

Lipid metabolism in conger eel (*Conger myriaster*) during artificially induced ovarian development

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Introduction

Conger eel (*Conger myriaster*) farming is completely dependent on wild eel seedlings, which severely restricts the healthy development of the industry. During the development of the eel, the conversion of lipids is closely related to the development of the eel's gonadal and the quality of the eggs. Lipidomic analysis is a systematic study of whole lipids, revealing the role of lipids in life activities.

Materials and Methods

After extracting total lipids from liver, gonads, muscle and plasma, the samples of the four tissues and QC samples were tested on the computer using UPLC-MS (Fig.1), and the raw data was imported into the lipidomics processing software Progenesis QI (Waters Corporation, Milford, USA) After analysis, PCA and OPLS-DA were performed in SIMCA-14.1 software (Umetrics), VIP>1, p<0.05 The lipids are significantly different lipids. Use online databases such as HMDB, LIPIDMAPS and MetaboAnalyst 5.0 to confirm the structure of differential lipids and lipid markers.



Fig.1 UPLC-MS sampling system

Results

1. Analysis of lipid metabolism in main tissues of conger eel at different developmental stages

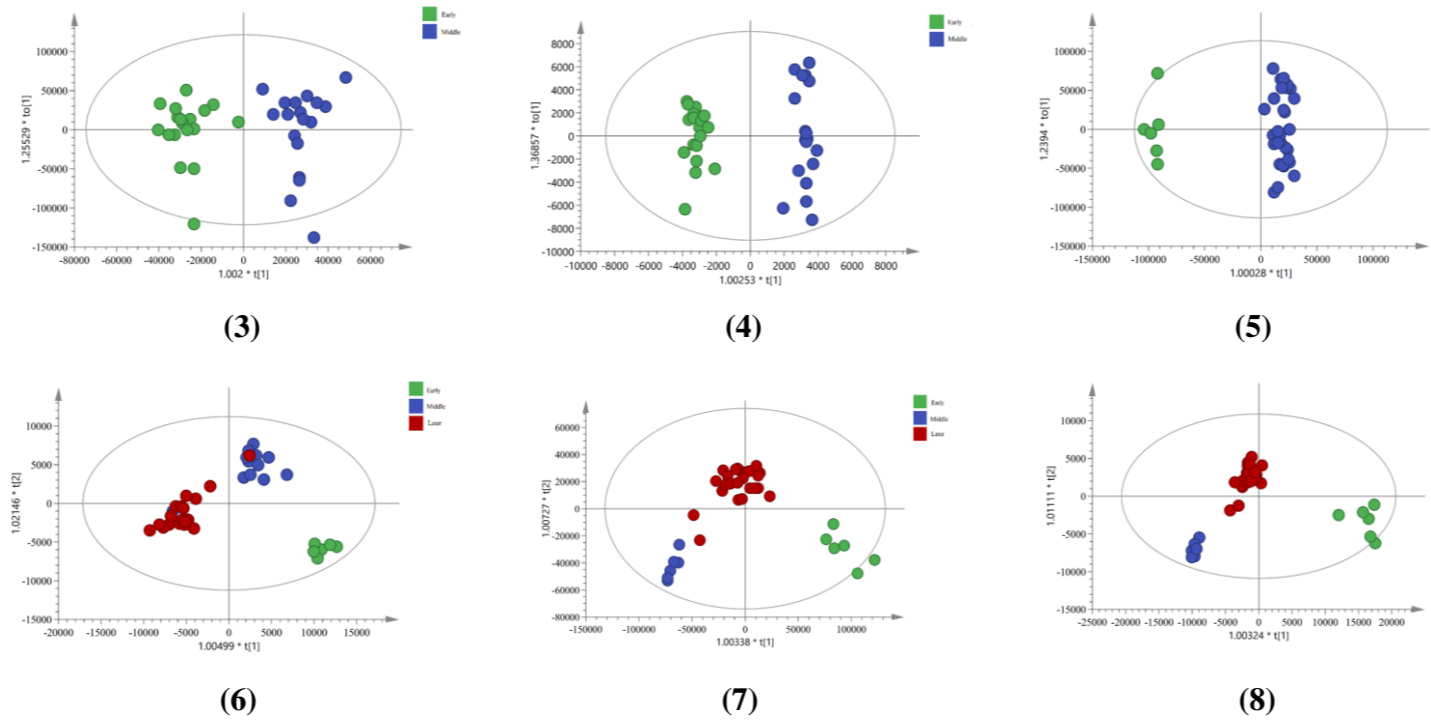
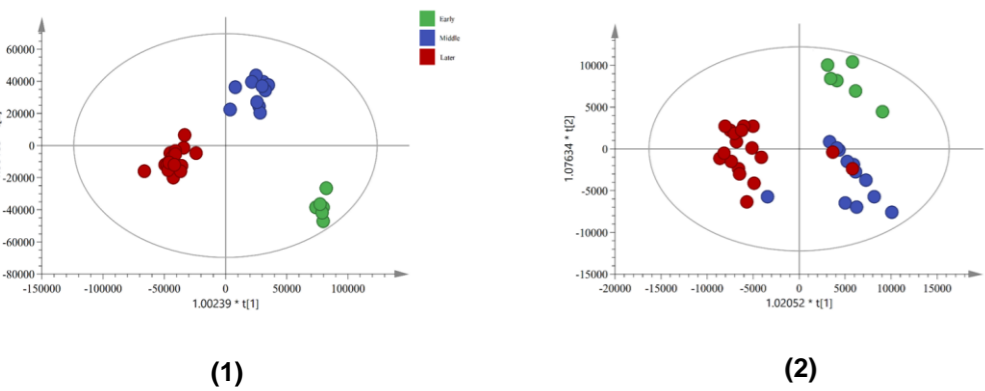


Fig.2 OPLS-DA analysis at different stages of four tissues

Notes: (1) liver (ESI+), (2) liver (ESI-), (3) muscle (ESI+), (4) muscle (ESI-), (5) gonad (ESI+), (6) gonad (ESI-), (7) plasma (ESI+), (8) plasma (ESI-)

2. Identification of lipid markers

Table.1 Summary of four types of tissue lipid markers

Compound name	PS	PE	PI	PC	PA	PG	TG	SM	DG	Cer	CL	CE	FFA	Total
Liver(kinds)	3	15	2	15	1	1	20	1	1	3	5		1	68
Muscle(kinds)		10	3	4			9						1	27
Gonad(kinds)	2	26	4	15		1	5	4		3			3	63
Plasma(kinds)	3	72	8	87			23	13		2		1	1	212

Notes: PS-phosphatidylserine, PE-phosphatidylethanolamine, PI-phosphatidylinositol, PC-phosphatidylcholine, PA-phosphatidic acid, PG-Phosphatidylglycerol, TG- triglycerides, SM-sphingomyelin, DG-diglyceride, Cer-ceramide, CL-cardiolipin, CE-cholesteryl ester, FFA-Free Fat Acid

3. Heat map analysis of relative content of lipid markers

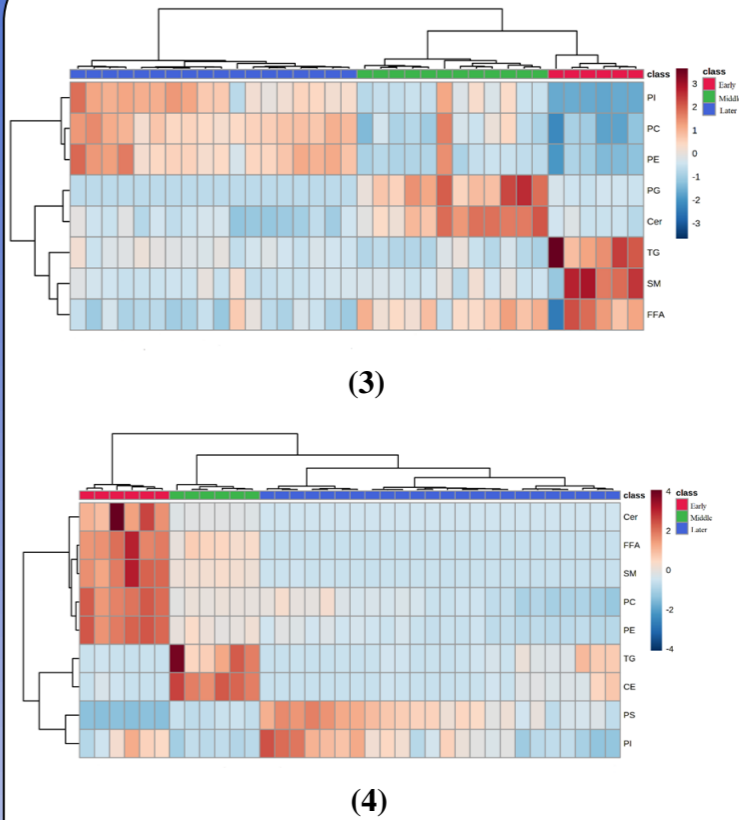
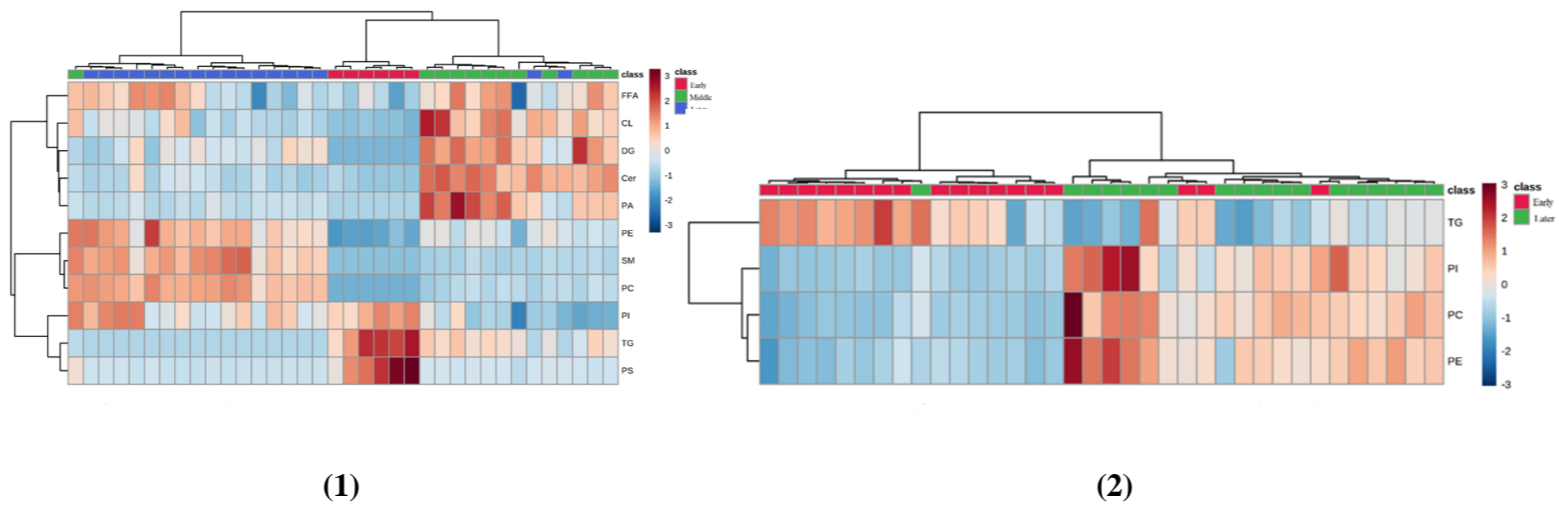


Fig.3 Heat map analysis of relative content of four tissue lipid markers

Notes: (1) liver, (2) muscle, (3) gonad, (4) plasma

4. Changes in the activity of lipid metabolism-related enzymes in the liver

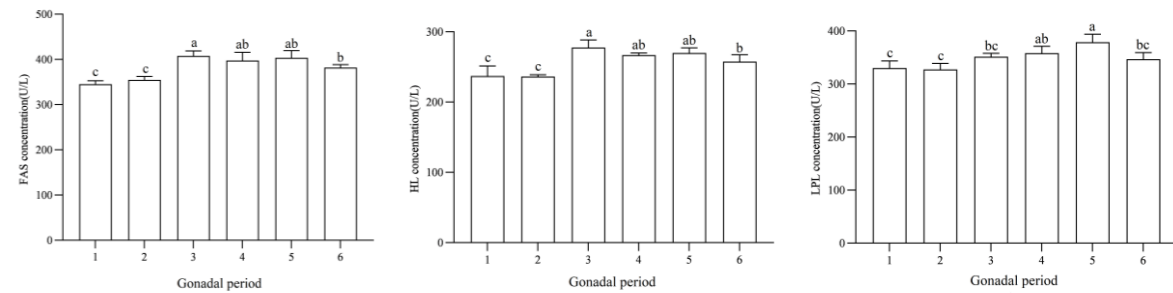


Fig.4 Lipid metabolism-related enzyme activities at different stages

Notes: 1. chromatin nucleolus stage, 2. oil droplet stage, 3. primary yolk globule stage, 4. secondary yolk globule stage 5. migratory nucleus stage 6. maturation stage. (1) Fatty acid synthase enzyme, (2) Liver lipase enzyme, (3) Lipoprotein lipase enzyme

Summary

Studies have shown that during the artificial induction of ovarian development in conger eel, TG, PC, PE and SM are mobilized for gonadal development, fatty acid synthase, liver lipase and lipoprotein lipase promotes the mobilization of main lipids. This experiment explored the changes in lipid metabolism during the artificial reproduction of the conger eel, in order to provide a basis for the sustainable development of the conger eel fishery, thereby increasing the number of wild populations.

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