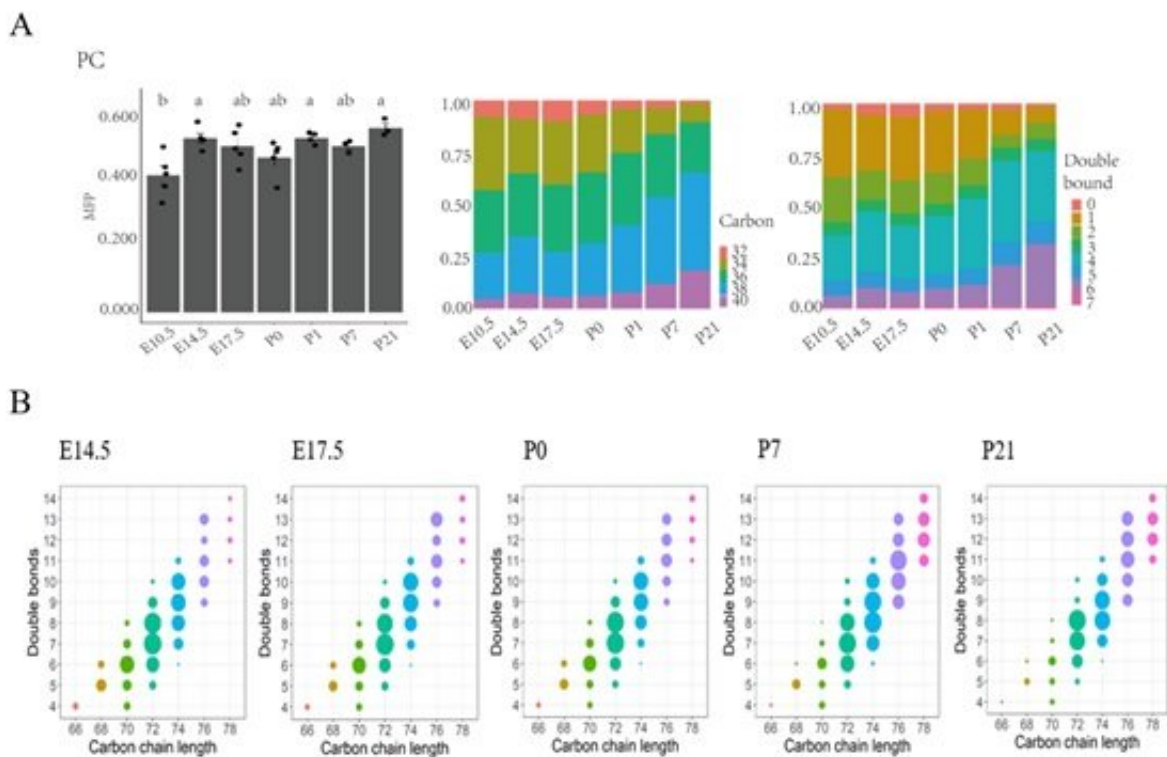


Researchers reveal lipidome atlas of developing heart

December 23 2022, by Zhang Nannan



The major membrane lipid characteristics during heart development. (A) The distribution of fatty acyls carbon atom numbers and double bond numbers in phosphatidylcholine (PC) of the heart lipidome across heart development. (B) The compositional changes in mitochondrial cardiolipins profiles across cardiac development. MFP: Molar fractions normalized to total polar lipids. Credit: IGDB

The heart, an indispensable organ with fascinating development biology,

is the first organ to become functional in the developing mammalian embryo. Cardiac lipid metabolism is intricately connected with heart physiology. However, a comprehensive lipidomic map of heart organogenesis has yet to be created.

Researchers led by Prof. Dr. Shui Guanghou at the Institute of Genetics and Developmental Biology (IGDB) of the Chinese Academy of Sciences (CAS) revealed the lipidome atlas of the developing heart uncovers dynamic membrane [lipid](#) attributes underlying cardiac structural and metabolic maturation.

They utilized high-coverage, quantitative lipidomic approaches to construct lipidomic atlases of whole-hearts (862 lipids; 31 [classes](#)) and mitochondria (587 lipids; 27 classes) across prenatal and postnatal developmental stages in mice.

They uncovered the progressive formation of docosahexaenoyl-phospholipids and enhanced remodeling of C18:2, C20:3 and C20:4 fatty acyl moieties into cardiolipins as cardiac development progresses. A preferential flow of ceramides toward sphingomyelin biosynthesis over complex glycosphingolipid formation was also noted.

Using maSigPro and GPclust algorithms, they identified a repertoire of 448 developmentally dynamic lipids and mapped their expression patterns to a library of 550 biologically relevant developmentally dynamic genes.

Their combinatorial transcriptomics and lipidomics approaches identified *Hadha*, *Lclat1* and *Lpcat3* as candidate molecular drivers governing the dynamic remodeling of cardiolipins and phospholipids, respectively, in heart development.

Their analyses revealed that postnatal [cardiolipin](#) remodeling in heart

constitutes a biphasic process, which first accumulates polyunsaturated C78-cardiolipins prior to tetralinoleoyl cardiolipin forming the predominant species.

The findings offer lipid-centric biological insights potentially important to understanding the molecular basis of cardiac metabolic flexibility and disease pathology.

This work, titled "Lipidome atlas of the developing [heart](#) uncovers dynamic membrane lipid attributes underlying cardiac structural and metabolic maturation," was published in *Research*.

More information: Huan Miao et al, Lipidome Atlas of the Developing Heart Uncovers Dynamic Membrane Lipid Attributes Underlying Cardiac Structural and Metabolic Maturation, *Research* (2022). [DOI: 10.34133/research.0006](https://doi.org/10.34133/research.0006).
spj.science.org/doi/10.34133/research.0006

Provided by Chinese Academy of Sciences

Citation: Researchers reveal lipidome atlas of developing heart (2022, December 23) retrieved 11 May 2024 from <https://medicalxpress.com/news/2022-12-reveal-lipidome-atlas-heart.html>

<p>This document is subject to copyright. Apart from any fair dealing for the purpose of private study or research, no part may be reproduced without the written permission. The content is provided for information purposes only.</p>
--