The effect of 24 weeks of high-fat and high-cholesterol diet on rat liver mitochondria

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NAFLD

- Nonalcoholic fatty liver disease
  > 30 % of world population
- Atherosclerosis, metabolic syndrome and type II diabetes
- Increased inflammation, reactive oxygen species production, insulin resistance & impaired lipid metabolism

- **How does it affect liver mitochondrial respiration?**

METHODS

- Male Wistar rats (n=4)
- Commercial Diet (Altromin)
  - **C**ontrol: 10 % energy in fat
  - **H**FD: 70 % energy in fat (lard) + 1.25 % in choles
  - **1**, **3**, **6**, **12** & **24** weeks
- Histology
  - Hematoxylin eosin, Oil red O, Masson's trichrom
- Mitochondrial respiration
  - Isolated mitochondria
  - OROBOROS Oxygraph-2k
  - Reference protocols 1 & 2

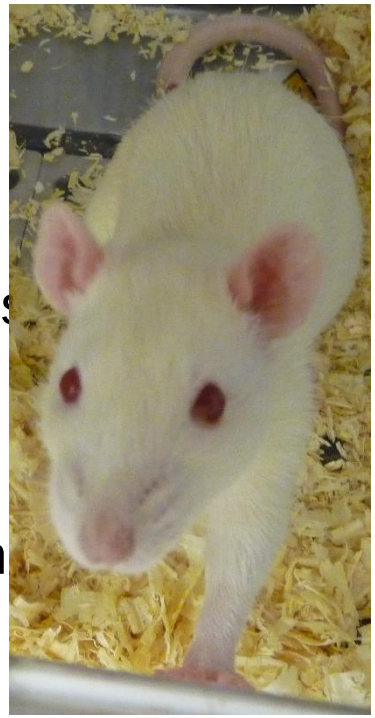
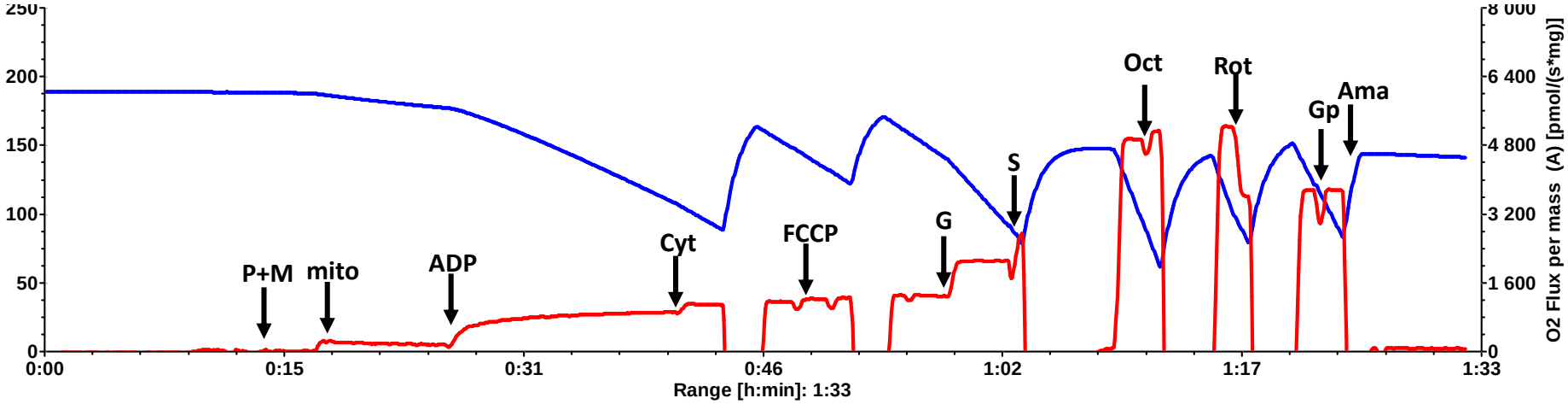
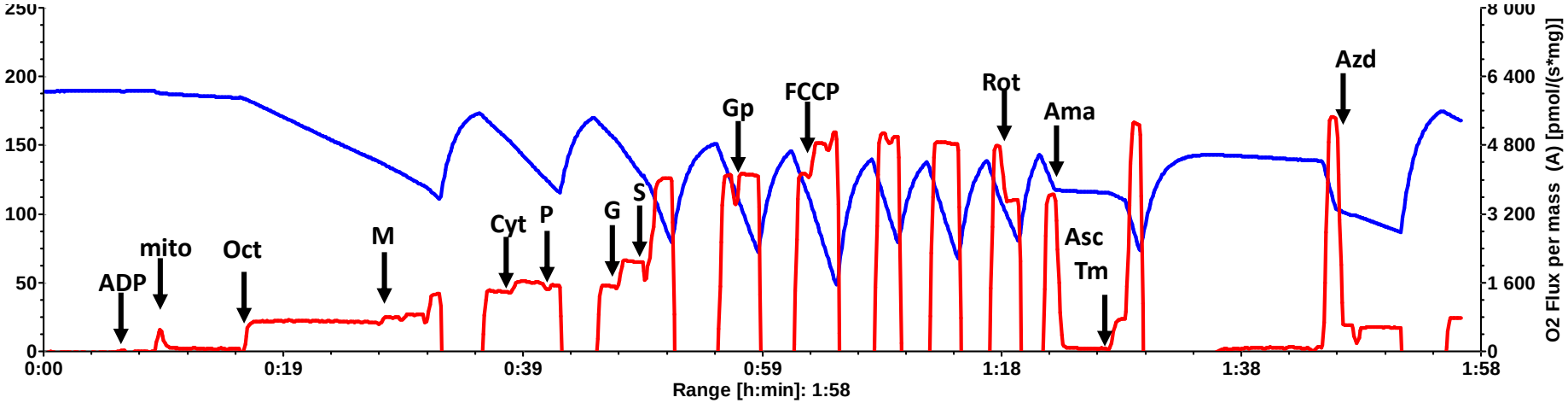


Foto: Oroboros GmbH

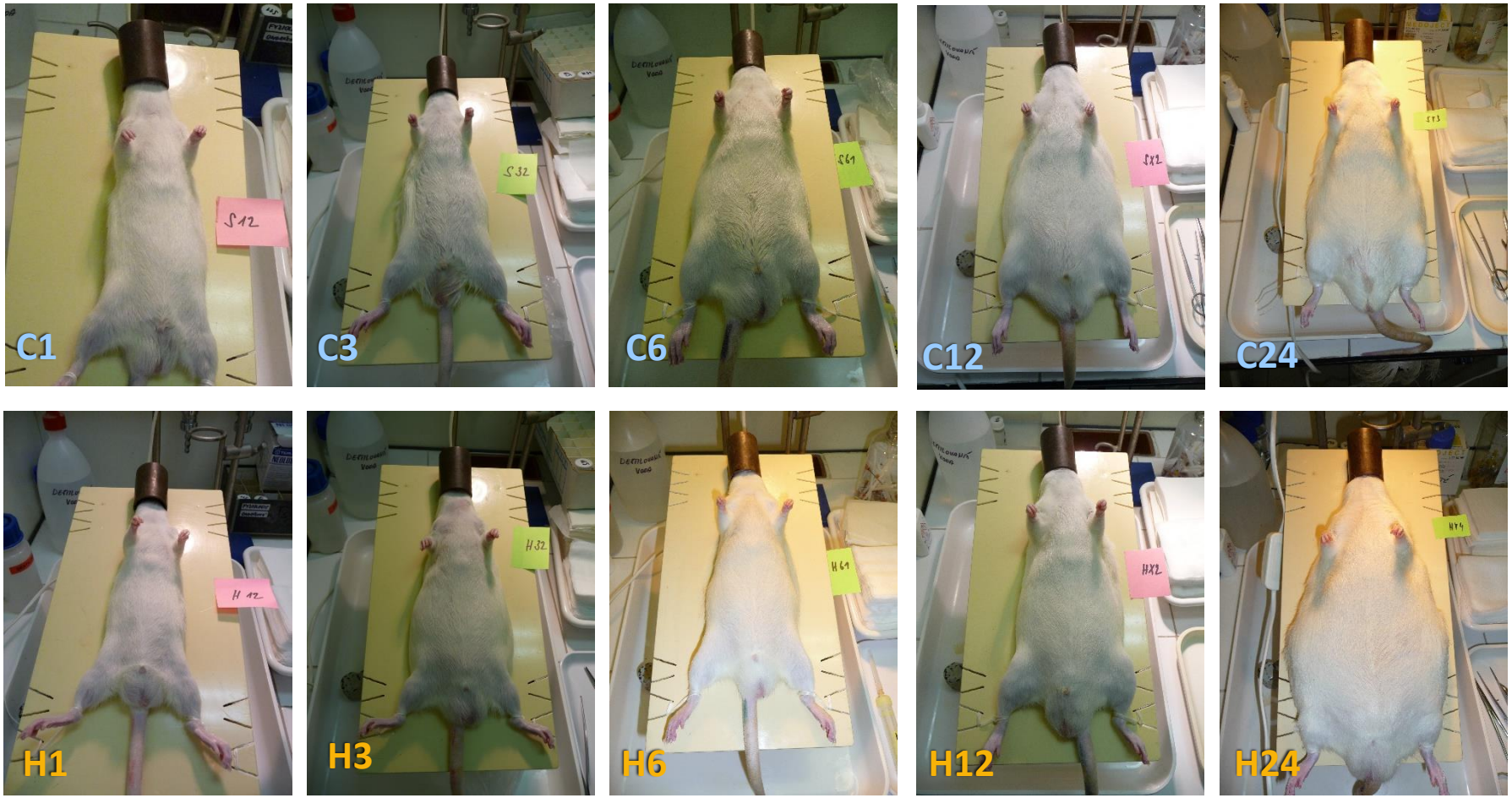
RESPIRATORY PROTOCOLS



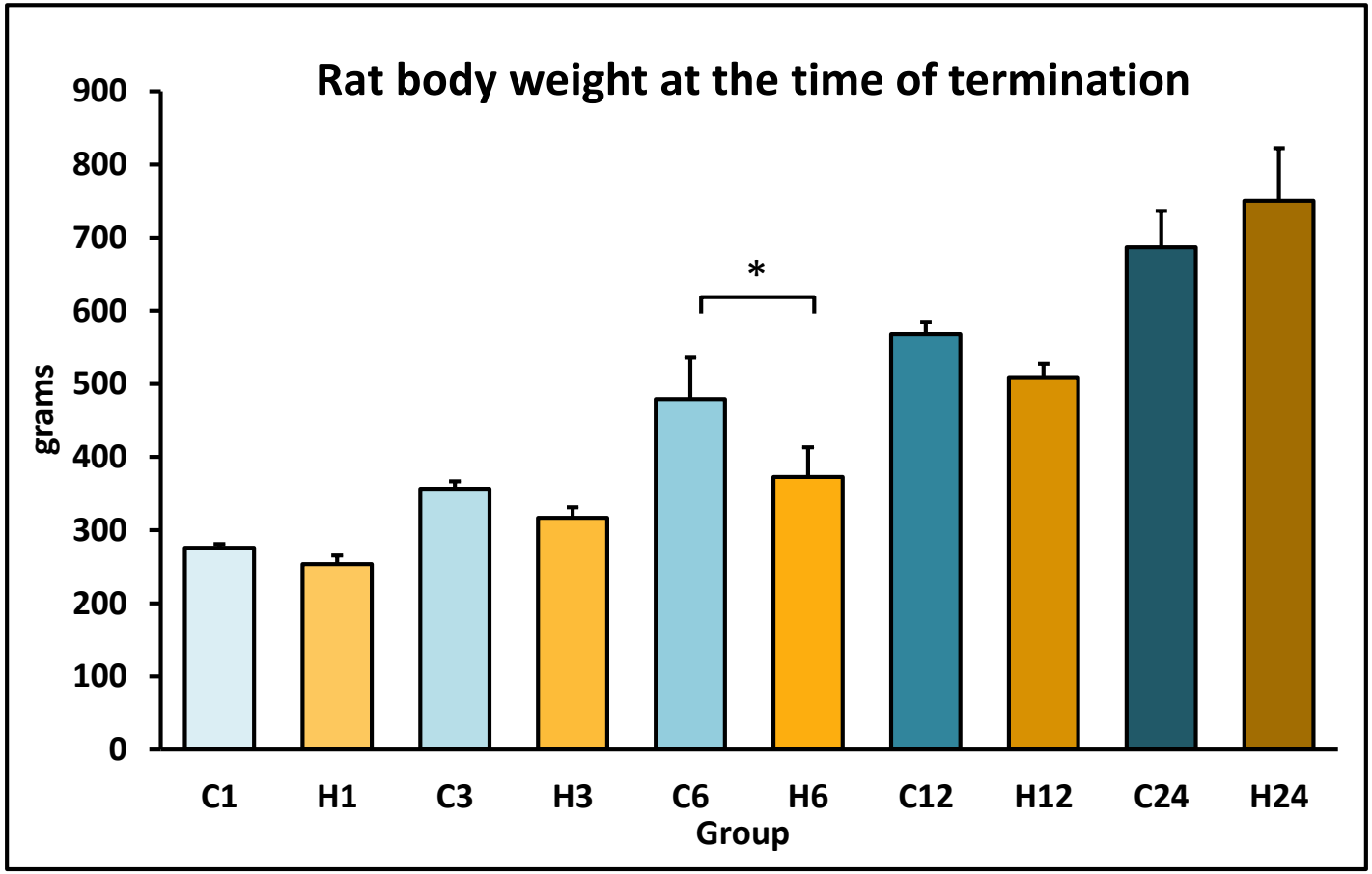


Results

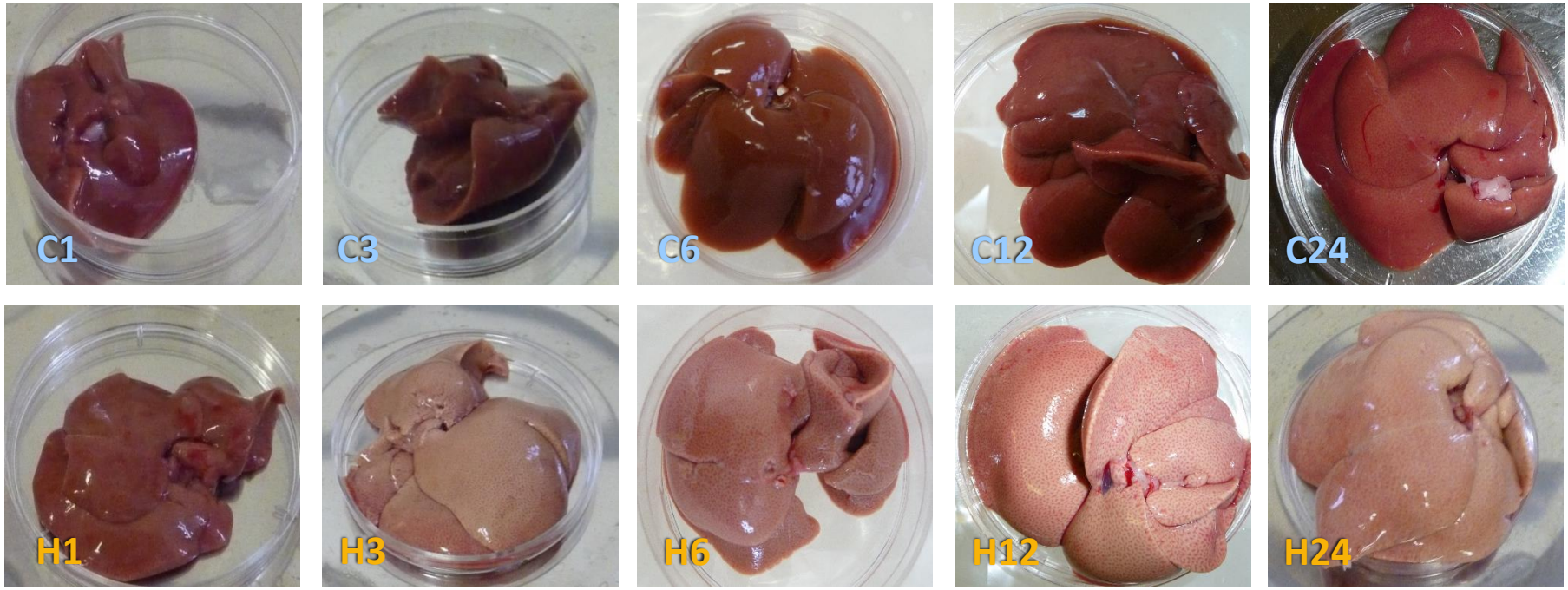
Body weight



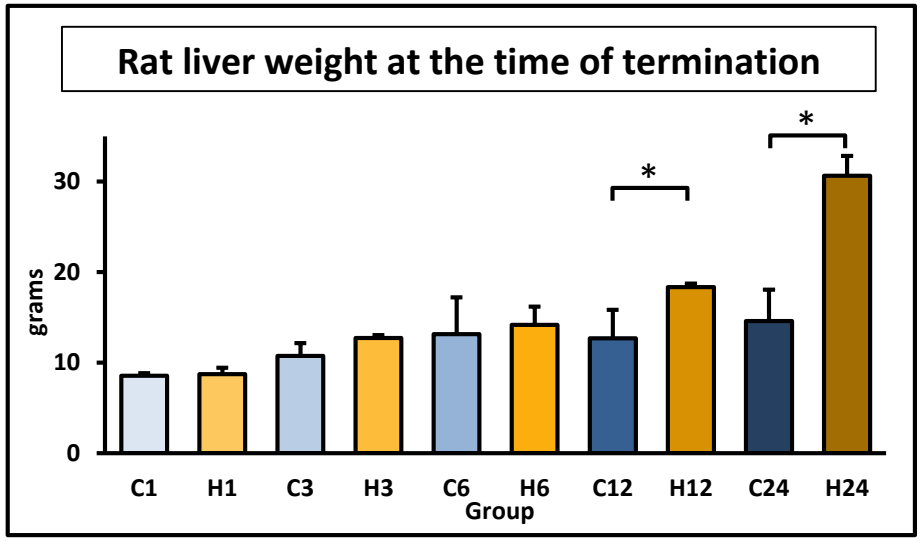
Body weight

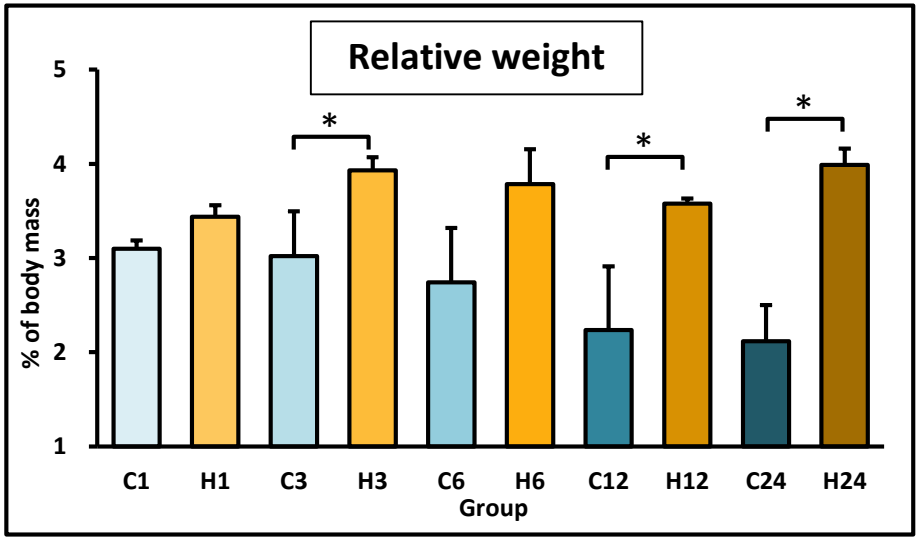

Rat body weight at the time of termination
900
800
700
600
500
400
300
200
100
0
grams
*
C1
H1
C3
H3
C6
H6
C12
H12
C24
H24
Group

Liver weight



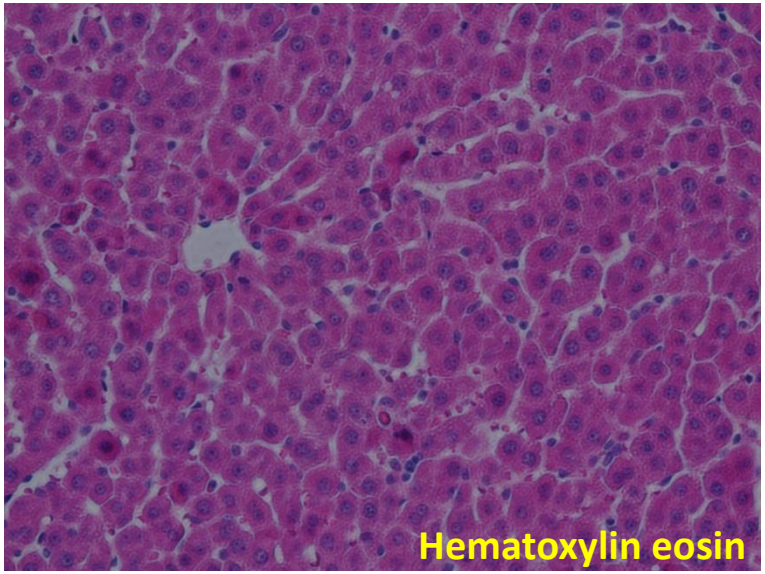
Liver weight



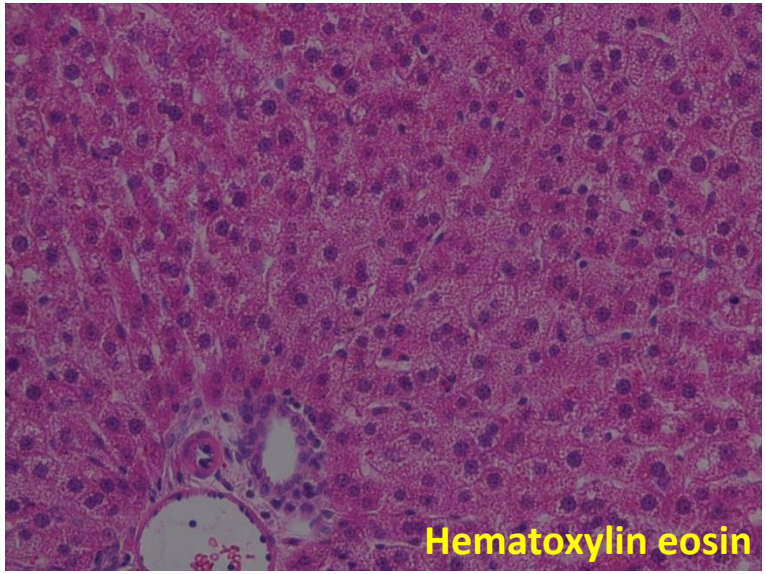


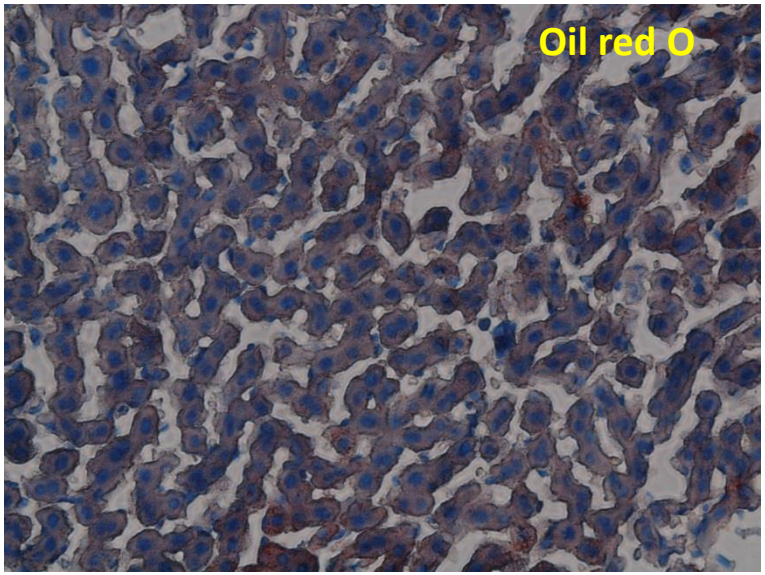
HISTOLOGY

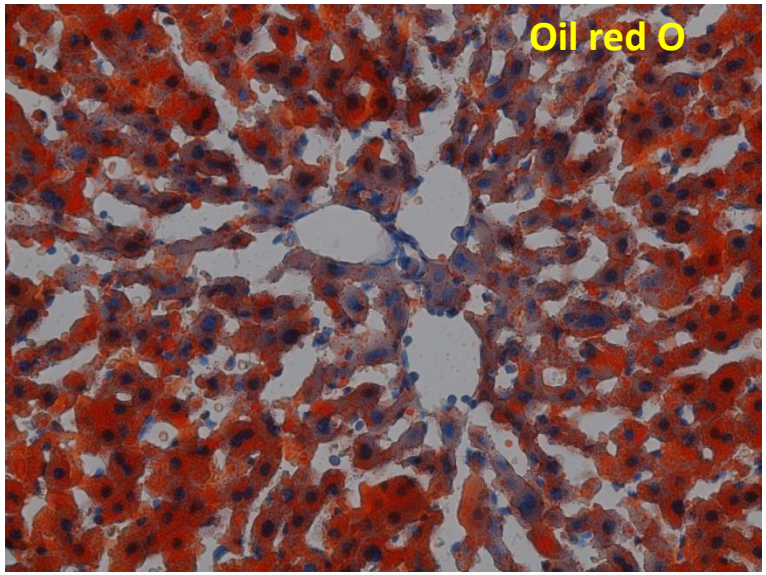
Control - 1 week



HFD - 1 week

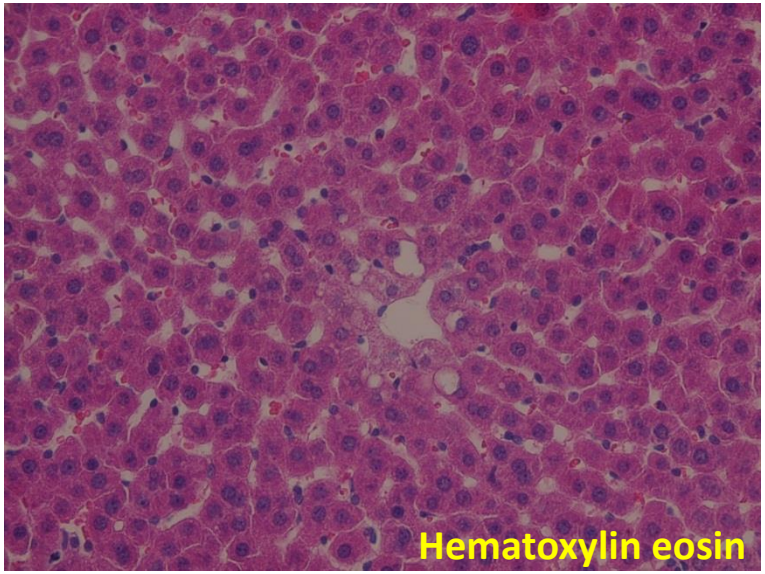


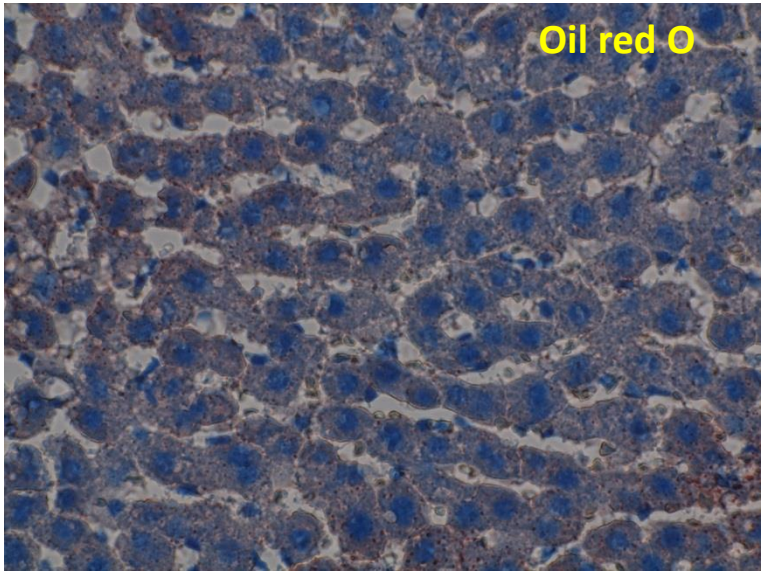




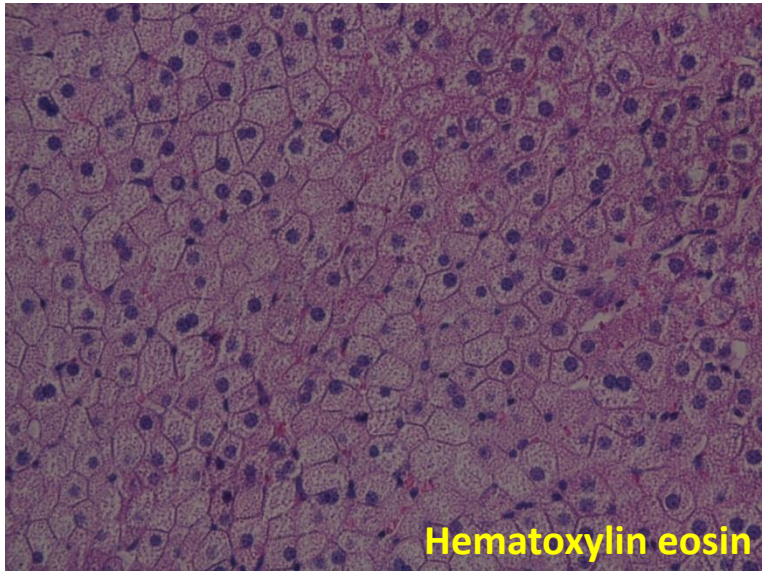
HISTOLOGY

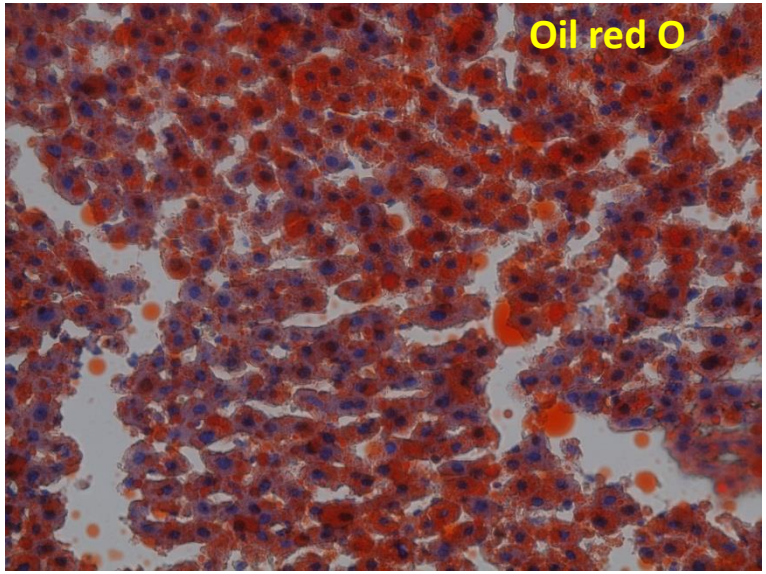
Control - 3 weeks





HFD - 3 weeks





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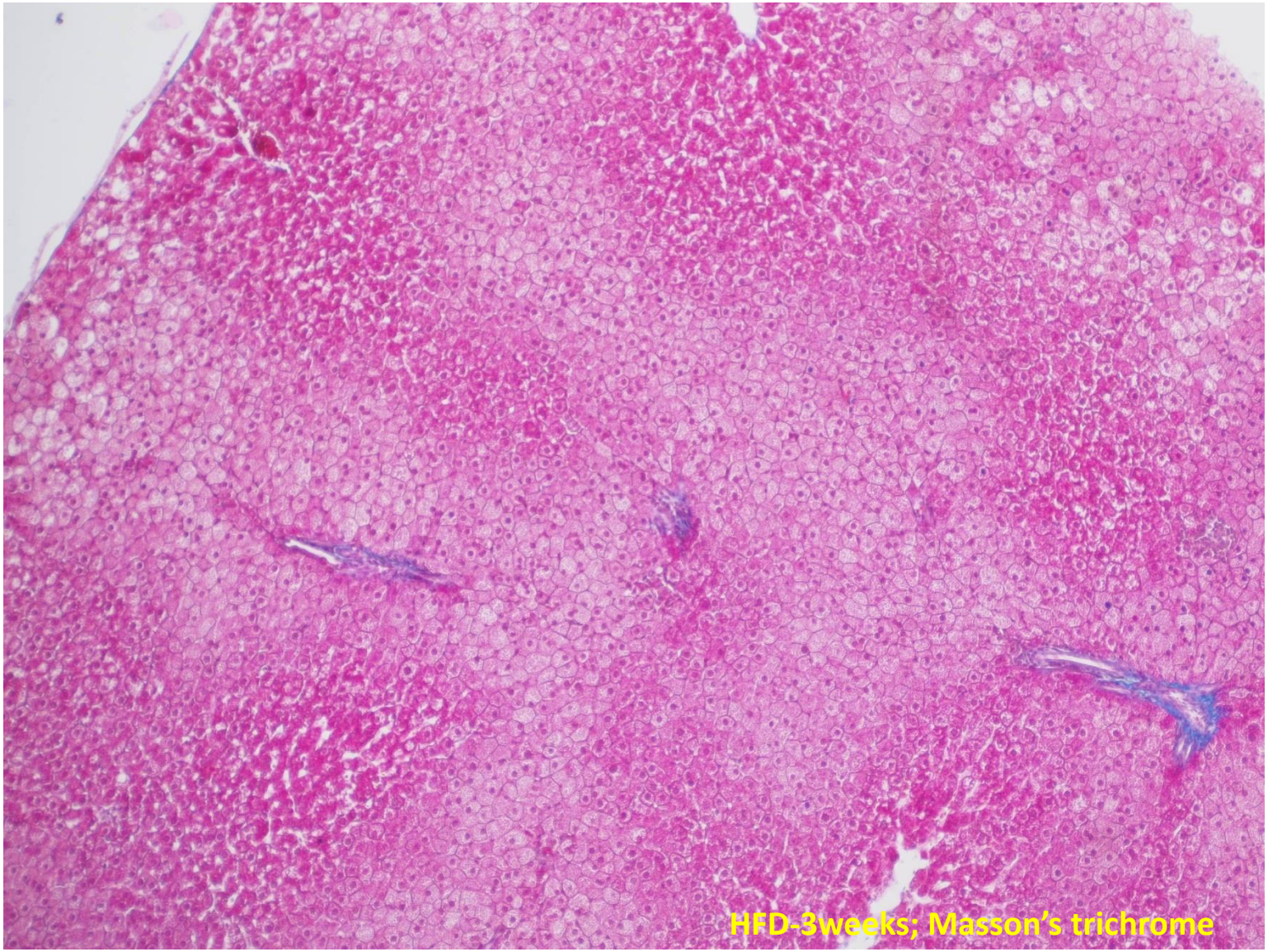
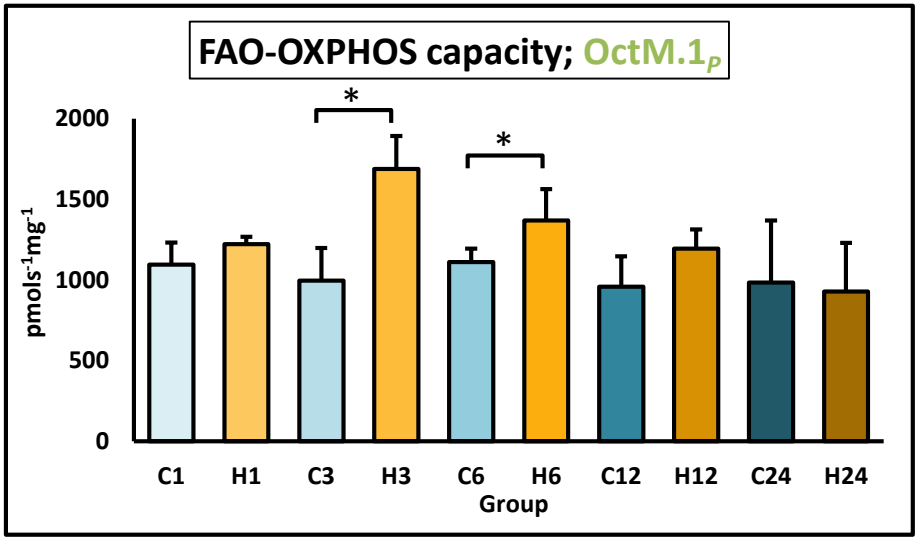
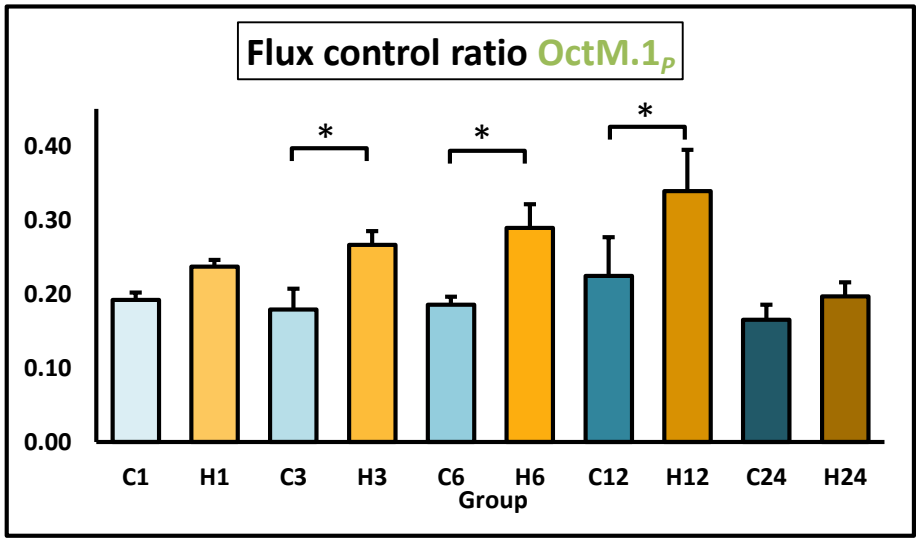
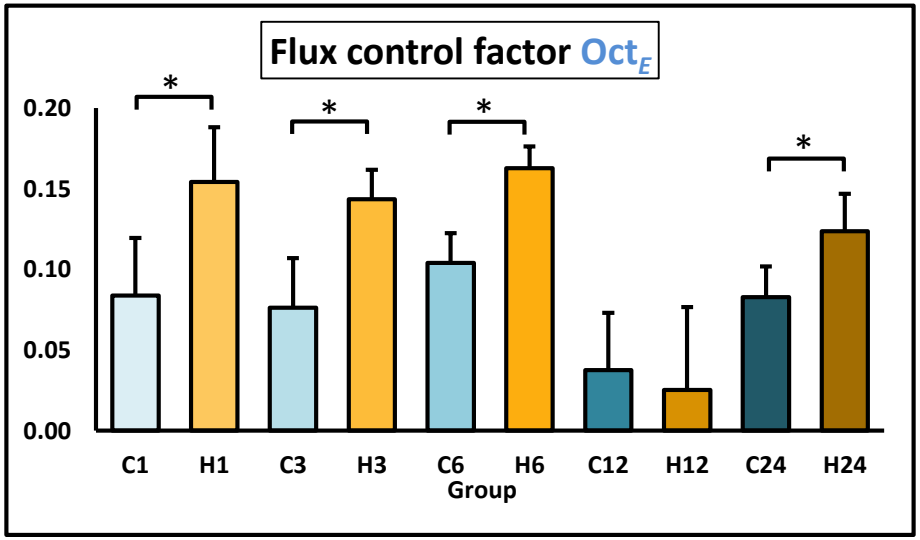


RESPIRATION







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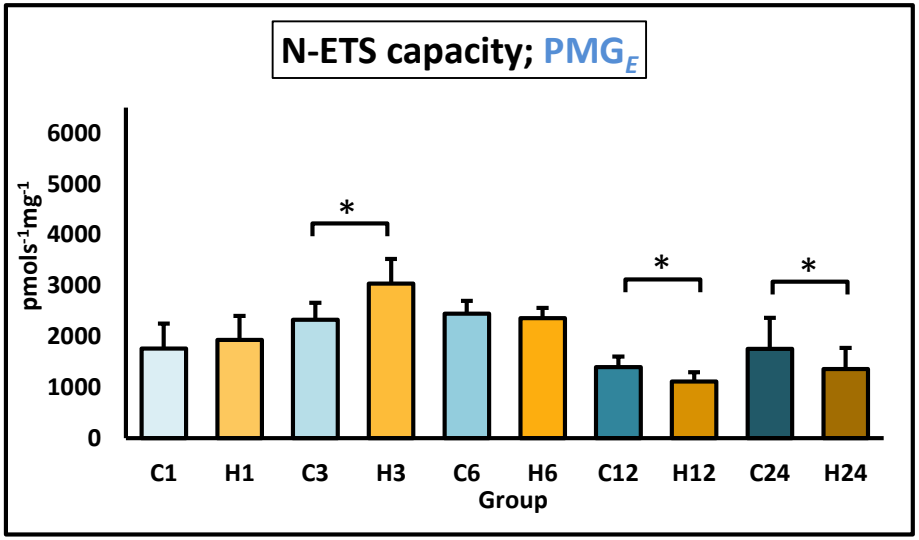

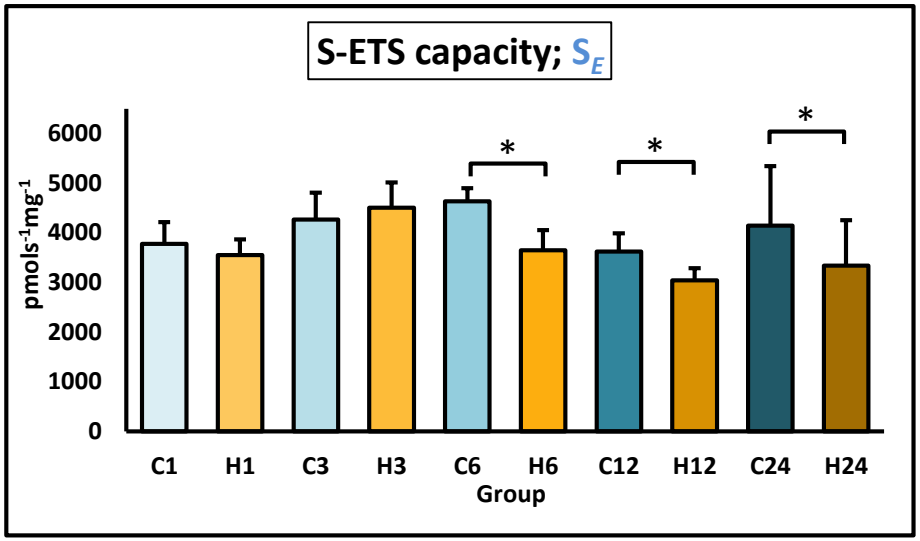

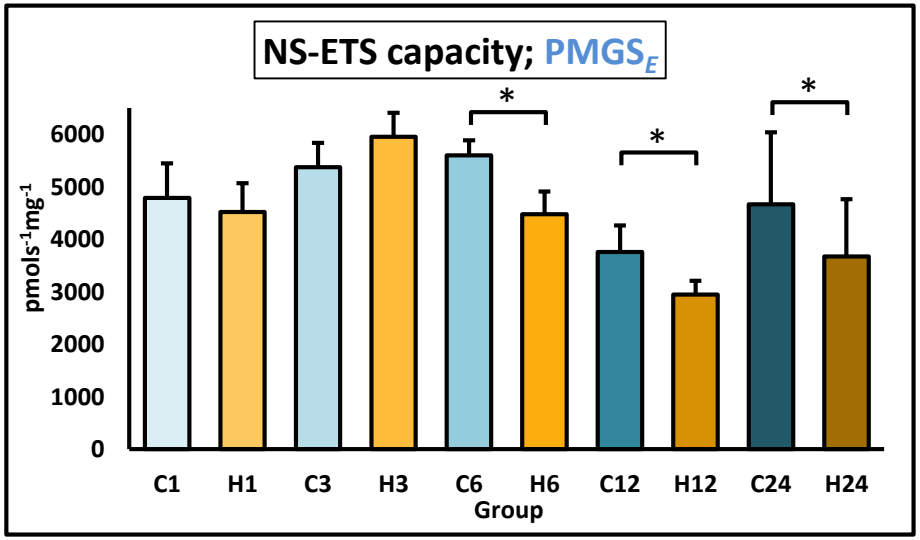

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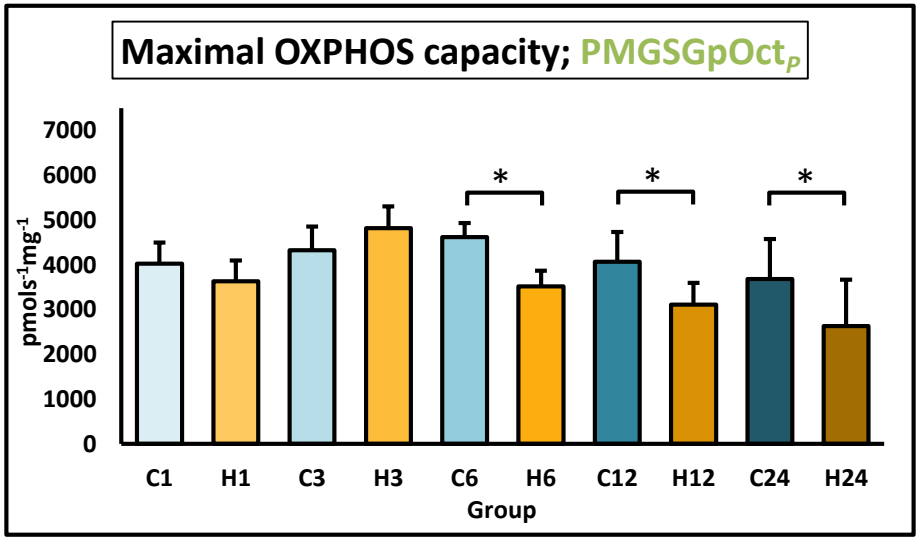

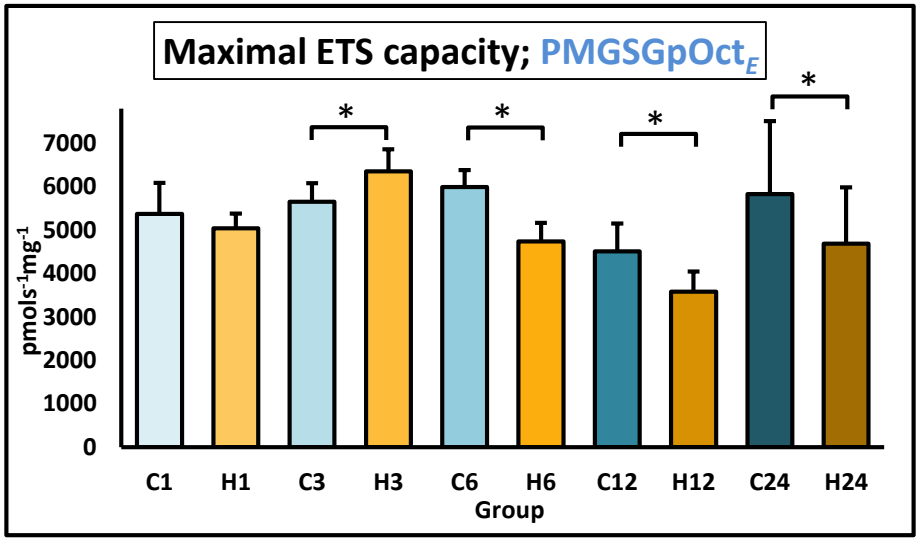

SUMMARY

- Mitochondria adapted to HFD by increasing the FCF_{Oct} already after one week
- Increase of respiratory capacity after 3 weeks:
  - maximal ETS
  - N-ETS
  - FAO-OXPHOS (3 & 6w)
- Decrease of respiratory capacity after 6 weeks and longer:
  - maximal ETS
  - maximal OXPHOS
  - S-ETS
  - NS-ETS

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Thank you for your attention!