



读书报告

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Breeding selection of rainbow trout for high or low muscle adiposity differentially affects lipogenic capacity and lipid mobilization strategies to cope with food deprivation



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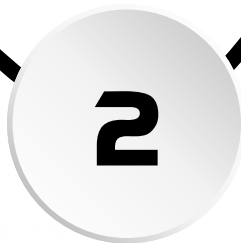
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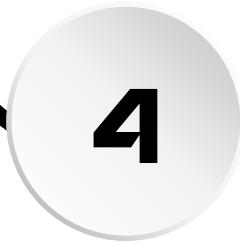
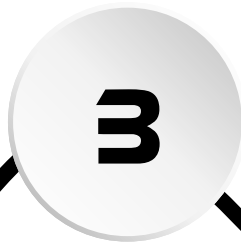
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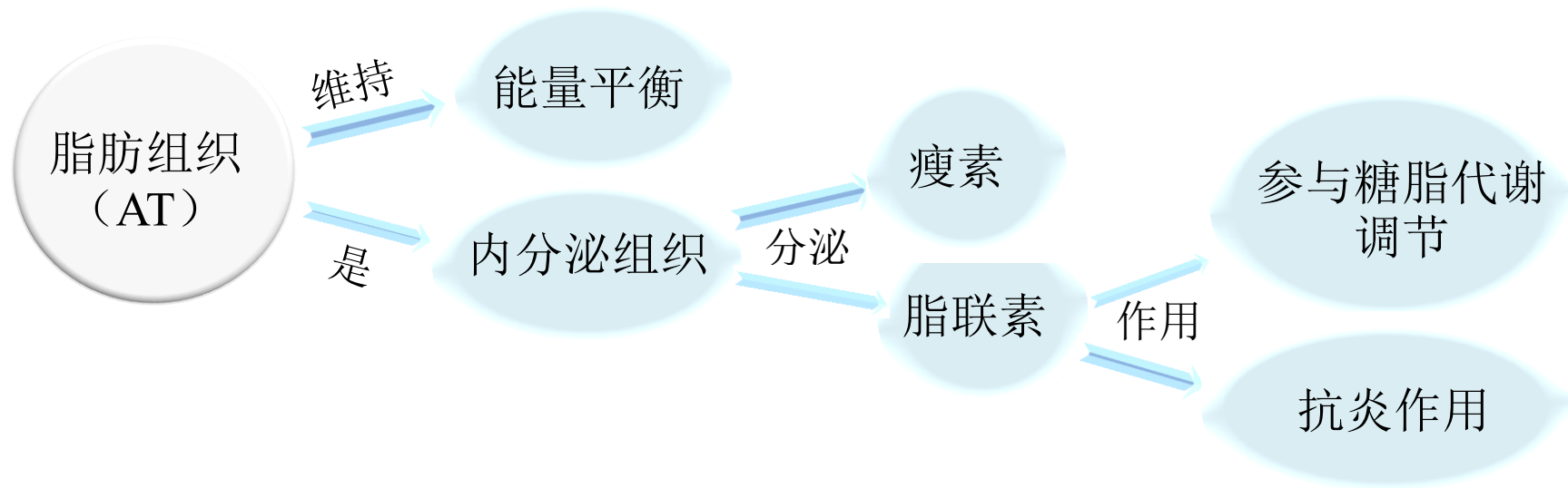
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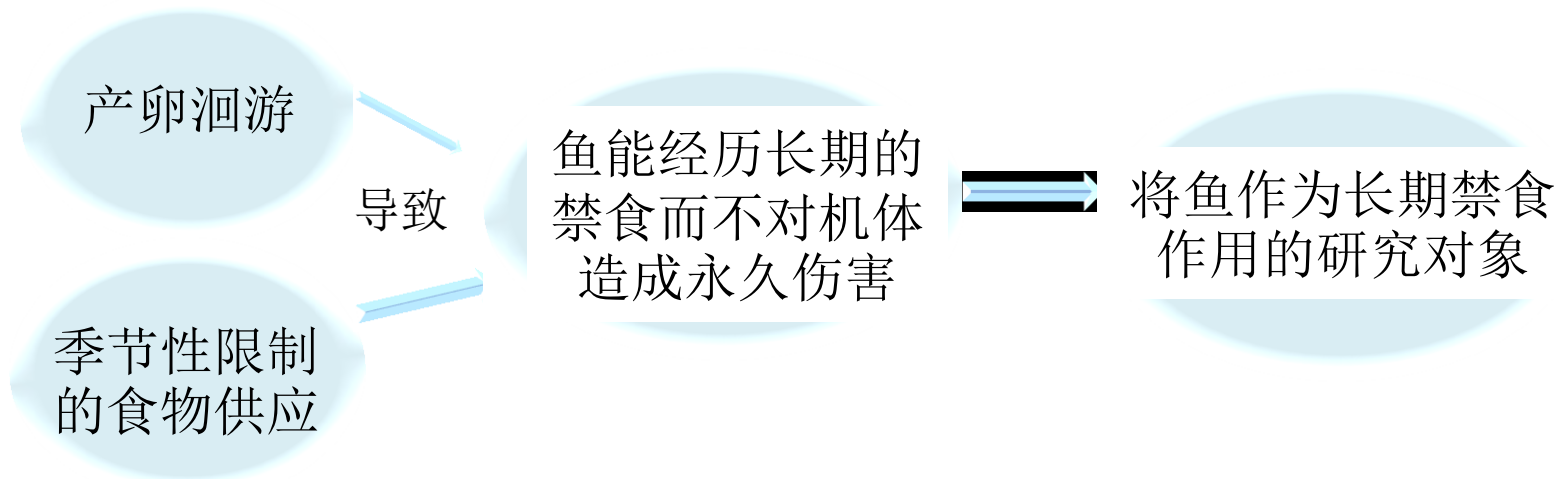
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Introduction

● Introduction

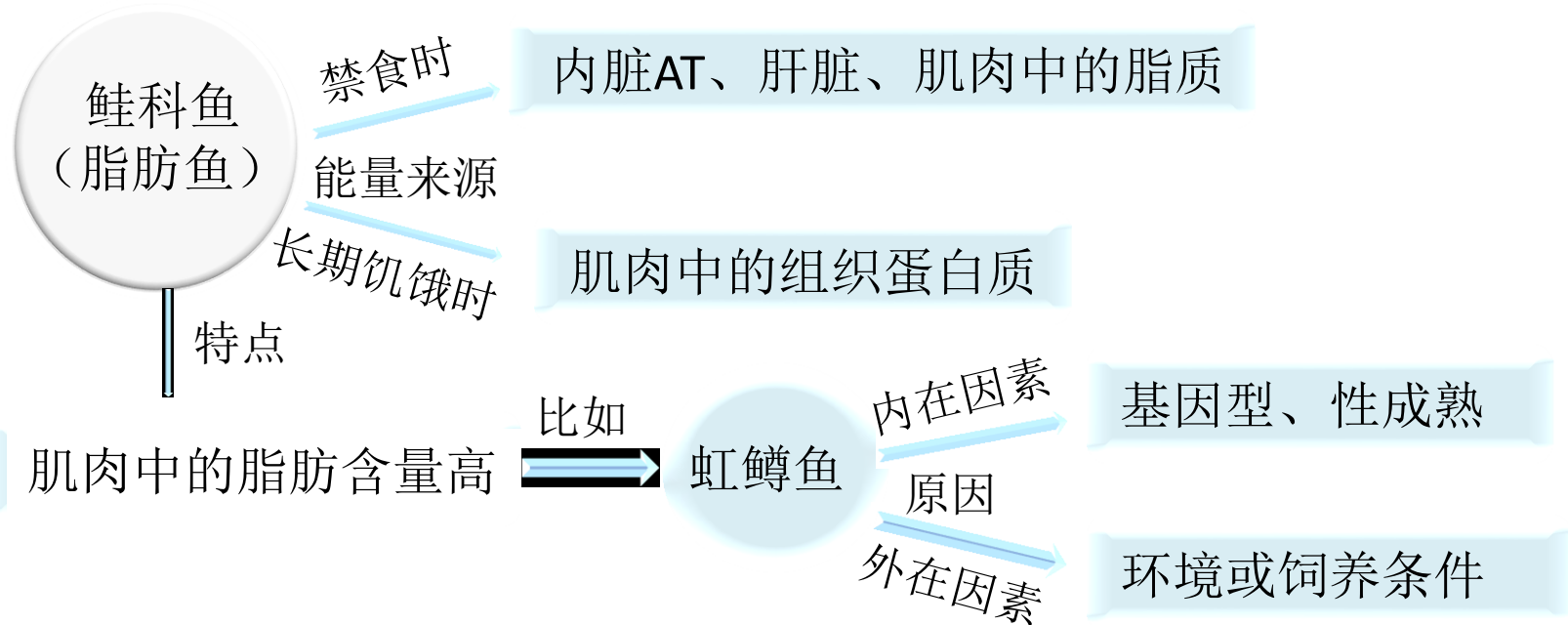


● Introduction

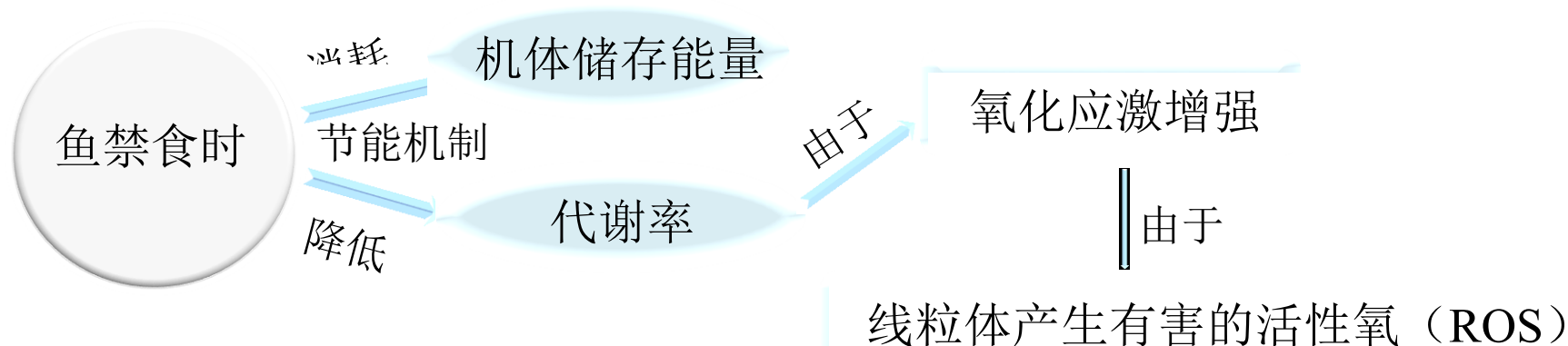


鱼类生长和分解代谢的分子机制已经进行研究，但是脂联素在其中如何发挥作用仍需进一步研究。

● Introduction



● Introduction



关于禁食对肝脏抗氧化防御能力和脂质氧化的影响在分子水平上的研究尚不多见。

因此，阐明禁食对虹鳟鱼脂代谢、脂联素系统调节和氧化应激状态引起人们的关注。

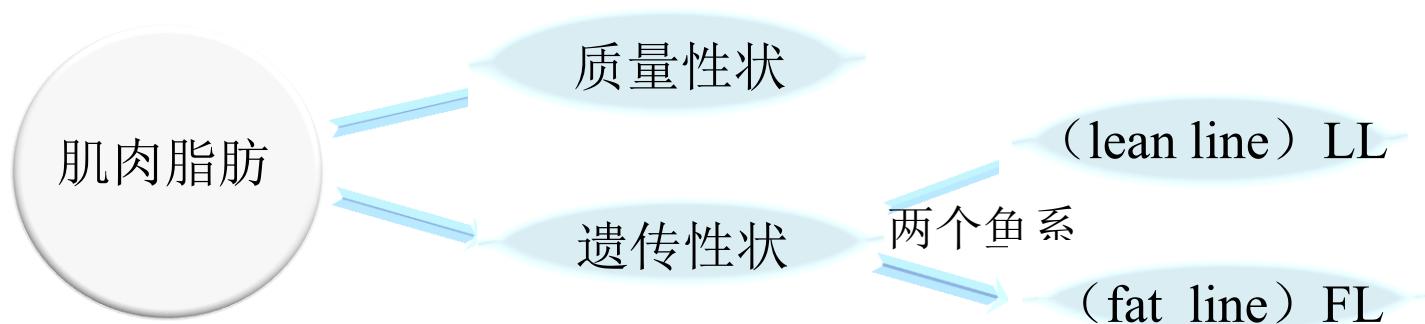
● Introduction



哺乳动物中代谢表型和疾病的关系已经被研究。虽然水产养殖业目前对通过选择特定的生理性状，来获得最佳的鱼类表型越来越有兴趣。

但是，在鱼类中的研究还很少。

● Introduction



已经获得的结论：

FL利用和存储葡萄糖的能力、产脂能力及维持稳态的能力更强。

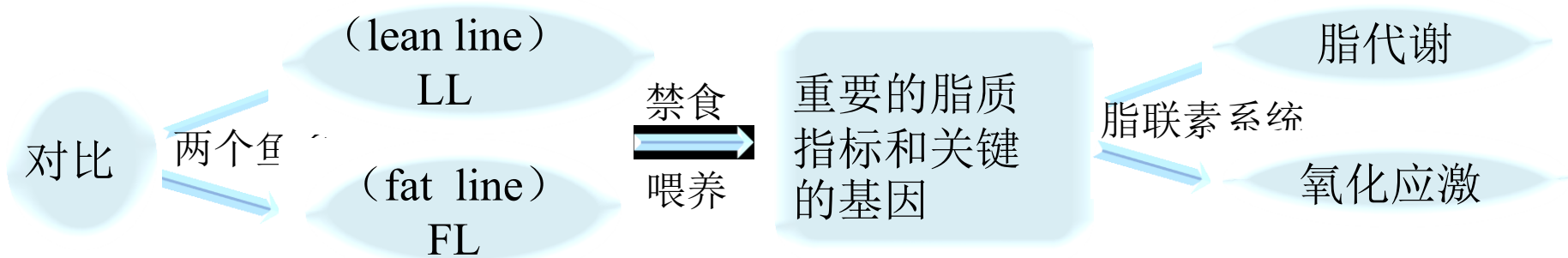
已经进行的研究：

2014年选育了7代LL和FL鱼系，已分析关于能量储存和脂代谢的瘦素分析系统和中枢效应。

**但是，脂肪组织在调节脂质稳态时发挥的作用
没有被细致研究。**

● Introduction

本研究的目的:



已经证明2个鱼系在正常饲喂条件下代谢过程的调节是不同的，所以本研究假定在禁食时2个鱼系也有不同的调节策略，尤其是在白肌（WM）和脂肪组织（AT）中。

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- Materials and methods

● Materials and methods

养殖实验（两个鱼系（FL/LL），四种方案（0W/1W/2W/4W）

驯化3周，养殖4周

一天投喂五次

样本采集

BW、血液、肝和内脏（包括胃肠道和内脏AT，去除胃和肠道内容物）

血浆非酯化脂肪酸和总甘油三酯的水平

肌肉脂质含量

肌肉脂质过氧化

RNA的提取和cDNA的合成

Real-time quantitative PCR

数据统计分析

0W:正常投喂4周

1W: 正常投喂3周，
禁食1周

2W: 正常投喂2周，
禁食2周

4W: 禁食4周

LL:lean line

FL:fat line

BW:white muscle

AT:adipose tissue



Results

● 生物特征指标、血浆参数和肌肉脂质

TABLE 1 Liver somatic index (LSI), visceral somatic index (VSI), muscle lipid content and peroxidation products (TBARS), and plasma levels of triglycerides (TG) and non-esterified fatty acids (NEFAs) in LL and FL rainbow trout subjected to regimes of 0, 1, 2 or 4 weeks (W) of fasting

Fasting regimes		0W	1W	2W	4W
LSI (%)	LL	1.16 ± 0.03 ^a	0.88 ± 0.04 ^b	0.81 ± 0.028 ^b	0.89 ± 0.03 ^b
	FL	1.23 ± 0.05 ^A	0.85 ± 0.017 ^B	0.79 ± 0.05 ^B	0.75 ± 0.03 ^{B*}
VSI (%)	LL	9.67 ± 0.23 ^a	8.22 ± 0.24 ^b	7.95 ± 0.22 ^{bc}	7.09 ± 0.37 ^c
	FL	8.24 ± 0.31 ^{A**}	7.02 ± 0.40 ^{B*}	6.69 ± 0.16 ^{BC**}	5.70 ± 0.26 ^{C**}
Muscle lipid content (%)	LL	3.90 ± 0.54	3.06 ± 0.39	2.99 ± 0.40	3.43 ± 0.62
	FL	7.31 ± 0.72 ^{A**}	5.10 ± 0.84 ^{B*}	4.58 ± 0.58 ^B	3.26 ± 0.22 ^B
TBARS (nmol MDA g ⁻¹)	LL	9.83 ± 0.43	9.40 ± 0.57	10.00 ± 0.67	9.69 ± 0.40
	FL	10.72 ± 0.68	12.24 ± 0.68 [*]	9.83 ± 0.70	10.10 ± 0.56
Plasma TG (mmol L ⁻¹)	LL	1.97 ± 0.20 ^a	3.80 ± 0.31 ^b	1.33 ± 0.15 ^a	1.71 ± 0.36 ^a
	FL	4.10 ± 0.33 ^{A**}	2.33 ± 0.48 ^{B*}	2.23 ± 0.36 ^B	1.63 ± 0.14 ^B
Plasma NEFAs (mEq L ⁻¹)	LL	0.25 ± 0.03	0.53 ± 0.12	0.35 ± 0.06	0.49 ± 0.10
	FL	0.62 ± 0.16 [*]	0.53 ± 0.09	0.46 ± 0.07	0.39 ± 0.03

● 脂代谢相关基因的表达

Adipose tissue

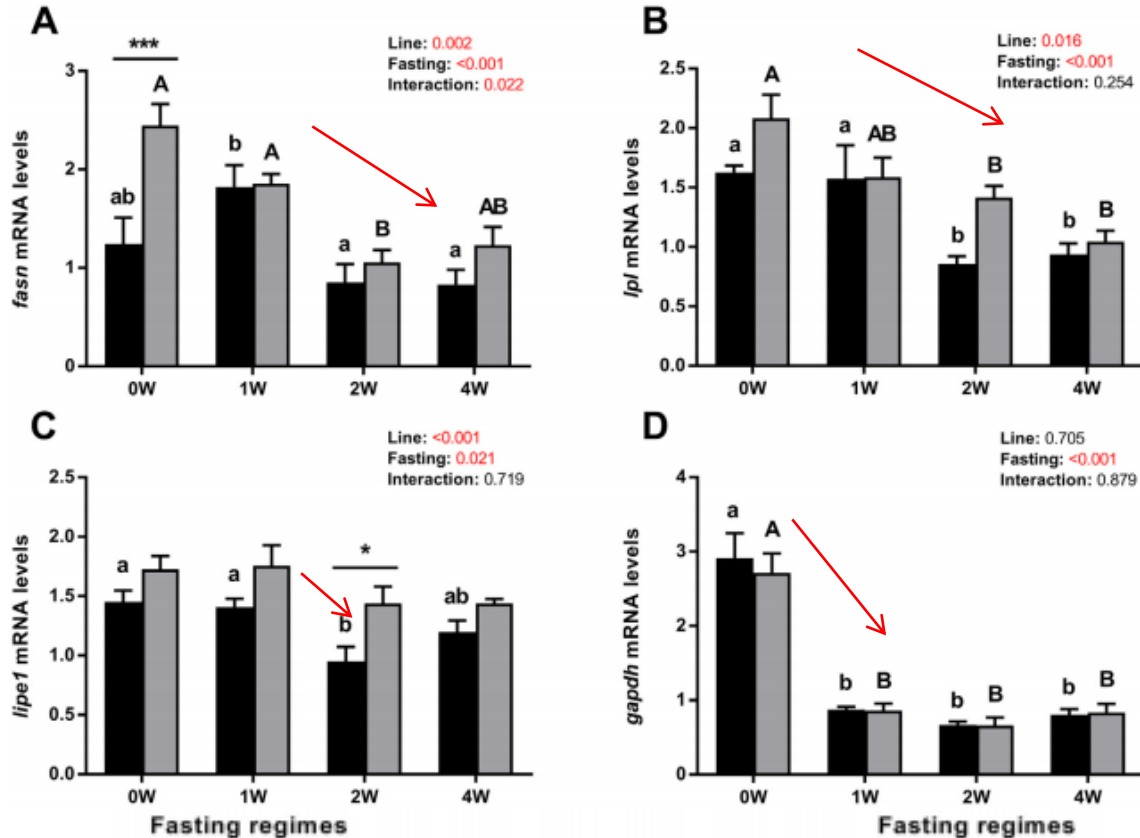


Fig. 1. Expression of selected lipid metabolism-related genes in adipose tissue. mRNA levels of *fasn* (A), *lpl* (B), *lipo1* (C), *gapdh* (D), *lxr* (E), *me1* (F), *ppara* (G) and *pparb* (H) from LL (black bars) and FL (grey bars) rainbow trout subjected to regimes of 0, 1, 2 or 4 weeks (W) of fasting.

● 脂代谢相关基因的表达

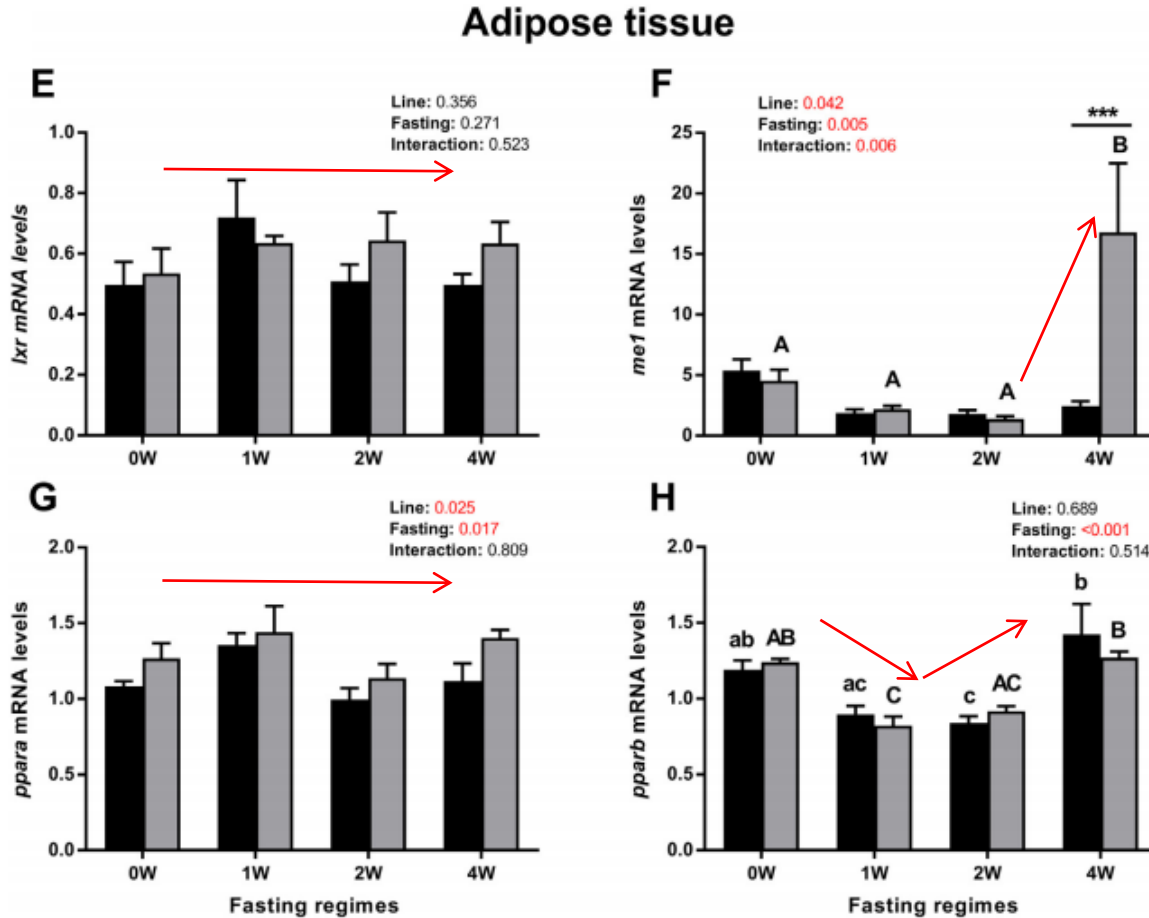


Fig. 1. Expression of selected lipid metabolism-related genes in adipose tissue. mRNA levels of *fasn* (A), *lpl* (B), *lipel1* (C), *gapdh* (D), *lxr* (E), *me1* (F), *ppara* (G) and *ppar β* (H) from LL (black bars) and FL (grey bars) rainbow trout subjected to regimes of 0, 1, 2 or 4 weeks (W) of fasting.

● 脂代谢相关基因的表达

White muscle

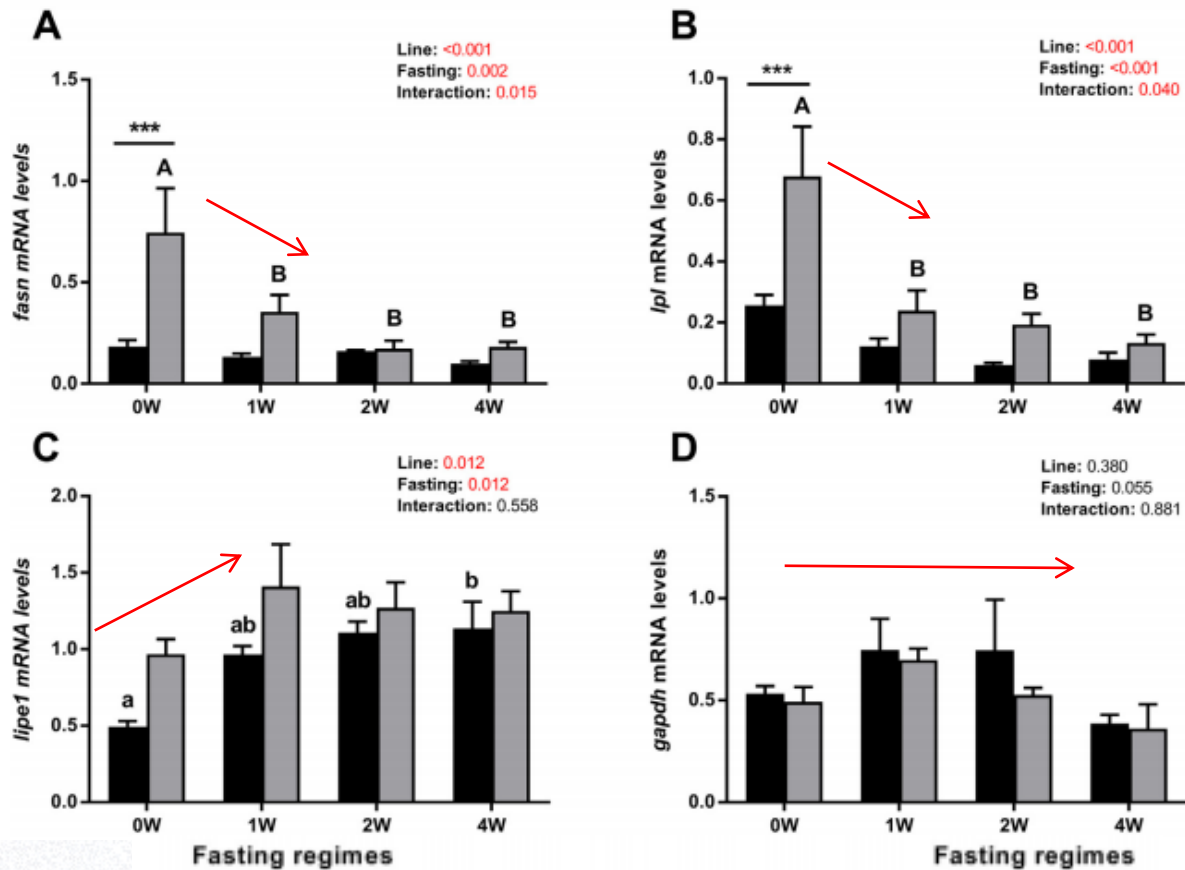


Fig. 2. Expression of selected lipid metabolism-related genes in white muscle. mRNA levels of *fasn* (A), *lpl* (B), *lipo1* (C), *gapdh* (D), *lxr* (E), *me1* (F), *ppara* (G) and *pparb* (H) from LL (black bars) and FL (grey bars) rainbow trout subjected to regimes of 0, 1, 2 or 4 weeks (W) of fasting.

● 脂代谢相关基因的表达

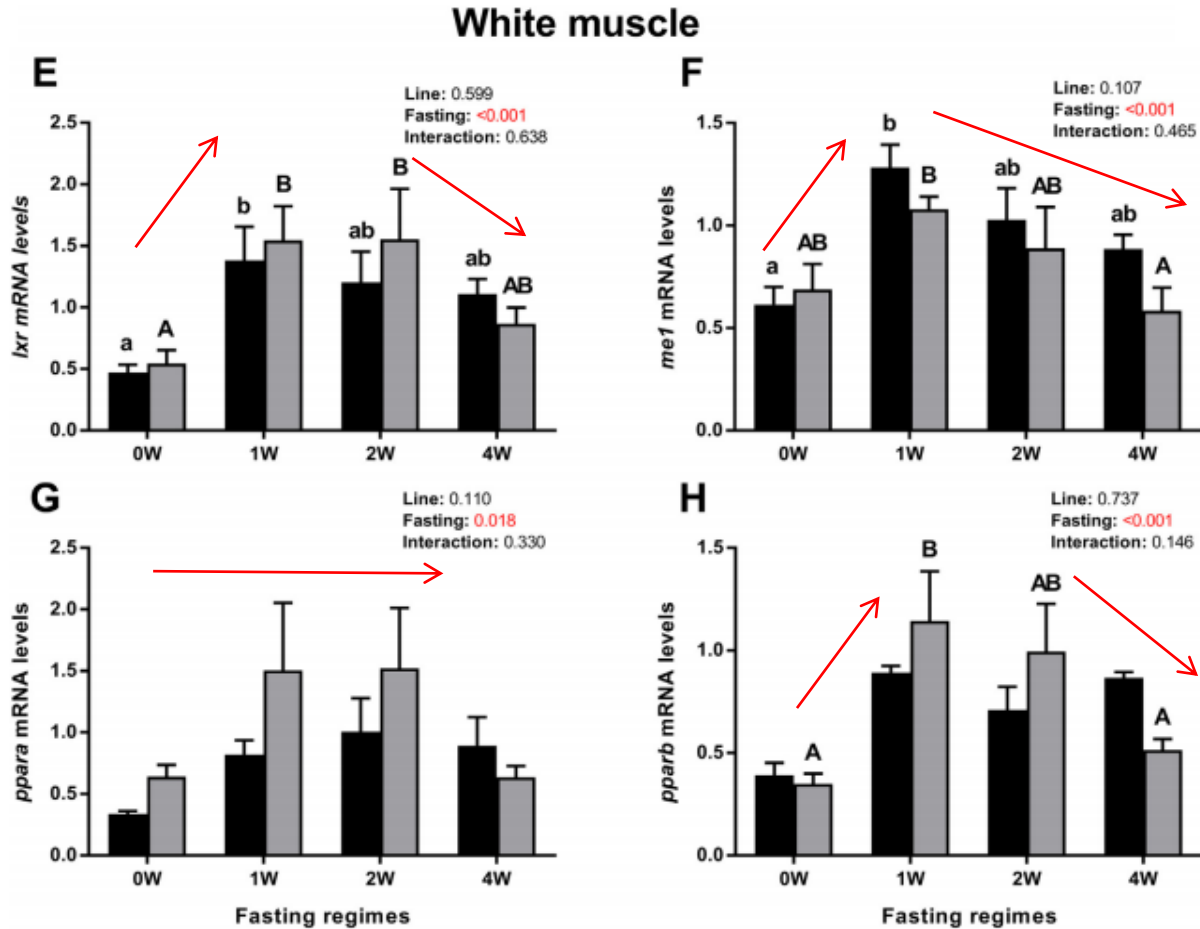


Fig. 2. Expression of selected lipid metabolism-related genes in white muscle. mRNA levels of *fasn* (A), *lpl* (B), *lipel1* (C), *gapdh* (D), *lxr* (E), *me1* (F), *ppara* (G) and *pparb* (H) from LL (black bars) and FL (grey bars) rainbow trout subjected to regimes of 0, 1, 2 or 4 weeks (W) of fasting.

● 脂联素和脂联素受体基因的表达

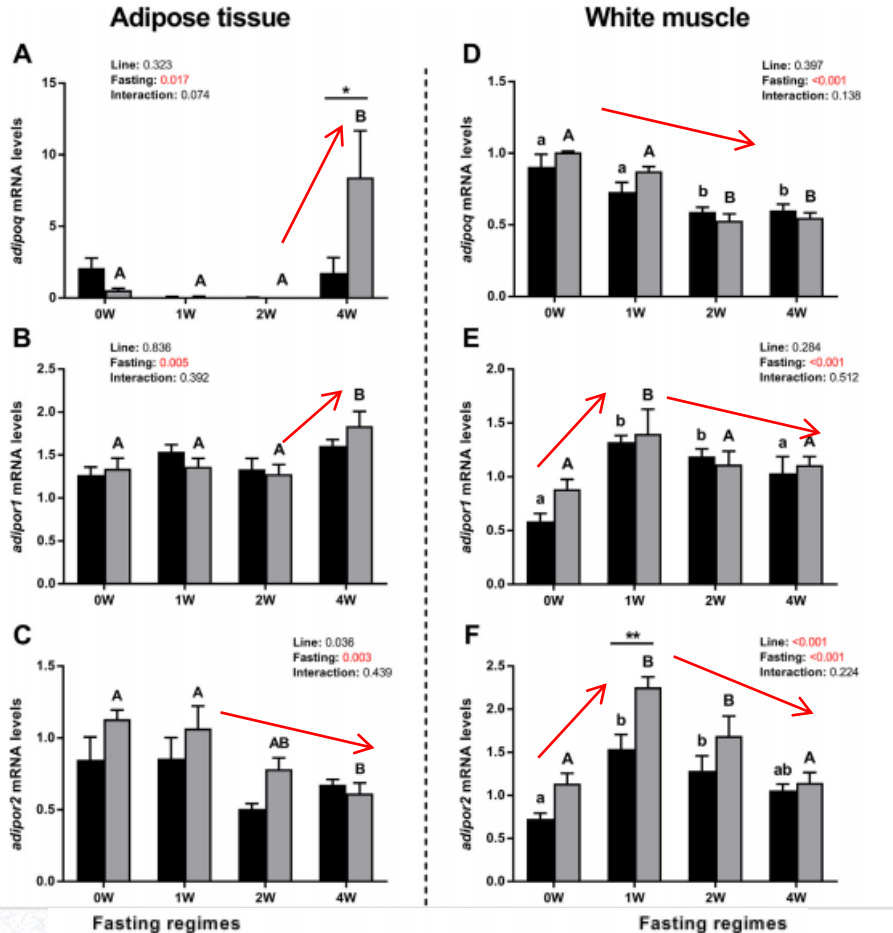


Fig. 3. Expression of adiponectin system genes in adipose tissue (A, C and E) and white muscle (B, D and F). mRNA levels of *adipoq* (A, B), *adipor1* (C, D) and *adipor2* (E, F) from LL (black bars) and FL (grey bars) rainbow trout subjected to regimes of 0, 1, 2 or 4 weeks (W) of fasting.

● 氧化应激相关基因的表达

Adipose tissue

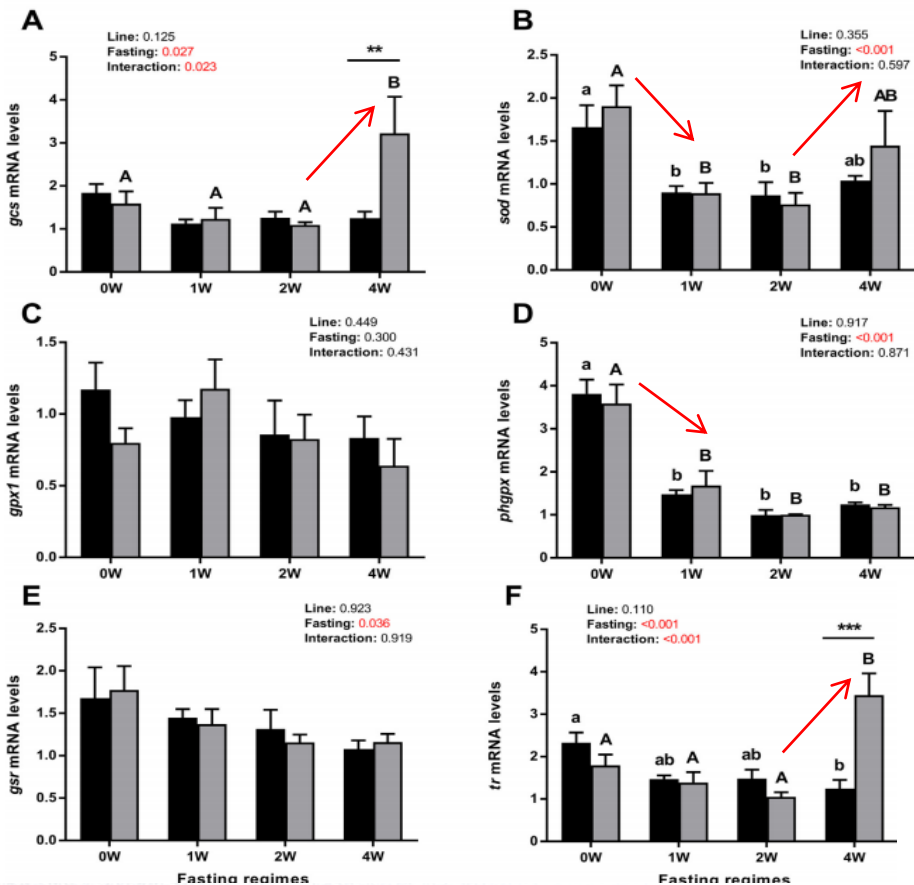


Fig. 4. Expression of selected oxidative stress genes in adipose tissue. mRNA levels of *gcs* (A), *sod* (B), *gpx1* (C), *phgp* (D), *gsr* (E) and *tr* (F) from LL (black bars) and FL (grey bars) rainbow trout subjected to regimes of 0, 1, 2 or 4 weeks (W) of fasting

● 氧化应激相关基因的表达

White muscle

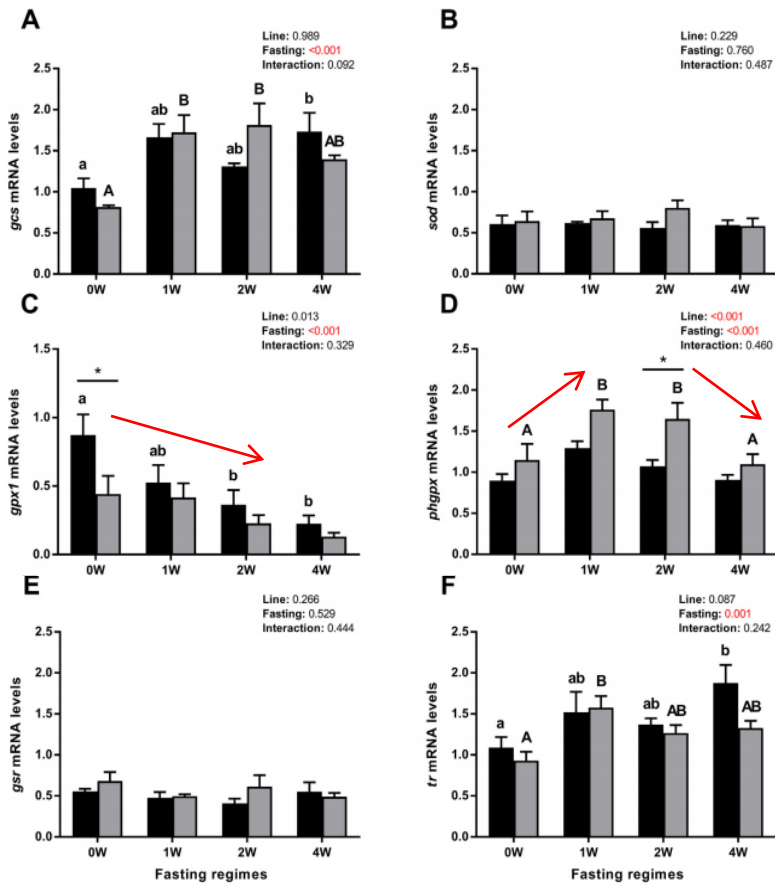


Fig. 5. Expression of selected oxidative stress genes in white muscle. mRNA levels of gcs (A), sod (B), gpx1 (C), phgpx (D), gsr (E) and tr (F) from LL (black bars) and FL (grey bars) rainbow trout subjected to regimes of 0, 1, 2 or 4 weeks (W) of fasting

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• Conclusion

● Conclusion

结论:

1. 本研究揭示了虹鳟鱼的两种鱼系（LL和FL）之间的脂类代谢调节存在差异，强调它们对食物缺乏有不同应对机制。
2. 血浆TG和NEFAs水平的变化，以及AT和WM中脂质代谢和氧化应激相关基因转录水平的差异，清晰地表明了FL和LL的代谢策略、脂类沉积及动员途径的分化。
3. FL鱼在AT和WM中的*fasn* mRNA水平显著高于LL鱼，而在WM中则有较高的*lpl* mRNA水平。表明前一种表型提高了脂肪生成能力，增加了脂肪摄取。
4. 两种鱼系在AT和WM中的脂代谢调节以及脂联素系统和与氧化应激相关的基因也存在差异。我们需要作进一步的分析，以确定这两种鱼系在食物缺乏时对脂质动员的不同策略是否也伴随着对蛋白质降解的不同调节，这可能会影响肌肉的质地，并最终影响鱼片的质量。

意义:

本研究为基因对虹鳟鱼脂代谢调控的影响提供了新的见解。展示出一种评价水产养殖生产的新方法,该方法是在营养研究时针对某些特定性状去选育新品种。



水产 2019级研究生

恳请各位老师批评指正!



河南师范大学

THANKS

汇报人：张隽美