

# DC60842 | Lipid H7T4-4

## Instructions for Use

H7T4-4 is an ionizable lipid designed for mRNA delivery via lipid nanoparticles (LNPs). It features a cyclic amine headgroup (derived from cyclen tetrahydrochloride) and four C14 hydrophobic alkyl tails, synthesized through a Michael addition reaction between cyclen and 1,2-epoxytetradecane. With a high transition temperature ( $T_m = 58.6^\circ\text{C}$ ) due to strong intermolecular interactions from its cyclic headgroup and multi-tail structure, H7T4-4 alone forms rigid aggregates incompatible with mRNA encapsulation. However, when blended with low- $T_m$  helper lipids (e.g., DOPE,  $T_m = -16^\circ\text{C}$ ), the system's overall  $T_m$  decreases, enabling stable LNP formation. Optimized formulations (20% H7T4-4, 41% DOPE, 38% cholesterol, 1% DMG-PEG) exhibit efficient mRNA encapsulation (>90%) and transfection. Structural analyses (SAXS, cryo-TEM) confirm monodisperse LNPs with lamellar/hexagonal phases. In vivo, H7T4-4 LNPs show tumor-targeted and intranasal mRNA delivery with reduced off-target accumulation compared to SM-102-based LNPs. This rational design highlights  $T_m$ -guided helper lipid selection to overcome rigidity challenges in ionizable lipids.

## Product information

|                    |                                                                                                                                                                                    |
|--------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| CAS No.            | Not available                                                                                                                                                                      |
| Chemical Name      | Lipid H7T4-4                                                                                                                                                                       |
| Formula            | C <sub>64</sub> H <sub>132</sub> N <sub>4</sub> O <sub>4</sub>                                                                                                                     |
| M.Wt               | 1,021.78                                                                                                                                                                           |
| Purity             | ELSD-HPLC>95%                                                                                                                                                                      |
| Storage            | Original product: up to 1 year under the storage conditions stated on the vial, kept tightly sealed. Stock solutions: aliquots at $-20^\circ\text{C}$ , generally up to one month. |
| Shipping condition | Ships from Shanghai. Pure lipid is stable during ice-pack transport.                                                                                                               |

## Formulation & study context

Literature values apply to the cited study only. Administration routes describe research, not clinical instructions.

A complete product-specific formulation has not been verified. No standard ratio is substituted.

|                      |                                      |
|----------------------|--------------------------------------|
| N/P ratio            | Not reported in the verified record  |
| Cargo                | Not available in the verified record |
| Administration route | Not available in the verified record |
| Animal model         | Not available in the verified record |
| Formulation process  | Not available in the verified record |

N/P is a nitrogen-to-phosphate molar ratio. Lipid:cargo mass ratio is a different quantity and must not be used as N/P.

## Stock-solution preparation table

Calculated using product-page MW: 1021.78 g/mol. Volumes are final solution volumes.

| Mass   | 1 mM       | 5 mM      | 10 mM     |
|--------|------------|-----------|-----------|
| 10 mg  | 9.787 mL   | 1.957 mL  | 0.979 mL  |
| 25 mg  | 24.467 mL  | 4.893 mL  | 2.447 mL  |
| 50 mg  | 48.934 mL  | 9.787 mL  | 4.893 mL  |
| 100 mg | 97.868 mL  | 19.574 mL | 9.787 mL  |
| 250 mg | 244.671 mL | 48.934 mL | 24.467 mL |

Volume (mL) = mass (mg) × 1000 / [MW (g/mol) × concentration (mM)]. Mathematical conversions only; not measured solubility. Confirm solvent compatibility and the exact material before preparation.

## Handling & storage

Provided that storage conditions are as stated on the product vial and the vial is kept tightly sealed, the product can be stored for up to 1 year.

Wherever possible, prepare and use solutions on the same day. If stock solutions must be prepared in advance, store them as aliquots in tightly sealed vials at -20°C. Generally, these will be usable for up to one month.

Before use, and prior to opening the vial, allow the product to equilibrate to room temperature for at least 1 hour.

## References

Transition Temperature-Guided Design of Lipid Nanoparticles for Effective mRNA Delivery-ACS Applied Materials & Interfaces Vol 17-Jeong Eun ShinEun-jeong WonJunchao XuJong Cheol LeeJeong Kyu Bang\*Michael J. Mitchell\*Hyunjoo Cha-Molstad\*