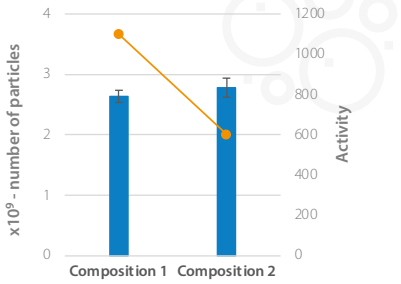
- **Videodrop is a ready-to-use tool for measuring the particle concentration and size distribution of LNPs in a single drop.**
- **Videodrop enables better control of the production process by quickly and easily measuring the concentration.**
- **Moreover, in comparative studies, standardizing cell-based assays (transfection activity) using the number of nanoparticles improves the evaluation of LNPs produced under different conditions.**

VIDEODROP IS THE IDEAL TOOL TO COMPLETE THE ANALYTICAL STRATEGY TO ASSESS LNP QUALITY

Does particle concentration influence the transfection activity?

Number of particles* Activity

1 SOLUTION PREPARATION RNA/LIPID

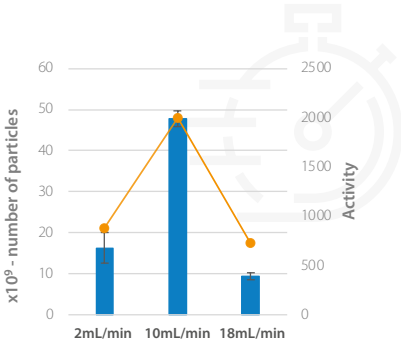


Lipid composition optimization

In this experiment, two LNPs with different lipid compositions were produced using the same process. Particle concentration was not affected by the lipid composition; however, lipid composition 1 exhibits higher activity compared to lipid composition 2.

Despite having approximately the same number of particles, lipid composition 1 is more efficient compared to lipid composition 2.

2 LNP FORMULATION



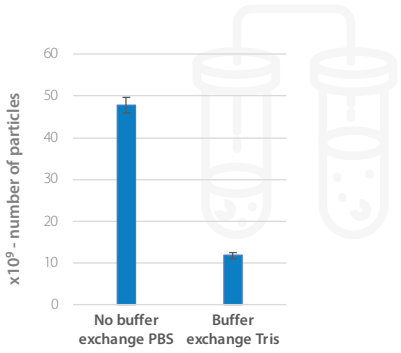
Mixing speed optimization

Here, we compare LNPs having the same composition but prepared with different mixing speeds (flow rates) on the microfluidic device.

The mixing speed step has a significant influence on the concentration of the generated particles.

In this case, the activity is directly related to the number of particles.

3 BUFFER EXCHANGE & CONCENTRATION



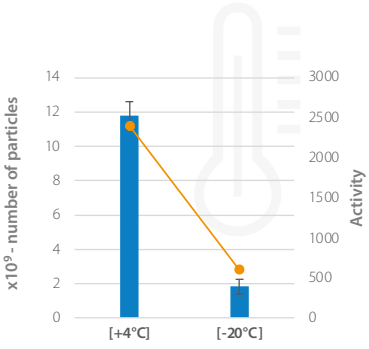
Buffer exchange optimization

Buffer exchange and concentration steps are crucial and require optimization to improve the yield.

This experiment examines the influence of incorporating a buffer exchange step.

In this case, the buffer exchange step results in a 75% reduction in the number of particles.

4 FILL & FINISH



Storage optimization

To ensure product quality, it is essential to optimize storage conditions.

In this experiment, we tested the same product stored at +4°C or -20°C.

The results indicate that the storage at -20°C leads to a decrease in the number of particles as well as a loss in activity.

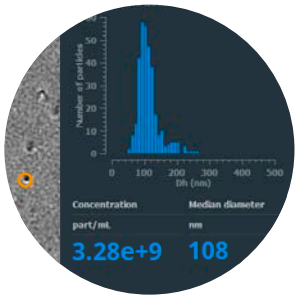
*Number of particles is calculated by multiplying the measured concentration by the volume used for activity assays.

VIDEO DROP

Measuring size & concentration
of nanoparticles

In a single drop
(5-10 µL)

In real time
(40 s)



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results

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