Stability of a lyophilized milk enriched with microbial CLA/CLNA

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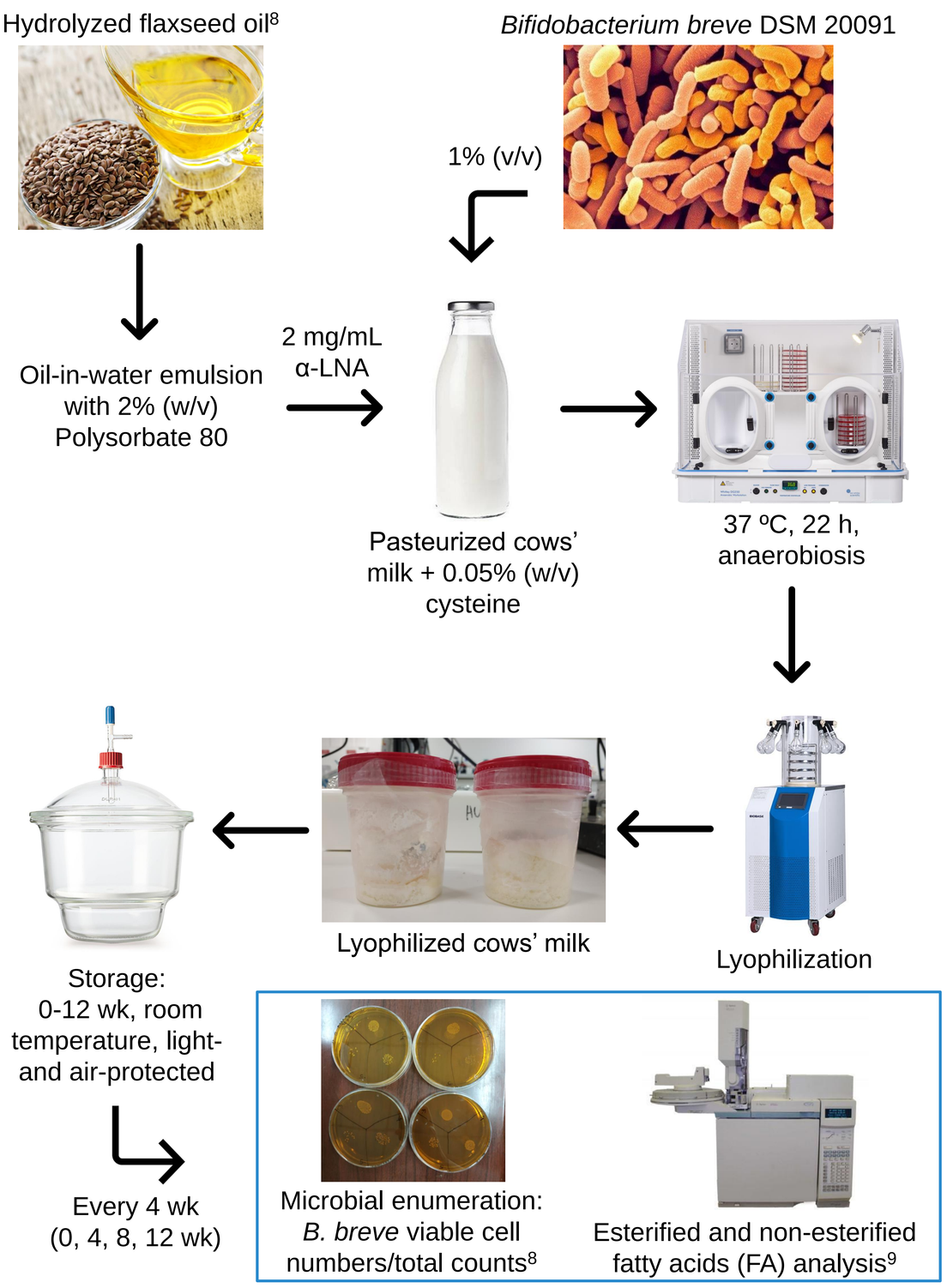
Introduction

There is an increasing interest towards the development of innovative value-added food products with a potential to prevent or counteract disease conditions. Several food-derived lipids with potential bioactive properties have been identified over the last decade, and these include conjugated linoleic (CLA) and conjugated linolenic (CLNA) acids[1,2]. Due to limited availability in their natural sources (e.g. ruminants' milk and meat or vegetable oils)[3,4], *in situ* microbial production in dairy products may potentially improve CLA/CLNA daily intake, since several probiotic strains have been reported to produce CLA/CLNA isomers using linoleic (LA) and alpha-linolenic (α-LNA) acids as precursor substrates, respectively[5,6]. Previous work by this research team led to the formulation of a CLA/CLNA-enriched lyophilized milk, using *Bifidobacterium breve* DSM 20091 and hydrolyzed flaxseed oil (FSO; rich in α-LNA). Since CLA, CLNA, LA and α-LNA are polyunsaturated and prone to oxidation[7], this research aimed to investigate if this new functional milk product is stable at conditions mimicking shelf-life.

Methods



Results

Bifidobacterium breve DSM 20091 viable cell numbers were found to be below the countable range (<5x10^3 CFU/mL) immediately after freeze-drying and throughout storage; total microbial counts followed a similar trend (<2x10^3 CFU/mL).

As for the FA profiles, in the non-esterified fraction (NEFA), the CLA and CLNA contents in the enriched milk product increased after 4 weeks (up to 1.80 and 11.12 mg/g, respectively) and, thereafter, no significant differences were detected. Similarly, total polyunsaturated FA (PUFA) increased by 16.88-31.83%, comparing to time 0 wks.

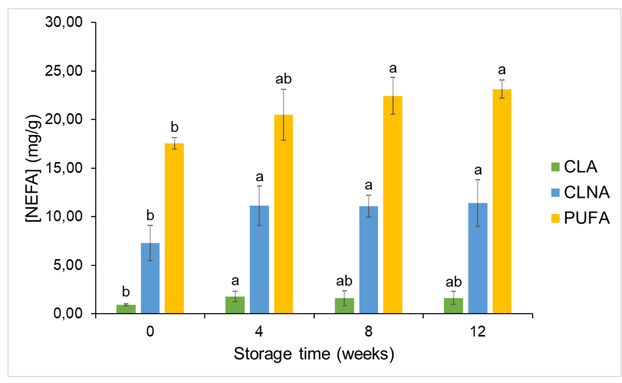


Figure 1. Non-esterified fatty acids (NEFA) content (mg/g) of lyophilized CLA/CLNA-enriched milk throughout 12 weeks storage.

Regarding FA profile in the esterified fraction (EFA), PUFA levels increased significantly after 8 weeks (up to 5.79 mg/g) and then slightly reduced to 5.18 mg/g at the end of 12-wk storage period. Only CLA was present at low amounts, but it also increased to a significant ($p<0.05$) extent after 8 weeks (up to 0.54 mg/g).

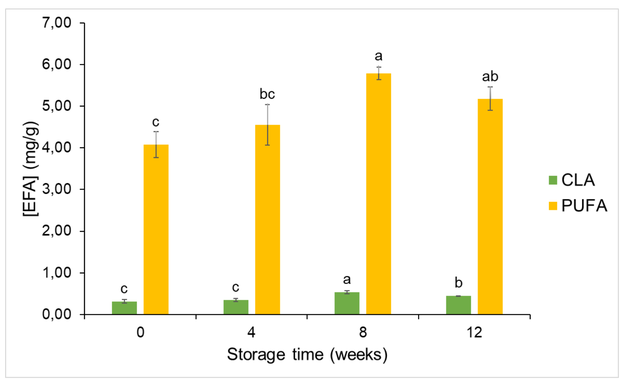


Figure 2. Esterified fatty acids (EFA) content (mg/g) of lyophilized CLA/CLNA-enriched milk throughout 12 weeks storage.

Conclusions

- The lyophilized form of CLA/CLNA-enriched milk was able to maintain a favorable microbial stability throughout 12 weeks of storage.
- Reported trends - increase in NEFA PUFA, including CLA and CLNA, throughout storage and overall similar EFA PUFA (except for 8 wks) - show that the PUFA content may have undergone hydrolysis, probably due to specific oxidation processes.

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Acknowledgements

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