

Live-Cell Imaging and Lipidomics of Low-Density Lipoprotein Containing Intrinsically Fluorescent Cholesteryl Esters

Autorzy

Alice Dupont Juhl
Richard R. Sprenger
Maciej Modzel
Senjuti Halder
Maria Szomek
Vibeke Akkerman
Yuanjian Xu
Christian W. Heegaard
Christer S. Ejning
Douglas F. Covey
Daniel Wüstner

Rok wydania

2026

Czasopismo

Analytical Chemistry

Numer woluminu

98

Strony

7069-7083

DOI

10.1021/acs.analchem.5c05064

Kolekcja

Naukowa

Streszczenie

Low-density lipoprotein (LDL) delivers cholesterol to mammalian cells in the form of cholesteryl esters (CEs), but due to the lack of suitable tools, our understanding of the intracellular transport and hydrolysis of CEs is limited. We present a novel approach for studying LDL-derived CEs in cells using fatty acyl chain conjugates of the intrinsically fluorescent cholestatrienol (CTL). We demonstrate that CTL esters reconstituted into LDL particles are hydrolyzed in late endosomes and lysosomes (LE/LYSs) by acid lipase, while an LDL-derived CTL ether analogue cannot leave LE/LYSs. Using live-cell imaging, lipidomics, and multimodal Bayesian modeling, we discover a sequential biphasic transport of LDL-derived CTL to LE/LYSs with a half-time of 3.0 h. Hydrolyzed CTL derived from LDL-associated CTL esters is rapidly re-esterified with a similar half-time and stored in lipid droplets, demonstrating efficient sterol transport to the endoplasmic reticulum. Lack of functional Niemann-Pick C1 or C2 protein caused lysosomal accumulation of LDL-derived sterol. Using lipidomics and kinetic modeling, we also track LDL-derived CEs and triacylglycerols in cells and determine the uptake kinetics for each lipid species individually. Our novel approach allows for precise measurement of postendocytic trafficking and metabolism of LDL-derived cholesterol and other lipids in living cells.

Słowa kluczowe

Cells, Cholesterol, Organic compounds, Peptides and proteins, Steroids

Język	Licencja otwartego dostępu
Angielski	CC-BY-NC-ND
Typ publikacji	Licencja ta zezwala na rozpowszechnianie, przedstawianie i wykonywanie utworu jedynie w celach niekomercyjnych oraz pod warunkiem zachowania go w oryginalnej postaci (nie tworzenia utworów zależnych). Jest to najbardziej restrykcyjna z licencji.
Artykuł	Pełny tekst licencji: https://creativecommons.org/licenses/by-nc-nd/4.0/legalcode
	Adres publiczny
	http://dx.doi.org/10.1021/acs.analchem.5c05064
	Strona internetowa wydawcy
	https://www.acs.org/content/acs/en.html

Plik został wygenerowany dnia 2026-08-24 20:27:17

Adres w repozytorium <https://old.chem.uni.wroc.pl/pl/repozytorium/RjSjCvJ>.