

**TECH OFFER**

## Highly Efficient Biocompatible Lipid Nanoparticles for Biomedical Applications



### KEY INFORMATION

TECHNOLOGY CATEGORY:

**Healthcare** - Diagnostics

**Materials** - Nano Materials

**Life Sciences** - Biotech Research Reagents & Tools

**Materials** - Bio Materials

**Healthcare** - Pharmaceuticals & Therapeutics

TECHNOLOGY READINESS LEVEL (TRL): **TRL5**

COUNTRY: **SINGAPORE**

ID NUMBER: **TO174918**

### OVERVIEW

Lipid nanoparticles have undergone significant advancements in biomedicine, evolving into a sophisticated platform for delivering therapeutic agents and imaging agents. Their biocompatibility, tuneable properties, and successful translation into clinical applications signify their maturity as a versatile and effective technology.

This technology is a patented lipid nanoparticle technology platform, designed to harness unique synergies from a combination of: (1) novel core fluorescence materials with tuneable wavelengths; (2) biocompatible lipid encapsulation matrix, delivering challenging materials in water-based environment; (3) surface functionalisation on nanoparticles, allowing for tailored targeting functionalities.

The technology is a key enabling solution for advanced fluorescence imaging and detection, with characteristics of high brightness, sensitivity, and biocompatibility. The high sensitivity and specificity of the technology allow researchers to obtain accurate and conclusive experimental data, whereas outstanding photostability eliminates concerns of signal loss, enabling precise visualization and long-term monitoring of cellular processes for both in-vitro and in-vivo studies.

The introduction of this technology opens new possibilities in accelerating biomedical breakthroughs, empowering studies in long-term in-vivo cell fate determination, drug development utilizing advanced 3D organoids, monitoring stem cell differentiation, transplantation, and potential for precision medicine and early diagnostic platforms, driving personalized therapeutic approaches, and leading to significant advancements in biomedicine and other similar applications.

The technology owner is seeking partners for research and application development projects, with the goal of integrating this technology into existing workflows and protocol for biotech companies and contract research organisations.

## TECHNOLOGY FEATURES & SPECIFICATIONS

This technology is a patented water-soluble fluorescence lipid nanoparticles that exhibits the following characteristics:

- Strong brightness – 10 times higher than quantum dots of similar size
- Increased sensitivity with lower limit of detection (LOD) of targeted biomarkers
- Biocompatible and photostable platform with minimal cell toxicity and exceptional signal retention
  - >95% cell viability after 48 hours
  - Compatible with cancer cells, bone marrow stem cells, induced-pluripotent stem cells etc
- Choice of novel core fluorescence materials with emission signal from visible to NIR-I/II spectral range
  - Visible range: 540 nm, 670 nm or others
  - NIR range: 800 nm, 1000 nm or others
- Configurable surface functionalisation with different conjugation chemistry
  - Thiol and maleimide
  - Amine and NHS ester
  - Streptavidin and biotin
  - Click chemistry

## POTENTIAL APPLICATIONS

This technology can be used in biomedical applications that require high biocompatibility and high flexibility for customisation to meet the different end users' unmet requirements.

Potential biomedical applications include (but are not limited to):

- Conjugation services
- Translational research
- Stem cell studies
- Immune-oncology development
- Drug development utilizing advanced 3D organoids
- Cell and gene therapies
- Personalised medicine
- Early disease detection and point-of-care diagnostics

The presented technology is designed for easy integration into the above applications, accelerating breakthroughs in biomedical development by allowing end users to collect higher quality experimental data and information, through the benefits of highly compatibility and efficient materials with enhanced brightness, monitoring duration, sensitivity and specificity of detection.

## MARKET TRENDS & OPPORTUNITIES

The market for advanced fluorescence imaging and detection is witnessing significant growth the demand for innovative biomedical solutions increases worldwide. This technology is designed to accelerate the advanced biomedical field, with focus on bio-imaging and disease detection related markets, such as global tumour profiling, personalised medicine, and Point-Of-Care diagnostics market.

Total Addressable Market (TAM) is defined by the global market of fluorescence biomarker applications, including bio-imaging, flow cytometry, and immunofluorescence assays. In overall terms, the fluorescence label market is worth \$8.64 billion in 2022. Selecting the materials-based market from the above gives the global fluorophores market valued at \$869.3M.

## UNIQUE VALUE PROPOSITION

- **Biocompatibility and stability:** The fluorescence nanoprobes are biocompatible and can be delivered to cells and tissues without worry of toxicity issues, maintaining high stability in the biological environment.
- **High sensitivity and specificity:** The fluorescence nanoprobes are ultra-bright even at low concentrations, capable of detecting targets when used in nanomolar level, enabling better visualisation and lower limit of detections (LOD) for targeted biomarkers.
- **Highly customisable and configurable:** The fluorescence nanoprobes are designed to be highly tuneable in wavelength, size, as well as surface functionalities, unlocking customization works for specific applications, including new fluorescence reporters, change of encapsulation materials, and surface bioconjugation, allowing fast turnaround development and production to address end users' unmet application needs.

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