Fatty acids profiles and lipids health indices of plant-based burgers compared to meat burger

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Objectives: Plant-based burgers (PBBs) are gathering interest among scientists and the food industry. For this, it is necessary to evaluate its traits and especially in terms of health quality compared to the meat. In this study, the fatty acids (FAs) were profiled in a commercial and new-produced PBBs and compared to a meat burger (MB).

Materials and Methods: One MB, two commercial (CB, CE) and seven self-produced (P1 to P7) PBBs were analyzed in triplicate for FAs profile. PBBs were based on pea protein. After cooking [1], samples were homogenized and freeze-dried. Lipid extraction and FAs analysis were conducted according to Schmid et al. [2] for MB, and to Alves et al. [3] for the PBBs. Lipids health quality was assessed by the atherogenic (AI) and the thrombogenic (TI) indices as well as the ratio between the hypocholesteronic and hypercholesteronic (HH) using the following equations [4]:

$AI = (4 \times C14:0 + C16:0 + C18:0)/ (\Sigma MUFA + \Sigma PUFA\_\omega6 + \Sigma PUFA\_\omega3)$

$TI= (C14:0+C16:0+C18:0) / (0.5\ \Sigma MUFA+0.5\Sigma PUFA\_\omega6+3\Sigma PUFA\_\omega3+ \Sigma PUFA\_\omega3/\Sigma PUFA\_\omega6)$

$HH=(C18:1\omega9+C18:2\omega6+C20:4\omega6+C18:3\omega3+C20:5\omega3+C22:5\omega3+C22:6\omega6)/ (C14:0+C16:0)$

PUFA:polyunsaturated fatty acids,

MUFA:monounsaturated fatty acids.

Results and Discussion: A total of 21 FAs were detected in MB and 19 FAs in PBBs. Oleic, palmitic, and stearic acid were identified in all the samples and were significantly higher in MB than PBBs, and consequently, a higher saturated fatty acids (SFA) level in MB than the PBBs. The CE has the significantly highest percentage of both MUFA and PUFA. The lipids in self-produced PBBs were predominantly MUFA, recording percentages between 44.7%, 49.6% for P6 and P4. MB had 50.0% and CE 57.6%. PBBs also contained a significantly higher percentage of PUFAs ranging from (20.8% and 30.4%) than the MB (7.0%).

In details, among all the FAs detected in PBBs, the three major FAs were oleic, linoleic and lauric acid, as expected, because the canola oil is an important ingredient with a percentage of about 7% [5], which explain the high percentage of MUFA and PUFA observed.

Compared to MB, the PUFAω3 and PUFAω6 of the PBBs were incremented which led to the decrease of atherogenicity and thrombogenicity indexes and an increase of hypo/hypercholesterolémic index. The higher ω-6 family for PBB types compared to the meat, which was mostly because of the rise of linoleic acid percentage, contributed largely to the observed differences in AI, hypocholesterolemic FAs percentages and HH ratios between self-produced burgers.

Our results showed that AI and TI of all self-produced PBBs were significantly lower (AI 0.425 to 0.552; TI 0.336 to 0.423) than AI and TI of the meat (0.842 and 1.364 respectively) and, as it is known, lower AI and TI has a good effect on the human circulatory system [6]. The HH indice was higher for CE (9.84) and ranged from 4.64 to 5.89 in the PBBs, while the HH of MT was only 1.73.

In humans, the FAs of the two families ω6 and ω3 are synthesized from their dietary precursors (linoleic and linolenic acid) through a series of reactions some of which share the same enzymes. Therefore, because of this competition for the same enzymes, on one hand, and of the distinct functions of these two families, on the other hand, a balance between the two families is considered important for cardiovascular health.

Conclusions: FAs profiles of PBBs were different from the meat and between each other depending on the ingredients and the type of oil added. According to the three studied indices, it seems that the PBBs could be linked to some health benefits. However, it would be better to improve the ω3/ω6 ratio which is recommended to be around 5 for the human [7].

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