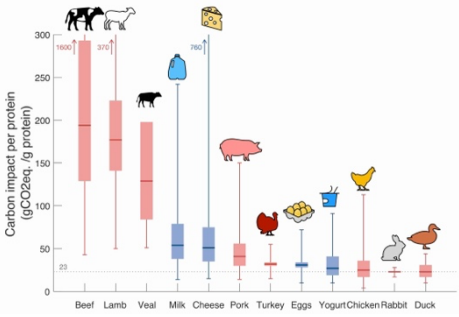
The carbon footprint of aquatic food proteins

Protein-rich products, which are vital for healthy life, represent a significant portion of anthropogenic greenhouse gas emissions [1]. To meet the Intergovernmental Panel on Climate Change recommendations to limit global warming, these emissions should be reduced. Yet, protein-rich products, such as meats, dairy, fish and legumes, contain very different amounts of proteins. Even among a single one of these categories, protein contents vary broadly. To compare these protein-sources one needs to compare the carbon footprint of products relative to the protein content. While there are numerous studies on the carbon footprints of food, these are usually limited to comparing them per gram of edible weight [2]. This makes it difficult in general to rationalize, from a consumer perspective, which protein source has the lowest carbon footprint.

We have recently introduced a simple methodology [3] to compare meat and dairy products relative to their protein content. We uncovered an unexpected result a vegetarian, dairy rich, diet, is not as effective from a carbon footprint diet, as an "enlightened" diet containing chicken and eggs. In fact, products such as cheese are not as effective carbon wise relative to their protein content.

Other important protein sources exist beyond meat and dairy. We propose to study the carbon footprint of aquatic foods (fish, crustaceans, bivalves, seaweed), as there exists many life cycle analysis of the carbon footprint of fish [2]. As for meat and dairy, these products contain very different amounts of protein (from seaweed 6g/100g to Tilapia, 26g/100g). The goal of this study is to perform a meta-analysis of the carbon footprint of aquatic products per protein content. Beyond this crucial output, the study will include a discussion of the different ways fish are eaten at the consumer level (transformed, fresh, frozen etc.). The intern will be able to relate their findings to existing studies on carbon footprints of other protein sources, as well as communicate with a journalist to disseminate their results (Karen Christensen, Berkshire Publishing group [D1]).



Comparing the carbon footprint per protein content of meat and dairy products [3]

The results could open up new consumer perspectives, and have important consequences in the general public [D1,D2].

Profile expected: Generic data analysis, backgrounds in physics, biology, math, economy all work
Tools to be learned: Data analysis with statistical treatment, Data sharing, basics of Life Cycle analysis

A few references

[1] J. Poore, T. Nemecek, Science, 2018, https://doi.org/10.1126/science.aaq0216
[2] J. A. Gephart et al. Nature, 2021, https://doi.org/10.1038/s41586-021-03889-2
[3] R. Gaillac, S. Marbach, J. Clean. Prod. 2021, https://doi.org/10.1016/j.jclepro.2021.128766

Dissemination contributions

[D1] Article in Home Ecology, Karen Christensen, Berkshire Publishing group, https://homeecology.substack.com/p/fresh-thinking-about-food-waste-and
[D2] Video « We gotta talk about cheese » by Planet A, Deustche Welle https://www.youtube.com/watch?v=_u_sLantkq4&t=18s

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