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# Monitoring of *de novo* lipogenesis *in vivo* via palmitic acid labelling with deuterium

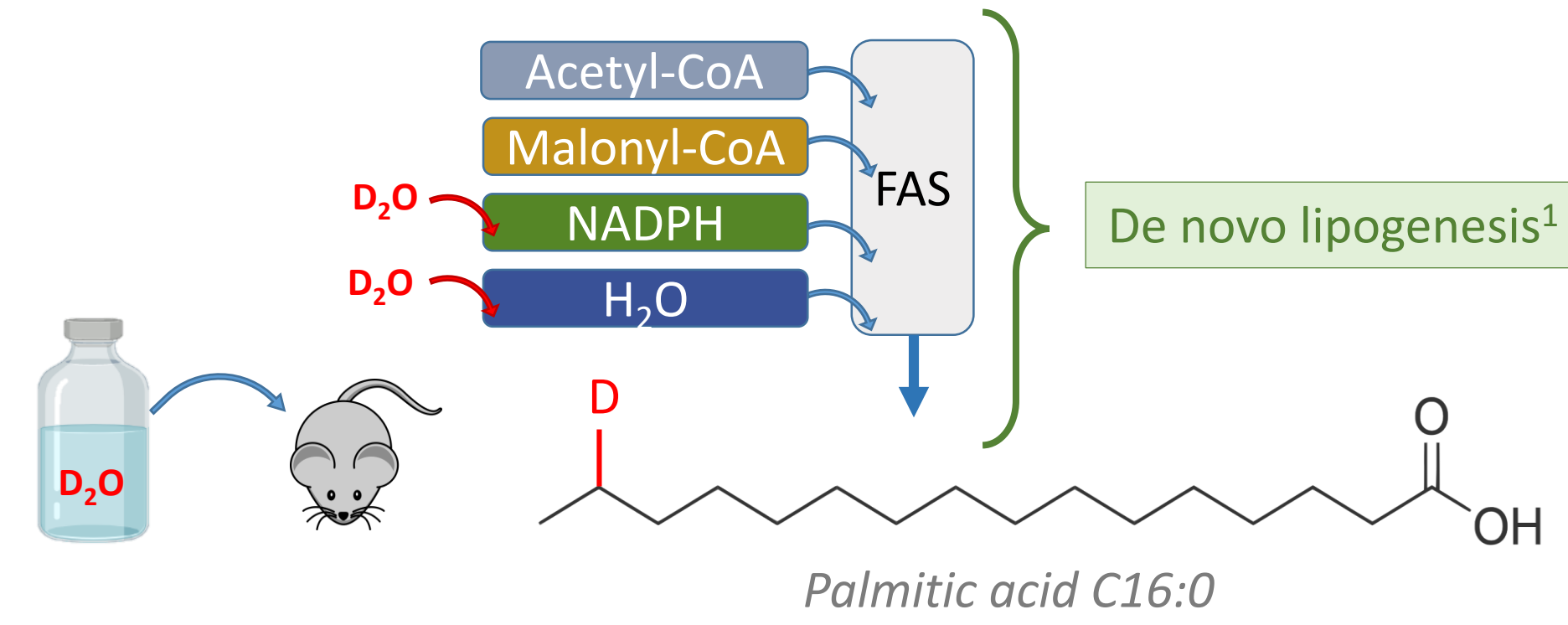


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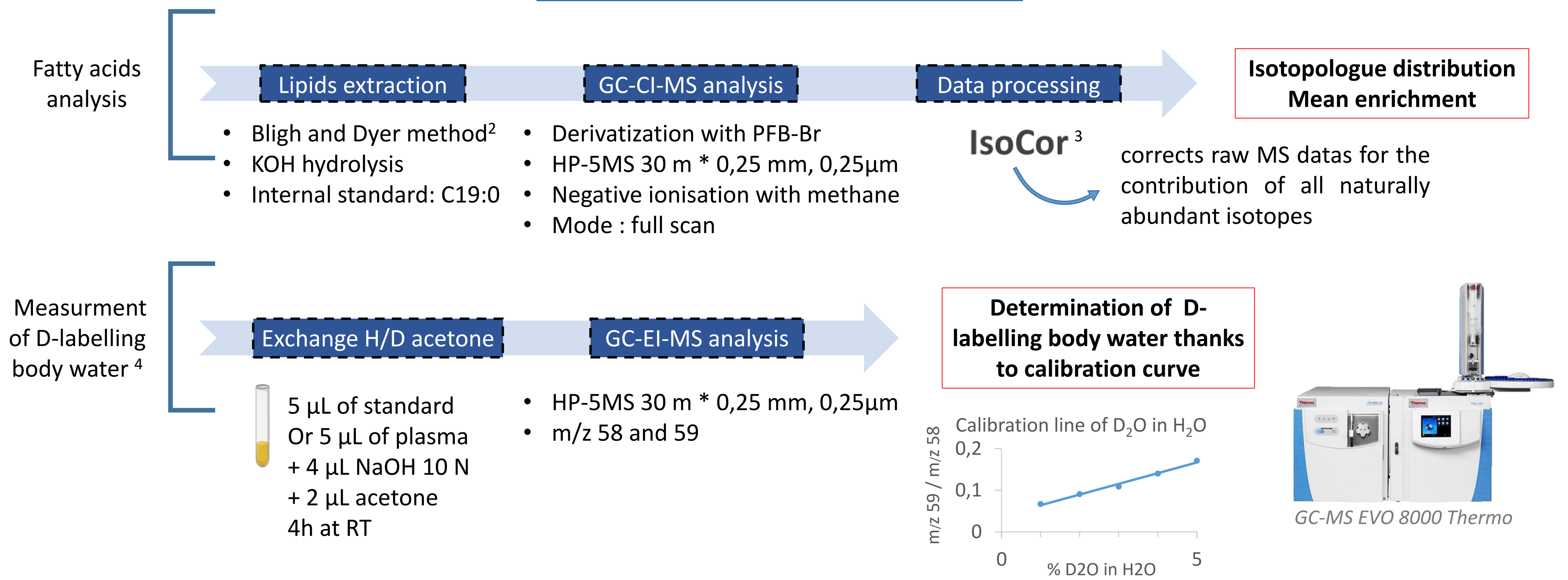
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## Context

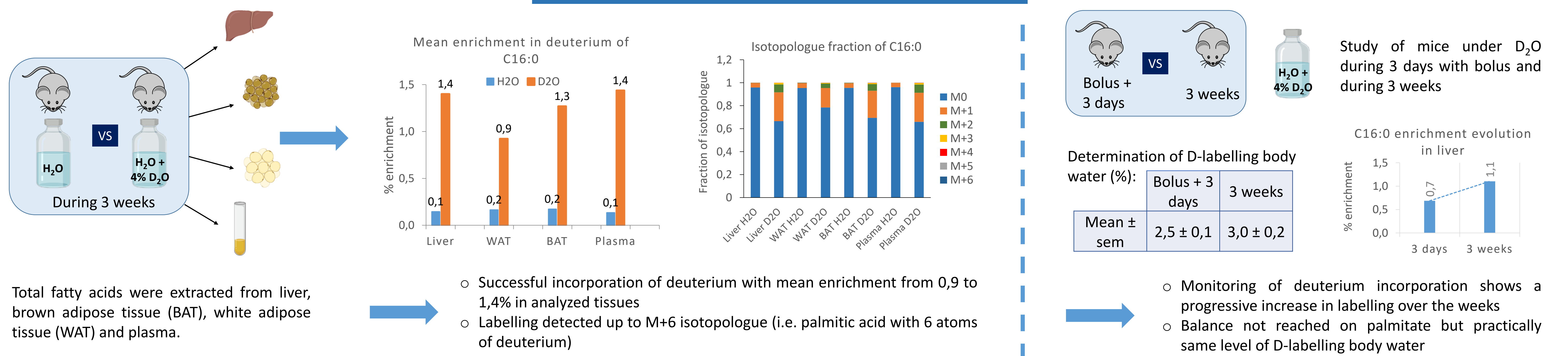
- De novo* lipogenesis (DNL) = *de novo* synthesis of fatty acids, can be altered in a large number of human diseases such as obesity, diabetes but also cancer.
- Quantification of DNL = understand and characterize the mechanisms involved in these pathologies.
- Several non-invasive methods using deuterated water ( $D_2O$ ) to determine lipogenic flux: bolus of  $D_2O$ , prolonged administration.



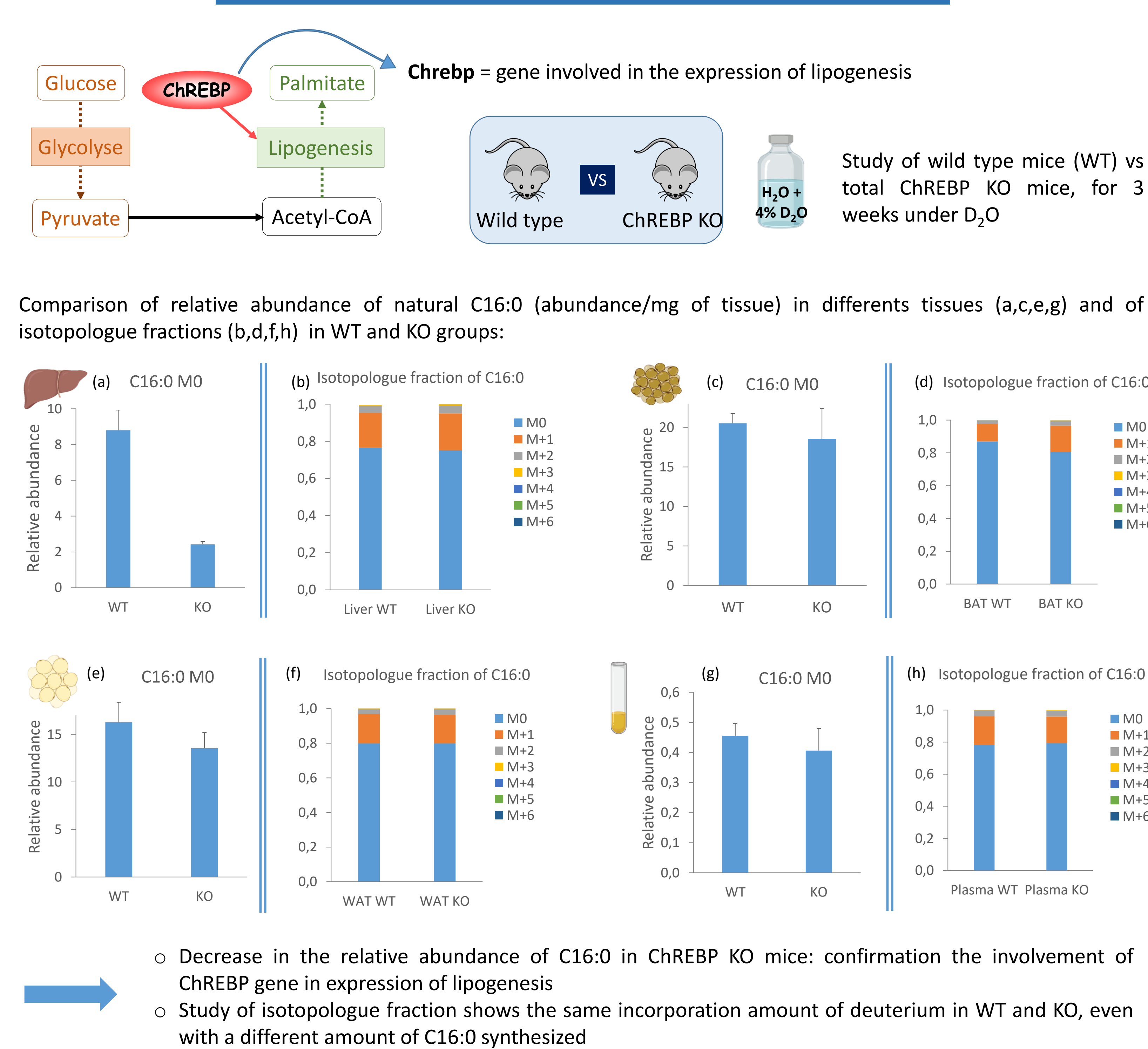
## Analytical workflow



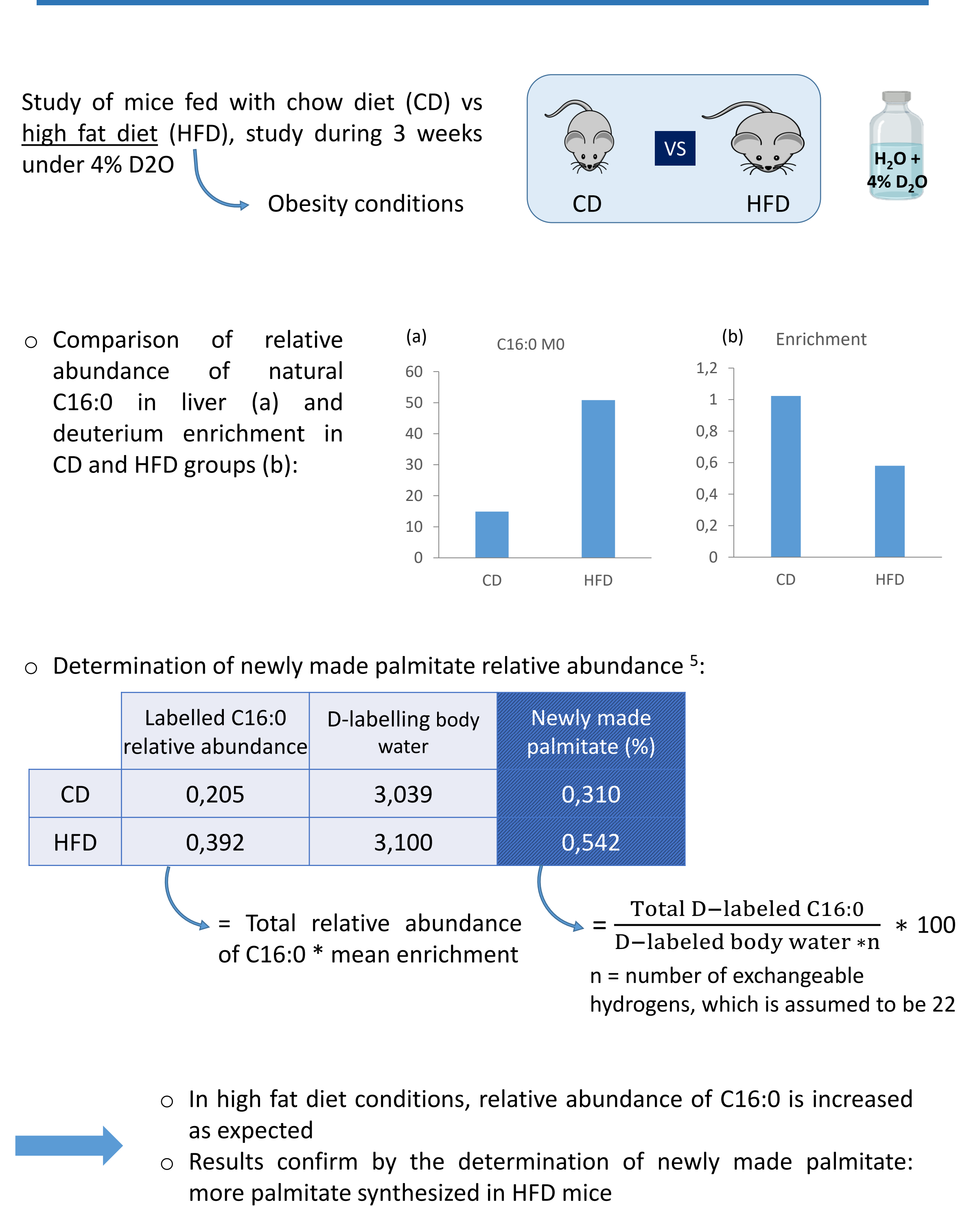
## Confirmation of deuterium incorporation



## Application to mice with a lipogenesis defect



## Application to a physiopathological model of obesity



## Conclusion and perspectives

- Implementation of a workflow that allows the incorporation of deuterium during the synthesis of palmitate
- First results show an mean enrichment around 1% under 3 weeks in various tissues and mice models
- To deepen the model, it will be interesting to study the mean enrichment during a bolus of  $D_2O$  to see on the very short term conditions, as well as on 6 weeks, to determine the time necessary to reach the equilibrium.

## References

- Pathway adapted from Fu, X., Deja, S., Fletcher, J.A. et al. Measurement of lipogenic flux by deuterium resolved mass spectrometry. *Nat Commun* 12, 3756 (2021)
- Bligh EG, Dyer WJ. A rapid method of total lipid extraction and purification. *Can J Biochem Physiol*. 1959
- Protocol adapted from Daurio et al. Spatial and temporal studies of metabolic activity: contrasting biochemical kinetics in tissues and pathways during fasted and fed states. *Am J Physiol Endocrinol Metab*. 2019
- Millard et al, IsoCor: Correcting MS data in isotope labelling experiments, *Bioinformatics*, 2012
- Lee WN, et al. Measurement of fractional lipid synthesis using deuterated water ( $2H_2O$ ) and mass isotopomer analysis. *Am J Physiol*. 1994