Dynamic and structural studies of lipid droplets using synchrotron light

To cite this version:

HAL Id: hal-02743719
https://hal.inrae.fr/hal-02743719
Submitted on 3 Jun 2020

HAL is a multi-disciplinary open access archive for the deposit and dissemination of scientific research documents, whether they are published or not. The documents may come from teaching and research institutions in France or abroad, or from public or private research centers.

L’archive ouverte pluridisciplinaire HAL, est destinée au dépôt et à la diffusion de documents scientifiques de niveau recherche, publiés ou non, émanant des établissements d’enseignement et de recherche français ou étrangers, des laboratoires publics ou privés.
Lipid droplets: not well known but with rising interest

From biologists:
- LDs are not an inert fat depot but a dynamic organelle which regulates cell metabolism and signaling.

From medical field:
- LDs have a crucial role in diseases with increasing prevalence (obesity, diabetes) [7].
- Oleosins (from peanuts and rice), seed LD-associated proteins are allergens [3].

From industries:
- Oleosins: site for food and non-food production, are extracted from seed LDs.
- Food processing industry, cosmetic and health: oleosin properties and could be used as emulsifying agents or in drug delivery systems [4].

HETEROLOGOUS EXPRESSION OF PLANT OLEOSINS IN YEAST

Oleosins are targeted to LDs in yeast

Oleosins induce LDs and lipid accumulation

DYNAMIC STUDY USING SYNCHROTRON FTIR

Single cell FTIR analysis on Soleil SMIS beamline revealed a link between neutral lipid and carbohydrate fluxes [7].

STRUCTURAL STUDY USING SRCD

SRCD at DISCO beamline revealed that Ole1 is mainly beta folded when inserted in LDs [9].

Oleosins, seed lipid body associated proteins

Oleosins, MTOLs and ATOLs, are LD integral proteins

Questions and objectives:
- Role on lipid filling
- Role on LD structure and stabilization
- Structural data on oleosins inserted into LD (natural environment)

Lipid classes were analyzed using thin layer chromatography after Folch extraction.

DYNAMIC AND STRUCTURAL STUDIES OF LIPID DROPLETS USING SYNCHROTRON LIGHT

Frédéric Jamme1, Jean David Vindigni2, Alexandre Giuliani2, Frank Wien3, Roselyne Tâche2, Franjo Jagić2, Matthieu Réfrégiers1, Pascale Jalivet2, Thierry Chardot1, Yann Salent1, Marine Froissard2

1 Synchrotron SOLEIL, 91 192 Grisy-sous-VAustralian, Equipe Dynamique et Structure du Corps Lipidiques, UMR 1318 Institut Jean Pierre Bourguin, INRA AgroParisTech, 78 026 Versailles
2 Département Caractérisation et Elaboration des Produits Issus de l’Agriculture, U1008 INRA, 44 316 Nantes

CONTEXT

Lipid droplet: a complex and dynamic organelle

In cells, neutral lipids (triacylglycerols and sterol esters) are stored in organelles called lipid droplets (LDs) [1]. They are present in all organisms, from bacteria to plants and animals.

Lipid droplets: not well known but with rising interest

From biologists:
- LD is not an inert fat depot but a dynamic organelle which regulates cell metabolism and signaling.

From medical field:
- LDs have a crucial role in diseases with increasing prevalence (obesity, diabetes) [7].
- Oleosins (from peanuts and rice), seed LD-associated proteins are allergens [3].

From industries:
- Oleosins: site for food and non-food production, are extracted from seed LDs.
- Food processing industry, cosmetic and health: oleosin properties and could be used as emulsifying agents or in drug delivery systems [4].