

Low-cost dietary proteins from algae-based and plant residual biomass for dietary supplements for elderly and active consumers

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Introduction

Currently used plant-based proteins from sources as soy, cereals or potatoes are mostly imported into Europe and are environmentally unsustainable. The scarcity of this kind of resources in Europe, whose availability does not meet the demands of the region, forces the search for new sources of protein, which have not been exploited until now. ALEHOOP project provides the demonstration at pilot scale of both sustainable macroalgae (commonly known as seaweed) and legume-based biorefineries for the recovery of LOW-COST DIETARY PROTEINS from algae-based and plant residual biomass and their validation to meet market requirements of consumers and industry. The biomass is converted into alternative forms of proteins for a variety of uses, ranging from animal feed, food additives and high-end applications considering nutritional awareness and health management. A sufficient quantity of high-quality protein is also required for hormone and enzyme production, as well as for the immune system. A targeted adaptation of protein intake to change training stimuli is therefore recommended for performance-oriented athletes. For sport practicing people, protein is an essential nutritional component in their diet to repair and build muscle tissue broken down during exercise.

Smoothfood concept, as texture modified foods, targets consumers with mastication and swallowing disorders, addressing thus mostly elderly people. This population group has high protein needs, mainly for counteracting age-related phenomena as sarcopenia and/ or malnutrition.

Material & Methods

In ALEHOOP EU Project, the main objectives are:

- (1) taking advantage of the remains from botanical origin materials processing (legumes) and residual macroalgae as feedstock, which can provide demanded proteins in an eco-friendlier way.
- (2) optimising the processing of algal biomass in biorefinery, in order to increase the protein harvest with respect to other processes at laboratory scale, with specific involvement in terms of quality and quantity.
- 3) Validation of specific food products with specific target audiences containing ALEHOOP proteins such as smoothfood and sport drinks for elderly and active consumers.

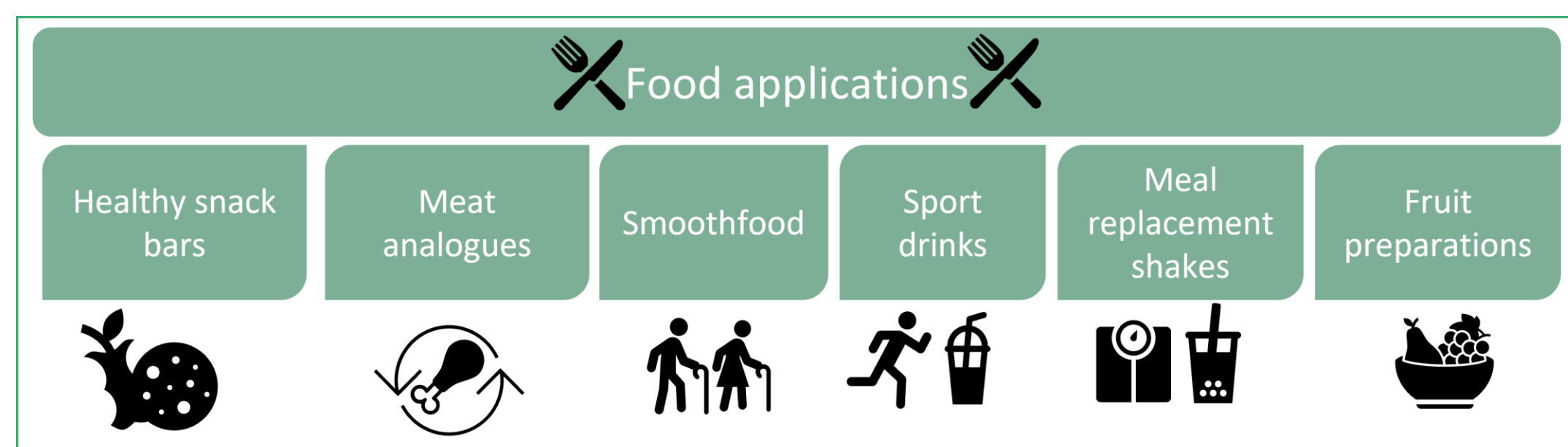


Figure 1: Food applications foreseen within ALEHOOP project

Results & Discussion

Within EU project ALEHOOP alternative protein sources such as the green macroalgal blooms, brown seaweed by-products from algae processors and legume processing by-products (peas, lupines, beans and lentils) are addressed. Pea protein content is about 20%-25%, beans 21%-25%, lentils 23.4%–36.4%, and lupines 36-52%, which are 2-3 times higher than the protein content of cereals (e.g., wheat 12%)^{1,2,3}. A detailed inventory of the relevant National and European regulations affecting the ALEHOOP Project has been prepared to assess the Legal and Ethics requirements.

Novel powder formulations have been generated combining the new proteins obtained with various nutrients (carbohydrates, dietary fibre, minerals, and vitamins), considering at the same time some key individual needs. Also, consumption/dietary recommendation for the targeted population groups have been considered and implemented within the product development. Thus, the new proteins were validated in texture modified (TM) foods for elderly, dietary supplements for active/sportive people, vegetarians and consumers of increased health-awareness.



Figure 2: First food applications: A. protein enriched TM bread B. high caloric instant potato puree C. solubility trials of protein in water for (sport) drink applications

Conclusion

Protein is an important ingredient of beverages in the active/sports nutrition and elderly market. The novel proteins will be a vital resource, particularly for high-protein active/vegan sports for elderly and active consumers in general. Innovative and differentiate products with health benefits to guarantee the consumers expectations are proposed within ALEHOOP project.

References

- 1: Verstringe, S., Vandercruyssen, R., Carmans, H., Rusu, A.V., Bruggeman, G., Trif, M. Alternative Proteins for Food and Feed. 2023. In: Galanakis, C.M. (eds) Biodiversity, Functional Ecosystems and Sustainable Food Production. Springer, Cham.
 - 2: Khazaei, H.; Subedi, M.; Nickerson, M.; Martínez-Villaluenga, C.; Frias, J.; Vandenberg, A. Seed Protein of Lentils: Current Status, Progress, and Food Applications. *Foods* 2019, 8, 391.
 - 3: Billy Lo, Stefan Kasapis, Asgar Farahnaky. Lupin protein: Isolation and techno-functional properties, a review. *Food Hydrocolloids* 2021, 112, 106318.
- <https://alehoop.eu/>
<https://www.bbi.europa.eu/projects/alehoop>
<https://renewable-carbon.eu/news/bbi-ju-launches-22-projects-to-support-green-recovery-of-europe/>

