

Lipid network and moiety analysis for revealing enzymatic dysregulation and mechanistic alterations from lipidomics data

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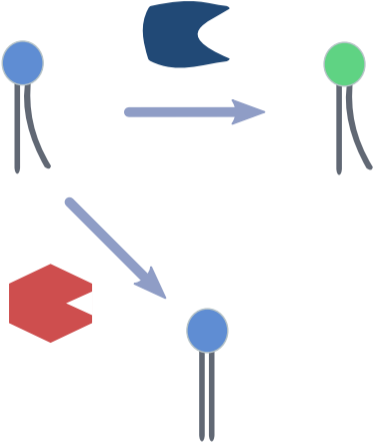
bidt Junior Research Group LipiTUM
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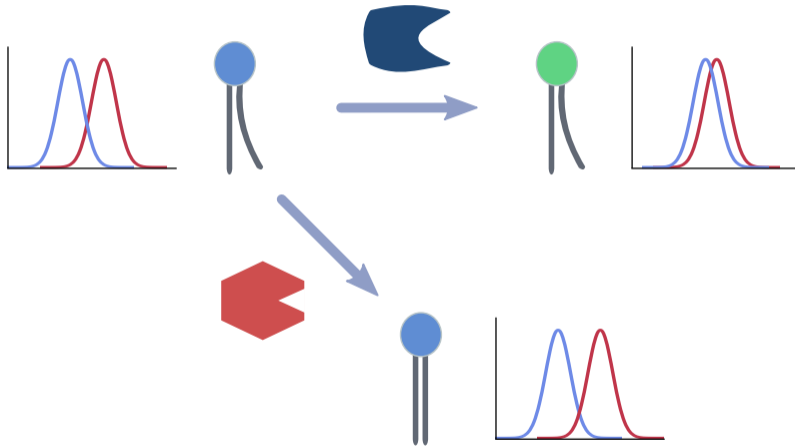


TUM Uhrenturm

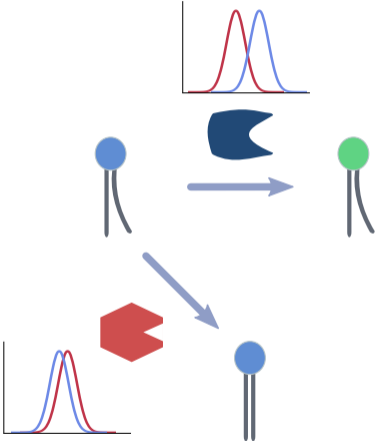
Motivation



Motivation



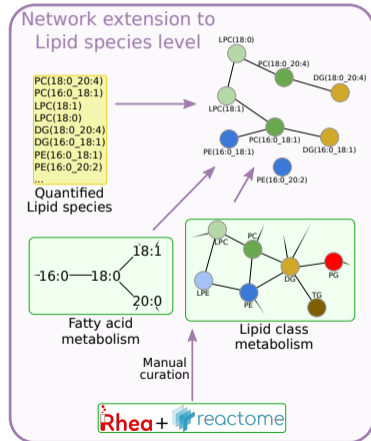
Motivation



Lipid Metabolic Networks

Network Generation

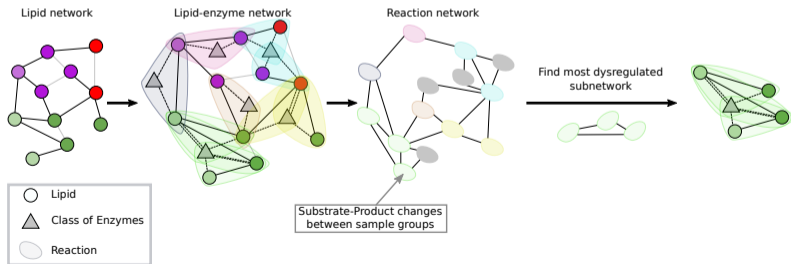
- lipid class metabolism: databases
 - matching fatty acids required
- fatty acid metabolism: metabolic rules
 - matching lipid classes required



Lipid Network Enrichment

Basic Rationale

- compute the substrate - product relations for each lipid reaction
- compute the ratio between two experimental for each lipid reaction
- find an 'optimal' subnetwork with two optimization objectives
 - large change between groups (i.e. maximum ratio)
 - small number of reactions



Lipid Network Enrichment

Proof-of-Principle

Knock-out Experiment by Thangapandi et al.¹

- 2 mouse strains
 - Wild-type
 - hepatospecific MBOAT7 Knock-out
- MBOAT7: Membrane Bound O-Acyltransferase 7
 - Lyso-Phosphoinositol (LPI) + FA → Phosphoinositol (PI)
 - Fatty-Acid Preference: Arachidonic Acid (20:4(ω -6))
- Liver tissue
- 253 lipid species from 15 lipid classes

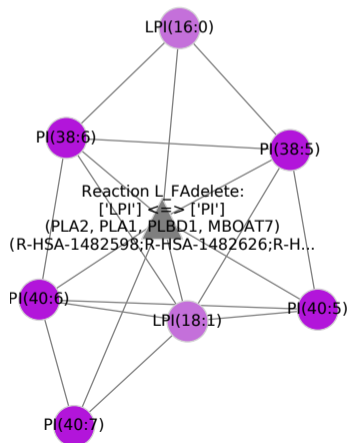
¹Thangapandi et al. "Loss of hepatic Mboat7 leads to liver fibrosis", Gut, 2021

Lipid Network Enrichment

Proof-of-Principle

Knock-out Experiment by Thangapandi et al.¹

- single reaction (acetyltransferase) incl. *MBOAT7*
- fatty acid "preference": long-chain PUFA incl. *Arachidonic Acid*



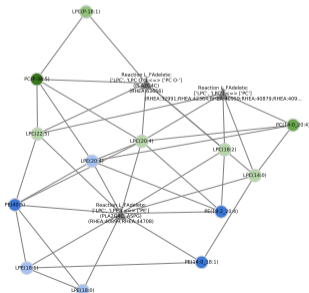
If you want to know more ...

- Novel hypothesis generation on adipocyte data in obesity
- Additional analyses complementary to network enrichment

Pre-print on bioRxiv

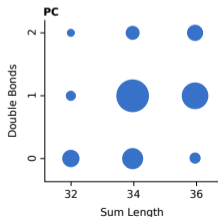
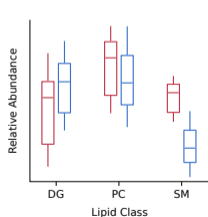


exbio.wzw.tum.de/linex2



If you want to know more ...

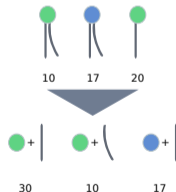
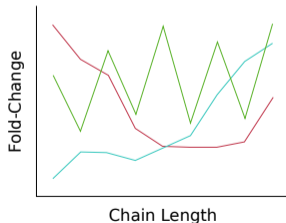
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- Olga Lazareva

bidt

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Lab



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Thank You!